EFFECT OF SOME BOTANICALS AND BIO-CONTROL AGENTS IN CONTROLLING BRINJAL SHOOT AND FRUIT BORER (LEUCINODES ORBONALIS GUEN) IN BRINJAL

MD. NASIR UDDIN



DEPARTMENT OF ENTOMOLOGY SHER-E-BANGLA AGRICULTURAL UNIVERSITY DHAKA 1207

JUNE, 2010

EFFECT OF SOME BOTANICALS AND BIO-CONTROL AGENTS IN CONTROLLING BRINJAL SHOOT AND FRUIT BORER (LEUCINODES ORBONALIS GUEN) IN BRINJAL

BY

MD. NASIR UDDIN

REGISTRATION NUNBER: 04-01464

A thesis Submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN ENTOMOLOGY

SEMESTER: JANUARY-JUNE, 2010

Approved by:

(Dr. Md. Mizanur Rahman) Supervisor & Professor Department of Entomology SAU, Dhaka (Dr. Md. Razzab Ali) Co-Supervisor & Professor Department of Entomology SAU, Dhaka

Chairman Department of Entomology & Examination Committee

ACKNOWLEDGEMENTS

The author first wants to articulate his enormous wisdom of kindness to the Almighty Allah for His never ending blessing, protection, regulation, perception and assent to successfully complete the Master of Science in Entomology.

The author like to express his deepest sense of gratitude and sincere appreciation to his honorable supervisor Dr. Md. Mizanur Rahman, Professor, Department of Entomology, Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh, for his continued supervision, support, encouragement, practical criticism and invaluable suggestions throughout the study period and gratuitous labor in conducting and successfully completing the research work and the preparation of the manuscript.

The author also expresses his gratefulness and best regards to respected Co-Supervisor, Md. Razzab Ali, Professor, Department of Entomology, Sher-e-Bangla Agricultural University, Dhaka for his pedagogic guidance, helpful comments and constant inspiration throughout the research work and preparation of the thesis.

The author expresses his sincere respect to the Chairman Department of Entomology, Sher-e-Bangla Agricultural University, Dhaka for valuable suggestions and pleasant cooperation during the study period. The author also expresses heartfelt thanks to all the teachers of the Department of Entomology, SAU, for their valuable suggestions, instructions, cordial help and encouragement during the period of the study.

The author expresses his sincere appreciation to his brother, sisters, relatives, well wishers and friends for their inspiration, help and encouragement throughout the study period.

Dated: Author Place: SAU, Dhaka

EFFECT OF SOME BOTANICALS AND BIO-CONTROL AGENTS IN CONTROLLING BRINJAL SHOOT AND FRUIT BORER (LEUCINODES ORBONALIS GUEN) IN BRINJAL

BY

MD. NASIR UDDIN

ABSTRACT

The experiment was conducted at the Farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh to study the effect of some botanicals and bio-control agents in controlling Brinjal Shoot and Fruit Borer (BSFB) during the period from April to October 2009. The experiment consists of the following management practices: T_1 : Neem oil @ 4ml/L of water at 7 days interval; T₂: Neem seed kernel @ 300g/L of water at 7 days interval; T₃: Trichogramma evanescense @ 0.1g/6 m² at 7 days interval; T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval; T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension/L of water + Safeclean 2.5 ml/L of water at 7 days interval; T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval and T_7 : Untreated control. The plants treated with T_1 treatment (Neem oil @ 4 ml/L of water at 7 days interval), resulted significantly lowest percentage of infested shoot & fruit compared to those of other treatments during early, mid and late fruiting stage. Significantly the highest yield was obtained in plant under the treatment T_1 . The treatments T_2 (Neem seed kernel @ 300g/L of water at 7 days interval) and T_3 (*Trichogramma evanescence* @ 0.1g/6 m² after 7 days interval) also gave more or less similar result as treatment T_1 . The yield contributing characters found highest in T_1 treatment for length and girth of fruits, weight of individual fruit, edible portion, non edible portion and yield per hectare. The highest Benefit Cost Ratio was found in T_1 may be due to the minimum infestation and cost compared to the other treatment components and the highest yield was produced in this treatment. Length, girth of healthy fruits, individual fruit weight and edible portion of fruit showed significant positive relation with yield of brinjal.

CHAPTER P		Page
	ACKNOWLEDGEMENTS	i
	ABSTRACT	ii
	TABLE OF CONTENTS	iii
	LIST OF TABLES	V
	LIST OF FIGURES	vii
	LIST OF PLATES	vii
	LIST OF APPENDICES	viii
1.	INTRODUCTION	01
2.	REVIEW OF LITERATURE	05
	2.1 Origin and Distribution of BSFB	05
	2.2 Pest Status and Host Range of BSFB	06
	2.3 Nature of Damage of BSFB	06
	2.4 Seasonal abundance of BSFB	07
	2.5 Bionomics of BSFB	09
	2.6 Management of BSFB	11
3.	MATERIALS AND METHODS	22
	3.1 Experimental site	22
	3.2 Soil	22
	3.3 Climate	22
	3.4 Planting material	23
	3.5 Land preparation	23
	3.6 Manures and fertilizers application	24
	3.7 Treatments of the experiment	24
	3.8 Experimental layout and design	25

TABLE OF CONTENTS

CHAP	TER	Page
	3.9 Raising of seedlings and transplanting	25
	3.10 Intercultural operations	25
	3.11 Crop sampling and data collection	25
	3.12 Monitoring and data collection	25
	3.13 Determination of shoot damage	27
	3.14 Determination of fruit damage in number	27
	3.15 Determination of fruit damage in weight	27
	3.16 Harvest and post harvest operations	28
	3.17 Procedure of data collection	28
	3.18 Statistical analyses	29
4.0	RESULTS AND DISCUSSION	30
	4.1 Shoot infestation	30
	4.2 Fruit bearing status at early fruiting stage	37
	4.3 Fruit bearing status at mid fruiting stage	41
	4.4 Fruit bearing status at late fruiting stage	45
	4.5 Fruit bearing status throughout the growing season	49
	4.6 Effect of temperature, rainfall and humidity on fruit infestation of brinjal at different harvesting time	55
	4.7 Yield and yield contributing characters	57
	4.8 Economic Analysis	67
	4.9 Relationship between yield contributing characters and yield ha^{-1}	67
5.	SUMMARY	72
	5.1 Conclusion and Recommendation	76
	REFERENCES	77

CHAPTER	
APPENDICES	88

LIST OF TABLES

Table No.	Title	Page
1	Infestation of brinjal shoot caused by the brinjal shoot and fruit borer (BSFB) in different treatments at early fruiting stage during kharif season, 2009	32
2	Infestation of brinjal shoot caused by the brinjal shoot and fruit borer (BSFB) in different treatments at mid fruiting stage during kharif season, 2009	34
3	Infestation of brinjal shoot caused by the brinjal shoot and fruit borer (BSFB) in different treatments at late fruiting stage during kharif season, 2009	36
4	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at early fruiting stage in number during kharif season, 2009	38
5	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at early fruiting stage in weight during kharif season, 2009	40
6	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at mid fruiting stage in number during kharif season, 2009	42
7	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at mid fruiting stage in weight during kharif season, 2009	44
8	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at late fruiting stage in number during kharif season, 2009	46
9	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at late fruiting stage in weight during kharif season, 2009	48
10	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments throughout the growing period in number during kharif season, 2009	50

Table No.	Title	Page
11	Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments throughout the growing period in weight during kharif season, 2009	53
12	Effect of botanicals and bio-control agents against brinjal shoot and fruit borer (BSFB) in terms of length of healthy and infested fruit	60
13	Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit Borer (BSFB) in terms of girth of healthy and infested fruit	62
14	Effect of botanicals and bio-control agents against brinjal shoot and fruit borer (BSFB) in terms of single fruit weight, edible and non edible portion of infested fruit	64
15	Yield of brinjal from different treatments against BSFB) during kharif season, 2009	66
16	Cost of production of brinjal for against brinjal shoot and fruit borer (BSFB) management practices	68

LIST OF FIGURES

Figure No.	Title	Page
1	Effect of botanicals and bio-control agents against brinjal shoot and fruit borer (BSFB) throughout the growing season in terms of fruits plant ⁻¹ in number	51
2	Effect of botanicals and bio-control agents against brinjal shoot and fruit borer (BSFB) throughout the growing season in terms of fruits plant ⁻¹ in weight	54
3	Relationship between BSFB infestation in number and weight with temperature, relative humidity & rainfal	56
4	Effect of botanicals and bio-control agents against brinjal shoot and fruit borer (BSFB) in terms of plant height	58
5	Relationship between length of healthy fruit and yield as influenced by some botanicals and bio-control agents in controlling BSFB of brinjal	69
6	Relationship between girth of fruit and yield as influenced by some botanicals and bio-control agents in controlling BSFB of brinjal	69
7	Relationship between individual fruit weight and yield as influenced by some botanicals and bio-control agents in controlling BSFB of brinjal	71
8	Relationship between edible portion of fruit and yield as influenced by some botanicals and bio-control agents in controlling BSFB of brinjal	71

LIST OF PLATES

Plate No.	Title	Page
1	Photograph showing plant and fruits of BARI begun-8	23

LIST OF APPENDICES

Appendix no.	Title	Page
Ι	Characteristics of experimental field soil is analyzed by Soil Resources Development Institute (SRDI), Khamarbari, Farmgate, Dhaka	88
Π	Monthly record of air temperature, rainfall and relative humidity of the experimental site during the period from April to October 2009	88
III	Analysis of variance of the data on shoots per plant by number and weight as influenced by some botanicals and bio-control agents in controlling BSFB at early harvesting stage	89
IV	Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and bio-control agents in controlling BSFB at early harvesting stage	89
V	Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and bio-control agents in controlling BSFB at mid harvesting stage	90
VI	Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and bio-control agents in controlling BSFB at late harvesting stage	90
VII	Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and bio-control agents in controlling BSFB at throughout the growing season	91
VIII	Analysis of variance of the data on healthy and infested fruit per plant as influenced by some botanicals and bio- control agents	91
IX	Analysis of variance of the data on yield contributing characters and yield of brinjal as influenced by some botanicals and bio-control agents in controlling BSFB	92

CHAPTER I

INTRODUCTION

Eggplant (*Solanum melongena* L.) is commonly known as brinjal in Indian sub-continent is a self-pollinated annual crop and belongs to the family Solanaceae. Eggplant is the principal and most popular vegetable crop in Bangladesh and extensively grown in both *Rabi* and *Kharif* seasons. It covers an area of 74,711 acres, is about 15% of total vegetable growing area of country. Its annual production in Kharif is scanty and brinjal plays an important role to cover during the shortage of vegetable lean period (Anon., 1995). More than 20 varieties of eggplant are grown in different regions of the country.

Brinjal is very much susceptible to insect pest that attack from seedling stage to final harvest. The incidence of the pest occurs either sporadically or as outbreak every year throughout the country wherever the eggplant is grown (Alam, 1969) and this crop is infested by 53 species of insect pests (Nayer *et al.*, 1995). Out of them 8 species are considered as major pests causing serious damage to the crop. One species of mites is considered as minor pests as it generally cause little damage to brinjal. The insect pests cause enormous losses to brinjal in every season and every year. Brinjal shoot and fruit borer, BSFB (*Leucinodes orbonalis* Guenee) is the most destructive of all the pests of brinjal in Bangladesh (Alam, 1969) and India (Tewari and Sandana,

43

1990) and also a major pest in some other countries of the world (Dhanker,

1988).

Brinjal shoot and fruit borer (BSFB) is active throughout the year at places having moderate climate. They are very active in summer months especially in the rainy season. The intensity of infestation by this pest may go over 90% (Kalloo, 1988). The yield loss has been estimated up to 86% (Ali *et al.*, 1986), 67% (Islam and Karim, 1991) in Bangladesh, and 95% (Naresh *et al.*, 1986) in Hanyana India. In the early stage of crop growth, the newly hatched larvae bore into petioles and midribs of leaves and tender shoots and close the entry holes with their excreta and feed inside (Butani and Jotwani, 1984).

At this stage of plant growth, the insect damage both shoots and fruits. Secondary infections caused by certain fungi may cause further deterioration of the fruits (Islam and Karim, 1994).

Considering the importance of brinjal and severity of BSFB problem a wide range of organophosphorus, carbamates and synthetic pyrethroids with various spray formulations have been advocated from time to time against this pest (Prakash, 1988; Yein, 1985; Metho and Lal, 1981; Yardani *et al.*, 1981). Among the available pest control techniques, chemical means are still vital and provide a rapid, cost-competitive, typically effective and valuable

pest management tool due to inadequate knowledge of farmers and unavailability of non-chemical pest management approaches. According to pesticides association of Bangladesh pesticide use for growing brinjal was 1.41 kg/ha whereas for vegetables altogether it was 1.12 kg/ha whiles it was

44

only 0.2 kg/ha in rice (Grainge and Ahmed, 1988). Socio-economic studies of current BSFB control practices in Jessore District of Bangladesh indicated that 98% of farmers relied exclusively on the use of insecticides and more than 60% of farmers sprayed their crop 140 times or more in the 6-7 months cropping season (Anon., 2003). Although it is not documented how much active material could be left in Brinjal fruit after washing and cooking, it may be assumed that the use of highly toxic insecticides on the Brinjal would widen the possibilities of consumers to be intoxicated.

In the context of Bangladesh, since harvesting and selling of brinjal are done without bothering for the pre-harvest interval, pesticide residue levels in such brinjal would undoubtedly be above Maximum Residue Limit (MRL). In most of the cases, the farmers either forgot or did not care to follow the instructions and went on using insecticides at their own choice or experience. Farmers usually spray insecticide in their field indiscriminately considering the level of infestation and without thinking the economic return of their investment. As a result, harmful impact of insecticides on man, animal, beneficial insects and environment is imposing a serious threat. Indiscriminate use of insecticides is reported to cause insecticide resistance in insect pests, resurgence and secondary pest's outbreak. The accumulation of insecticide residues in food is increasing at an alarming rate and there is a chance of health hazards due to these detrimental toxicants. But research on alternative non-chemical approaches like cultural, mechanical, biological, host plant resistance etc. undertaken against this pest in Bangladesh and elsewhere throughout the world is limited.

In recent years, there has been tremendous renewed interest in botanical neem products been used in some Asian countries (Karim *et al.*, 1992). Parasitic wasps viz. *Trichogramm* sp. egg parasitoid (Mohanraj *et al.*, 1995), *Bacillus thuringiensis* insect pathogenic bacterium are the new introduction in Bangladesh for the management BSFB. Many parts of the world use *Trichogramma* sp. successfully for crop production (Hasan, 1992). The egg parasitoid *Trichogramma* can achieve a level of control that is near 100% in some years or areas (Kim and Heinrichs, 1985; Kim *et al.*, 1986). *Bacillus thuringiensis* (Bt) is an insecticide with unusual properties that make it useful for pest control in certain situations.

Considering the present situation it is necessary to identify suitable management practices of brinjal shoot and fruit borer (BSFB). Therefore, the present study was designed with the following objectives:

- 1. To evaluate the effectiveness of selected botanicals and bio-control agents against brinjal shoot and fruit borer;
- 2. To find out a suitable control option which comprising with botanicals and bio-control agents for suppression of brinjal shoot and fruit borer;
- 3. To analyze the benefit cost ratio of various botanicals and bio-control agents in the present study.

CHAPTER 2

REVIEW OF LITERATURE

Brinjal is one of the most important vegetable crop in Bangladesh as well as many countries of the world. Brinjal shoot and fruit borer (BSFB) is the most destructive pest of brinjal. For controlling BSFB it is necessary to have a concept of the origin and distribution, pest status and host range, nature of damage, seasonal abundance, and bionomics of this pest. Farmers mainly control BSFB through use of different chemicals. But the concept of management of pest employing eco-friendly materials gained momentum as mankind became more safely about environment. Use of botanicals and biocontrol agents is the recent and ecofriendly approaches for pest control. Information related to management of BSFB using botanicals and biocontrol agents is very scanty. Nevertheless, some of the important and informative works and research findings related to the control of BSFB through botanicals and bio-control agents so far been done at home and abroad have been reviewed in this chapter.

2.1 Origin and Distribution of BSFB

According to Butani and Jotwani (1984), *Leucinodes orbonalis* Guenee, the most destructive pest of eggplant is widely distributed not only in the Indian subcontinent but also in South Africa, Congo and Malaysia. Eggplants are severely attacked by shoot and fruit borer in the tropics but not in the temperate zone. Eggplant is a native of India and is extensively grown in all the Southeast Asian countries. It was introduced into Spain from India during the Moorish invasion from where it spread throughout Europe then into America. The domesticated non- bitter types spread eastward into China by the fifth century BC from India (Yamaguchi, 1983).

2.2 Pest Status and Host Range of BSFB

Shoot and fruit borer is the most destructive insect pest of eggplant (Alam and Sana, 1962; Alam 1969; Butani and Jotwani, 1984; Nair, 1986; Chattopadhyay, 1987). It can also infest potato, tomato and peas (Hill, 1983). Several Solanaceous crops and wild *Solarium* species are also attacked by this pest (Karim, 1994). According to Isahaque and Chaudhuri (1983), the alternate hosts of BSFB were *Solarium nigrum, S. indicum, S. torvum, S. myriacanthum* and potato.

2.3 Nature of Damage of BSFB

Eggplant is severely attacked by shoot and fruit borer during the rainy and summer season. The losses due to its infestation are sometimes reported to be more than 90% (Kallo, 1988). The damage by this pests starts soon after transplanting of the crop and continues up to the last harvest of the fruits. The eggs are laid singly and deposited on the ventral surface of the leaves, shoots, flower buds, and petiole and occasionally on the fruit. In young plants, the larvae bore into the petioles and midribs of large leaves and also bore into the young shoots. Immediately after boring, the larvae close the entry hole with their excreta and feed inside (Butani and Jotwani, 1984). The infested shoots droop due to disruption of vascular system and ultimately wither (Alam and Sana, 1962).

At later stage of the plant growth, the larvae bore generally through calyx and later into the flower buds and the fruits without leaving any visible sign of infestation and feed inside (Butani and Jutwani, 1984). The infested flower buds dry and shed. When fruits are available they prefer to bore into the fruits. Infested fruits show exit holes along with excreta. When an infested fruit is cut open, dark excreta, moulds and sometime rotten portion is found. Often the infested fruits become unfit for human consumption and marketing. The full grown larvae come out through the exit hole and drop on the ground for pupation in the soil or plant debris, the larvae feed on the pith tissues of infested fruits by boring tunnels. The per cent infestation of fruits is more than that of the shoots (Alam and Sana, 1962). The pest is reported to cause 1 to 16% damage to shoots and 16 to 64% to fruits in Bangladesh (Butani and Jotwani, 1984). Hami (1955) found that vitamin C (ascorbic acid) is reduced to the extent of 68% in infested fruit. Peswani and Rattan Lal (1964) reported that this borer damaged 20.7% fruits and if only damaged portion of these fruits is discarded, the loss in weight comes to 9.7%.

2.4 Seasonal abundance of BSFB

The seasonal history of shoot and fruit borer varies considerably with varying climatic conditions throughout the year. Hibernation does not take place and the insects are found active in summer months, especially in rainy season. They are less active during February to April (Alam, 1969). A study revealed that the population of this insect began to increase from the first week of July and peaked (50 larvae per 2m) during the third week of August.

The population to this pest was positively correlated with average temperature, mean relative humidity and total rainfall (Shukla, 1989).

During winter months, the duration of different stages last for longer periods. Overlapping of generations was observed. There are altogether five generations of

49

the pest in a year of which three occur during May to October and two from November to April. During summer months, each generation covers about four to six weeks but in winter months it covers up to the extent of sixteen weeks (Alam, 1969).

There is a considerable mortality of larvae by rot caused by fungus during winter and by predatory black ants, *Camponotus compressus* F. during summer. Pupal mortality has been observed during rainy season due to attack of *Ichneumonid* parasitoid. The adult moths are also attacked by the black ant, *Camponotus compressus* F. (Alam, 1969). Maximum population of adult moths has been observed in the month of December and April (Alam, 1969). Populations of *Leucinodes orbonalis* on eggplant increased in the 1st and 3rd and declined in the 2^{nd} and 4th generations. Patel *et al.*, (1988) observed low population variation in minimum and maximum temperature but high relative humidity and heavy rain enhanced the population of this pest.

In another study Mohanraj *et al.* (1995) reported that the infestation of shoots began 30 days after transplanting, peaked in the 2^{nd} week of September and reached zero on the 1^{st} week of November. Fruit was infested from the 3^{rd} week of September and the infestation peaked in the 2^{nd} week of November. On the summer crop, shoots were infested from the 3^{rd} week of January and the infestation peaked in the 2^{nd} week of January and the infestation peaked in the 2^{nd} week of February. Infestation of fruit peaked in the 1^{st} week of April. Infestation levels were lower during the summer than during Kharif.

2.5 Bionomics of BSFB

The adult Leucinodes orbonalis Guenee moths are white and cryptic in nature (Alam, 1969) with 22 to 26 mm long at wing expanse (Butani and Jotwani, 1984). Head and thorax are variegated with black and brown color. The white fore wings have conspicuous black and brown patches and dots, the hind wings are opalescent with black dots along the margins (Butani and Jotwani, 1984). The margins of both the wings are provided with fine bristle like hairs. Mating takes place in the second night after emergence. The male dies after copulation and female after egg deposition. The eggs are laid singly and deposited on shoots, flower buds, petioles and on the ventral surface of the leaves. Eggs are laid during the later part of the night and continue till the early hours in the morning (Alam, 1969). The number of egg laid by a female varies from 11 to 68 with an average of 42. But, Butani and Jotwani (1984) reported that a female lays an average of 250 eggs. According to Baang and Corey (1991), the average number of eggs laid per female was 121.5 ± 0.449 and of these 79.24% were viable. The egg measures on an average 0.44 mm \times 0.32 mm with creamy white colour and changed into yellow to yellowish orange as the development proceeds. The young larva on hatching measures 1.49 mm \times 0.41 mm with slender abdomen tapers posterior. It is dull white color with yellowish tinge which later turns into creamy white. The full-fed larva measures 16.3 mm \times 3.16 mm in its widest part. The body is light pinkish in color with creamy tinge. The thoracic and the first three abdominal segments are more pinkish than those of the rest (Alam *et al*, 1964). The pupa is formed within a boat shaped cocoon of dirty brown coloured silk which is spun by the full grown larvae before pupation in a suitable dark or semi-dark place in soil and plant debris. During rainy season pupation takes place on the stems or shoots or the dried leaves of the plants (Alam, 1969). The full-grown pupa measures 6.4 $mm \times 1.66$ mm. The anal segment of the male pupa is devoid of bristles, whereas the female pupa has eight bristles with curved tips at the anal segment. The incubation, larval and pupal periods are 3 to 5, 12 to 15 and 7 to 10 days during the summer and 7-8, 14-22 and 13-15 days in the winter, respectively (Butani and Jotwani, 1984; Alam and Sana, 1962). The full-grown larva shows a pre-pupal period of 3-4 days. The life cycle is completed in 34 to 59 days with five or more overlapping generations per year (Alam and Sana, 1962; Alam, 1969). The insects are active throughout the year with more activity in the summer and rainy season than in the winter months (Alam and Sana, 1962). Sandanayake and Edirisinghe (1992) observed that Leucinodes orbonalis 1st instar larvae occurred in flower buds and flowers, while 2nd instars larvae were present in all susceptible parts of the plant. Larvae were confined to the shoots and fruits in their 3rd and 4th instars, while 5th instars larvae were found only in the fruits. The size of entry hole made by a larva was found to be a good indicator of its instars.

Yin (1993) reported that in case *of Leucinodes orbonalis* one to six generations were completed annually over-wintering as pupae. Adults were not active during the day; copulation and oviposition take place at night. The eggs were laid separately on the lower surface of young leaves (80-88%). One female laid about 200 eggs. The hatching rate was 57.5-85.0% at 25-30°C. Larval stage lasted for 21.2-12 days. Pupated mainly in decomposed, leaves and under withered branches

and fallen leaves, and in the soil. Pupal stage lasted for 8-15 days. Another study revealed that the egg stage averaged 5.4 days, the larval stage 17.5 days, the pupal stage 9.8 days, the pre-oviposition and oviposition periods 1.2-2.1 and 1.4-2.9 days, respectively, and adult male and female life-span 1.5-2.4 and 2.0-3.9 days respectively. Average fecundity (eggs/female) ranged from 84.5 in January to 253.5 in May (Metho *el al.*, 1983). Alam *et al.* (1964) reported that the total length of the *Leucinodes orbonalis* life cycle ranged from 19 to 28 days. The eggs were laid mostly on the underside of the leaves. The pest had 6 larval instars. The duration of larval development ranged from 9 to 13 days and the pupal period lasted for 7 to 11 days.

2.6 Management of BSFB

2.6.1 Use of botanical pesticides

More than 2000 species of plants have been reported to possess insecticidal properties (Grainge and Ahmed, 1988). The seeds and leaves of the neem tree (*Azadirachta indica*) contain terpenoids with potent anti-insect activity. One of the most active terpenoids in neem seeds is azadirachtin, which acts as an antifeedent and causes growth disruption against a wide range of insect pests at microgram level. The active terpenoids in neem leaves include nimbin, deactylnimbin and thionemone (Simmonds *et al.*, 1992). The leaf extract of neem tested against the leaf caterpillar of brinjal, *Silepa docilis* Bult. at 5% concentration exhibited a high antifeedent activity (Jacob and Sheila, 1994).

Neem (Azadicachat Indica A. Juss) seed oil, a botanical pesticide have also been used to control different insect pests of important agricultural crops in different countries of the world. More than 2000 species of plants have been reported to posses' insecticidal properties (Grainge and Ahmed, 1988). The neem tree (Azadirachta indica A. Juss) is one of them. The development and use of botanical pesticides become an integral part of the integrated pest management (IPM) strategies. Stoll (1992) summarized the potential benefits of botanical pesticides which diminish the risk of resistance development, natural enemy elimination, secondary out break of pest and ensure overall safety to the environment.

The seed and leaves of the neem tree contain terpenoids with potent anti-insect activity. One of the most active terpenoids in neem seeds is "azadirachtain" which acts as an antifeedant and growth disrupter against a wide range of insect pest at microgram levels. The active terpenoids in neem leaves include nimbin, deactylnimbin and thionemone (Simmonds *et al.*, 1992).

During last two decades neem oil and extracts from leaves and seeds have been evaluated as plant protectant against a wide range of arthropod and nematode pests in several countries of the world. Although, most of the trails are laboratory based but it is not scanty in case of field condition. Ketkar (1976) reviewed 95 and Jacobson (1985) reviewed 133 papers on neem and documented neem's potential in the management of arthropods pests (Warthen, 1979). Ahmed and Grainge (1985) and Saxena (1988) summarized the effectiveness of neem oil against 87 arthropods and 5 nematodes, 100 insects and mites and 198 different species of insects, respectively.

Experiment with botanical pesticides has also been conducted in Bangladesh on a limited scale. Islam (1983) reported that extract of leaf, seed and oil of neem, showed potential as antifeedants or feeding and oviposition deterrents for the control of brown plant hopper, green leaf hopper, rice hispa and lesser rice weevil. He also conducted experiments to asscertain the optimal doses of the extract against rice hispa, and pulse beetle. Addition of sesame or linseed oil to extract of neem resulted in higher mortality of the grubs and in greater deterrence in feeding and oviposition compared to those obtained with extract alone (Islam, 1986).

Field trail with neem products have shown, not only a decrease in damage by pest but also an increase in crop yield compared to those obtained with recommended synthetic insecticides. A methanol suspension of 2-4% of the neem leaves have been used against the caterpillar of diamondback moth, *Plutella xylostella* and it was as effective as either synthetic insecticides mevinphous (0.05%) or deltamethrin in (0.02%) in Togo (Dreyer, 1987). In Thailand, a field trail showed that piperanyl butoxide increased the efficacy of neem and the combination was as active as cypermethrin (0.025%) against *Plutella xylostella* and *Spodoptera litura*, which revealed that neem oil with synthetic insecticides may have some synergetic effect in controlling insect pests (Sombatsiri and Tigvattanont, 1987). Fagoonee (1986) used neem in vegetable crop protection in Mauritius and showed neem seed kernel extract was found to be effective as deltamethrin (Decis) against the *Plutella xylostella* and *Crocidolomia binotalis*. He also found neem extract alternate with insecticides gave best protection against *Helicoverpa armigera*. Neem product have been used to control vegetable pests under field condition and good control of *Plutella xylostella* and Pyralid, *Hellula undalis* on cabbage was achieved with weekly application of 25 or 50 gm neem kernel powder/liter of water (Dreyer, 1987). The leaf extract of neem tested against the leaf caterpillar of brinjal, *Selepa docilis* at 5% concentration had a high anti-feedant activity with a feeding ratio of 28.29 followed by 3% having only medium anti-feedant properties with 23.89 as the feeding ratio (Jacob and Sheila, 1994).

Entomologist of many countries including India, The Philippines, Pakistan and Bangladesh has conducted various studies of neem against different insect pests. Most of the cases the investigators have been used a particular concentration of the neem extract. Neem seed kernel extracts (3-5%) were effective against *Nilaparbata lugens, Nephotettix* spp., *Marasmia patnalis, Oxya nitidula* and Asian gall midge. Neem leaf extract, however, is less effective than neem seed kernel extract. But the same extract of 5-10% was highly effective, inclusive of *Scirpophaga incertulus* and thrips. Damage by leaf folders was reduced by 3% neem oil. Neem seed kernel extracts reduced egg deposition on rice seedling by *Nephotettix* spp. and *Nilaparbata lugens* (Jayaraj, 1991). Neem seed kernel extract was an effective antifeedent to pigeon pea pod borer. He also found that there has been no adverse effect, even though neem was systemic. According to him neem oil can be used @ 1-3% without any problem. But 5% neem oil will cause phytotoxicity in many plants. The effect of neem oil is systemic, though not persistent. It should be noted that application of neem oil beyond 5% will cause serious phytotoxicity in rice. At 3%, the initial phytotoxicity effects are minimum and the plant can recovered completely. Thus, neem oil should be applied at concentrations not beyond 3% (Jayaraj, 1991).

Most of the cases, the user of neem oil use it at different doses ranged from 0.5-50% (Krishnaiah and Kalode, 1991). They use different emulsifier to mixe neem oil with the water. Neem oil normally stays separately on the upper surface of the water. Detergent in water helps neem oil to emulsify in the water. In a field observation of neem oil Krishanaiah and Kalode (1991) used soap as emulsifier with water. Another study with neem oil in rice field, Palanginan and Saxena (1991) added 1.66% Teepol (liquid detergent) to the extract solutions as an emulsifier. In a study of Bangladesh Rice Research Institute (BRRI), Gazipur, Alam (1991) added 1 ml (0.1%) of teepol detergent per liter of water and spray at 7 days interval against stem borer of rice.

2.6.2 Biological control

Mallik *et al.*, (1989) reported that *Trathala flavoorbitalis* cam. is the parasitoid of the BSFB. *Trathala flavoorbitalis* is recorded from *L. orbonalis* in India and also in Srilanka where *L. orbonalis* is its major host and where an average parasitisation level of 36.2% has been reported (Sandanayake and Edirisinghe, 1993). In Hissar, India, *Trathala* was found as the only parasitoid of *L. orborialis* which attack the larvae of BSFB ranging from 13.2 to 18.21% in winter to 12.9%

in summer when 95.2% of fruits were infested (Naresh *et al.*, 1986). *Trathala flavo-orbitalis* is identified as an effective larval parasitoid against BSFB in Bangladesh. The rate of parasitism varied from 20 to 25% (Anon., 2001).

Trathala flavoorbitalis was recorded parasitizing the eggplant pest *L.orbonalis* in Bihar, India in 1986-88. Parasitism increased the host pupal period to 11-18 days, as compared to 6-14 days for healthy pupae. Adult parasitoids lived for 4-7 days in the laboratory (Mallik *et al.*, 1989).

Tewari and Sandana (1990) reported a larval ectoparasite, *Bracon* sp. on *L.orbonalis* on eggplant in Karnataka, India and stated the possibility of its use in the biological control of the pest. Naresh *et al.*, (1986) reported that the *L.orbonalis* larval population peaked in May and the pest was active throughout the year where *Trathala* sp. caused 12.90-18.18% parasitism of larvae. The parasitoid was active throughout the winter and summer seasons and preferred mature host larvae.

Itamoplex sp. recorded for the first time in the Indian state of Himachal Prodesh parasitizing the pyralid *L. orbonalis* is a serious pest of eggplant there. About 9-15% of pupae of the pyralid that were collected from the field was parasitized (Verma and Lal, 1985). A species of *Phanerotoma* near *P.hendecasisella* and *Campyloneura* sp, are recorded for the first time as parasites of larvae of *L.orbonalis*. The parasites were found attacking larvae infesting eggplant near Bangalore, Karnataka, India in July 1982. Combined parasitism was only 1-2% (Tewari and Moorthy, 1984).

2.6.2.1 Trichogramma Sp.

Trichogramma sp are extremely tiny wasps in the family *Trichogrammatidae*. While it is uncommon for an insect's scientific name, especially one so long and unusual as *Trichogramma*, to also become its common name, the commercial development of this natural enemy and the fact that it attacks so many important caterpillar pests has earned it a place in the popular vocabulary of many pest management advisors and producers.

Trichogramma wasps occur naturally in almost every terrestrial habitat and some aquatic habitats as well. They parasitize insect eggs, especially eggs of moths and butterflies. Some of the most important caterpillar pests of field crops, forests, and fruit and nut trees are attacked by *Trichogramma* wasps. However, in most crop production systems, the number of caterpillar eggs destroyed by native populations of *Trichogramma* is not sufficient to prevent the pest from reaching damaging levels.

Recognizing the potential of *Trichogramma* species as biological control agents, entomologists in the early 1900s began to mass rear *Trichogramma* for insect control. Although a small commercial production of *Trichogramma* eventually developed in the U.S., insect control research and commercial efforts focused on the development of chemical pesticides following the discovery of DDT (73). This was not the case in the Soviet Union and China, both of which developed programs to control several crop pests with *Trichogramma*. In these countries, insectaries were less expensive and less sophisticated than production facilities for synthetic insecticides, and could be located on farms where labor was inexpensive and readily available. Also, control standards were not as stringent, and releasing *Trichogramma* was often better than no control at all (King, 1993).

Species and distribution

The genus *Trichogramma* is one of 80 genera in the family *Trichogrammatidae*. All members of this family are parasites of insect eggs. Trichogrammatidae includes the smallest of insects, ranging in size from 0.2 to 1.5 mm. Within the genus Trichogramma, there are 145 described species worldwide; 30 species have been identified from North America and an estimated 20 to 30 species remain to be described. The species most commonly collected from crops and orchards are *atopovirilia*, *brevicapillum*, *deion*, *exiguum*, *fuentesi*, minutum, nubilale, platneri, pretiosum, and thalense (Neil et al., 1998).

Life cycle

The effect of temporary host deprivation on parasitization rates of *T. cacoeciae* [*T. cacaeciae*] and *T. dendrolimi* was investigated by Hegazi and Khafag (2001). The insect host in the experiments was *Sitotroga cerealella*. The study was conducted with females that we allowed to engage in 3 days of oviposition after various periods of host deprivation. It seems that the production and management of eggs by the two species is completely different. During the first day of oviposition, parasitization by *T. cacoeciae* was almost unaffected after 1 to 5 days of host deprivation. As deprivation time increased, however, the number of parasitized hosts decreased from an average of 28.6+or-2.0 hosts provided at emergence to an

average of 12.5+or-2.3 hosts when the waiting time was 10 days. The number of hosts parasitized on the first day of parasitization by *T. dendrolimi* was not affected whatever the waiting tests period. During the second or third days of oviposition, the lack of suitable hosts for *T. cacoeciae* did not depress egg-laying potentiality, whereas a strong reduction in parasitization rates by *T. dendrolimi* occurred in the next 2 days of oviposition whatever was the waiting period. This leads to ca. 50% reduction in total activity of 3 days of oviposition. Only in *T. cacoeciae* was it possible to distinguish between ageing and host deprivation. The data suggest that *T. dendrolimi* is a typical proovigenic species, while T. cacoeciae is neither definitely proovigenic nor synovigenic. A slight decrease in rate of emergence of offspring of *T. cacoeciae* females that had waited 8 to 10 days for their hosts was observed.

The functional response of third generation of the *Trichogramma brassicae* reared in laboratory, was studied by Asgari *et al.* (2004) at various densities (5, 10, 20, 40, 80, 100, 120) of the *Sitotroga cerealella* eggs under 25+or-1 degrees C, %60+or-5 RH, and 16 L:8 D.h. photoperiod. One day old eggs of angoumois grain moth. *S. cerealella*, in 15 replications for 24 hours were exposed to one-day old female wasps. Functional response of *T. brassicae* was found to be type III. Searching efficiency (a) handling time and maximum attack rate were estimated, 0.168+or-0.055, 1.468+or-0.121 and 16.34, respectively.

2.6.2.2 Bacillus thuringiensis

Bacillus thuringiensis (Bt) is a Gram-positive, soil-dwelling bacterium, commonly

used as a biological alternative to a pesticide; alternatively, the Cry toxin may be extracted and used as a pesticide. *B. thuringiensis* also occurs naturally in the gut of caterpillars of various types of moths and butterflies, as well as on the dark surface of plants (Wikipedia).

Distribution and use

Bacillus thuringiensis Berliner isolates were detected by Theunis *et al.* (1998) in 57% of 801 samples of rice grain dust, soil, rice field arthropods, and miscellaneous habitats (rice straw compost and mammal faeces) collected at 100 sites in the Philippines. The collection yielded 3950 isolates of *B. thuringiensis* (8.7 isolates/ positive sample). Grain dust from rice mills was the richest source (63%) of the samples were positive, with 10.2 isolates/positive sample), followed by rice field arthropods, soil, and miscellaneous habitats. Polyclonal antibodies to six o-endotoxin groups (Cry1A, Cry1B, Cry1C, Cry1D, Cry1E, and Cry3A) were used in enzyme-linked immunosorbent assays (ELISA) to characterize the toxins produced by each isolate. Subsamples of isolates representing the diversity of isolate sources and o-endotoxin profiles were bioassayed against the yellow stem borer, *Scirpophaga incertulas* (walker) and striped stem borer, *Chilo suppressalis* (Walker).

2.6.3. Botanical products

Field studies were conducted by Korat *et al* (2009) during three successive wet seasons (1995-97) in rice fields in Gujarat, India, to determine the efficacy of various concentrations of azadirachtin (Nimbicidine, Neemax, and Neem Gold (all 300 ppm), Econeem (3000 ppm), Neem Azal T/S (10 000 ppm) and Fortune Aza (1500 ppm)) compared to chlorpyrifos for the control of *Cnaphalocrocis medinalis*, *Sogatella furcifera* and *Scirpophaga incertulas*. Results showed that although all neem formulations were effective against pests and resulted in an increased yield none were superior in efficacy to chlorpyrifos.

Safe clean, safe max, and neem oil are the botanicals products use for controlling insect and pests. Safe clean is a detergent type products and safe max produced from mehogoni plant oil, whereas neem oil prepared from leaf of neem plant.

CHAPTER 3

MATERIALS AND METHODS

The experiment was conducted to study the effect of some botanicals and biocontrol agents in controlling brinjal shoot and fruit borer in brinjal during April to October 2009. The detail materials and methods of this experiment are presented below:

3.1 Experimental site

The experiment was conducted at the central farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh, which is situated in $23^{0}74'$ N latitude and $90^{0}35'$ E longitude (Anon., 1989).

3.2 Soil

The soil of the experimental area belongs to the Modhupur Tract (UNDP, 1988) corresponding AEZ No. 28 and is shallow red brown terrace soil. The characteristics of the soil under the experimental plot were analyzed in the Soil Testing Laboratory, SRDI, Dhaka and has been presented in Appendix I.

3.3 Climate

The climate of experimental site was subtropical, characterized by the winter season from November to February and the pre-monsoon period or hot season from March to April and the monsoon period from May to October (Edris *et al.*, 1979). Meteorological data related to the temperature, relative humidity and rainfall during the experimental period was collected from

64

Bangladesh Meteorological Department (Climate Division), Sher-e-Bangla Nagar and has been presented in Appendix II.

3.4 Planting material

BARI Begun-8 (Plate 1) was used as the test crop of this experiment. The seeds of BARI Begun-8 were collected from Horticulture Research Centre, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur.



Plate 1. Photograph showing plant and fruits of BARI begun-8

3.5 Land preparation

The land was first opened with the tractor drawn disc plough. Then the soil was ploughed and cross ploughed. Ploughed soil was then brought into desirable fine

tilth by the operations of ploughing, harrowing and laddering. The stubble and weeds were removed. Experimental land was divided into unit plots following the design of experiment. During land preparation 10 t/ha decomposed cowdung were mixed with soil.

3.6 Manures and fertilizers application

Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) were used as a source of nitrogen, phosphorous, and potassium, respectively. Manures and fertilizers that were applied to the experimental plot following doses/ha, Urea 120 kg/ha, TSP 150 kg/ha and MP 80 kg/ha, respectively (Anon., 2005). The entire amount of TSP and MP was applied as basal dose at the time of land preparation. Urea was applied as top dressing in three equal splits at vegetative stage and early and mid fruiting stage.

3.7 Treatments of the experiment

The experiment consists of the following management practices:

- T_1 : Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ at 7 days interval
- T₄: *Bacillus thuringiensis* serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

3.8 Experimental layout and design

The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. An area of 24.50 m \times 13.00 m was divided into three equal blocks. Each block was divided into 7 plots, where 7 treatment combinations were allocated at random. There were 21 unit plots altogether in the experiment. The size of the each unit plot was 3.0 m \times 2.5 m. The distance maintained between two blocks and two plots were 1.0 m and 0.5 m, respectively.

3.9 Raising of seedlings and transplanting

Brinjal seeds of BARI Begun-8 were sown directly in the Nursery bed. The beds were lightly irrigated regularly for ensuring proper growth and development of the seedlings. Thirty day old healthy seedlings (3/4 leaf stage) were transplanted in the experimental plots.

3.10 Intercultural operations

Irrigation was done at 30 and 45 Days after transplanting (DAT). The crop field was weeded twice; first weeding was done at 25 DAT and second at 40

DAT.

3.11 Crop sampling and data collection

Five plants from each treatment were randomly marked inside the central row of each plot with the help of sample card.

3.12 Monitoring and data collection

The brinjal plants of different treatment were closely examined at regular intervals commencing from germination to harvest. The following data were collected during the course of the experiment-

- Number of healthy shoots
- Number of infested shoots
- Shoot infestation in number (%)
- Number of healthy fruits
- Number of infested fruits
- Fruit infestation in number (%)
- Weight (g) of healthy fruits
- Weight (g) of infested fruit
- Fruit infestation in weight (%)
- Plant height at harvest (cm)
- Length of healthy fruit (cm)
- Length of infested fruit (cm)
- Girth of healthy fruit (cm)
- Girth of infested fruit (cm)
- Individual fruit weight (g)
- Edible portion (%)
- Non-edible portion (%)

- Fruit yield per plot (kg)
- Fruit yield per hectare (ton)

3.13 Determination of shoot damage

All the healthy and infested shoots were counted from 5 randomly selected plants from middle rows of each plot and examined. The collected data were divided into early, mid and late fruiting stage according to harvest time. The healthy and damaged shoots were counted and the percent shoot damage was calculated using the following formula:

% Shoot damage = Total number of shoot × 100

3.14 Determination of fruit infestation in number

All the healthy and infested fruits were counted from 5 randomly selected plants from middle rows of each plot and examined. The collected data were divided into early, mid and late fruiting stage. The healthy and infested fruits were counted and the percent fruit damage was calculated using the following formula:

% Fruit infestation =
$$\frac{\text{Number of infested fruits}}{\text{Total number of fruits}} \times 100$$

3.15 Determination of fruit infestation in weight

All the healthy and infested fruits were weighted from 5 randomly selected plants from middle rows of each plot and examined. The collected data were divided into early, mid and late fruiting stage. The healthy and infested fruits were weighted and the percent fruit infestation was calculated using the following formula:

% Fruit infestation =
$$\frac{\text{Weight of infested fruit}}{\text{Total weight of fruit}} \times 100$$

3.16 Harvest and post harvest operations

Harvesting of fruit was done when the fruits attained marketable sized. The optimum marketable sized fruits were collected by hand picking from each plot and yield was converted into t ha⁻¹.

3.17 Procedure of data collection

3.17.1 Plant height at harvest

The plant heights of 5 randomly selected plants were measured with a meter scale from the ground level to the top of the plants and the mean height was expressed in centimeter (cm). Data were recorded from the inner rows plant of each plot during harvesting period.

3.17.2 Fruit length

Healthy and infested fruits were collected from 5 randomly selected plants and length for healthy and infested fruit was measured and the mean length was expressed on per fruit basis in centimeter (cm).

3.17.3 Fruit girth

The circumstances of healthy and infested fruits of 5 randomly selected plants were measured with a meter scale at base, middle and upper level and average were calculated and expressed in centimeter (cm) for healthy and infested fruit. Data were recorded from the inner rows plant of each plot during harvesting period.

3.17.4 Individual fruit weight

Healthy fruits were collected from the ten randomly selected plants and were weighted by a digital electronic balance. The weight was expressed plant⁻¹ basis in gram (g).

3.17.5 Edible and non-edible portion of infested fruit

Infested fruits from 5 randomly selected plants were collected and observed edible and non-edible portion and expressed in percentage.

3.17.6 Fruits yield plot⁻¹

The fruits were collected from 5 each plot in each harvest and weighted. The weight of fruits per plot was expressed in kilogram (kg).

3.17.7 Fruits yield hectare⁻¹

Fruits per plot were converted into hectare and the weight of fruits per hectare was calculated and expressed in ton.

3.18 Statistical analyses

The data on different parameters as well as yield of brinjal were statistically analyzed to find out the significant differences among the effects of some botanicals and bio-control agents against Brinjal Shoot and Fruit Borer (BSFB). The mean values of all the characters were calculated and analyses of variance were performed by the 'F' (variance ratio) test. The significance of the differences among the mean values of treatment in respect of different parameters was estimated by the Duncan's Multiple Range Test (DMRT) at 5% level of probability (Gomez and Gomez, 1984).

CHAPTER IV

RESULTS AND DISCUSSION

The study was conducted to find out the effect of some botanicals and bio-control agents in controlling brinjal shoot and fruit borer in brinjal in the central farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh during the period from April to October 2009. The analysis of variance (ANOVA) of the data on shoot and fruit infestation and different yield contributing characters and yield are given in Appendix III-IX. The results of comparative effectiveness of treatments consisting of various control measures in reducing the infestation of brinjal shoot and fruit borer (BSFB) was evaluated. Influence of these treatments on yield, extent of damage were presented and discussed under the following headings.

4.1 Effect of different treatments on shoot infestation of brinjal

4.1.1 At early fruiting stage

Number of healthy shoots plant⁻¹, number of infested shoots plant⁻¹ and percent infestation of shoot plant⁻¹ at early, mid and late fruiting stage in controlling brinjal shoot and fruit borer showed statistically significant difference for some botanicals and bio-control agents (Table 1-3).

The results revealed that the highest number of healthy shoots plant⁻¹ (22.20) was recorded in T₁ treatment (Neem oil @ 4ml/L of water at 7 days interval) which was statistically similar (21.40, 21.10 and 20.07) with T₂ (Neem seed kernel @ 300g/L of water at 7 days interval), T₃ (*Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval), and T₅ (*Bacillus thuringiensis* serovar kurstaki @ 1ml suspension/L of water + Safeclean 2.5 ml/L of water at 7 days interval), respectively. Again, the lowest number of healthy shoots plant⁻¹ (16.13) was recorded in T₇ (untreated control) which was also statistically similar (9.33 and

10.11) with T_6 (Botanical pesticides Safeclean 5 ml/L of water at 7 days interval) and T_4 (*Bacillus thuringiensis* serovar kurstaki @ 1.5ml/L of water at 7 days interval), respectively. The highest number of infested shoots (2.47) was recorded in T_7 treatment followed (1.20) by T_6 , while the lowest number of infested shoot (0.80) in T_1 which was statistically similar (0.93, 1.00) with T_2 and T_3 respectively while T_4 and T_5 (1.07 and 1.07) were statistically similar(Table 1).

The percentage of shoot infestation was highest by number (13.25) was recorded in T_7 treatment which was closely followed by (6.52) T_6 treatment. On the other hand, the percentage of shoot infestation was lowest by number (3.48) in T_1 treatment which was statistically similar with (4.19) T_2 . The percent of shoot infestation reduction over control in brinjal was estimated for different management practices and the highest percentage (73.74) was recorded for the treatment T_1 and the lowest (50.79) from T_6 treatment (Table 1).

The comparisons of the results of the present study with existing findings revealed that spraying of neem oil @ 4ml/L of water at 7 days interval performed maximum healthy shoot and minimum infested shoot as well as lowest percentage of shoot infestation followed by neem seed kernel @ 300g/L of water at7 days interval, while in control treatment the situation is reverse under the trail followed by botanical pesticides safeclean 5 ml/L of water at 7 days interval. Butani and Jotwani (1984) reported that larvae bore generally through calyx and later into the flower buds and the fruits without leaving any visible sign of infestation and feed inside the pest is reported to cause 1 to 16% damage to shoots.

Table 1.	Infestation of brinjal shoot caused by the brinjal shoot and fruit
	borer (BSFB) in different treatments at early fruiting stage during
	kharif season, 2009

	Brinjal shoot in number plant ⁻¹			
Treatment	Healthy	Infested	% infestation	Infestation reduction over control (%)
T ₁	22.20 a	0.80 c	3.48 e	73.74
T ₂	21.40 ab	0.93 bc	4.19 de	68.38
T ₃	21.20 ab	1.00 bc	4.51 cde	65.96
T ₄	18.47 bcd	1.07 bc	5.47 c	58.72
T ₅	20.07 abc	1.07 bc	5.08 cd	61.66
T ₆	17.40 cd	1.20 b	6.52 b	50.79
T ₇	16.13 d	2.47 a	13.25 a	
LSD(0.05)	2.826	0.251	1.000	
CV(%)	8.13	11.60	9.25	

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.1.2 At mid fruiting stage

The highest number of healthy shoots plant⁻¹ (29.47) was recorded in T_1 treatment which was statistically similar with (28.53 and 26.60) T_2 and T_3 treatment respectively, whereas the lowest (21.00) number of healthy shoots was recorded in T_7 treatment which was also statistically similar (22.53 and 23.67) with T_6 and T_4 , respectively. The highest number of infested shoots (3.87) was recorded in T_7 treatment followed by (2.00, 1.67 and 1.60) T_6 , T_4 and T_5 respectively. Again, the lowest number of infested shoot (1.07) was recorded in T_1 treatment which was statistically similar (1.33) with T_2 (Table 2).

The highest percentage of shoot infestation in number (15.56) was recorded in T_7 treatment followed by (8.16) T_6 treatment, while the lowest percentage of shoot infestation by number (3.49) was recorded in T_1 treatment (Table 2) which was statistically similar with (4.46) T_2 . Brinjal shoot infestation percentage reduction over control was estimated for different management practices and the highest percentage (77.57) was recorded for the treatment T_1 and the lowest percentage (47.56) from T_6 treatment (Table 2).

From the findings it is revealed that spraying of neem oil @ 4ml/L of water at 7 days interval performed maximum healthy shoot and minimum infested shoot as well as lowest percentage of shoot infestation followed by neem seed kernel @ 300g/L of water at 7 days interval, while in untreated control treatment the situation is reverse under the trail followed by safeclean 5 ml/L of water at 7 days interval. Korat *et al*, (2009) reported earlier that all neem formulations were effective against brinjal pests and resulted in ncreased yield.

	Brinjal shoot in number plant ⁻¹				
Treatment	Healthy	Infested	% infestation	Infestation reduction over control (%)	
T ₁	29.47 a	1.07 d	3.49 e	77.57	
T ₂	28.53 a	1.33 cd	4.46 de	71.34	
T ₃	26.60 ab	1.53 c	5.47 cd	64.85	
T ₄	23.67 cd	1.67 bc	6.61 c	57.52	
T ₅	25.47 bc	1.60 bc	5.91 cd	62.02	
T ₆	22.53 d	2.00 b	8.16 b	47.56	
T ₇	21.00 d	3.87 a	15.56 a		
LSD(0.05)	2.746	0.394	1.493		
CV(%)	6.09	11.85	11.83		

Table 2. Infestation of brinjal shoot caused by the brinjal shoot and fruit
borer (BSFB) in different treatments at mid fruiting stage during
kharif season, 2009

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.1.3 At late fruiting stage

The highest number of healthy shoots plant⁻¹ (33.73) was recorded in T₁ treatment which was statistically similar with (32.87) T₂ and (31.60) T₃, respectively. On the other hand, the lowest (22.80) number of healthy shoots plant⁻¹ was recorded in T₇ treatment which was statistically similar with (25.67) T₆. The highest number of infested shoots plant⁻¹ (5.27) was recorded in T₇ treatment followed by (2.93, 2.63, 2.53 and 2.40) T₆, T₄, T₅, and T₃, respectively, whereas the lowest number of infested shoot (1.27) was recorded in T₁ treatment which was similar with (1.53) T₂ (Table 3).

The highest percentage of infested shoot in number was recorded in (18.75) T_7 treatment followed by (10.27) T_6 treatment, while the lowest percentage of infested shoot was recorded in (3.62) T_1 treatment which was statistically similar with (4.45) T_2 . Brinjal shoot infestation percentage reduction over control was estimated for different management practices and the highest percentage (80.69) was recorded for the treatment T_1 and the lowest percentage from (45.23) T_6 treatment (Table 3).

Butani and Jotwani (1984) reported that larvae bore generally through calyx and later into the flower buds and the fruits without leaving any visible sign of infestation and feed inside the pest is reported to cause 1 to 16% damage to shoots. Damage by leaf folders in rice was reduced by 3% neem oil. Neem seed kernel extracts reduced egg deposition on rice seedling by *Nephotettix* spp. and *Nilaparvata lugens* (Jayaraj, 1991).

Table 3. Infestation of brinjal shoot caused by the brinjal shoot and fruitborer (BSFB) in different treatments at late fruiting stage duringkharif season, 2009

	Brinjal shoot in number plant ⁻¹				
Treatment	Healthy	Infested	% infestation	Infestation	
				reduction over	
				control (%)	
T ₁	33.73 a	1.27 c	3.62 e	80.69	
T ₂	32.87 ab	1.53 c	4.45 e	76.27	
T ₃	31.60 abc	2.40 b	7.06 d	62.35	
T ₄	28.53 cd	2.67 b	8.57 c	54.29	
T ₅	30.27 bc	2.53 b	7.74 cd	58.72	
T ₆	25.67 de	2.93 b	10.27 b	45.23	
T ₇	22.80 e	5.27 a	18.75 a		
LSD(0.05)	2.938	0.503	1.278		
CV(%)	5.63	10.65	8.32		

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.2 Effect of different treatments on fruit infestation of brinjal

The effect of various treatments on the number of healthy fruits plant⁻¹, percent infestation of fruit plant⁻¹ infestation reduction over control at early, mid and late fruiting stage by number and weight in controlling brinjal shoot and fruit borer showed statistically significant differences for some botanicals and bio-control agents are presented in Table 4-6.

4.2.1 At early fruiting stage

At early fruiting stage the healthy fruit plant⁻¹ was highest (7.00) in T₁ treatment which was statistically similar (6.53 and 6.20) with T₂ and T₃, respectively, while the lowest (4.60) number was recorded in T₇ treatment which was statistically similar with (4.67, 5.07 and 5.53) T₆, T₄ and T₅, respectively. The highest number of infested fruit plant⁻¹ (0.67) was recorded in T₇ treatment, whereas the lowest number of infested fruit (0.13) was recorded in T₁ and T₂ treatment which was statistically similar with (0.20 and 0.27) T₃, T₄, T₅ and T₆, respectively (Table 4).

The highest percentage of infested fruit in number (12.64) was recorded in T_7 treatment. Again, the lowest percentage of infested fruit in number (1.79) was recorded in T_1 treatment which was statistically similar with (2.09, 3.13, 4.60, 5.03 and 5.35) T_2 , T_3 , T_5 , T_4 and T_6 , respectively. Brinjal fruit infestation percentage reduction over control at early fruiting stage in number was estimated for some botanicals and bio-control agents and the highest percentage (85.84) was recorded for the treatment T_1 and the lowest percentage (57.67) from T_6 treatment (Table 4).

Treatment		Brinjal	fruit by number	
	Healthy	Infested	% infestation	Infestation reduction over control (%)
T ₁	7.00 a	0.13 b	1.79 b	85.84
T ₂	6.53 a	0.13 b	2.09 b	83.47
T ₃	6.20 ab	0.20 b	3.13 b	75.24
T_4	5.07 c	0.27 b	5.03 b	60.21
T ₅	5.53 bc	0.27 b	4.60 b	63.61
T ₆	4.67 c	0.27 b	5.35 b	57.67
T ₇	4.60 c	0.67 a	12.64 a	
LSD(0.05)	0.935	0.195	3.302	
CV(%)	9.28	9.77	13.52	

Table 4. Infestation of brinjal fruits caused by the brinjal shoot and fruitborer (BSFB) in different treatments at early fruiting stage innumber during kharif season, 2009

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.2.2 Brinjal fruit in weight

The highest weight of healthy fruit plant⁻¹ (752.05 g) was recorded in T₁ treatment which was statistically similar with (708.28 g and 663.10 g) T₂ and T₃, respectively, while the lowest (463.56 g) weight of healthy fruits plant⁻¹ was recorded in T₇ treatment which was also statistically similar with (497.11 g and 543.78 g) T₆ and T₄, respectively. The highest weight of infested fruit (68.33 g) was recorded in T₇ treatment, while the lowest weight of infested fruit (22.00 g) was recorded in T₁ treatment which was statistically similar with (21.67 g, 32.67 g, 36.67 g and 37.00 g) T₂, T₃, T₄, T₅ and T₆, respectively (Table 5).

The highest percentage of infested fruit in weight (12.84) was recorded in T_7 treatment. Again, the lowest percentage of infested fruit in weight (2.72) was recorded in T_1 treatment which was statistically similar (3.06 and 4.70) with T_2 and T_3 , respectively. Brinjal fruit infestation percentage reduction over control in weight at early fruiting stage was estimated for some botanicals and bio-control agents and the highest percentage (78.82) was recorded for the treatment T_1 and the lowest percentage (46.11) from T_6 treatment (Table 5).

From the findings it is revealed that spraying of Neem oil @ 4ml/L of water at 7 days interval performed lowest percentage of fruit infestation in weight followed by neem seed kernel @ 300g/L of water at 7 days interval, while in control treatment the situation is reverse under the trail. The similar studies ware conducted on the effect of neem products on brinjal shoot and fruit borer (*Leucinodes orbonalis*). Among the different neem products neem oil 4% recorded less fruit damage (9.07%) and higher yield (24.48 t/ha). (Raja *et al.*, 1998).

Treatment		Brinjal fruit by weight (g)			
	Healthy	Infested	% infestation	Reduction over control (%)	
T_1	752.05 a	22.00 b	2.72 d	78.82	
T ₂	708.28 a	21.67 b	3.06 cd	76.17	
T ₃	663.10 ab	32.67 b	4.70 bcd	63.40	
T_4	543.78 cd	37.00 b	6.39 b	50.23	
T ₅	597.48 bc	36.67 b	5.85 bc	54.44	
T ₆	497.11 d	37.00 b	6.92 b	46.11	
T ₇	463.56 d	68.33 a	12.84 a		
LSD(0.05)	92.70	20.17	2.855		
CV(%)	8.63	11.08	16.44		

Table 5. Infestation of brinjal fruits caused by the brinjal shoot and fruitborer (BSFB) in different treatments at early fruiting stage inweight during kharif season, 2009

- T₁: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ at 7 days interval
- T₄: *Bacillus thuringiensis* serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.3.2 Brinjal fruit in number

The highest number of healthy fruit plant⁻¹ (10.53) was recorded in T_1 treatment which was statistically similar with (9.53 and 9.33) T_2 and T_3 , respectively. Again, the lowest (6.20) number of healthy fruits per plant was recorded in T_7 treatment which was statistically similar with (7.07) T_6 . The highest number of infested fruit (1.13) was recorded in T_7 treatment. On the other hand the lowest number of infested fruit (0.27) was recorded in T_1 treatment which was statistically similar with (0.33 and 0.40) T_2 and T_3 , respectively (Table 6).

The highest percentage of infested fruit in number plant⁻¹ (15.52) was recorded in T_7 treatment, again the lowest percentage of infested fruit in number (2.45) was recorded in T_1 treatment which was statistically similar (3.35 and 4.11) with T_2 and T_3 , respectively. Brinjal fruit infestation percentage reduction over control at mid fruiting stage in number was estimated for some botanicals and bio-control agents and the highest percentage (84.21) was recorded for the treatment T_1 and the lowest percentage (44.72) from T_6 treatment (Table 6). Butani and Jotwani (1984) reported that the pest is reported to cause 16 to 64% damage to fruits.

Table 6.	Infestation of brinjal fruits caused by the brinjal shoot and fruit						
	borer (BSFB) in different treatments at mid fruiting stage in						
	number during kharif season, 2009						

Treatment	Brinjal fruit by number			
	Healthy	Infested	% infestation	Reduction over
				control (%)
T ₁	10.53 a	0.27 e	2.45 e	84.21
T ₂	9.53 ab	0.33 de	3.35 de	78.41
T ₃	9.33 ab	0.40 cde	4.11 de	73.52
T ₄	8.13 bc	0.53 bc	6.13 c	60.50
T ₅	8.80 b	0.47 cd	5.02 cd	67.65
T ₆	7.07 cd	0.67 b	8.58 b	44.72
T ₇	6.20 d	1.13 a	15.52 a	
LSD(0.05)	1.343	0.178	1.787	
CV(%)	8.87	18.85	15.57	

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.3.2 Brinjal fruit in weight

The highest weight of healthy fruit plant⁻¹ (993.22 g) was recorded in T_1 treatment which was statistically similar (954.94 g and 919.49 g) with T_2 and T_3 , respectively, while the lowest (555.93 g) weight of healthy fruits per plant was recorded in T_7 treatment. The highest weight of infested fruit (106.63 g) was recorded in T_7 treatment, whereas the lowest weight of infested fruit (33.15 g) was recorded in T_1 treatment which was statistically similar (40.17 g) with T_3 and closely followed (60.10 g, 63.33 g, 67.93 g and 68.33 g) with T_3 , T_5 , T_4 and T_6 , respectively (Table 7).

The highest percentage of infested fruit in weight (16.11) was recorded in T_7 treatment, whereas the lowest percentage of infested fruit in weight (3.23) was recorded in T_1 treatment which was statistically similar (4.04) with T_2 and closely followed (6.14) by T_3 treatment. Brinjal fruit infestation percentage reduction over control in weight at mid fruiting stage was estimated for some botanicals and bio-control agents and the highest percentage (79.95) was recorded for the treatment T_1 and the lowest percentage (42.52) from T_6 treatment (Table 7).

It is revealed that spraying of neemoil @ 4ml/L of water at 7 days interval gave lowest % of fruit infestation while in control treatment the highest percent fruit infestation was recorded, Singh (2003), reported that spraying neem oil @ 5% was effective in reducing the fruit borer incidence (20.63%) and increased yield (82.5q/ha) compared to control (27.7q/ha).

Table 7. Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at mid fruiting stage in weight during kharif season, 2009

Treatment	Brinjal fruit by weight (g)			
	Healthy	Infested	% infestation	Reduction over control (%)
T ₁	993.22 a	33.15 c	3.23 e	79.95
T ₂	954.94 ab	40.17 c	4.04 e	74.92
T ₃	919.49 ab	60.10 b	6.14 d	61.89
T ₄	783.06 c	67.93 b	8.04 c	50.09
T ₅	852.71 bc	63.33 b	6.94 d	56.92
T ₆	672.21 d	68.43 b	9.26 b	42.52
T ₇	555.93 e	106.63 a	16.11 a	
LSD(0.05)	110.3	9.154	1.088	
CV(%)	7.57	8.19	7.96	

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.4.1 Brinjal fruit in number

The highest number of healthy fruit per plant (7.73) was recorded in T_1 treatment which was statistically similar with (7.07) T_2 . On the other hand the lowest (5.53) number of healthy fruits per plant was recorded in T_7 treatment which was statistically similar with (5.67 and 6.07) T_6 and T_4 , respectively. The highest number of infested fruit (1.27) was recorded in T_7 treatment, whereas the lowest number of infested fruit (0.27) was recorded in T_1 treatment which was statistically similar with (0.33) T_2 (Table 8).

The highest percentage of infested fruit in number (18.63) was recorded in T_7 treatment, while the lowest percentage of infested fruit in number (3.31) was recorded in T_1 treatment which was statistically similar (4.54) with T_2 and closely followed (6.55) by T_3 . Brinjal fruit infestation percentage reduction over control at late fruiting stage in number was estimated for some botanicals and bio-control agents and the highest percentage (82.23) was recorded for the treatment T_1 , while the lowest percentage (53.35) from T_6 treatment (Table 8). The results obtained from the present study were similar with the findings of Sarode *et al.* (1994).

Table 8.	Infestation of brinjal fruits caused by the brinjal shoot and fruit					
	borer (BSFB) in different treatments at late fruiting stage in					
	number during kharif season,2009					

Treatment	Brinjal fruit by number				
	Healthy	Infested	% infestation	Reduction over control (%)	
T ₁	7.73 a	0.27 c	3.31 d	82.23	
T ₂	7.07 ab	0.33 bc	4.54 cd	75.63	
T ₃	6.60 bc	0.47 b	6.55 bc	64.84	
T_4	6.07 cde	0.53 b	8.03 b	56.90	
T ₅	6.47 bcd	0.53 b	7.65 b	58.94	
T ₆	5.67 de	0.53 b	8.69 b	53.35	
T ₇	5.53 e	1.27 a	18.63 a		
LSD(0.05)	0.811	0.187	2.920		
CV(%)	7.08	19.03	10.02		

- T₁: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.4.2 Brinjal fruit in weight

The highest weight of healthy fruit per plant (744.37 g) was recorded in T_1 treatment which was statistically similar (668.24 g) with T_2 , while the lowest (517.08 g) weight was recorded in T_7 treatment which was statistically similar (538.42 g and 573.66 g) with T_6 and T_4 , respectively. The highest weight of infested fruit (118.57 g) was recorded in T_7 treatment. On the other hand, the lowest weight of infested fruit (34.12 g) was recorded in T_1 treatment which was closely followed (43.77 g, 48.58 g and 50.72 g) by T_2 , T_3 and T_5 , respectively (Table 9).

The highest percentage of infested fruit in weight (18.67) was recorded in T_7 treatment, again the lowest percentage of infested fruit in weight (4.38) was recorded in T_1 treatment. Brinjal fruit infestation percentage reduction over control in weight at late fruiting stage was estimated for some botanicals and bio-control agents and the highest percentage (76.54) was recorded for the treatment T_1 and the lowest percentage (51.31) from T_6 treatment (Table 9).

From the findings it is revealed that spraying of neem oil @ 4ml/L of water at 7 days interval performed maximum healthy fruit and minimum infested fruit as well as lowest % of fruit infestation in weight followed by neem seed kernel @ 300g/L of water at 7 days interval, while in control treatment the situation is reverse under the trail followed by Botanical pesticides safeclean 5 ml/L of water at 7 days interval. Joyoti D. Pareet, 2006, reported that botanical spray was more effective in reducing the shoot (15.64%) and fruit infestation (18.49%) and recorded highest marketable fruit yield (122.20 q/ha) against BSFR in brinjal.

Table 9. Infestation of brinjal fruits caused by the brinjal shoot and fruit borer (BSFB) in different treatments at late fruiting stage in weight during kharif season, 2009

Treatment		Brinjal fruit	t by weight (g)	
	Healthy	Infested	% infestation	Reduction over
				control (%)
T ₁	744.37 a	34.12 d	4.38 e	76.54
T ₂	668.24 ab	43.77 c	6.16 d	67.01
T_3	625.69 bc	48.58 bc	7.23 cd	61.27
T_4	573.66 cde	53.83 b	8.60 bc	53.94
T ₅	610.42 bcd	50.72 bc	7.75 bc	58.49
T_6	538.42 de	53.75 b	9.09 b	51.31
T ₇	517.08 e	118.57 a	18.67 a	
LSD(0.05)	77.41	7.886	1.517	
CV(%)	7.12	7.69	9.64	

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.5 Fruit bearing status throughout the growing season

Number of healthy fruits plant⁻¹, number of infested fruits plant⁻¹ and percent infestation of fruit plant⁻¹ throughout the growing season by number and weight in controlling brinjal shoot and fruit borer showed statistically significant differences for some botanicals and bio-control agents are presented in Table 10-11.

4.5.1 Brinjal fruit in number

The highest number of healthy fruit per plant (25.27) was recorded in T_1 treatment which was statistically similar (23.13) with T_2 , whereas the lowest (16.33) number of healthy fruits per plant was recorded in T_7 treatment which was statistically similar with (17.40) T_6 . The highest number of infested fruit (3.07) was recorded in T_7 treatment, whereas the lowest number of infested fruit (0.67) was recorded in T_1 treatment which was statistically identical (0.80) with T_2 and closely followed (1.07) by T_3 treatment (Table 10).

The highest percentage of infested fruit in number (15.85) was recorded in T_7 treatment, while the lowest percentage of infested fruit in number (2.57) was recorded in T_1 treatment which was statistically similar (3.36) with T_2 and closely followed (4.59 and 5.76) by T_3 and T_5 , respectively (Figure 1). Brinjal fruit infestation percentage reduction over control throughout the growing season in number was estimated for some botanicals and bio-control agents and the highest percentage (83.79) was recorded for the treatment T_1 , whereas the lowest percentage (50.91) from T_6 treatment (Table 10).

Table 10.	Infestation of brinjal fruits caused by the brinjal shoot and fruit					
	borer (BSFB) in different treatments throughout the growing					
	period in number during kharif season, 2009					

Treatment	Treatment Brinjal fruit by number				
	Healthy	Infested	% infestation	Reduction over	
				control (%)	
T ₁	25.27 a	0.67 e	2.57 f	83.79	
T ₂	23.13 ab	0.80 de	3.36 ef	78.80	
T ₃	22.13 bc	1.07 cd	4.59 de	71.04	
T_4	19.27 de	1.33 bc	6.47 bc	59.18	
T ₅	20.80 cd	1.27 bc	5.76 cd	63.66	
T ₆	17.40 ef	1.47 b	7.78 b	50.91	
T ₇	16.33 f	3.07 a	15.85 a		
LSD(0.05)	2.161	0.287	1.619		
CV(%)	11.75	13.74	4.54		

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.5.2 Brinjal fruit in weight

The highest weight of healthy fruit plant⁻¹ (2489.6 g) was recorded in T₁ treatment which was statistically similar (2331.5 g) with T₂ and closely followed (2208.3 g) by T₃ treatment. On the other hand the lowest (1536.6 g) weight of healthy fruits per plant was recorded in T₇ treatment. The highest weight of infested fruit (293.53 g) was recorded in T₇ treatment, while the lowest weight (89.28 g) was recorded in T₁ treatment which was statistically similar (105.60 g) with T₂ (Table 11).

The highest percentage of infested fruit in weight (16.04) was recorded in T_7 treatment and the lowest percentage of infested fruit in weight (3.46) was recorded in T_1 treatment (Figure 2). Brinjal fruit infestation percentage reduction over control in weight throughout the growing season was estimated for some botanicals and bio-control agents and the highest percentage (78.43) was recorded for the treatment T_1 and the lowest percentage (46.82) from T_6 treatment (Table 11).

From the findings it is revealed that spraying of neem oil @ 4ml/L of water at 7 days interval performed maximum healthy fruit and minimum infested fruit as well as lowest percentage of fruit infestation in weight followed by neem seed kernel @ 300g/L of water at 7 days interval, while in control treatment the situation is reverse under the trail followed by Botanical pesticides safeclean 5 ml/L of water at 7 days interval. Butani and Jotwani (1984) reported that the pest is reported to cause 16 to 64% damage to fruits.

Treatment	Brinjal fruit by weight (g)				
	Healthy	Infested	% infestation	Reduction over control (%)	
T ₁	2489.6 a	89.28 c	3.46 e	78.43	
T ₂	2331.5 ab	105.60 c	4.35 d	72.88	
T ₃	2208.3 bc	141.35 b	6.02 c	62.47	
T_4	1900.5 d	158.76 b	7.70 b	52.00	
T ₅	2060.6 cd	150.72 b	6.83 c	57.42	
T ₆	1707.7 e	159.18 b	8.53 b	46.82	
T ₇	1536.6 f	293.53 a	16.04 a		
LSD(0.05)	164.1	18.95	0.834		
CV(%)	6.79	6.21	7.72		

Table 11.Infestation of brinjal fruits caused by the brinjal shoot and fruit
borer (BSFB) in different treatments throughout the growing
period in weight during kharif season, 2009

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: Trichogramma evanescense @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.6 Effect of temperature, rainfall and humidity on fruit infestation of brinjal at different harvesting time

With increasing of temperature at different harvesting time, percent fruit infestation of brinjal increasing and with increasing the temperature percent fruit infestation also followed increasing trend (Figure 3) and it was highest in 5th harvesting, when the highest mean temperature was raised at 30.35° C. Similar results were obtained by Dhillon *et al.*, (2005). They observed that the extent of losses vary 30 to 100% depending on the species and season, and the abundance of BSFB increases when the temperature fall bellow 32° C. Brevault *et al.*, (2000) also reported that the developmental rate of the different life stages increased linearly with increasing temperature upto 30° C.

Percent brinjal fruit infestation trend was found more or less similar when the mean rainfall was bellow 185 mm and the trend was increasing when the mean rainfall was more than 265 mm (Figure 3). Result also supported with the report of Hui *et al.*, (2007) they concluded that the population was depressed when the amount of monthly mean rainfall was lower than 50 mm but increased when rainfall ranged from 200 to 1000 mm and when the amount of monthly rainfall was higher than 628 mm the BSFB population was reduced remarkably. Like temperature positive effect was also found in case of relative humidity. With increasing relative humidity, percent fruit infestation increased and with the decreasing relative humidity, percent fruit infestation decreased. It was highest in 5th harvesting time when the highest relative humidity was 85% (Figure 3). Dhillon *et al.*, (2005) also stated that the abundance of BSFB increased when the relative humidity ranges 60 to 70%. Narayan and Batra (1960) reported that most of the BSFB species are more or less active at temperatures ranging between 12° C- 15° C and become inactive below 10° C.

4.7 Yield and yield contributing characters

4.7.1 Plant height (cm)

Plant height at final harvest of brinjal showed a statistically significant difference in terms of for some botanicals and bio-control agents (Figure 4). The longest plant (124.08 cm) was found in T_1 treatment which was statistically similar (120.99 cm, 117.62 cm and 115.50 cm) with T_2 , T_3 and T_5 treatment. On the other hand, the shortest plant (101.50 cm) was recorded in T_7 treatment which was statistically similar (104.87 cm and 111.23 cm) with T_6 and T_4 treatment (Figure 4). Plant height increased with the decrease of shoot infestation level. Probably shoot infestation hinders the normal growth of brinjal fruit.

Plant height of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (22.25) was recorded for the treatment T_1 and the lowest percentage (3.32) was recorded from T_6 treatment.

4.7.2 Length of healthy fruit (cm)

Significant difference was recorded in terms of length of healthy fruit of brinjal for some botanicals and bio-control agents (Table 12). The maximum length of healthy fruit (26.25 cm) was found in T_1 treatment which was statistically similar (24.83 cm, 24.29 cm and 23.20 cm) with T_2 , T_3 and T_5 treatment, whereas the minimum length (20.93 cm) was found in T_7 treatment which was statistically identical (21.46 cm and 22.68 cm) with T_6 and T_4 treatment (Table 12).

Length of healthy fruits of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (25.42) was recorded for the treatment T_1 , while the lowest percentage (2.53) was recorded from T_6 treatment (Table 12).

4.7.3 Length of infested fruit (cm)

A statistically significant difference was recorded in terms of length of infested fruit of brinjal for some botanicals and bio-control agents (Table 12). The maximum length of infested fruit (22.29 cm) was found in T₁ treatment which was statistically similar (21.59 cm and 21.06 cm) with T₂ and T₃ treatment. On the other hand, the minimum length of infested fruit (17.07 cm) was recorded in T₇ treatment which was statistically similar (17.46 cm) with T₆ (Table 12).

Length of healthy fruits of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (30.58) was recorded for the treatment T_1 and the lowest percentage (2.28) was recorded from T_6 treatment (Table 12).

Table 12. Effect of botanicals and bio-control agents against brinjal	shoot
and fruit borer (BSFB) in terms of length of healthy and in	fested
fruit	

Treatment		Length				
	Hea	llthy	Infe	ested		
	Length	Increase over	Length	Increase over		
		control (%)		control (%)		
T ₁	26.25 a	25.42	22.29 a	30.58		
T ₂	24.83 ab	18.63	21.59 a	26.48		
T ₃	24.29 abc	16.05	21.06 ab	23.37		
T ₄	22.68 bc	8.36	19.25 bc	12.77		
T ₅	23.20 abc	10.85	19.08 bc	11.78		
T ₆	21.46 bc	2.53	17.46 c	2.28		
T_7	20.93 c		17.07 c			
LSD(0.05)	3.212		2.035			
CV(%)	7.72		5.81			

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) did not differ significantly and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

- T₁: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.7.4 Girth of healthy fruit (cm)

A statistically significant difference was recorded in terms of girth of healthy fruit of brinjal for some botanicals and bio-control agents (Table 13). The maximum girth of healthy fruit (7.31 cm) was found in T_1 treatment which was statistically similar (7.07 cm and 6.63 cm) with T_2 and T_3 treatment. On the other hand, the minimum girth of healthy fruit (5.17 cm) was recorded in T_7 treatment which was statistically similar (25.53 cm and 6.01 cm) with T_6 and T_4 treatment (Table 13).

Girth of healthy fruits of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (41.39) was recorded for the treatment T_1 and the lowest percentage (6.96) was recorded from T_6 treatment (Table 13).

4.7.5 Girth of infested fruit (cm)

A statistically significant difference was recorded in terms of girth of infested fruit of brinjal for some botanicals and bio-control agents (Table 13). The maximum girth of infested fruit (6.59 cm) was found in T_1 treatment which was statistically similar (6.41 cm and 6.02 cm) with T_2 and T_3 treatment. Again, the minimum girth of infested fruit (4.81 cm) was recorded in T_7 treatment which was statistically similar (5.11 cm) with T_6 (Table 13).

Girth of healthy fruits of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (37.01) was recorded from T_1 and the lowest percentage (6.24) from T_6 treatment (Table 13).

Table 13. Effect of botanicals and	bio-control agents against Brinjal Shoot
and Fruit Borer (BSFB)	in terms of girth of healthy and infested
fruit	

Treatment		Girth o	of fruit				
	Hea	althy	Infe	ested			
	Girth (cm)	Increase over	Girth (cm)	Increase over			
		control (%)		control (%)			
T ₁	7.31 a	41.39	6.59 a	37.01			
T ₂	7.09 ab	37.14	6.41 ab	33.26			
T ₃	6.63 abc 2		6.02 abc	25.16			
T ₄	6.01 cde	16.25	5.51 cde	14.55			
T ₅	6.29 bcd	21.66	5.74 bcd	19.33			
T ₆	5.53 de	6.96	5.11 de	6.24			
T ₇	5.17 e		4.81 e				
LSD(0.05)	0.871		0.727				
CV(%)	5.91		5.27				

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) did not differ significantly and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ $0.1g/6 m^2$ at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.7.6 Individual fruit weight (g)

A statistically significant difference was recorded in terms of individual fruit weight of brinjal for some botanicals and bio-control agents (Table 14). The highest weight of individual fruit weight (85.34 g) was obtained in T₁ treatment which was statistically similar (84.82 g and 82.39 g) with T₂ and T₃ treatment. On the other hand, the lowest weight (66.97 g) was recorded in T₇ treatment which was statistically similar (68.96 g) with T₆ (Table 14).

Individual fruit weight of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest percentage (27.43) was recorded for the treatment T_1 and the lowest percentage (2.97) was recorded from T_6 treatment (Table 14).

4.7.7 Edible portion (%)

A statistically significant difference was recorded in terms of edible portion of brinjal for some botanicals and bio-control agents (Table 14). The highest edible portion (95.77%) was found in T_1 treatment which was statistically similar (94.18%, 92.36%, 89.66% and 88.15%) with T_2 , T_3 , T_5 and T_4 , treatment, respectively, while the lowest edible portion (76.33%) was recorded in T_7 treatment (Table 14).

Table 14. Effect of botanicals and bio-control agents against brinjal shootand fruit borer (BSFB) in terms of single fruit weight, edible andnon edible portion of infested fruit

Treatment	Individual fruit weight (g)	Increase over control (%)	Edible portion (%)	Non edible portion (%)
T_1	85.34 a	27.43	95.77 a	4.23 c
T ₂	84.82 a	26.65	94.18 a	5.82 c
T ₃	82.39 a	23.03	92.36 ab	7.64 bc
T ₄	73.77 bc	10.15	88.15 ab	11.85 bc
T ₅	75.69 b	13.02	89.66 ab	10.34 bc
T ₆	68.96 cd	2.97	85.15 b	14.85 b
T ₇	66.97 d		76.33 c	23.67 a
LSD(0.05)	6.234		7.364	7.364
CV(%)	4.56		6.66	16.96

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) did not differ significantly and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

- T₁: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.7.8 Non edible portion (%)

A statistically significant difference was recorded in terms of non edible portion of brinjal for some botanicals and bio-control agents (Table 14). The lowest non edible portion (23.67%) was found in T_7 treatment, whereas the lowest portion (4.23%) was recorded in T_7 treatment which was similar (5.82%, 7.64%, 10.34% and 11.85%) with T_2 , T_3 , T_5 and T_4 , treatment, respectively (Table 14).

Effect of different treatments on the yield of brinjal

4.7.9 Yield plot⁻¹ (kg)

Healthy fruit yield, infested yield and increase over control obtained from different treatment varied significantly (Table 15). The treatment T_1 produced the highest yield per plot (29.95 kg) was found in T_1 treatment which was statistically similar (28.98 kg, 28.50 kg and 27.77 kg) with T_2 , T_3 and T_5 treatment, while the lowest yield per plot (18.24 kg) was recorded in T_7 treatment (Table 15).

Fruit yield per plot of brinjal increased over control was estimated for some botanicals and bio-control agents and the highest value (64.20%) was recorded for the treatment T_1 and the lowest value (37.61%) was recorded from T_6 treatment (Table 15).

4.7.10 Yield hectare⁻¹ (ton)

Some botanicals and bio-control agents showed significant difference in terms of yield per hectare of brinjal (Table 15). The highest yield per hectare (49.92 ton) was found in T_1 treatment which was statistically similar (48.31 ton, 47.50 ton and 46.29 ton) with T_2 , T_3 and T_5 treatment, whereas the lowest yield per hectare (30.40 ton) was recorded in T_7 treatment (Table 15).

Treatment	Yield of fruit									
	Yield per plot	Increase over	Yield per	Increase over						
	(kg)	control (%)	hectare (ton)	control (%)						
T_1	29.95 a	64.20	49.92 a	64.21						
T ₂	28.98 ab	58.88	48.31 ab	58.91						
T ₃	28.50 abc	56.25	47.50 abc	56.25						
T ₄	25.59 bc	40.30	42.65 bc	40.30						
T ₅	27.77 abc	52.25	46.29 abc	52.27						
T ₆	25.10 c	37.61	41.84 c	37.63						
T ₇	18.24 d		30.40 d							
LSD(0.05)	3.542		5.903							
CV(%)	7.57		7.57							

Table 15. Yield of brinjal from different treatments against BSFB) during
kharif season, 2009

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) did not differ significantly and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

- T₁: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

Fruit yield per plot of brinjal increase over control was estimated for some botanicals and bio-control agents and the highest value (64.21%) was recorded for the treatment T_1 and the lowest value (37.63%) from T_6 treatment (Table 15).

4.8 Economic Analysis

The analysis was done in order to find out the most profitable botanicals and biocontrol agents based on cost and benefit of various components. The results of economic analysis of brinjal showed that the highest net benefit of Tk. 454,200 ha⁻¹ was obtained in T₁ treatment and the second highest net benefit was found Tk. 438,100 ha⁻¹ in T₂. The highest benefit cost ratio (3.34) was estimated for T₅ treatment and the lowest (2.81) benefit cost ration for T₆ treatment under the trial (Table 16). The highest BCR was found in the treatment T₁ may be due to the minimum infestation cost compared to the other treatment components and highest yield.

4.9 Relationship between yield contributing characters and yield ha⁻¹

4.9.1 Relationship between length of fruit yield ha⁻¹

The data on length of fruit were regressed against yield ha⁻¹ and a positive linear relationship was obtained between them. It was evident from the Figure 5 that the equation y = 3.0134x - 26.599 gave a good fit to the data, and the co-efficient of determination ($R^2 = 0.7398$) showed that, fitted regression line had a significant regression co-efficient. It is evident from the regression line and equation that, the yield increased with the increased of length of fruit for some botanicals and biocontrol agents in controlling BSFB in brinjal.

Treatments	Cost of pest Management (Tk.)	Total Yield (t/ha)	Gross return (Tk.)	Net Return (Tk.)	Adjusted net return (Tk.)	Benefit cost ratio
T_1	45000	49.92	499200	454200	150200	3.34
T ₂	45000	00 48.31 483100 438100 134100		2.98		
T ₃	40000	47.5	475000	435000	131000	3.28
T ₄	35000	42.65	426500	391500	87500	2.50
T ₅	T ₅ 45000		462900	417900	113900	2.53
T ₆	T ₆ 30000		418400	388400	84400	2.81
T ₇	0	30.4	304000	304000	0	

 Table 16. Cost of production of brinjal for against brinjal shoot and fruit borer (BSFB) management practices

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) did not differ significantly and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

- T1: Neem oil @ 4ml/L of water at 7 days interval
- T₂: Neem seed kernel @ 300g/L of water at 7 days interval
- T₃: *Trichogramma evanescense* @ 0.1g/6 m² at 7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water at 7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water at 7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval
- T₇: Untreated control

4.9.2 Relationship between girth of fruit and yield ha⁻¹

Correlation study was done to established a relationship between breadth of fruit and yield (t/ha). From the study it was revealed that significant correlations existed between the characters. The regression equation y = 7.5351x - 3.5513 gave a good fit to the data and the value of the co-efficient of determination ($R^2 = 0.802$). From this it can be concluded that increase the girth of fruit increase the yield (Figure 6).

4.9.3 Relationship between individual fruit weight and yield ha⁻¹

When the data individual fruit weight and yield hectare⁻¹ were regressed a positive relationship was obtained between these two characters. Here the equation y = 0.7624x - 14.743 gave a good fit to the data, and the value of the co-efficient of determination (R² = 0.7464) showed that the fitted regression line had a significant regression coefficient. Increase the yield per hectare due to the increase of individual fruit weight of brinjal (Figure 7).

4.9.4 Relationship between edible portion and yield ha⁻¹

The data on edible portion of fruit were regressed against yield ha⁻¹ and a positive linear relationship was obtained between the characters. It was evident from the Figure 8 that the equation y = 0.9887x - 43.948 gave a good fit to the data, and the co-efficient of determination ($R^2 = 0.9692$) showed that, fitted regression line had a significant regression co-efficient. It is evident from the regression line and equation that, the yield increased with the increased of edible portion of brinjal.

CHAPTER V

SUMMARY

The study was conducted to find out the effect of some botanicals and bio-control agents in controlling brinjal shoot and fruit borer in brinjal in the central farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, Bangladesh during the period from April to October 2009. BARI Begun-8 was used as the test crop of this experiment. The experiment consists of the following management practices: T₁: Neem oil @ 4ml/L of water at 7 days interval; T₂: Neem seed kernel @ 300 g/L of water at 7 days interval; T₃: *Trichogramma evanescense* @ 0.1g/6 m² of water at 7 days interval; T₄: *Bacillus thuringiensis* serovar kurstaki @ 1.5ml/L of water at 7 days interval; T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension/L of water + Safeclean 2.5 ml/L of water at 7 days interval; T₆: Botanical pesticides Safeclean 5 ml/L of water at 7 days interval and T₇: Untreated control. The experiment was laid out in Randomized Complete Block Design (RCBD) with three replications.

Significant difference was observed on the number of healthy shoot at early, mid and late fruiting stage in controlling brinjal shoot and fruit borer (BSFB) by using some botanicals and bio-control agents. At early fruiting stage, the highest number of healthy shoots per plant (22.20) was recorded in T_1 treatment and the lowest (16.13) number in T_7 . The highest number of infested shoot (2.47) was recorded in T_7 treatment, while the lowest number (0.80) in T_1 treatment. The highest percentage of infested shoot (13.25) was recorded in T_7 treatment, again the lowest (3.48) in T_1 treatment. Percent brinjal shoot infestation reduction over control was estimated for different management practices and the highest percent (73.74) reduction over control was recorded for the treatment T_1 and the lowest percent (50.79) from T_6 treatment. At mid fruiting stage, the highest number of healthy shoots per plant (29.47) was recorded in T_1 , whereas the lowest (21.00) in T_7 treatment. The highest number of infested shoots (3.87) was recorded in T_7 treatment, again the lowest number of infested shoots (3.87) was The highest percentage of infested shoot in number (15.56) was recorded in T_7 treatment, while the lowest (3.49) in T_1 treatment. Percent brinjal shoot infestation reduction over control was estimated for different management practices and the highest percentage (77.57) was recorded for the treatment T_1 and the lowest (47.56) from T_6 treatment. At late fruiting stage the highest number of healthy shoots per plant (33.73) was recorded in T_1 treatment and the lowest (22.80) in T_7 treatment. The highest number of infested shoots (5.27) was recorded in T_7 treatment, whereas the lowest number (1.27) in T_1 treatment. The highest percentage of infested shoot in number (18.75) was recorded in T_7 treatment, while the lowest (3.62) in T_1 treatment. Percent brinjal shoot infestation reduction over control was estimated for different management practices and the highest percent (80.69) was recorded for the treatment T_1 and the lowest value (45.23) from T_6 treatment.

Number of healthy fruit, infested fruit, percentage of infestation at early, mid, late and throughout the fruiting stage in controlling BSFB by using some botanicals and biocontrol agents showed a statistically significant difference. Throughout the growing season the highest number of healthy fruit per plant (25.27) was recorded in T_1 treatment, whereas the lowest number (16.33) was recorded in T_7 treatment. The highest number of infested fruit (3.07) was recorded in T_7 treatment, again the lowest number (0.67) in T_1 treatment. The highest percentage of infested fruit in number (15.85) was recorded in T_7 treatment, while the lowest (2.57) in T_1 treatment. Percent brinjal fruit infestation reduction over control agents and the highest percent (83.79) reduction over control was recorded for the treatment T_1 , whereas the lowest percent (50.91) from T_6 treatment. The highest weight of healthy fruit per plant (2489.6 g) was recorded in T_1 and the lowest weight (1536.6 g) was recorded in T_7 treatment. The highest weight of fruit per plant (2489.6 g) was recorded fruit the lowest fruit in the lowest weight fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded for the treatment fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of infested fruit per plant (2489.6 g) was recorded for the treatment fruit per plant (2489.6 g) was recorded in Ta and the lowest weight of (293.53 g) was recorded in T_7 treatment, while the lowest weight of infested fruit (89.28 g) was recorded in T_1 treatment. The highest percentage of infested fruit in weight (16.04) was recorded in T_7 treatment and the lowest (3.46) in T_1 treatment. Percent brinjal fruit infestation reduction over control in weight throughout the growing season was estimated for some botanicals and bio-control agents and the highest percent (78.43) reduction over control was recorded for the treatment T_1 and the lowest percent (46.82) from T_6 treatment.

Yield contributing characters and yield of brinjal showed a statistically significant difference by using some botanicals and bio-control agents. The longest plant (124.08 cm) was observed in T_1 treatment and the shortest plant (101.50 cm) in T_7 treatment. The maximum length of healthy fruit (26.25 cm) was found in T1 treatment, whereas the minimum length (20.93 cm) in T7 treatment. The maximum length of infested fruit (22.29 cm) was recorded in T_1 and the minimum length (17.07 cm) in T_7 treatment. The maximum girth of healthy fruit (7.31 cm) was found in T_1 treatment and the minimum girth (5.17 cm) in T₇ treatment. The maximum girth of infested fruit (6.59 cm) was found in T₁ treatment, again the minimum (4.81 cm) in T₇ treatment. The highest weight of individual fruit weight (85.34 g) was obtained in T_1 treatment and the lowest weight (66.97 g) in T_7 treatment. The highest edible portion (95.77%) was found in T_1 treatment, while the lowest (76.33%) in T_7 treatment. The lowest non edible portion (23.67%) was found in T_7 treatment, whereas the lowest non edible portion (4.23%) in T_7 treatment. The highest yield per hectare (49.92 ton) was obtained in T_1 treatment and the lowest yield per hectare (30.40 ton) was recorded in T₇ treatment. The highest benefit cost ratio (3.34) was estimated for T_5 treatment and the lowest (2.81) benefit cost ration for T_6 treatment.

CONCLUSION AND RECOMMENDATION

The present study revealed that the increased yield per hectare of brinjal with decrease rate of fruit/shoot infestation and the reduced weight of infested fruits might be obtained by applying Neem oil @ 4 ml/L of water at 7 days interval. Treatment T_2 consists of Neem seed kernel @ 300g/L of water at 7 days interval might be chosen as the alternative approach.

Evaluation of treatment T_3 using *Trichogramma evanescense* @ 0.1g/6 m² of water at 7 days interval, treatment T_5 *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension/L of water + Safeclean 2.5 ml/L of water at 7 days interval applied against brinjal shoot and fruit borer revealed that treatment T_1 having Neem oil @ 4ml/L of water at 7 days interval ensured rate of shoot/fruit infestation with increased yield. Treatment T_2 consisting of Neem seed kernel @ 300g/L of water at 7 days interval could be the second

effective option for controlling brinjal shoot and fruit borer. These two treatments could be integrated with the judicious use of selective chemicals and non-chemical approaches for combating this obnoxious pest. On the other hand, treatment T_3 and T_5 also have significant effect in suppressing this pest and it might be tested with other chemical and non-chemical components (i.e. pheromone, mechanical and cultural operation etc.) to combat this pest. However, further trials may be undertaken in order to confirm the validity of these results.

REFERENCE

- Ahmed, S. and Grainge, M. (1985). Potentila of the neem tree (*Azadirachta indica*) for pest control and rural development. *Econ. Botany*. **4**: 201-209.
- Alam, M. Z. (1969). Insect pests of vegetables and their control in East Pakistan. The Agriculture Information Service. Department of Agriculture; 3, R. K. Mission Road, Dhaka, East Pakistan, 146 p.
- Alam, M. Z. and Sana, D. L. (1962). Biology of the brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee in East Pakistan. In: Review of Research, Division of Entomology (1947-62). *Agric. Inf. Serv.* pp. 192-200.
- Alam, M. Z., Ali, M., Akanda, A. M., Chowdhury, D. A. M., Haque, N. M. M., Hossain,
 M. M. and Ogata, K. (1964). Grafting technology: An Integrated Pest
 Management Component for Eggplant and Tomato. *Bull. Inst. Trop. Agri. Kyushu*Univ.. 7: 85-91.
- Alam, S. (1991). Efficacy evaluation of neem and farmer field trail. In: Proceedings of the midterm Project Review meeting. *Botanical pest control project*. Phase –II .
 28-31. July, 1991, Dhaka, Bangladesh.
- Ali, M. I., Ali, M. S. and Rahman, M. S. (1986). Field observation of wilt disease and fruit borer attack on different cultivars of brinjal. *Bangladesh J. Agril. Sci.* 7(2):193-194.

- Anonymous. (1995). Annual Weather Report, Meteorological Station, Dhaka. Bangladesh.
- Anonymous. (2001). Field screening of some chemical insecticides for the control of brinjal shoot and fruit borer. In: Annual Report. 2000-2001. Entomology Division, BARI, Joydebpur, Gazipur, Bangladesh. pp. 28-29.
- Anonymous. (2003). Year Book of Agricultural Statistics of Bangladesh, 2000.Bangladesh Bureau of statistics, Planning Division, Ministry of Planning,Government of the People's Republic of Bangladesh, Dhaka, Bangladesh. 350p.
- Anonymous. (2005). Krishi Projukti Hatboi, Bangladesh Agricultural Research Institute, Joydevpur, Gazipur. 304p.
- Anonymous. (2008). Integrated management for the brinjal shoot and fruit borer. Annual report 2007-2008. BARI, Gazipur, Bangladesh. pp. 44-46.
- Asgari, S., Tafti, R. A., Sahragard, A. and Salehi, L. (2004). Study on functional response of *Trichogramma brassicae* Bezdenco (Hym.: Trichogrammatide) to different densities of *Sitotroga cerealella* Olivier (Lep.: Gelechiidae) eggs. J. Agric. Sci., 1(1): 1-8.
- Baang, L. A. and Corey, F. M. (1991). Life history of an eggplant fruit and shoot borer, *Leucinodes orbonalis* Guenee. (Lepidoptera: Pyralidae), J. Sci. Bukidnon, Central Mindanao University (CMU). 4(1): 45-61.
- Butani, D. K. and Jotwani, M. G. (1984). Insect in vegetables. Periodical Expert Book Agency, D-42. Vivck, Delhi-110032, India. 356p.

- Chattopadhyay, P. (1987). Entomology, Pest Control and crop Protection (in Bangla). West Bengal State Book Board, Arjo Mansion (9th floor), 6A, Raja Subodh Mollick Square, Calcutta-700013, India. 304 p.
- Dhankar, B. S. (1988). Progress in resistance studies in eggplant (Solanum melongena
 L.) against shoot and fruit borer (Leucinodes orbonalis Guen.) infestation. Trop. pest management, 34: 343-345.
- Dreyer, M. (1987). Field and Laboratory trail with simple neem products against pests of vegetable and field crops in Togo. In: Proceedings of the 3rd Neem *Conference, Nairobi, Kenya 1986 (Eds. Schmutterer, H. and Ascher, K.R.S.);* GTZ press, Eschborn, West Germany. 431p.
- Edris, K. M., Islam, A. T. M. T., Chowdhury, M. S. and Haque, A. K. M. M. (1979). Detailed Soil Survey of Bangladesh, Dept. Soil Survey, BAU and Govt. People's Republic of Bangladesh. 118 p.
- Fagoonee, I. (1986). Use of neem in vegetable crop protection in Mauritius. In Natural pesticides from the neem tree. Botanical pest research in Philippines. *Philippines Entomologist.* 7(1): 1-30.
- Gomez, K. A. and Gomez, A. A. (1984). Statistical Procedures for Agricultural Research. John Wilely and Sons. New York pp. 182p.
- Grainge, M. and Ahmed, S. (1988). Hand book of plant with pest control properties, p. 470. John Wiley and Sons, New York.
- Hami, M. A. (1955). Effect of borer attack on vit. C. content of brinjal. *Pakis. J. Hlth.*,4(4): 223-224.

- Hasan, S. A. (1992). Stem borer of graminacious crop in South East Asia. *Trop. Agric. Res.*, **8**:145-153.
- Hegazi, E. M. and Khafagi, W. E. (2001). Pattern of egg management by *Trichogramma cacoeciae* and *T. dendrolimi* (Hymenoptera: Trichogrammatidae). *Biocontrol Sci. Tech.*, **11**(3): 353-359.
- Hill, D. S. (1983). Agricultural Insect pests of the tropics and their control. 2nd edition, Cambridge University Press. pp 619, 634.
- Isahaque, N. M. and Chaudhuri, R. P. (1983). A new alternative host plant of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. J. Res. Assam Agril. Univ., 4(1): 83-85.
- Islam, B. N. (1983). Pesticidal action of neem and certain indigenous plants and weeds of Bangladesh . In: proc. 2nd Neem conf. Rauischholzhausen . F.R. Germany , May 25-28, 1983.
- Islam, B. N. (1986). Use of some extract from meliaceae and annonaceae for control of rice hispa, *Dicladispa armigera* OL. and the pulse beetle, *Callosobruchus chinensis*. pp. 217-242.
- Islam, M. A. (1999). Integrated pest (Insects) management of vegetables. Consultancy, report, 18 November 1998 to17 May 1999. AVRDC – USAID Bangladesh project, Horticulture Research center, BARI, Gazipur -1701.
- Islam, M. N. and Karim, M. A. (1991). Integrated management of shoot and fruit borer, *Leucinodes orbonalis* Guen. (Lepidoptera: Pyralidae) at Joydebpur. In Ann. Res. Report 1993-94. Ent. Div. BARI. Joydebpur, Gazipur, Bangladesh. pp. 44-46.

- Islam, M. N. and Karim, M. A. (1994). Management of the brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee. (Lepidoptera: Pyralidae) in field. In: Annual Research Report 1990-91. Entomological Division, BARI, Joydebpur, pp. 44-46.
- Jacob, S. and Sheila, M. K. (1994). Studies on the antifeedent activity of some plant products against the leaf caterpillar, *Silepa docilis*. Butl., on brinjal and wooly bear, *Pericallia ricini* F. on castor. *Indian J. Ent.*, **56** (3): 276-279.
- Jacopson, M. (1985). The neem tree; Natural resistance par excellence, .In: *Natural resistance of plants to pests. M. B. Green and P. A. Hedin (eds.)* ACS symposium series. 296: 220-231.
- Jayaraj, D. A. (1991). Neem seed kernel extracts on egg deposition on seedling. *Tropical pest management*. **36**(2): 138-140.
- Joati, D. P. (2006). Biorational Approaches for the Management of Brinjal Shoot and fruit borer, University of Agricultural Sciences, Dharwad.
- Kalloo, K. (1988). Solanaceous crops. In: Vegetable Breeding, vol. II CRC. Press INC. Boca Ratan, Florida.
- Karim R. A. N. M., Chowdhery M. N. A. and Hoque, N. M. (1992). Current research on neem in rice in Bangladesh. In: Botanical Pest Control Project Phase II, Proceedings of Final Workshop on Botanical Pest Control, 28-31 July, Los BaPios, Laguna, Philippines. pp 30-34.
- Karim, M. A. (1994). Vegetable and spice insect pests and their control. A. lecture note in training course on winter vegetable and spice production. Horticulture Research and Development Project, Joydebpur, Bangladesh.

- Ketkar, S. C. M. (1976). Utilization of neem (*A. indica juss*) and its by-products. Nana Dengle Sadhana press. Poona, India.
- Kim, H. S. and Heinrichs, E. A. (1985). Parasitization of yellow stem borer eggs (YST) Scirpophaga incertulas eggs. IRRI Newsl., 10: 14.
- Kim, H. S., Heinrichs E. A. and Mylvaganam, P. (1986). Egg parasitism of *Scirpophaga incertulas* Walker (Lepidoptera: Pyralidae) by hymenopterous parasitoids in IRRI rice fields. *Korean J. Plant Prot.* 25: 37-40.
- King, E. G. (1993). Augmentation of parasites and predators for suppression of arthropod pests. pp. 90-100.
- Korat, D. M., Dodia, J. F., Patel, M. C. and Pathak, A. R. (2009). Evaluation of some neem formulations against insect pests of paddy. *Gujarat Agril. Uni. Res. J.*, 45(1): 112-116.
- Krishnaiah, N. V. and Kalode, M. B. (1991). Feasibility of rice insect pest control with Botanical pesticide. In: proceedings of the midterm project Review meeting. Botanical pest control project. Phase-II . 28-31. July, 1991, Dhaka, Bangladesh.
- Mallik, S. N., Kumar, M., Sinha, A. N. and Karn, B. P. (1989). Trathala flavoorbitalis Cam. (lchneumonidae)-a parasite of brinjal shoot and fruit borer, Leucinodes orbonalis Guenee from Bihar. Current Science. 58 (19): 1098-1099.
- Metho, D. N. and Lal, B. S. (1981). Chemical control of brinjal shoot and fruit borer. Indian J. Ent. 43(1): 105.
- Metho, D. N., Singh, Y. V. and Lal, B. S. (1983). Chemical control of brinjal shoot and fruit borer. *Indian J. Ent.* **43**(1): 105.

- Mohanraj P., Veenakumari, K. and Mandal, A. B. (1995). "Biocontrol of yellow stem borer using Trichogramma - a parasitoid native to Andamans. *Rice Biotech.*, USA, 23: 9-10.
- Nair, M. R. G. K. (1986). Insects and Mites of Crops in India. Revised Edition. Indian Council of Agriculture research, New Delhi. 408p.
- Naresh, J. S., Malik, V. S., Balan, J. S. and Khokhar, K. S. (1986). A new record of *Trathala* sp., a larval endoparasite attacking brinjal fruit borer, (*Leucinodes orbonalis* Guen.) *Bulletin Entomol.* **27**(1):74.
- Nayer, K. K., Ananthakrishnan, T. N. and David, B. V. (1995). General and Applied Entomology. Eleventh edn. Tata McGraw- Hill pub. Co. Ltd. 4/12, New Delhi-110002. 557p.
- Neil, R. J., Giles, K. L., Obrycki, J. J., Mahr, D. L., Legaspi, J. C. and Katovich, K. (1998). Evaulation of the quality of four commercially available natural enemies. *Bio. Control.* 11:1-8.
- Paluuginan, E. L and Saxena, R. C. (1991). Field evaluation of neem seed bitters and neem seed kernel extract for the control of green leafhopper and Tungro in Rice. *In:* Proceedings of the midterm Project Review meeting. Botanical pest control project. Phase II . 28-31. July, 1991, Dhaka, Bangladesh.
- Parkash, O. (1988). Schedule of insecticidal application against insect pest complex of brinjal with special reference to brinjal shoot and fruit borer, *Leucinodes* orbonalis Guen. Indian J. Ent. 50(1): 16-19.

- Peswani, K. M. and Rattan L. (1964). Estimation of loss of brinjal fruits caused by shoot and fruit borer, *Leucinodes orbonalis* Guen. *Indian J. Entomol.*, **26**(1): 112-113.
- Raja, J., Rajendran , B. and Pappiah, C.M. (1998). Management of egg plant shoot and fruit borer *L. orbonalis* G. In: Proceeding of Second International Symposium on Pest Management in Horticulture Crops, Bangalore, pp. 84-93.
- Sandanayake, W. R. M. and Edirisinghe, J. P. (1992). Instars determination and larval distribution in brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. *Ceylon J. Sci., Bio. Sci.* 22: 50-59.
- Sandanayake, W. R. M. and Edirisinghe, J. P. (1993). Aspects of reproductive biology of Trathala flavo-orbitalis (Cam.): a parasitoid of *Leucinodes orbonalis* Guen. *Entomon.* 17: 159-168.
- Sarode, S.V., Deotale, R.O., Jumdi, Y.S. and Thakare, H.S. (1994). Fields evaluation of Helithis neuclear polyhedrosis virus (HNPV) for the management of *Helicoverpa armigera* on pigeonpea. *Indian J. Ent.* **56**(2):176-179.
- Saxena, R. C. (1988). Insecticides from neem. In: Insecticides of Plantorigin (Eds. Arnsason, J.T.; B. J. R Philogene and P. Morand). ACS 387. Washington. pp. 110-135.
- Shukla, R. P. (1989). Population fluctuation of *Leucinodes orbonalis* and *Amrasca biguttula* in brinjal (*Solanum melongena*) in relation to abiotic factors in Meghalaya. *Indian J. Agric. Sci.*, **59**(4): 260-264.

- Simmonds, N. S. J., Evans, H. C. and Blaney, W. M. (1992). Pesticides for the year 2000. Mycochemicals and Botanicals. In: Pest Management and the Environment in 2000. pp. 127-164.
- Singh, P.K. (2009), control shoot and fruit borer *L. orbonalis* with combination of insecticides and plant extracts. *Indian Journal of Entomology*, **65**(2): 155-159.
- Sombatisiri, K. and Tigvattanont, S. (1987). Effects of neem extract on some insect pest of economic importance in Thailand. In: Natural Pesticides from the neem tree and other Tropical Tries (Eds. Schmutterer, H. and Ascher, K. R. S.), GTZ pres, Eschborn, West Germany.
- Stoll, G. (1992). Natural crop protection in the Tropics. Verlag Josef Margraf Scintific Book, Muhlstr. 9, Weikersheim, FR Germany. p. 188.
- Tewari, G. C. and Moorthy, P. N. K. (1984). New recorded of two parasitoids of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. *Entomol.* **9**(1): 63-64.
- Tewari, G. C. and Sandana, H. R. (1990). An unusual heavy parasitization of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen., by a new braconid parasite. *Indian J. Entomol.* 52(2): 338-341.
- Theunis, W., Aguda, R., Cruz, W., Decock, C., Peferoen, M. and Lambert, B. (1998). *Bacillus thuringiensis* isolates from the Philippines: habitat distribution, oendotoxin diversity, and toxicity to rice stem borers (lepidoptera: Pyralidae). *Bull. Entomol. Res.* 88(3): 335-342.
- UNDP. (1988). Land Resource Apprisal of Bangladesh for Agricultural Development Report 2: Agro-ecological Regions of Bangladesh, FAO, Rome, Italy, 577p.

- Verma, T. S. and Lal, O. P. (1985). A new record of *Itamoplex* sp. (Hymenoptera: Ichneumonidae) parasiting eggplant shoot and fruit borer in Kulu Valley, Himachal Pardesh. Bull. *Entomol.* 26(2): 219-222.
- Warthen, T. D. J. (1979). A. indica, a source of insect feeding inhibitors and growth regulators. USDA. Agric. Res. Results. 4.
- Yamaguchi, M. (1983). Solanaceous fruit. In World Vegetables Principles, Protection and Nutritive values. AVI Publishing Company, INC. Westport Connecticut. pp.298-304.
- Yardani, S. S., Metho, D. N., Singh, R. and Kumar, A. (1981). Control of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guen. With granular insecticides alone or in combination with spray formulation. *Indian J. Ent.* 43(3): 297-301.
- Yien, B. R. (1985). Field efficiency of some insecticides against shoot and fruit borer, Leucinodes orbonalis Guen. J. Res. Assm Agril. Univ. 6(1):31-34.
- Yin, R. G. 1993. Bionomics of *Leucinodes orbonalis* Guenee and its control, *Entomological Knowledge*. 30(2): 91-92.
- Table 1. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit
Borer (BSFB) at early, mid and late fruiting stage in terms of number of
shoot per plant

Treatment	Number of shoots plant ⁻¹ at									
	Early frui	ting stage	Mid fruit	ing stage	Late fruit	ting stage				
	%	Reduction	%	Infestation	Healthy	Infested				
	infestation	over control	infestation	reduction						
		(%)		over control						
				(%)						
T_1	3.48 e		3.49		3.62					
		73.74	e	77.57	e	80.69				
T_2	4.19		4.46		4.45					
	de	68.38	de	71.34	e	76.27				
T ₃	4.51	65.96	5.47	64.85	7.06	62.35				

	cde		cd		d	
T_4	5.47 c		6.61		8.57	
		58.72	c	57.52	c	54.29
T ₅	5.08		5.91		7.74	
	cd	61.66	cd	62.02	cd	58.72
T ₆	6.52 b		8.16		10.27	
		50.79	b	47.56	b	45.23
T ₇	13.25 a		15.56		18.75	
			a		a	
LSD(0.05)	1.000		1.493		1.278	
CV(%)	9.25		11.83		8.32	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

 $T_3: \textit{Trichogramma evanescense} @ 0.1g/6 \ m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

 T_6 : Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

		SFB) at e		ng stage in t	0	0		
Treatment		Brinjal fi	uit by numbe	er	-	Brinjal fru	it by weight	(g)
	Healthy	Infested	%	Infestation	Healthy	Infested	%	Reduction
			infestation	reduction			infestation	over
				over				control

Table 3. Effect of botanicals and bio-control agents against Brinial Shoot and Fruit

			infestation	reduction over control (%)			infestation	over control (%)
T_1	7.00 a	0.13 b	1.79 b	85.84	752. 05 a	22.0 0 b	2.72 d	78.82
T ₂	6.53 a	0.13 b	2.09 b	83.47	708. 28 a	21.6 7 b	3.06 cd	76.17
T ₃	6.20 ab	0.20 b	3.13 b	75.24	663. 10 ab	32.6 7 b	4.70 bcd	63.40
T_4	5.07 c	0.27 b	5.03 b	60.21	543. 78 cd	37.0 0 b	6.39 b	50.23
T ₅	5.53 bc	0.27 b	4.60 b	63.61	597. 48 bc	36.6 7 b	5.85 bc	54.44
T ₆	4.67 c	0.27 b	5.35 b	57.67	497. 11 d	37.0 0 b	6.92 b	46.11
T ₇	4.60 c	0.67 a	12.64 a		463. 56 d	68.3 3 a	12.84 a	
LSD(0.05)	0.93 5	0.19 5	3.302		92.7 0	20.1 7	2.855	
CV(%)	9.28	9.77	13.52		8.63	11.0 8	16.44	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval
- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 4. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit Borer (BSFB) at mid fruiting stage in terms of fruit per plant by number and weight

Treatment	Brinjal fruit by number					Brinjal fru	it by weight	(g)
	Healthy Infested % Reduction			Healthy	Infested	%	Reduction	
			infestation	over			infestation	over

				control (%)				control (%)
T_1	10.5 3 a	0.27 e	2.45 e	84.21	993.2 2 a	33.15 c	3.23 e	79.95
T ₂	9.53 ab	0.33 de	3.35 de	78.41	954.9 4 ab	40.17 c	4.04 e	74.92
T ₃	9.33 ab	0.40 cde	4.11 de	73.52	919.4 9 ab	60.10 b	6.14 d	61.89
T ₄	8.13 bc	0.53 bc	6.13 c	60.50	783.0 6 c	67.93 b	8.04 c	50.09
T ₅	8.80 b	0.47 cd	5.02 cd	67.65	852.7 1 bc	63.33 b	6.94 d	56.92
T ₆	7.07 cd	0.67 b	8.58 b	44.72	672.2 1 d	68.43 b	9.26 b	42.52
T ₇	6.20 d	1.13 a	15.52 a		555.9 3 e	106.6 3 a	16.11 a	
LSD(0.05)	1.34 3	0.178	1.787		110.3	9.154	1.088	
CV(%)	8.87	18.85	15.57		7.57	8.19	7.96	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

- T_6 : Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval
- T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 5. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) at late fruiting stage in terms of fruit per plant by numberand weight

Treatment	Brinjal fruit by number				Brinjal fruit by weight (g)			
	Healthy	Infested		Reduction	Healthy	Infested		Reduction
			infestation	over			infestation	over
				control				control
				(%)				(%)
T_1	7.73 a	0.27	3.31		744.3	34.12	4.38	
		c	d	82.23	7 a	d	e	76.54
T_2	7.07	0.33	4.54		668.2	43.77	6.16	
	ab	bc	cd	75.63	4 ab	c	d	67.01
T_3	6.60	0.47	6.55		625.6	48.58	7.23	
	bc	b	bc	64.84	9 bc	bc	cd	61.27
T_4	6.07	0.53	8.03		573.6	53.83	8.60	
	cde	b	b	56.90	6 cde	b	bc	53.94
T_5	6.47	0.53	7.65		610.4	50.72	7.75	
	bcd	b	b	58.94	2 bcd	bc	bc	58.49
T ₆	5.67	0.53	8.69		538.4	53.75	9.09	
Ŭ	de	b	b	53.35	2 de	b	b	51.31
T ₇	5.53 e	1.27	18.63		517.0	118.5	18.67	
		a	а		8 e	7 a	а	
LSD(0.05)	0.811	0.187	2.920				1.517	
					77.41	7.886		
CV(%)	7.08	19.03	10.02		7.12	7.69	9.64	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 6. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit
Borer (BSFB) throughout the growing season in terms of fruit per plant
by number and weight during April-October, 2009

Treatment	Brinjal fruit by number				Brinjal fruit by weight (g)			
	Healthy	Infested	%	Reduction	Healthy	Infested	%	Reduction
			infestation	over			infestation	over
				control				control
				(%)				(%)
T ₁	25.2	0.67	2.57 f		248	89.2	3.46 e	
	7 a	e		83.79	9.6 a	8 c		78.43
T_2	23.1	0.80	3.36 ef		233	105.	4.35 d	
	3 ab	de		78.80	1.5 ab	60 c		72.88
T ₃	22.1	1.07	4.59 de		220	141.	6.02 c	
	3 bc	cd		71.04	8.3 bc	35 b		62.47
T_4	19.2	1.33	6.47 bc		190	158.	7.70 b	
	7 de	bc		59.18	0.5 d	76 b		52.00
T ₅	20.8	1.27	5.76 cd		206	150.	6.83 c	
	0 cd	bc		63.66	0.6 cd	72 b		57.42
T ₆	17.4	1.47	7.78 b		170	159.	8.53 b	
	0 ef	b		50.91	7.7 e	18 b		46.82
T ₇	16.3	3.07	15.85 a		153	293.	16.04 a	
	3 f	а			6.6 f	53 a		
LSD(0.05)	2.16	0.28	1.619		164.	18.9	0.834	
	1	7			1	5		
CV(%)	11.7	13.7	4.54		6.79	6.21	7.72	
	5	4						

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Treatm		Length	of fruit		Girth of fruit				
ent	Hea	lthy	Infested		Healthy		Infe	Infested	
	Length	Increase	Length	Increase	Girth	Increase	Girth	Increase	
		over		over	(cm)	over	(cm)	over	
		control		control		control		control	
		(%)		(%)		(%)		(%)	
T1	26.25 a		22.29 a		7.31		6.59 a		
		25.42		30.58	а	41.39		37.01	
T_2	24.83 ab		21.59 a		7.09		6.41		
		18.63		26.48	ab	37.14	ab	33.26	
T ₃	24.29		21.06 ab		6.63		6.02		
	abc	16.05		23.37	abc	28.24	abc	25.16	
T_4	22.68 bc		19.25 bc		6.01		5.51		
		8.36		12.77	cde	16.25	cde	14.55	
T ₅	23.20		19.08 bc		6.29		5.74		
	abc	10.85		11.78	bcd	21.66	bcd	19.33	
T_6	21.46 bc		17.46 c		5.53		5.11		
		2.53		2.28	de	6.96	de	6.24	
T ₇	20.93 c		17.07 c		5.17		4.81 e		
					e				
LSD(0.0	3.212		2.035		0.871		0.727		
5)									
CV(%)	7.72		.81 5		5.91		5.27		

Table 7. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) in terms of length and girth of healthy and infested fruit

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 8. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) in terms of single fruit weight, edible and non edibleportion of infested fruit

Treatment	Individual fruit weight (g)	Increase over control (%)	Edible portion (%)	Non edible portion (%)
T ₁	85.34 a	27.43	95.77 a	4.23 c
T ₂	84.82 a	26.65	94.18 a	5.82 c
T ₃	82.39 a	23.03	92.36 ab	7.64 bc
T ₄	73.77 bc		88.15 ab	11.85
		10.15		bc
T ₅	75.69 b		89.66 ab	10.34
		13.02		bc
T ₆	68.96 cd	2.97	85.15 b	14.85 b
T ₇	66.97 d		76.33 c	23.67 a
LSD(0.05)	6.234		7.364	7.364
CV(%)	4.56		6.66	16.96

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T2: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ 0.1g/6 m² of after 5-7 days interval

T₄: *Bacillus thuringiensis* serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 9.Effect of botanicals and bio-control agents against Brinjal Shoot and
Fruit Borer (BSFB) in terms of yield per plot and hectare

Treatment	Yield of fruit									
	Yield per plot (kg)	Increase over	Yield per hectare	Increase over						
		control (%)	(ton)	control (%)						
T ₁	29.95 a	64.20	49.92 a	64.21						
T ₂	28.98 ab	58.88	48.31 ab	58.91						
T ₃	28.50 abc		47.50							
		56.25	abc	56.25						
T_4	25.59 bc	40.30	42.65 bc	40.30						
T ₅	27.77 abc		46.29							
		52.25	abc	52.27						
T ₆	25.10 c	37.61	41.84 c	37.63						
T ₇	18.24 d		30.40 d							
LSD(0.05)	3.542		5.903							
CV(%)	7.57		7.57							

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 10. Cost of production of Brinjal for against Brinjal Shoot and Fruit Borer (BSFB) management practices

Treatments	Cost of pest	Yield (t/ha)	Gross return (Tk.)	Net Return (Tk.)	Adjusted net	Benefit cost
	Management (Tk.)	(t/ha)			return (Tk.)	ratio
T_1	45000	49.92	499200	454200	150200	3.34
T ₂	45000	48.31	483100	438100	134100	2.98
T ₃	40000	47.5	475000	435000	131000	3.28
T_4	35000	42.65	426500	391500	87500	2.50
T ₅	45000	46.29	462900	417900	113900	2.53
T ₆	30000	41.84	418400	388400	84400	2.81
T ₇	0	30.4	304000	304000	0	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

 T_6 : Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

Market price of brinjal @ Tk. 10,000 per ton

Table 2. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) at early fruiting stage in terms of number of shoot per plant

Treatment						
	Early frui	ting stage	Mid fruit	ing stage	Late fruit	ting stage
	%	Reduction	%	Infestation	Healthy	Infested
	infestation	over control	infestation	reduction		
		(%)		over control		
				(%)		
T_1	3.48 e		3.49		3.62	
		73.74	e	77.57	e	80.69
T_2	4.19		4.46		4.45	
	de	68.38	de	71.34	e	76.27
T ₃	4.51		5.47		7.06	
	cde	65.96	cd	64.85	d	62.35
T_4	5.47 c		6.61		8.57	
		58.72	с	57.52	с	54.29
T ₅	5.08		5.91		7.74	
	cd	61.66	cd	62.02	cd	58.72
T_6	6.52 b		8.16		10.27	
		50.79	b	47.56	b	45.23
T ₇	13.25 a		15.56		18.75	
			a		a	
LSD(0.05)	1.000		1.493		1.278	
CV(%)	9.25		11.83		8.32	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ 0.1g/6 m² of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

	and weig	ht	J.	8 8		L		
Treatment		Brinjal fi	uit by numbe	er		Brinjal fru	it by weight	(g)
	Healthy	Infested	% infestation	Infestation reduction over control (%)	Healthy	Infested	% infestation	Reduction over control (%)
T ₁	7.00 a	0.13 b	1.79 b	85.84	752. 05 a	22.0 0 b	2.72 d	78.82
T ₂	6.53 a	0.13 b	2.09 b	83.47	708. 28 a	21.6 7 b	3.06 cd	76.17
T ₃	6.20 ab	0.20 b	3.13 b	75.24	663. 10 ab	32.6 7 b	4.70 bcd	63.40
T ₄	5.07 c	0.27 b	5.03 b	60.21	543. 78 cd	37.0 0 b	6.39 b	50.23
T ₅	5.53 bc	0.27 b	4.60 b	63.61	597. 48 bc	36.6 7 b	5.85 bc	54.44

57.67

__

11 d

56 d

0

497.

463.

92.7

8.63

37.0

68.3

20.1

11.0

0 b

3 a

7

8

6.92 b

12.84 a

2.855

16.44

46.11

--

Table 3. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit Borer (BSFB) at early fruiting stage in terms of fruit per plant by number

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

5.35 b

12.64 a

3.302

13.52

- T₅: Bacillus thuringiensis serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

с

с

5

 T_6

 T_7

LSD(0.05)

CV(%)

4.67

4.60

0.93

9.28

b

a

5

0.27

0.67

0.19

9.77

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

In a column means having similar letter(s) are statistically identical and those having dissimilar letter(s) differ significantly as per 0.05 level of probability

Table 4. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit Borer (BSFB) at mid fruiting stage in terms of fruit per plant by number and weight

Treatment		Brinjal fr	uit by numbe	er	Brinjal fruit by weight (g)			
	Healthy Infested %			Reduction	Healthy	Infested	%	Reduction
			infestation	over			infestation	over

				control (%)				control (%)
T_1	10.5 3 a	0.27 e	2.45 e	84.21	993.2 2 a	33.15 c	3.23 e	79.95
T ₂	9.53 ab	0.33 de	3.35 de	78.41	954.9 4 ab	40.17 c	4.04 e	74.92
T ₃	9.33 ab	0.40 cde	4.11 de	73.52	919.4 9 ab	60.10 b	6.14 d	61.89
T ₄	8.13 bc	0.53 bc	6.13 c	60.50	783.0 6 c	67.93 b	8.04 c	50.09
T ₅	8.80 b	0.47 cd	5.02 cd	67.65	852.7 1 bc	63.33 b	6.94 d	56.92
T ₆	7.07 cd	0.67 b	8.58 b	44.72	672.2 1 d	68.43 b	9.26 b	42.52
T ₇	6.20 d	1.13 a	15.52 a		555.9 3 e	106.6 3 a	16.11 a	
LSD(0.05)	1.34 3	0.178	1.787		110.3	9.154	1.088	
CV(%)	8.87	18.85	15.57		7.57	8.19	7.96	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 5. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) at late fruiting stage in terms of fruit per plant by numberand weight

Treatment		Brinjal fr	uit by numbe	er		Brinjal fru	it by weight	(g)
	Healthy	Infested	%	Reduction	Healthy	Infested	%	Reduction
			infestation	over			infestation	over
				control				control
				(%)				(%)
T ₁	7.73 a	0.27	3.31		744.3	34.12	4.38	
		с	d	82.23	7 a	d	e	76.54
T_2	7.07	0.33	4.54		668.2	43.77	6.16	
	ab	bc	cd	75.63	4 ab	c	d	67.01
T ₃	6.60	0.47	6.55		625.6	48.58	7.23	
	bc	b	bc	64.84	9 bc	bc	cd	61.27
T ₄	6.07	0.53	8.03		573.6	53.83	8.60	
	cde	b	b	56.90	6 cde	b	bc	53.94
T ₅	6.47	0.53	7.65		610.4	50.72	7.75	
	bcd	b	b	58.94	2 bcd	bc	bc	58.49
T ₆	5.67	0.53	8.69		538.4	53.75	9.09	
	de	b	b	53.35	2 de	b	b	51.31
T ₇	5.53 e	1.27	18.63		517.0	118.5	18.67	
		a	а		8 e	7 a	a	
LSD(0.05)	0.811	0.187	2.920				1.517	
					77.41	7.886		
CV(%)	7.08	19.03	10.02		7.12	7.69	9.64	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 6. Effect of botanicals and bio-control agents against Brinjal Shoot and Fruit
Borer (BSFB) throughout the growing season in terms of fruit per plant
by number and weight during April-October, 2009

Treatment		Brinjal fr	uit by numbe	er		Brinjal fru	it by weight	(g)
	Healthy	Infested	%	Reduction	Healthy	Infested	%	Reduction
			infestation	over			infestation	over
				control				control
				(%)				(%)
T ₁	25.2	0.67	2.57 f		248	89.2	3.46 e	
	7 a	e		83.79	9.6 a	8 c		78.43
T_2	23.1	0.80	3.36 ef		233	105.	4.35 d	
	3 ab	de		78.80	1.5 ab	60 c		72.88
T ₃	22.1	1.07	4.59 de		220	141.	6.02 c	
	3 bc	cd		71.04	8.3 bc	35 b		62.47
T_4	19.2	1.33	6.47 bc		190	158.	7.70 b	
	7 de	bc		59.18	0.5 d	76 b		52.00
T ₅	20.8	1.27	5.76 cd		206	150.	6.83 c	
	0 cd	bc		63.66	0.6 cd	72 b		57.42
T ₆	17.4	1.47	7.78 b		170	159.	8.53 b	
0	0 ef	b		50.91	7.7 e	18 b		46.82
T ₇	16.3	3.07	15.85 a		153	293.	16.04 a	
	3 f	a			6.6 f	53 a		
LSD(0.05)	2.16	0.28	1.619		164.	18.9	0.834	
	1	7			1	5		
CV(%)	_ 11.7	13.7	4.54		6.79	6.21	7.72	
	5	4						

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

 T_6 : Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 7. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) in terms of length of healthy and infested fruit

Treatment	Plant		Lei	ngth of fruit	
	height	H	lealthy	Ir	nfested
		Length	Increase over control (%)	Length	Increase over control (%)
T ₁	124.08 a	26.25 a	25.42	22.29 a	30.58
T ₂	120.99 ab	24.83 ab	18.63	21.59 a	26.48
T ₃	117.62 ab	24.29 abc	16.05	21.06 ab	23.37
T_4	111.23bcd	22.68 bc	8.36	19.25 bc	12.77
T ₅	115.50	23.20 abc		19.08 bc	
	abc		10.85		11.78
T_6	104.87cd	21.46 bc	2.53	17.46 c	2.28
T ₇	101.50 d	20.93 c		17.07 c	
LSD(0.05)		3.212		2.035	
CV(%)	5.60	7.72		5.81	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval
- T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval
- T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 8. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) in terms of girth of healthy and infested fruit

Treatment		Girth	of fruit	
	Hea	althy	In	fested
	Girth (cm)	Increase over control (%)	Girth (cm)	Increase over control (%)
T_1	7.31 a	41.39	6.59 a	37.01
T_2	7.09 ab	37.14	6.41 ab	33.26
T ₃	6.63 abc		6.02	
		28.24	abc	25.16
T_4	6.01 cde		5.51	
		16.25	cde	14.55
T ₅	6.29 bcd		5.74	
		21.66	bcd	19.33
T ₆	5.53 de	6.96	5.11 de	6.24
T_7	5.17 e		4.81 e	
LSD(0.05)	0.871		0.727	
CV(%)	5.91		5.27	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ 0.1g/6 m² of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 9. Effect of botanicals and bio-control agents against Brinjal Shoot and FruitBorer (BSFB) in terms of single fruit weight, edible and non edibleportion of infested fruit

Treatment	Individual fruit	Increase over	Edible portion	Non edible portion
	weight (g)	control (%)	(%)	(%)
T ₁	85.34 a	27.43	95.77 a	4.23 c
T ₂	84.82 a	26.65	94.18 a	5.82 c
T ₃	82.39 a	23.03	92.36 ab	7.64 bc
T_4	73.77 bc		88.15 ab	11.85
14		10.15		bc
T ₅	75.69 b		89.66 ab	10.34
15		13.02		bc
T ₆	68.96 cd	2.97	85.15 b	14.85 b
T ₇	66.97 d		76.33 c	23.67 a
LSD(0.05)	6.234		7.364	7.364
CV(%)	4.56		6.66	16.96

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ 0.1g/6 m² of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 10.Effect of botanicals and bio-control agents against Brinjal Shoot and
Fruit Borer (BSFB) in terms of yield per plot and hectare

Treatment		Yield	of fruit	
	Yield per plot (kg)	Increase over	Yield per hectare	Increase over
		control (%)	(ton)	control (%)
T ₁	29.95 a	64.20	49.92 a	64.21
T ₂	28.98 ab	58.88	48.31 ab	58.91
T ₃	28.50 abc		47.50	
		56.25	abc	56.25
T_4	25.59 bc	40.30	42.65 bc	40.30
T ₅	27.77 abc		46.29	
		52.25	abc	52.27
T ₆	25.10 c	37.61	41.84 c	37.63
T ₇	18.24 d		30.40 d	
LSD(0.05)	3.542		5.903	
CV(%)	7.57		7.57	

T1: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

In a column, numeric data represents the mean value of 3 replications; each replication is derived from 3 plants per treatment

Table 11. Cost of production of Brinjal for against Brinjal Shoot and Fruit Borer (BSFB) management practices

Treatments	Cost of pest	Yield (t/ha)	Gross return (Tk.)	Net Return (Tk.)	Adjusted net	Benefit cost
	Management (Tk.)	(t/ha)			return (Tk.)	ratio
T_1	45000	49.92	499200	454200	150200	3.34
T ₂	45000	48.31	483100	438100	134100	2.98
T ₃	40000	47.5	475000	435000	131000	3.28
T_4	35000	42.65	426500	391500	87500	2.50
T ₅	45000	46.29	462900	417900	113900	2.53
T ₆	30000	41.84	418400	388400	84400	2.81
T ₇	0	30.4	304000	304000	0	

T₁: Neem oil @ 4ml/L of water after 5-7 days interval

T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval

T₃: Trichogramma evanescense @ $0.1g/6 \text{ m}^2$ of after 5-7 days interval

T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval

T₅: *Bacillus thuringiensis* serovar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval

 T_6 : Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval

T₇: Control

Market price of brinjal @ Tk. 10,000 per ton

	HS_Early	IS_Early	%IS_Early	
T_1	22.20 a	0.80 c	3.48 e	73.74
T ₂	21.40 ab	0.93 bc	4.19 de	68.38
T ₃	21.20 ab	1.00 bc	4.51 cde	65.96
T_4	18.47 bcd	1.07 bc	5.47 c	58.72
T ₅	20.07 abc	1.07 bc	5.08 cd	61.66
T ₆	17.40 cd	1.20 b	6.52 b	50.79
T ₇	16.13 d	2.47 a	13.25 a	
	2.826	0.251	1.000	
L				

- T₁: Neem oil @ 4ml/L of water after 5-7 days interval
- T₂: Neem seed kernel @ 300g/L of water after 5-7 days interval
- T₃: Trichogramma evanescense @ $0.1g/6 m^2$ of after 5-7 days interval
- T₄: Bacillus thuringiensis serovar kurstaki @ 1.5ml/L of water after 5-7 days interval.
- $T_5: \textit{Bacillus thuringiensis servar kurstaki @ 1ml suspension /L of water + Safeclean 2.5 ml/L of water after 5-7 days interval$
- T₆: Botanical pesticides Safeclean 5 ml/L of water after 5-7 days interval
- T₇: Control

Market price of brinjal @ Tk. 10,000 per ton

В

	HS_Mid	IS_Mid	%IS_Mid	
T_1	29.47 a	1.07 d	3.49 e	77.57
T ₂	28.53 a	1.33 cd	4.46 de	71.34
T ₃	26.60 ab	1.53 c	5.47 cd	64.85
T ₄	23.67 cd	1.67 bc	6.61 c	57.52
T ₅	25.47 bc	1.60 bc	5.91 cd	62.02
T_6	22.53 d	2.00 b	8.16 b	47.56
T ₇	21.00 d	3.87 a	15.56 a	
	2.746	0.394	1.493	

	HS_Late	IS_Late	%IS_Late	
T ₁	33.73 a	1.27 c	3.62 e	80.69
T ₂	32.87 ab	1.53 c	4.45 e	76.27
T ₃	31.60 abc	2.40 b	7.06 d	62.35
T_4	28.53 cd	2.67 b	8.57 c	54.29
T ₅	30.27 bc	2.53 b	7.74 cd	58.72
T ₆	25.67 de	2.93 b	10.27 b	45.23
T ₇	22.80 e	5.27 a	18.75 a	
	2.938	0.503	1.278	

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB

```
Variable 3 : HF-Early(No.)
Function : _RANGE_
Error Mean Square = 0.2760
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.9346
s_ = 0.3033 at alpha = 0.050
х
     Original Order
                                Ranked Order
Mean 1 =
             7.000 A
                                       7.000 A
                         Mean 1 =
             6.533 A Mean 2 = 6.533 A
6.200 AB Mean 3 = 6.200 AB
Mean
      2 =
Mean
       3 =
Mean 4 =
             5.067 C Mean 5 =
                                       5.533
                                              BC
Mean 5 =
             5.533 BC Mean 4 =
                                       5.067
                                               С
Mean 6 = 4.667 C Mean 6 = 4.667 C
Mean 7 = 4.600 C Mean 7 = 4.600 C
Data File : NASIR
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 4 : IF-Early
Function : _RANGE_
Error Mean Square = 0.01200
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.1949
s_ = 0.06325 at alpha = 0.050
х
    Original Order
                              Ranked Order
     1 =
                                     0.6667 A
Mean
            0.1333 B
                         Mean 7 =
Mean 5 =
                         Mean
                                 7 =
       2 =
                                     0.2667
                                             В
Mean
            0.1333 B
     3 =
                                     0.2667
Mean
            0.2000 B Mean 6 =
                                             В
       4 =
Mean
            0.2667
                    В
                         Mean 4 = 0.2667
                                             В
                         Mean 3 = 0.2000
Mean 5 =
            0.2667
                    В
                                             В
Mean 6 = 0.2667
                    В
                         Mean 2 = 0.1333
                                             В
Mean 7 = 0.6667 A
                         Mean 1 = 0.1333
                                             В
```

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 5 : %Inf-Early
Function : _RANGE_
Error Mean Square = 3.445
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 3.302
           at alpha = 0.050
s_{-} = 1.072
х
    Original Order
                             Ranked Order
       1 =
            1.786 B
                                7 =
                                     12.64 A
Mean
                        Mean
       2 =
            2.092 B
                               б =
                                     5.347
                        Mean
Mean
                                            В
      3 =
             3.127 B Mean 4 =
                                     5.033
Mean
                                            В
Mean 4 =
            5.033 B Mean 5 =
                                     4.597
                                            В
Mean 5 =
            4.597 B Mean 3 =
                                     3.127
                                            В
Mean 6 =
            5.347 B Mean 2 =
                                     2.092 В
Mean 7 = 12.64 A
                       Mean 1 =
                                     1.786
                                           В
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 6 : HF-Early (Wt.)
Function : _RANGE_
Error Mean Square = 2715.
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 92.70
         at alpha = 0.050
s_{-} = 30.08
x
    Original Order
                               Ranked Order
                                        752.0 A
Mean 1 =
             752.0 A
                          Mean 1 =
             708.3 A
                                        708.3 A
                          Mean 2 =
Mean 2 =
                                 3 =
                          Mean
                                        663.1 AB
Mean 3 =
            663.1 AB
                                 5 =
Mean 4 =
            543.8 CD
                          Mean
                                       597.5 BC
Mean 5 =
            597.5 BC
                          Mean
                                 4 =
                                       543.8 CD
Mean 6 = 497.1 D Mean 6 =
Mean 7 = 463.6 D Mean 7 =
                                              D
                                       497.1
                                        463.6
                                                D
```

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 7 : IF-Early
Function : _RANGE_
Error Mean Square = 128.5
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 20.17
            at alpha = 0.050
s_ = 6.545
х
   Original Order
                            Ranked Order
                                   68.33 A
      1 =
            22.00
                              7 =
Mean
                  В
                       Mean
      2 =
            21.67 B
                       Mean 6 =
                                    37.00
Mean
                                           В
      3 =
            32.67
                  B Mean
                              4 =
                                    37.00
                                          В
Mean
     4 =
            37.00 B Mean 5 =
                                    36.67
Mean
                                           В
Mean 5 =
            36.67 B
                       Mean 3 =
                                    32.67 B
            37.00 B Mean 1 =
Mean 6 =
                                    22.00 B
Mean 7 = 68.33 A
                       Mean 2 =
                                    21.67 B
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 8 : %Inf-Early
Function : _RANGE_
Error Mean Square = 2.575
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 2.855
s_ = 0.9265 at alpha = 0.050
x
    Original Order
                              Ranked Order
            2.718
                         Mean 7 =
                                      12.84 A
Mean 1 =
                    D
            3.062
                                    6.920 B
Mean 2 =
                    CD
                         Mean 6 =
                         Mean
Mean 3 =
            4.696 BCD
                                4 =
                                      6.394
                                            В
                         Mean
Mean 4 =
            6.394 B
                                5 = 5.850
                                             BC
                         Mean
Mean 5 =
            5.850 BC
                                3 =
                                      4.696
                                            BCD
                         Mean
Mean 6 = 6.920 B
                                2 = 3.062 CD
Mean 7 = 12.84 A
                         Mean 1 =
                                      2.718
                                              D
```

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 9 : HF-Mid (No.)
Function : _RANGE_
Error Mean Square = 0.5700
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 1.343
s_ = 0.4359 at alpha = 0.050
х
    Original Order
                                  Ranked Order
       1 =
              10.53 A
                                    1 =
                                           10.53 A
                             Mean
Mean
       2 =
              9.533 AB
                             Mean 2 = 9.533 AB
Mean
       3 =
              9.333 AB
                             Mean
                                    3 = 9.333 AB
Mean
                             Mean 5 = 8.800
      4 =
              8.133 BC
                                                   В
Mean
Mean 5 =
                             Mean 4 = 8.133 BC
              8.800 B

        Mean
        6 =
        7.067
        CD
        Mean
        6 =
        7.067

        Mean
        7 =
        6.200
        D
        Mean
        7 =
        6.200

                                                    CD
                       D Mean 7 = 6.200
                                                     D
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 10 : IF-Mid
Function : _RANGE_
Error Mean Square = 0.01000
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.1779
s_ = 0.05774 at alpha = 0.050
x
      Original Order
                                    Ranked Order
                       E Mean 7 = 1.133 A
DE Mean 6 = 0.6667 B
             0.2667
Mean 1 =
            0.3333
Mean 2 =
Mean 3 =
             0.4000
                       CDE Mean 4 = 0.5333 BC
                              Mean 5 = 0.4667 CD
Mean
        4 = 0.5333 BC
                             Mean 3 = 0.4000 CDE
Mean 5 = 0.4667 CD
Mean 6 = 0.6667 B
                             Mean 2 = 0.3333 DE
Mean 7 = 1.133 A
                             Mean 1 =
                                            0.2667
                                                       E
```

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 11 : %Inf-Mid Function : _RANGE_ Error Mean Square = 1.009 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 1.787s_ = 0.5799 at alpha = 0.050 х Original Order Ranked Order E Mean 1 = 2.454 7 = 15.52 A Mean Mean б= 2 = 3.352 DE 8.584 В Mean Mean 4 = 3 = 4.112 DE 6.127 С Mean Mean 5 = 4 = 6.127 С 5.023 CD Mean Mean 5 = 5.023 CD Mean 3 = 4.112 DE Mean 2 = 3.352 Mean 1 = 2.454 Mean 6 = 8.584 в DE Mean 7 = 15.52 A E Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 12 : HF-Mid (Wt.) Function : _RANGE_ Error Mean Square = 3843. Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 110.3s_ = 35.79 at alpha = 0.050 x Original Order Ranked Order Mean 1 = Mean 2 = Mean 1 = 993.2 A 993.2 A 993.2 A 954.9 AB Mean 2 = 954.9 AB Mean 3 = 919.5 AB Mean 3 = 919.5 AB Mean 4 = 783.1 C Mean 5 = 852.7 BC
 Mean
 5 =
 852.7
 BC
 Mean
 4 =

 Mean
 6 =
 672.2
 D
 Mean
 6 =

 Mean
 7 =
 555.9
 E
 Mean
 7 =
 Mean 4 = 783.1 C Mean 6 = 672.2 D Mean 7 = 555.9 555.9 E

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 13 : IF-Mid
Function : _RANGE_
Error Mean Square = 26.48
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 9.154
           at alpha = 0.050
s_{-} = 2.971
х
    Original Order
                               Ranked Order
                                      106.6 A
      1 =
             33.15 C
                                7 =
                        Mean
Mean
                          Mean 6 =
       2 =
             40.17 C
                                      68.43
Mean
                                             В
                         Mean 4 =
                                      67.93
      3 =
            60.10 B
                                             В
Mean
                         Mean 5 =
     4 =
             67.93 B
                                             В
                                      63.33
Mean
Mean 5 =
                         Mean 3 =
             63.33 B
                                      60.10 B
                          Mean 2 =
Mean 1 =
            68.43 B
Mean 6 =
                                      40.17
                                              С
Mean 7 = 106.6 A
                                      33.15 C
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 14 : %Inf-Mid
Function : _RANGE_
Error Mean Square = 0.3740
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 1.088
s_ = 0.3531 at alpha = 0.050
x
     Original Order
                                 Ranked Order
                   E Mean 7 =
E Mean 6 =
D Mean 4 =
Mean 1 =
             3.230
                                        16.11 A
Mean 2 =
             4.040
                                        9.263 B
Mean 3 =
            6.140
                                        8.044 C
Mean 4 =
            8.044 C
                           Mean 5 =
                                        6.938 D
Mean 5 = 0.255
Mean 6 = 9.263 B
7 16 11 A
Mean 5 =
            6.938 D
                          Mean 3 =
                                        6.140
                                                D
                                                 Е
                          Mean 2 =
                                        4.040
                           Mean 1 =
                                        3.230
                                                  E
```

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 15 : HF-Late (No.)
Function : _RANGE_
Error Mean Square = 0.2080
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.8113
             at alpha = 0.050
s_{-} = 0.2633
х
      Original Order
                                  Ranked Order
       1 =
              7.733 A
                                    1 =
                                          7.733 A
                            Mean
Mean
       2 =
             7.067 AB
                            Mean 2 =
                                          7.067 AB
Mean
                    BC
       3 =
             6.600
                           Mean
                                   3 = 6.600
                                                 BC
Mean
                     CDE Mean 5 =
     4 =
             6.067
                                         6.467
                                                 BCD
Mean
Mean 5 =
                            Mean 4 =
             6.467 BCD
                                          6.067
                                                  CDE
                     DE
                            Mean 6 = 5.667
Mean 7 = 5.533
Mean 6 =
             5.667
                                                   DE
Mean 7 = 5.533
                       Е
                                                    E
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 16 : IF-Late
Function : _RANGE_
Error Mean Square = 0.01100
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.1866
s_ = 0.06055 at alpha = 0.050
x
     Original Order
                                Ranked Order
                         Mean 7 =
Mean 5 =
Mean 1 =
            0.2667
                     С
                                        1.267 A
Mean 2 =
            0.3333 BC
                                       0.5333 B
            0.4667 B
                           Mean 6 = 0.5333
Mean 3 =
                                               В
Mean4 =0.5333BMean4 =0.5333Mean5 =0.5333BMean3 =0.4667Mean6 =0.5333BMean2 =0.3333Mean7 =1.267AMean1 =0.2667
                           Mean 4 = 0.5333
Mean 4 = 0.5333 B
                                               В
                                               В
                           Mean 2 = 0.3333
                                               BC
Mean 7 = 1.267 A
                           Mean 1 = 0.2667 C
```

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 17 : %Inf-Late Function : _RANGE_ Error Mean Square = 2.694Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.920s_ = 0.9476 at alpha = 0.050 х Original Order Ranked Order 1 = 3.314 D 7 = 18.63 A Mean Mean 2 = 4.536 CD Mean 6 = 8.694 Mean В 3 = 6.552 BC Mean 4 = 8.030 В Mean Mean 5 = 4 = 8.030 B 7.650 В Mean Mean 5 = 7.650 B Mean 3 = 6.552 BC Mean 2 = 4.536 Mean 1 = 3.314 8.694 B Mean 6 = CD Mean 7 = 18.63 A D Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 18 : HF-Late (Wt.) Function : _RANGE_ Error Mean Square = 1893. Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 77.41s_ = 25.12 at alpha = 0.050 x Original Order Ranked Order 668.2 AB Mean 1 = 625.7 BC Mean 572 7 744.4 A Mean 1 = Mean 2 = 668.2 AB 625.7 BC Mean 3 = Mean 4 = 573.7 CDE Mean 5 = 610.4 BCD Mean 5 = 610.4 BCD Mean 4 = 573.7 CDE
 Mean
 6 =
 538.4
 DE
 Mean
 6 =
 538.4
 DE

 Mean
 7 =
 517.1
 E
 Mean
 7 =
 517.1
 E

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 19 : IF-Late
Function : _RANGE_
Error Mean Square = 19.65
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 7.886
           at alpha = 0.050
s_ = 2.559
х
    Original Order
                               Ranked Order
      1 =
             34.12
                     D
                                 7 =
                                       118.6 A
                          Mean
Mean
       2 =
            43.77
                    С
                          Mean 4 = 53.83
Mean
                                              В
                          Mean б=
      3 =
            48.58 BC
                                        53.75 B
Mean
Mean 4 =
                          Mean 5 = 50.72 BC
            53.83 B
Mean 5 =
                          Mean 3 = 48.58 BC
            50.72 BC
                          Mean 2 = 43.77
Mean 1 = 34.12
Mean 6 =
            53.75 B
                                               С
Mean 7 = 118.6 A
                                               D
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 27 - 33
Variable 20 : %Inf-late
Function : _RANGE_
Error Mean Square = 0.7270
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 1.517
s_ = 0.4923 at alpha = 0.050
x
     Original Order
                                 Ranked Order
                   E Mean 6 =
D Mean 6 =
Mean 4 =
                      E Mean 7 =
Mean 1 =
             4.379
                                        18.67 A
            6.161
Mean 2 =
                                       9.089 B
             7.231
                    CD
Mean 3 =
                          Mean 4 =
                                        8.599 BC
Mean 4 =
            8.599 BC
                          Mean 5 =
                                        7.748 BC
Mean 5 =
             7.748 BC
                          Mean 3 =
                                        7.231 CD
                          Mean 2 = 6.161 D
Mean 1 = 4.379 H
Mean 6 = 9.089 B
Mean 7 = 18.67 A
                                                 E
```

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 21 : THF (No.) Function : _RANGE_ Error Mean Square = 1.476Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.161s_ = 0.7014 at alpha = 0.050 х Original Order Ranked Order 1 = 25.27 A 1 = 25.27 A Mean Mean 23.13 AB Mean 2 = 2 = 23.13 AB Mean BC Mean 3 = 3 = 22.13 22.13 BC Mean Mean 5 = 4 = 19.27 DE 20.80 CD Mean Mean 5 = Mean 4 = 20.80 CD 19.27 DE EF EF Mean 6 = 17.40 F Mean 7 = 16.33 Mean 6 = 17.40 EF Mean 7 = 16.33 ਜ Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 22 : TIF Function : _RANGE_ Error Mean Square = 0.02600Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 0.2869s_ = 0.09309 at alpha = 0.050 x Original Order Ranked Order 0.6667 Mean 7 = Mean 1 = E Mean 6 = DE Mean 6 = 4 = E 3.067 A CD 0.8000 Mean 2 = 1.467 B 1.067 Mean 3 = Mean 4 = 1.333 BC Mean 4 = 1.333 BC Mean 5 = 1.267 BC Mean 5 = 1.267 BC Mean 3 = 1.067 CD Mean 2 = 0.8000 DE Mean 6 = 1.467 В Mean 7 = 3.067 A Mean 1 = 0.6667 E

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 23 : TInf. Function : _RANGE_ Error Mean Square = 0.8280Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 1.619s_ = 0.5254 at alpha = 0.050 х Original Order Ranked Order F 1 = 2.566 7 = 15.85 A Mean Mean EF 2 = 3.362 Mean 6 = 7.779 Mean В DE 3 = 4.593 Mean 4 = 6.467 BC Mean Mean 5 = 5.762 4 = 6.467 BC CD Mean Mean 5 = Mean 3 = 5.762 CD 4.593 DE Mean 2 = 3.362 Mean 1 = 2.566 7.779 в Mean 6 = 3.362 EF Mean 7 = 15.85 A ਜ Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 24 : THF-Wt. Function : _RANGE_ Error Mean Square = 8509. Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 164.1s_ = 53.26 at alpha = 0.050 x Original Order Ranked Order Mean 1 = Mean 2 = Mean 1 = 2490. A 2490. A 2331. AB Mean 2 = 2331. AB 2208. BC Mean 3 = Mean 3 = 2208. BC Mean 4 = 1901. D Mean 5 = 2061. CD Mean 4 = 1901. D Mean 5 = 2061. CD
 Mean
 6 =
 1708.
 E

 Mean
 7 =
 1537.
 F
 Mean 6 = 1708. Е Mean 7 = 1537. F

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 25 : TIF Function : _RANGE_ Error Mean Square = 113.5 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 18.95at alpha = 0.050 $s_{-} = 6.150$ х Original Order Ranked Order 1 = 89.28 C 7 = 293.5 A Mean Mean Mean б= 159.2 2 = 105.6 C Mean В Mean 4 = 3 = 141.3 B 158.8 В Mean Mean 5 = В 4 = 158.8 B 150.7 Mean Mean 5 = Mean 3 = 150.7 B 141.3 в Mean 2 = 105.6 C Mean 1 = 89.28 C Mean 6 = 159.2 B Mean 7 = 293.5 A Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 27 - 33 Variable 26 : TInf. Function : _RANGE_ Error Mean Square = 0.2200Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 0.8344s_ = 0.2708 at alpha = 0.050 x Original Order Ranked Order E Mean 7 = Mean 1 = 3.458 E Mean 7 = D Mean 6 = 16.04 A 4.352 Mean 2 = 8.533 B С 7.704 B Mean 3 = 6.021 Mean 4 = 4 = Mean 7.704 B Mean 5 = 6.828 C Mean 5 = 6.828 C Mean 3 = 6.021 C Mean 6 = 8.533 B Mean 2 = 4.352 D Mean 7 = 16.04 A Mean 1 = 3.458 E

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 27 : Length-HF Function : _RANGE_ Error Mean Square = 3.259Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 3.212at alpha = 0.050 $s_{-} = 1.042$ х Original Order Ranked Order 1 = 26.25 A 1 = 26.25 A Mean Mean 2 = 24.83 AB Mean 2 = 24.83 AB Mean 24.29 ABC Mean 3 = 3 = 24.29 ABC Mean Mean 4 = 22.68 BC Mean 5 = 23.20 ABC Mean 5 = 23.20 ABC Mean 4 = 22.68 BC Mean 6 = 21.46 BC Mean 7 = 20.93 C Mean 6 = 21.46 BC Mean 7 = 20.93 C Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 28 : Length-IF Function : _RANGE_ Error Mean Square = 1.309 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.035s_ = 0.6606 at alpha = 0.050 x Original Order Ranked Order 22.29 A Mean 1 = 21.59 A Mean 2 = Mean 1 = 22.29 A 21.59 A 21.59 A Mean 2 = 21.06 AB Mean 3 = 21.06 AB Mean 3 = 19.25 BC Mean 4 = 19.25 BC Mean 4 = Mean 5 = 19.08 BC Mean 5 = 19.08 BC Mean 6 = 17.46 C Mean 6 = 17.46 C Mean 7 = 17.07 C Mean 7 = 17.07 C

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 29 : Girth_Healthy Function : _RANGE_ Error Mean Square = 0.2400Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 0.8715at alpha = 0.050 $s_{-} = 0.2828$ х Original Order Ranked Order 1 = 9.308 A 1 = 9.308 A Mean Mean 9.092 AB 2 = Mean 2 = 9.092 AB Mean 8.630 ABC Mean 3 = 8.630 ABC 3 = Mean Mean 4 = 8.012 CDE Mean 5 = 8.288 BCD Mean 5 = Mean 4 = 8.288 BCD 8.012 CDE 7.532DEMean6 =7.5327.172EMean7 =7.172 Mean 6 = DE Mean 7 = 7.172 E Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 30 : Girth_Infested Function : _RANGE_ Error Mean Square = 0.1670Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 0.7270s_ = 0.2359 at alpha = 0.050 x Original Order Ranked Order
 0.000
 A
 Mean
 1 =

 8.410
 AB
 Mean
 2 =

 8.025
 ABC
 Mean
 7
 Mean 1 = 8.590 A Mean 2 = 8.410 AB Mean 3 = 8.025 ABC Mean 4 = 7.510 CDE Mean 5 = 7.740 BCD Mean 5 = 7.740 BCD Mean 4 = 7.510 CDE Mean6 = 7.110DEMean6 = 7.110DEMean7 = 6.810EMean7 = 6.810E

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 31 : Single fruit Weight Function : _RANGE_ Error Mean Square = 12.28 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 6.234at alpha = 0.050 $s_{-} = 2.023$ х Original Order Ranked Order 1 = 85.34 A 1 = 85.34 A Mean Mean 2 = 84.82 A Mean 2 = 84.82 A Mean 82.39 A 3 = Mean 3 = 82.39 A Mean 4 = 73.77 BC Mean 5 = 75.69 Mean В Mean 5 = Mean 4 = 75.69 B 73.77 BC Mean 6 = 68.96 CD Mean 6 = 68.96 Mean 7 = 66.97 D Mean 7 = 66.97 CD D Mean 7 = 66.97 D Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 32 : Edible portion Function : _RANGE_ Error Mean Square = 17.13 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 7.364s_ = 2.390 at alpha = 0.050 x Original Order Ranked Order

 Mean
 1 =
 95.77
 A
 Mean
 1 =
 95.77
 A

 Mean
 2 =
 94.18
 A
 Mean
 2 =
 94.18
 A

 Mean
 3 =
 92.36
 AB
 Mean
 3 =
 92.36
 AB

 Mean
 4 =
 88.15
 AB
 Mean
 5 =
 89.66
 AB

 Mean
 5 =
 89.66
 AB
 Mean
 4 =
 88.15
 AB

 Mean
 6 =
 85.15
 B
 Mean
 6 =
 85.15
 B

 76.33 C Mean 7 = Mean 7 = 76.33 C

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 33 : Non Edible Portion
Function : _RANGE_
Error Mean Square = 17.13
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 7.364
          at alpha = 0.050
s_{-} = 2.390
х
    Original Order
                              Ranked Order
                                     23.67 A
      1 =
            4.230 C Mean
                                7 =
Mean
       2 =
            5.823
                    C Mean 6 =
                                     14.85
Mean
                                            В
      3 =
             7.639 BC Mean 4 =
                                     11.85
                                            BC
Mean
                         Mean 5 =
     4 =
            11.85 BC
                                     10.34 BC
Mean
Mean 5 =
                         Mean 3 =
            10.34 BC
                                      7.639 BC
                         Mean 2 = 5.823 C
Mean 1 = 4.230 C
Mean 6 =
            14.85 B
Mean 7 = 23.67 A
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 34 : Yield/Plot
Function : _RANGE_
Error Mean Square = 3.964
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 3.542
         at alpha = 0.050
s_{-} = 1.149
x
    Original Order
                              Ranked Order
                                       29.95 A
Mean 1 =
            29.95 A
                          Mean 1 =
            28.98 AB
                          Mean 2 =
                                       28.98 AB
Mean 2 =
                                3 =
                          Mean
Mean 3 =
            28.50 ABC
                                       28.50 ABC
                          Mean
Mean 4 =
            25.59 BC
                                5 = 27.77 ABC
Mean 5 = 27.77 ABC
                         Mean 4 = 25.59
                                             BC
                         Mean 6 = 25.10
Mean 6 = 25.10 C
                                             С
Mean 7 = 18.24 D
                         Mean 7 =
                                       18.24
                                              D
```

```
Page 57
```

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 35 : Yield/Hectare Function : _RANGE_ Error Mean Square = 11.01 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 5.903at alpha = 0.050 $s_{-} = 1.916$ х Original Order Ranked Order 1 = 49.92 A 1 = 49.92 A Mean Mean 48.31 AB Mean 2 = 2 = 48.31 AB Mean Mean 3 = 3 = 47.50 ABC 47.50 ABC Mean Mean 4 = Mean 5 = 42.65 BC 46.29 ABC Mean 5 = 46.29 ABC Mean 4 = 42.65 BC C Mean 6 = 41.84 D Mean 7 = 30.40 Mean 6 = 41.84 C С Mean 7 = 30.40 D Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 36 : HS_Early Function : _RANGE_ Error Mean Square = 2.524Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.826s_ = 0.9172 at alpha = 0.050 x Original Order Ranked Order 22.20 A Mean 1 = 22.20 A Mean 1 = 21.40 AB Mean 2 = 21.40 AB Mean 2 = 21.20 AB 21.20 AB Mean 3 = Mean 3 = 18.47 Mean 5 = Mean 4 = BCD 20.07 ABC Mean5 =20.07ABCMean4 =18.47BCDMean6 =17.40CDMean6 =17.40CDMean7 =16.13DMean7 =16.13D

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 37 : IS_Early
Function : _RANGE_
Error Mean Square = 0.02000
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.2516
s_ = 0.08165 at alpha = 0.050
х
    Original Order
                               Ranked Order
                                     2.467 A
      1 = 0.8000 C
                               7 =
                        Mean
Mean
                         Mean 6 =
      2 = 0.9333 BC
                                     1.200
Mean
                                            В
      3 =
            1.000 BC Mean 5 = 1.067
                                            BC
Mean
                         Mean 4 =
     4 =
            1.067 BC
                                     1.067
                                            BC
Mean
Mean 5 =
            1.067 BC Mean 3 =
                                     1.000 BC
                         Mean 2 = 0.9333 BC
Mean 1 = 0.8000 C
Mean 6 =
            1.200 B
Mean 7 = 2.467 A
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 38 : %IS_Early
Function : _RANGE_
Error Mean Square = 0.3160
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 1.000
s_ = 0.3246 at alpha = 0.050
x
     Original Order
                                Ranked Order
                      E Mean 7 =
Mean 1 =
            3.481
                                       13.25 A
                     DE Mean 6 =
Mean 2 =
             4.187
                                       6.524 B
                                       5.468 C
Mean 3 =
             4.508
                   CDE Mean 4 =
Mean 4 =
            5.468 C
                          Mean 5 =
                                       5.078 CD
Mean 5 =
            5.078 CD
                          Mean 3 =
                                       4.508 CDE
Mean 6 = 6.524 B
Mean 7 = 13.25 A
                          Mean 2 =
                                       4.187 DE
                          Mean 1 =
                                       3.481
                                                 E
```

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 39 : HS_Mid Function : _RANGE_ Error Mean Square = 2.382 Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.746s_ = 0.8911 at alpha = 0.050 х Original Order Ranked Order 1 = 29.47 A 1 = 29.47 A Mean Mean Mean 2 = 2 = 28.53 A 28.53 A Mean 26.60 AB 3 = Mean 3 = 26.60 AB Mean Mean 4 = 23.67 CD Mean 5 = 25.47 BC Mean 5 = Mean 4 = 25.47 BC 23.67 CD Mean 6 = 22.53 D Mean 7 = 21.00 D Mean 6 = 22.53 D D Mean 7 = 21.00 Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 40 : IS_Mid Function : _RANGE_ Error Mean Square = 0.04900Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 0.3938s_ = 0.1278 at alpha = 0.050 x Original Order Ranked Order Mean 7 = 3.867 A Mean 1 = 1.067 D 1.333 2.000 B Mean 2 = CD Mean 6 = 1.533 Mean 1.667 Mean 3 = С 4 = BC Mean Mean 4 = 1.667 BC 5 = 1.600 BC Mean 3 = 1.533 Mean 5 = 1.600 BC С Mean 6 = 2.000 B Mean 7 = 3.867 A Mean CD 2 = 1.333 Mean 1 = 1.067 D

Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 41 : %IS_Mid Function : _RANGE_ Error Mean Square = 0.7040Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 1.493s_ = 0.4844 at alpha = 0.050 х Original Order Ranked Order 1 = 3.489 E Mean 7 = 15.56 A Mean Mean 6 = 2 = 4.459 DE 8.158 В Mean CD Mean 4 = 3 = 5.469 6.605 С Mean Mean 5 = 4 = 6.605 C 5.911 CD Mean Mean3 =5.469Mean2 =4.459Mean1 =3.489Mean 5 = 5.911 CD CD Mean 6 = 8.158 B DE Mean 7 = 15.56 A E Data File : _NASIR_ Title : Effect of Botanicals and Bio-control agents against BSFB Case Range : 41 - 47 Variable 42 : HS_Late Function : _RANGE_ Error Mean Square = 2.727Error Degrees of Freedom = 12No. of observations to calculate a mean = 3 Duncan's Multiple Range Test LSD value = 2.938s_ = 0.9534 at alpha = 0.050 x Original Order Ranked Order Mean 1 = 33.73 A Mean 1 = 33.73 A 32.87 AB 32.87 AB Mean 2 = Mean 2 = 31.60 ABC 31.60 ABC Mean 3 = Mean 3 = 28.53 CD Mean 4 = Mean 5 = 30.27 BC Mean5 =30.27BCMean4 =28.53CDMean6 =25.67DEMean6 =25.67DEMean7 =22.80EMean7 =22.80E

```
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 43 : IS_Late
Function : _RANGE_
Error Mean Square = 0.08000
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 0.5032
s_ = 0.1633 at alpha = 0.050
х
    Original Order
                               Ranked Order
                                      5.267 A
      1 =
            1.268 C Mean
                                7 =
Mean
                         Mean 6 =
      2 =
            1.533 C
                                     2.933
Mean
                                            В
                                            В
      3 =
            2.400 B
                        Mean 4 =
                                     2.667
Mean
Mean 4 =
                        Mean 5 =
            2.667 В
                                     2.533
                                            В
Mean 5 =
            2.533 В
                        Mean 3 =
                                      2.400
                                            В
                         Mean 2 = 1.533 C
Mean 1 = 1.268 C
Mean 6 =
            2.933 B
Mean 7 = 5.267 A
Data File : _NASIR_
Title : Effect of Botanicals and Bio-control agents against BSFB
Case Range : 41 - 47
Variable 44 : %IS_Late
Function : _RANGE_
Error Mean Square = 0.5160
Error Degrees of Freedom = 12
No. of observations to calculate a mean = 3
Duncan's Multiple Range Test
LSD value = 1.278
s_ = 0.4147 at alpha = 0.050
x
     Original Order
                                Ranked Order
                    Е Mean 7 =
Е Mean 6 =
            3.622
Mean 1 =
                                       18.75 A
                  D
                                       10.27 B
Mean 2 =
             4.454
Mean 3 =
             7.060
                          Mean 4 =
                                       8.565 C
       4 =
Mean
            8.565 C
                          Mean 5 =
                                        7.739 CD
Mean 5 =
             7.739 CD
                          Mean 3 =
                                       7.060 D
Mean 6 = 10.27 B
Mean 7 = 18.75 A
                                                Е
                          Mean 2 =
                                       4.454
                          Mean 1 =
                                       3.622
                                                 E
```

_

Data Fil Title : :	_	—	nicals a	nd Bio-c	ontrol	agents	against	BSFB
Case Ran Variable Function	45 : P	lant he	ight					
Error Me Error De No. of o	grees o	f Freed	om = 12	te a mea	n = 3			
Duncan's LSD valu s_ = 3.6 x	e = 11.	33		50				
- 0r	iginal	Order		Ra	nked Or	der		
Mean Mean Mean Mean Mean	2 = 3 = 4 = 5 = 6 =	121.0 117.6 111.2 115.5 104.9	AB AB BCD	Mean Mean Mean Mean	2 = 3 = 5 = 4 = 6 =	121.0 117.6 115.5 111.2 104.9	AB AB ABC BCD CD	

—

```
Data file: _NASIR_
Title: Effect of Botanicals and Bio-control agents against BSFB
   Function: FACTOR
   Experiment Model Number 7: One Factor Randomized Complete Block Design
   Data case no. 1 to 21.
   Factorial ANOVA for the factors:
      Replication (Var 1: Replication) with values from 1 to 3
      Factor A (Var 2: Treatment) with values from 1 to 7
   Variable 3: HF-Early(No.)
   Grand Mean = 5.657 Grand Sum = 118.800 Total Count = 21
            TABLE OF MEANS
    1 2
                 3
                           Total
     _____
                   _____
                             39.200
    1
      *
                 5.600
                            39.400
    2
       *
                 5.629
                            40.200
    3
       *
                 5.743
   -----
    * 1
                 7.000
                            21.000
    *
      2
                             19.600
                 6.533
    *
      3
                 6.200
                             18.600
    *
                             15.200
      4
                 5.067
    *
                             16.600
      5
                 5.533
    *
                             14.000
                 4.667
      6
      7
                 4.600
                             13.800
   _____
     ANALYSIS OF VARIANCE TABLE
 Κ
            Degrees of Sum of
                               Mean
                                        F
Value Source Freedom Squares
                              Mean F
Square Value
                                             Prob
_____
    Replication20.0800.0400.1452Factor A615.9852.6649.6682Error123.3070.276
 1
 2
                                       9.6682 0.0005
-3 Error
_____
                                    _____
    Total 20 19.371
_____
   Coefficient of Variation: 9.28%
   s_ for means group 1: 0.1984 Number of Observations: 7
   v
   s_ for means group 2: 0.3031 Number of Observations: 3
   V
_____
```

1	2		4		Total		
	*		0.314	 1	2.200	-	
2			0.25		1.800		
3			0.25		1.800		
	1		0.133		0.400	-	
*	-		0.133		0.400		
*	3		0.200		0.600		
*			0.26		0.800		
*	5		0.26	7	0.800		
*	0		0.26		0.800		
*	7		0.66	7 	2.000	_	
	ANAL	Y S I S	O F	VARI	ANCE T	'ABLE F	
ıe	Source	Free	edom	Squares	Square	F Value	Prob
					0.00	8 0.6316	
			5	0.598	0.10	0 8.2632	
	Error	1:	2	0.145	0.01		
	Total	2	о С	0.758			
У	for means	group 1	: (0.0415	Number of	Observations:	7
y ==== Var	iable 5: % nd Mean =	======================================	====== ly Grand			Observations: Count = 21	
y Var Gra	iable 5: % nd Mean =	======================================	====== ly Grand	Sum = 103	 .870 Total A N S		
y Var Gra 1	iable 5: % nd Mean = 2	======================================	====== ly Grand L E (5	Sum = 103)F M E			
y Var Gra 1 	iable 5: % nd Mean = 2 *	======================================	====== ly Grand L E (5 	Sum = 103)F M E			
y Var Gra 1	iable 5: % nd Mean = 2 * *	======================================	====== ly Grand L E (5	Sum = 103 DF ME			
y Var Gra 1 1 2	iable 5: % nd Mean = 2 * * *	======================================	Grand Grand E E (5 5.48 [°] 4.824 4.528	Sum = 103 DF ME 7 4 3	.870 Total A N S Total 		
y Var Gra 1 1 2 3 	iable 5: % nd Mean = 2 * * * 1	======================================	Grand Grand L E (5 5.48 [°] 4.824	Sum = 103 DF ME 7 4 3 	.870 Total A N S Total 		
y ==== Gra 1 1 2 3 * *	iable 5: % nd Mean = 2 * * * 1 2 3	======================================	Grand L E (5 5.48 4.528 1.786 2.092 3.12	Sum = 103 DF ME 7 4 3 5 2 7	.870 Total A N S Total .38.406 33.766 31.698 		
y Var Gra 1 1 2 3 * *	iable 5: % nd Mean = 2 * * * 1 2 3 4	======================================	ly Grand L E (5 5.48 4.528 4.528 1.786 2.092 3.12 5.033	Sum = 103 DFME 7 4 3 5 2 7 3	.870 Total A N S Total 		
y Var Gra 1 1 2 3 * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5	======================================	Grand L E (5 5.48 4.528 4.528 1.786 2.092 3.12 5.033 4.59	Sum = 103 DFME 7 4 3 5 2 7 3 7	.870 Total A N S Total 38.406 33.766 31.698 5.357 6.275 9.381 15.100 13.792		
y Var Gra 1 1 2 3 * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6	======================================	ly Grand L E (5 5.48 4.528 4.528 1.786 2.092 3.12 5.033	Sum = 103 D F M E 7 4 3 5 2 7 3 7 7	.870 Total A N S Total 		
y Var Gra 1 1 2 3 * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	Y S I S	Grand 5 5.48 4.528 4.528 1.786 2.092 3.12 5.032 4.59 5.34 12.642 0 F	Sum = 103 D F M E 7 4 3 7 4 3 7 7 2 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7	<pre>.870 Total A N S Total</pre>	- Count = 21	
y Var Gra 1 1 2 3 * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	Y S I S Degree Free	Grand Grand L E (5 5.487 4.824 4.528 4.528 1.786 2.092 3.127 5.347 12.642 12.642 0 F es of edom	Sum = 103) F M E 7 4 3 7 4 3 7 7 2 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 2 7 7 7 2 7	<pre>.870 Total A N S Total</pre>	Count = 21	Prob
y Var Gra 1 1 2 3 * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatic	Y S I S Degree Free	Grand Grand L E (5 5.487 4.824 4.528 4.528 1.786 2.092 3.127 5.347 12.642 0 F es of edom	Sum = 103 DF ME 7 4 3 	<pre>.870 Total A N S Total</pre>	Count = 21	Prob
y Var Gra 1 1 2 3 * * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 	Y S I S Degree Free	Grand Grand L E (5 5.487 4.824 4.528 4.528 1.786 2.092 3.127 5.347 12.642 0 F es of edom	Sum = 103 F M E F M E 7 4 3 7 7 2 7 7 8 7 7 2 7 7 8 7 7 2 7 7 8 7 7 2 7 7 8 7 7 2 7 7 8 7 7 2 7 7 8 7 7 2 7 8 7 7 7 2 7 8 7 7 7 8 7 7 7 8 7	<pre>.870 Total A N S Total .38.406 .33.766 .31.698</pre>	Count = 21 A B L E F Value 6 0.4894 1 11.7518	Prob
y Var Gra 1 1 2 3 * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatic	Y S I S Degree Free	Grand Grand L E (5 5.487 4.824 4.528 4.528 1.786 2.092 3.127 5.347 12.642 0 F es of edom	Sum = 103 DF ME 7 4 3 	<pre>.870 Total A N S Total</pre>	Count = 21 A B L E F Value 6 0.4894 1 11.7518	Prob
y Var Gra 1 1 2 3 * * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatic Factor A Error Total	Y S I S Degree Free 200	<pre> ======= ly Grand L E 5 5.48 4.82 4.528 4.52 1.78 2.09 3.12 5.03 4.59 5.34 12.64 2 0 F es of edom 2 5 2 0 F </pre>	Sum = 103 D F M E A 3 5 2 7 3 7 7 2 2 V A R I Sum of Squares 3.371 242.886 41.336 287.594	<pre>.870 Total A N S Total .38.406 .33.766 .31.698</pre>	Count = 21	Prob 0.000
y Var Gra 1 1 2 3 * * * * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error Total	Y S I S Degree Free on	<pre>ly Grand L E 5 5.48 4.824 4.528 4.528 1.786 2.092 3.12 5.34 12.642 12.642 0 F es of edom 2 5.2 cion: 12</pre>	Sum = 103 D F M E 7 4 3 7 7 2 7 7 2 7 7 3 7 7 2 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 7 2 7 7 3 7 7 7 2 7 7 7 3 7 7 7 7	<pre>.870 Total A N S Total .38.406 33.766 31.698</pre>	Count = 21	Prob 0.000
y Var Gra 1 1 2 3 * * * * * * * *	iable 5: % nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error Total	Y S I S Degree Free on	<pre>ly Grand L E 5 5.48 4.824 4.528 4.528 1.786 2.092 3.12 5.34 12.642 12.642 0 F es of edom 2 5.2 cion: 12</pre>	Sum = 103 D F M E 7 4 3 7 7 2 7 7 2 7 7 3 7 7 2 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 2 7 7 3 7 7 7 2 7 7 3 7 7 7 2 7 7 7 3 7 7 7 7	<pre>.870 Total A N S Total .38.406 33.766 31.698</pre>	Count = 21	Prob 0.0002

Gra		Т							
1	1 2		6		Total				
	 1 *		602.	 955	4220.68	 32	-		
2	2 *			023	4228.16	54			
	3 *		603.	886	4227.19	99			
	 * 1		 750	 045	2256.13		-		
	~⊥ *2			045 279	2124.83				
÷	* 3				1989.29				
ż	* 4				1631.34				
ż	* 5		597.	479	1792.43	37			
	* 6		497.	106	1491.31	L8			
ć	* 7		463.	561	1390.68	32			
	A N				RIANCE f N				
	Sour	ce	Freedom	Squar	es So	quare	V	Value	Prob
	Repli	cation	2	4.7	33	2.367	<i>v</i> 0	0.0009	
	Facto	r A	б	213303.5	80 3555	50.597	/ 13	8.0936	0.000
	Error				88 271				
	Total		20	245889.7	01				
y s_ y	for m				Numbe		Observa	tions:	3
s_ y ===== Vai	for m ===== riable	eans gro ====== 7: IF-E an = 36.	oup 2: ======== Garly 476 Gr	30.0839 ======= and Sum =	Numbe	er of	======	======	
s_ y ===== Vai Gra	for m ===== riable	eans gro ====== 7: IF-E an = 36.	oup 2: ======== Garly 476 Gr	30.0839	Numbe	er of	======	======	
s_ y Vai Gra	for m ===== riable and Me 1 2 	eans gro ====== 7: IF-E an = 36.	oup 2: Carly 476 Gr A B L E 7	30.0839 ======= and Sum = O F M	Numbe 766.000 E A N S Total	er of Total	======	======	
s_ y Vai Gra	for m ====== riable and Me 1 2 1 *	eans gro ====== 7: IF-E an = 36.	Dup 2: Carly 476 Gr A B L E 7 39.	30.0839 ======= and Sum = O F M 	Numbe 766.000 E A N S Total 276.00	er of Total	======	======	
s_ y Vai Gra	for m ===== riable and Me 1 2 	eans gro ====== 7: IF-E an = 36.	Dup 2: Carly 476 Gr A B L E 7 39. 35.	30.0839 ======= and Sum = O F M	Numbe 766.000 E A N S Total	er of Total	======	======	
s_ y Vai Gra	for m ====== riable and Me 1 2 1 * 2 *	eans gro ====== 7: IF-E an = 36.	Dup 2: Carly 476 Gr A B L E 7 39. 35. 34.	30.0839 ======= and Sum = O F M 429 286	Numbe 766.000 E A N S Total 276.00 247.00	er of Total	======	======	
s_ y Van Gra	for m ====== riable and Me 1 2 1 * 2 * 3 *	eans gro ====== 7: IF-E an = 36.	Dup 2: Carly 476 Gr A B L E 7 39. 35. 34. 22.	30.0839 ======= and Sum = O F M 429 286 714 	Numbe 766.000 E A N S Total 276.00 247.00 243.00	er of Total	======	======	
s_ y ===== Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * * 1	eans gro ====== 7: IF-E an = 36.	Dup 2: Carly 476 Gr A B L E 7 39. 35. 34. 22. 21.	30.0839 ======= and Sum = O F M 429 286 714 000	Numbe 766.000 E A N S Total 276.00 247.00 243.00 	er of Total 00 00 00 00	======	======	
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * * 1 * 2 * 3 * 4	eans gro ====== 7: IF-E an = 36.	<pre>pup 2: carly 476 Gr A B L E 7 </pre>	30.0839 ======= and Sum = O F M 429 286 714 000 667 667 000	Numbe 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00	er of Total 00 00 00 00 00 00 00 00 00 0	======	======	
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 1 * 2 * 3 * 1 * 2 * 3 * 5	eans gro ====== 7: IF-E an = 36.	bup 2: 	30.0839 ======= o F M 429 286 714 000 667 667 000 667	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00	er of Total 00 00 00 00 00 00 00 00 00 0	======	======	
sy Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * * 1 * 2 * 3 * 4	eans gro ====== 7: IF-E an = 36.	<pre>pup 2: ========== Carly 476 Gr A B L E 7 39. 35. 34. 32. 34. 22. 21. 32. 37. 36. 37.</pre>	30.0839 ======= O F M 429 286 714 000 667 667 000 667 000 667 000	Numbe 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00	er of Total Total 00 00 00 00 00 00 00 00 00 0	======	======	
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 	eans gro ====== 7: IF-E an = 36. T 	<pre>pup 2: carly 476 Gr A B L E 7 39. 35. 34. 22. 21. 32. 37. 36. 37. 68. 3 I S 0</pre>	30.0839 ====== o F M 429 286 714 000 667 667 000 667 000 667 000 533 F V A 2	Number 766.000 T E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C F	er of Total Total 00 00 00 00 00 00 00 00 00 0	 Count	= 21	
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 	eans gro ====== 7: IF-E an = 36. T 	bup 2: arly 476 Gr A B L E 7 39. 35. 34. 22. 21. 32. 37. 36. 37. 68. 5 I S O Degrees o	30.0839 ====== O F M 429 286 714 000 667 667 000 667 000 667 000 533 F V A f f Sum o	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00	er of Total Total 00 00 00 00 00 00 00 00 00 0	- Count A B L E	= 21 F	
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 A N Sour	eans gro	bup 2: 	30.0839 ====== O F M 429 286 714 000 667 667 000 667 000 667 000 333 F V A f Sum o Squar	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f N es Sc	er of Total Total 00 00 00 00 00 00 00 00 00 0	- Count - - A B L E	= 21 = 21 S F Value	
sy Van Gra	for m ====== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 A N Sour Repli	eans gro ======= 7: IF-E an = 36. T 	bup 2: 	30.0839 ======= O F M 429 286 714 000 667 667 000 667 000 667 000 333 F V A f Sum o Squar 92.6	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f N es Sc 67 4	er of Total Total 	- Count - - - A B L E V 	= 21 = 21 F Value 0.3606	Prob
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 A N Sour	eans gro ======= 7: IF-E an = 36. T 	bup 2: 	30.0839 ======= O F M 429 286 714 000 667 667 000 667 000 667 000 333 F V A f Sum o Squar 92.6	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f N es Sc 	er of Total Total 	- Count A B L E 	= 21 = 21 F Value 0.3606	Prob
sy Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * * 1 * 2 * 3 * 4 * 5 * 6 * 7 A N Sour Repli Facto	eans gro	bup 2: 	30.0839 ======= o F M 429 286 714 000 667 667 000 667 000 333 f Sum o Squar 92.6 4376.5	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f mes Score 67 4 71 72 00 12	er of Total Total 	- Count A B L E 	= 21 = 21 F Value 0.3606	
s Y Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 1 * 2 * 3 * 4 * 5 * 6 * 7 Repli Facto Error Total	eans gro	<pre>pup 2: carly 476 Gr A B L E 7 39. 35. 34. 22. 21. 32. 37. 36. 37. 68. 5 I S O Degrees o Freedom 5 I S O Degrees o Freedom 2 6 12 20</pre>	30.0839 ======= o F M 429 286 714 000 667 000 667 000 333 f Sum o Squar 92.6 4376.5 1542.0 6011.2	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f mes Score 67 4 71 72 00 12	er of Total Total 	- Count A B L E 	= 21 = 21 F Value 0.3606	Prob
SY Van Gra	for m ===== riable and Me 1 2 1 * 2 * 3 * 4 5 * 3 * 4 * 5 * 6 * 7 Repli Facto Error Total effici	eans gro	<pre>pup 2: carly 476 Gr A B L E 7 39. 35. 34. 22. 21. 32. 37. 36. 37. 68. 5 I S O Degrees o Freedom 5 I S O Degrees o Freedom 2 6 12 20 Variation</pre>	30.0839 ======= o F M 429 286 714 000 667 667 000 667 000 333 f Sum o Squar 92.6 4376.5 1542.0 6011.2 : 11.08%	Number 766.000 E A N S Total 276.00 247.00 243.00 66.00 65.00 98.00 111.00 110.00 111.00 205.00 R I A N C H f mes Score 67 4 71 72 00 12	er of Total Total 00 00 00 00 00 00 00 00 00 0	- Count A B L E 	= 21 = 21 F Value 0.3606 5.6765 	Prob 0.005

Gı											
	1	2		8			Total				
	1	*		 б 4	 25		45.0	 147	-		
		*									
	3	*									
	 *	 1		2.7	 10		8.3		-		
	*	2					o 9.1				
	*										
	*	4		4.0 6.3			19.1				
	*	5		5.8			17.5				
	*	6		6.9			20.7				
	*	7		12.8			38.5				
	 i	ANAL	 Y S I	s o	 F	V A R I	A N C	 Е Т	- A B	LE	
ζ	G		Degr	ees of		Sum of	,	Mean		F Value	Davala
.ue 		ource	F'1 	eedom		Squares		Square		Value	Prob
										0.3495	0 0007
				6 12		30.900		34.47	5 E	13.3887	0.0001
	Er:	ror 		12		30.900		2.57	5		
	Tot	tal		20		239.551					
s_	Y	r means	group	2:	0.		Num	per of	Obse	ervations:	
s_ ==== Va	_ fo: y ====: arial	r means ======= ble 9: H Mean =	group ===== F-Mid 8.514	2: (No.) Gran	0. === d S	9265	Numb ======	oer of	0bse =====	ervations:	
s_ Va	_ fo: y ====: arial	r means ======= ole 9: H Mean =	group ===== F-Mid 8.514	2: (No.) Gran	0. === d S 0	9265 ====================================	Num1 ====== .800 A N S	oer of	0bse =====	ervations:	
s_ ==== Va	_ fo: Y arial rand	r means ======= ole 9: H Mean =	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9	0. === d s 0	9265 	Num .800 A N S Total	Der of Total	0bse =====	ervations:	
s_ ==== Va	_ fo: y arial rand 1 1	r means ======= ole 9: H Mean = 2	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 8.6	0. === d S 0 86	9265 	Num .800 A N S Total .60.8	Der of Total	0bse =====	ervations:	
s_ Va	_ fo: y arial rand	r means ======= ole 9: H Mean = 2 *	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9	0. === d s 0 86 14	9265 	Num .800 A N S Total	Der of Total	0bse =====	ervations:	
s_ Va	_ fo: y arial rand 1 2	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 8.6 8.7 8.1	0. ==== d S 0 86 14 43 	9265 	Num .800 A N S Total .60.8 61.0 57.0	Der of Total 300 000 000	0bse =====	ervations:	
s_ ==== Va	_ fo: y arial rand 1 2 3	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 	0. ==== d s 0 86 14 43 33	9265 Sum = 178 F M E 2	Numi .800 A N S Total .60.8 61.0 57.0	Der of Total 700 000 000 500	0bse =====	ervations:	
s_ ==== Va	_ fo: y arial rand 1 2 3 	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 8.6 8.7 8.1 10.5 9.5	0. ==== d s 0 86 14 43 33 33	9265 	Numi .800 A N S Total .60.8 61.0 57.0 .31.6 28.0	Der of Total Total 000 000 500 500	0bse =====	ervations:	
s_ Va	_ fo: y arial rand 1 2 3 *	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33	9265 	Numi .800 A N S Total .60.8 61.0 57.0	Der of Total Total 300 000 000 500 500 500 000	0bse =====	ervations:	
s_ ==== Va	_ fo: y arial rand 1 2 3 * *	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 33 33	9265 	Numi .800 A N S Total .60.8 61.0 57.0 .31.6 28.6 28.0	Der of Total Total 300 000 500 500 500 500 500 500 500 500	0bse =====	ervations:	
s_ ==== Va	_ fo: y ====: arial rand 1 2 3 * * *	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 	0. ==== d s 0 86 14 43 33 33 33 33 00	9265 	Numi .800 A N S Total .60.8 61.0 57.0 .28.0 28.0 24.4	Der of Total Total 000 000 000 500 500 500 500 500 500 50	0bse =====	ervations:	
s_ ==== Va	_ fo: y ====: arial rand 1 2 3 * * * *	r means ======= ble 9: H Mean = 2 * * * * 1 2 3 4 5	group ===== F-Mid 8.514	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 33 00 67	9265 	Numi ====== .800 A N S Total 60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4	Der of Total Total 300 000 000 500 500 500 500 400 400 200	0bse =====	ervations:	
s_ Va	_ fo: y ====: arial rand 1 2 3 * * * * * *	r means ======= ole 9: H Mean = 2 * * * * 1 2 3 4 5 6 7	group ===== F-Mid 8.514 T A E	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 33 00 67 00 	9265 	Num .800 A N S Total .60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0	Der of Total Total 300 000 000 500 500 400 400 200 500	Obse ===== Cour - -	ervations: ====================================	
S Va G1 	_ fo: y ====: arial rand 1 2 3 * * * * * *	r means ======= ole 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L	group ===== F-Mid 8.514 T A E 	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 33 00 67 00 F	9265 Sum = 178 F M E 2	Num .800 A N S Total .60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 400 400 200 500 500 500 500 500 500 500 500 5	Obse Cour - -	ervations: ====================================	
S Va G1 	_ fo: y ===== arial rand 1 2 3 * * * * * * * *	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514 T A E Y S I Degr Fr	2: (No.) Gran 3 L E 9 8.6 8.7 8.1 10.5 9.5 9.3 8.1 8.8 7.0 6.2 S O rees of reedom	0. ==== d 2 0 = 86 14 43 33 33 33 33 00 67 00 F	9265 Sum = 178 F M E 2 V A R I Sum of Squares	Num .800 A N S Total .60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 400 200 500 500 E T Mean Square	Obse Cour - -	L E F Value	Prob
s_ 	_ fo: y ===== arial rand 1 2 3 * * * * * * * * *	r means ======= ble 9: H Mean = 2 	group ===== F-Mid 8.514 T A E Y S I Degr Fr	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 00 67 00 F 	9265 Sum = 178 F M E 2 	Num .800 A N S Total .60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 200 500 500 500 5	Obse 	Ervations: ====================================	Prob
s_ 	_ fo: y ===== arial rand 1 2 3 * * * * * * * * * * * * * * * *	r means ======= ble 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce plicatio	group ===== F-Mid 8.514 T A F 	2: (No.) Gran 3 L E 9 	0. ==== 0 0 14 43 33 33 33 00 67 00 F	9265 Gum = 178 F M E 2 	Num .800 A N S Total 60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 500 500 500 500	Obse 	L E F Value 1.2728	Prob
s_ Va G1 	_ fo: y ===== arial rand 1 2 3 * * * * * * * * * * Rej Fac	r means ======= ble 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce plicatio	group ===== F-Mid 8.514 T A E Y S I Degr Fr n	2: (No.) Gran 3 L E 9 	0. ==== d S 0 86 14 43 33 33 33 00 67 00 F 	9265 Gum = 178 F M E 2 	Num .800 A N S Total 60.8 61.0 57.0 28.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 500 500 500 500	Obse 	Ervations: ====================================	Prob
s Va G1 	fo: Y ====: arial rand 1 2 3 * * * * * * * * * * * * * * * *	r means ======= ole 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 	group ===== F-Mid 8.514 T A E Y S I Degr Fr n	2: (No.) Gran 3 L E 9 	0. ==== d s 0 14 43 33 33 33 33 00 67 00 F 	9265 Sum = 178 F M E 2 V A R I Sum of Squares 1.451 40.392 6.842 48.686	Num .800 A N S Total 60.8 61.0 57.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 500 500 500 500	Obse 	L E F Value 1.2728 11.8073	Prob 0.3153 0.0002
s_ Va G1 	_ fo: y ===== arial rand 1 2 3 * * * * * * * * * * * * *	r means ======= ole 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 	group ===== F-Mid 8.514 T A E Y S I Degr Fr n	2: (No.) Gran 3 L E 9 	0. ==== d S 0 14 43 33 33 33 00 67 00 F 	9265 Sum = 178 F M E 2 V A R I Sum of Squares 1.451 40.392 6.842 48.686	Num .800 A N S Total 60.8 61.0 57.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 500 500 500 500	Obse 	L E F Value 1.2728	Prob 0.3153 0.0002
s_ 	_ fo: y ===== arial rand 1 2 3 * * * * * * * * * * * * *	r means ======= ole 9: H Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatio ctor A ror tal tal	group ===== F-Mid 8.514 T A E Y S I Degr Fr n f Vari	2: (No.) Gran 3 L E 9 	0. ==== d S 0 14 43 33 33 33 33 00 67 00 F 8.	9265 Sum = 178 F M E 2 V A R I Sum of Squares 1.451 40.392 6.842 48.686 87%	Num .800 A N S Total 60.8 61.0 57.0 28.0 28.0 24.4 26.4 21.2 18.0 A N C	Der of Total Total 300 000 000 500 500 500 500 500 500 500	Obse 	L E F Value 1.2728 11.8073	Prob 0.3153 0.0002

1	2		10		Total			
							-	
1	*		0.514	4	3.600			
2	*		0.600	0	4.200			
3	*		0.514	4	3.600		_	
*	1		0.26	7	0.800			
*	2		0.333	3	1.000			
*	3		0.400	0	1.200			
*	4		0.533	3	1.600			
*	5		0.46		1.400			
*	6		0.66		2.000			
*	7		1.133	3 	3.400		-	
	ANAL	YSIS	O F	VARI	ΑΝСΕ	Т	ABLE	
	_	Degree	s of	Sum of	Mea	an	F Value	
le S	Source	Free	edom	Squares	Squa	are	Value	Prob
							1.6364	
		6		1.531			24.3636	0.0000
Er	ror	12	! 	0.126	0	.010) 	
Tc	otal	20)	1.691				
	icient o or means				Number	of	Observations:	7
	r moong							
Varia	able 11: Mean =	======================================	===== l Grand				Observations: Count = 21	
Varia Grand	able 11: Mean =	*====== %Inf-Mid 6.453 T A B L	Grand E	======= Sum = 135 O F M E				
Varia Grand	able 11: 1 Mean = 2	*====== %Inf-Mid 6.453 T A B L	Grand Grand E (======= Sum = 135 O F M E				
Varia Grand 1 	able 11: d Mean = 2 *	*====== %Inf-Mid 6.453 T A B L	Grand Grand E (11 6.12	======= Sum = 135 O F M E 7	.522 Tot A N S Total 			
Varia Grand 1 1 2	able 11: d Mean = 2 * *	*====== %Inf-Mid 6.453 T A B L	Grand 5 E (11 6.12 7.05	======= Sum = 135 O F M E 7 7 7	.522 Tot A N S Total 42.886 49.402			
Varia Grand 1 	able 11: d Mean = 2 *	*====== %Inf-Mid 6.453 T A B L	Grand Grand E (11 6.12	======= Sum = 135 O F M E 7 7 7	.522 Tot A N S Total 			
Varia Grand 1 1 2	able 11: d Mean = 2 * *	*====== %Inf-Mid 6.453 T A B L	Grand 5 E (11 6.12 7.05	======= Sum = 135 OFME 7 7 6 	.522 Tot A N S Total 42.886 49.402			
Varia Grand 1 1 2 3 	able 11: d Mean = 2 * *	*====== %Inf-Mid 6.453 T A B L	Grand Grand 11 6.12 7.05 6.17	Sum = 135 OFME 7 7 6 4				
Varia Grand 1 1 2 3 	able 11: d Mean = 2 * * * 1 2 3	*====== %Inf-Mid 6.453 T A B L	Grand , E (11 6.12 7.05 6.176 2.454	======= Sum = 135 OFME 7 7 6 4 2	.522 Tot A N S Total 			
Varia Grand 1 1 2 3 * * *	able 11: d Mean = 2 * * * 1 2 3 4	*====== %Inf-Mid 6.453 T A B L	Grand , E (11 6.12 7.05 6.176 2.454 3.352	======= Sum = 135 OFME 7 7 6 4 2 2	.522 Tot A N S Total 			
Varia Grand 1 1 2 3 * * *	able 11: d Mean = 2 * * * 1 2 3 4 5	*====== %Inf-Mid 6.453 T A B L	Grand Grand 11 6.12 7.05 6.176 2.454 3.352 4.112 6.12 5.02	Sum = 135 OFME 7 7 6 4 2 2 7 3	.522 Tot A N S Total 42.886 49.402 43.233 			
Varia Grand 1 1 2 3 * * * *	able 11: Mean = 2 * * 1 2 3 4 5 6	*====== %Inf-Mid 6.453 T A B I	Grand Grand 11 6.12 7.05 6.17 2.45 3.35 4.11 6.12 5.02 8.58	Sum = 135 OFME 7 7 6 7 2 2 2 3 4	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752			
Varia Grand 1 1 2 3 * * *	able 11: d Mean = 2 * * * 1 2 3 4 5	*====== %Inf-Mid 6.453 T A B I	Grand Grand 11 6.12 7.05 6.176 2.454 3.352 4.112 6.12 5.02	Sum = 135 OFME 7 7 6 7 2 2 2 3 4	.522 Tot A N S Total 42.886 49.402 43.233 			
Varia Grand 1 1 2 3 * * * * *	able 11: Mean = 2 * * 1 2 3 4 5 6 7 A N A L	*====== %Inf-Mid 6.453 T A B I	Grand , E (1) 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F	Sum = 135 OFME 7 7 6 7 7 3 4 2 2 7 3 4 2 7 3 4 2 7 3 4 2 7 3 4 2 7 3 4 2 7 7 3 4 2 7 7 3 4 2 7 7 3 4 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 	tal	Count = 21	
Varia Grand 1 1 2 3 * * * * *	able 11: Mean = 2 * * 1 2 3 4 5 6 7 A N A L	*====== %Inf-Mid 6.453 T A B I	Grand , E (1) 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F	Sum = 135 OFME 7 7 6 7 7 3 4 2 2 7 3 4 2 7 3 4 2 7 3 4 2 7 3 4 2 7 3 4 2 7 7 3 4 2 7 7 3 4 2 7 7 3 4 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 	tal	Count = 21	
Varia Grand 1 1 2 3 * * * * *	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	%Inf-Mid 6.453 T A B I Y S I S Degree Free	Grand Grand 11 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F es of edom	Sum = 135 D F M E 7 7 6 7 2 2 2 7 3 4 2 2 7 3 4 2 2 7 5 3 4 2 2 7 7 3 4 2 2 7 7 3 4 2 2 7 7 3 4 2 2 7 7 5 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	.522 Tot A N S Total 42.886 49.402 43.233 	tal	Count = 21	Prob
Varia Grand 1 1 2 3 * * * * * * * *	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplicatio	%Inf-Mid 6.453 T A B I 	Grand Grand 11 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F es of edom	Sum = 135 OFME 7 7 6 7 7 6 2 2 7 3 4 2 2 7 3 4 2 2 7 5 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 8 1 9 7 7 7 7 8 1 9 7 7 7 7 7 7 7 7 7 8 9 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 	===== tal T an are .920	Count = 21	Prob
Uaria Grand 1 1 2 3 * * * * * * * * * * * * * * * *	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplicatio actor A	%Inf-Mid 6.453 T A B I 	Grand Grand 11 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F es of edom	Sum = 135 D F M E 7 7 6 7 7 3 4 2 2 7 3 4 2 2 7 7 3 4 2 2 7 7 3 4 2 2 7 7 3 4 2 2 7 7 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 3 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 3 3 9 360.1122 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 	===== tal T an are .920 .019	Count = 21 A B L E F Value 0. 1.9020 59.4655	Prob
Uaria Grand 1 1 2 3 * * * * * * * * * * * * * * * *	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplicatio	%Inf-Mid 6.453 T A B I 	Grand Grand 11 6.12 7.05 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F es of edom	Sum = 135 OFME 7 7 6 7 7 6 2 2 7 3 4 2 2 7 3 4 2 2 7 5 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 8 1 9 7 7 7 7 8 1 9 7 7 7 7 7 7 7 7 7 8 9 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 	===== tal T an are .920 .019	Count = 21 A B L E F Value 0. 1.9020 59.4655	Prob
Varia Grand 1 1 2 3 * * * * * * * * * * * * * * * *	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplication actor A cror btal	*Inf-Mid 6.453 T A B L 	Grand Grand 11 6.12 7.05 6.170 2.454 3.352 4.112 5.022 8.584 15.522 0 F es of edom	Sum = 135 D F M E 7 7 6 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 7 6 7 7 7 6 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 A N C E Mea Squa 1 60 1	 tal T an are .920 .019 .009	Count = 21	Prob 0.1916 0.0000
Le S	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplication actor A cror	<pre>%Inf-Mid 6.453 T A B I </pre>	Grand Grand 11 6.12 7.05 6.176 2.454 3.352 4.112 5.022 8.584 15.522 OF s of edom	Sum = 135 D F M E 7 7 6 2 2 7 3 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 6 5 7 7 6 7 7 7 6 7 7 7 7 7 7 7 7 7	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 A N C E Mea Squa 1 60 1	 tal T an are .920 .019 .009	Count = 21 A B L E F Value 0. 1.9020 59.4655	Prob 0.1916 0.0000
Le S Le S L	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplication actor A cror btal ficient o	<pre>%Inf-Mid 6.453 T A B I </pre>	Grand Grand 11 6.12 7.05 6.17 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F s of dom	Sum = 135 D F M E 7 7 6 2 2 7 3 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 5 8 9 8 9 8 9 3 6 0.112 1 1 2 1 2 7 7 5 7 6 1 2 7 7 7 6 1 2 2 7 7 3 3 4 2 2 7 7 5 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 	tal	Count = 21	Prob 0.1916 0.0000
Le S Le S L	able 11: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source eplication actor A cror btal ficient o	<pre>%Inf-Mid 6.453 T A B I </pre>	Grand Grand 11 6.12 7.05 6.17 6.17 2.45 3.35 4.11 5.02 8.58 15.52 0 F s of dom	Sum = 135 D F M E 7 7 6 2 2 7 3 4 2 2 7 3 4 2 2 7 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 3 3 4 2 2 7 7 5 8 9 8 9 8 9 3 6 0.112 1 1 2 1 2 7 7 5 7 6 1 2 7 7 7 6 1 2 2 7 7 3 3 4 2 2 7 7 5 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	.522 Tot A N S Total 42.886 49.402 43.233 7.361 10.055 12.337 18.382 15.068 25.752 46.567 	tal	Count = 21	Prob 0.1916 0.0000

Variable 12: HF-Mid (Wt.) Grand Mean = 818.794 Grand Sum = 17194.683 Total Count = 21 TABLE OF MEANS 1 2 12 Total _____ * 830.045 5810.318 1 * 2 831.212 5818.482 * 3 795.126 5565.883 _____ * 993.217 2979.650 1 * 954.944 2 2864.833 * 3 919.494 2758.483 * 4 783.061 2349.182 * 5 852.706 2558.117 6 672.206 2016.617 7 1667.800 555.933 _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean Freedom Squares Square K ਸ K Value Source Value Prob _____ Replication25886.7532943.377Factor A6456334.08276055.680Error1246121.9223843.493 1 2943.377 0.7658 2 19.7882 0.0000 -3 _____ 20 508342.758 Total _____ _____ _____ Coefficient of Variation: 7.57% s_ for means group 1: 23.4323 Number of Observations: 7 У s_ for means group 2: 35.7934 Number of Observations: 3 У ______ Variable 13: IF-Mid Grand Mean = 62.820 Grand Sum = 1319.220 Total Count = 21 TABLE OF MEANS 1 2 13 Total ------61.529 63.886 1 430.700 447.200 2 * 63.046 441.320 3 -----_ _ _ _ _ _ _ _ _ * 33.153 99.460 1 * 2 40.167 120.500 * 3 60.097 180.290 * 4 67.930 203.790 5 190.000 63.333 68.427 6 205,280 106.633 319.900 _____ -----ANALYSIS OF VARIANCE TABLE K Degrees of Sum of Mean F Value Source Freedom Squares Square Value Prob _____ 1Replication219.9819.9910.37732Factor A610134.3601689.06063.7919-3Error12317.73226.478 63.7919 0.0000 - 3 _____ 20 10472.073 Total _____ -----Coefficient of Variation: 8.19% s_ for means group 1: 1.9449 Number of Observations: 7 V 2.9708 s_ for means group 2: Number of Observations: 3 У _____

	1	2		14			Tota	1			
	1	*		7.	429		52	.005			
	2	*		7.	778		54	.444			
	3	*		7.	834		54	.839			
	*	1			230			.689			
		2									
	*										
		4			044		24				
		5 6			938			.815			
		6 7		9. 16.	263		27 48	.790 .322			
	A	ANAL	Y S I Dear	S (cees o)F of	V A R I Sum of	AN	CE 7 Mean	C A B L	E F	
ıe	Sc	ource	Fr	reedon	n	Sum of Squares		Square	5	Value	Prob
	Rep	licatio	on	2		0.673		0.33	37	0.9002	
				6		328.911		54.82	.9 1		0.0000
	Err			12		4.487		0.3	/4		
	Tot	al		20		334.071					
У				_							
У	for		group	2:	0	.2311 .3530	Nur				
у ==== Va:	for ==== riab	======= ble 15: Mean =	group ====== HF-Lat 6.448	2: ===== :e (No Gra	0 ===== 5.) and 3	.3530	Nur =====:	Tota	======	=======	
y ==== Va: Gr	for ==== riab	======= ble 15: Mean =	group HF-Lat 6.448 T A E	2: ===== ce (No Gra 3 L E	0 o.) and s O	.3530 ======= Sum = 135	Nun ====== .400 A N S	Tota	======	=======	
y ==== Va: Gr:	for ==== riab and	======= ble 15: Mean =	group HF-Lat 6.448 T A E	2: ce (No Gra 3 L E 15	0 o.) and s O	.3530 ======= Sum = 135 F M E	Nun ====== .400 A N S	Tota:	======	=======	
y ==== Va: Gr	for ==== riak and 1	2	group HF-Lat 6.448 T A E	2: .e (No Gra 3 L E 15 	0 	.3530 ======= Sum = 135 F M E	Nun ====== .400 A N S Tota 44	Tota:	======	=======	
y ==== Va: Gr	for ==== riab and 1 	2 *	group HF-Lat 6.448 T A E	2: Gra 3 L E 15	0 ===== 0.) and s 0 	.3530 ======= Sum = 135 F M E	Nun 	Tota 1 .600	======	=======	
У ==== Va: Gr	for ==== riab and 1 1 2 3 	2 ***	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6.	0 371 286	.3530 ======= Sum = 135 F M E	Nun 	Tota 1 .600 .000 .800	======	=======	
y Va: Gr	for ==== riab and 1 2 3 	2 2 * *	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7.	0 ==== 0.) and 8 0 .371 .286 .686	.3530 ======= Sum = 135 F M E	Nun 44 44 44 46 23	Tota 1 .600 .000	======	=======	
y Va: Gr	for ==== riab and 1 2 3 *	2 2 * * *	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7.	0 and s 371 286 686	.3530 ======= Sum = 135 F M E	Nun 44 44 44 46 23 21	Tota 1 .600 .000 .800 .200	======	=======	
У Va: Gr	for ==== riab and 1 2 3 * * *	2 Mean = 2 * * * 1 2 3 4	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 7.	0 and s 0 371 286 686 733 067	.3530 ======= Sum = 135 F M E	Nun .400 A N S Tota: 44 44 46 23 21 19	Tota 1 .600 .800 .200 .200	======	=======	
У ==== Va: Gr. 	for ==== riab and 1 2 3 * * * *	2 Mean = 2 * * * 1 2 3 4 5	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 6. 6. 6. 6. 6. 6. 6. 7. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6.	0 ==== 0.) and 5 0 371 286 686 733 067 600 067 467	.3530 ======= Sum = 135 F M E	Nun .400 A N S Tota: .44 44 44 46 23 21 19 18	Tota 1 .600 .000 .800 .200 .200 .800	======	=======	
У Ч 	for ==== riab and 1 2 3 * * * *	2 Mean = 2 * * * 1 2 3 4 5 6	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 6. 6. 5.	0 ==== 0.) and 5 0 371 286 686 733 067 600 067 467 667	.3530 ======= Sum = 135 F M E	Nun ====== .400 A N S Tota: 44 44 44 46 23 21 19 18 19 17	Tota Tota 1 .600 .000 .800 .200 .200 .800 .200 .400 .000	======	=======	
y Va: Gr.	for ==== riab and 1 2 3 * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 6. 6. 5. 5.	0 and 5 0 371 286 686 733 067 600 067 467 667 533 	.3530 ======= Sum = 135 F M E	Nun 4400 A N S Tota: 44 44 44 46 23 21 19 18 19 17 16 	Tota 1 .600 .000 .800 .200 .200 .800 .200 .400 .000 .600		= 21	
y Va Gr	for ==== riab and 1 2 3 * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 N A L	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 6. 6. 5. 5. 5. 5.	0 ==== 0.) and 5 0 371 286 686 733 067 600 067 467 533 F	.3530 ======= Sum = 135 F M E	Nun 4400 A N S Tota: 44 44 44 44 44 46 23 21 19 18 19 17 16 A N O	Tota 1 .600 .000 .800 .200 .200 .200 .400 .000 .600 	Count	= 21 E	
y Va Gr	for ==== riab and 1 2 3 * * * * * * * * * * * * *	2 Mean = 2 * * * * 2 3 4 5 6 7 N A L ource	group HF-Lat 6.448 T A E	2: Gra 3 L E 15 6. 6. 7. 7. 6. 6. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	0 and 5 .371 .286 .686 .733 .667 .667 .667 .533 	.3530 ======= Sum = 135 F M E	Nun .400 A N S Tota: 44 44 46 23 21 19 18 19 17 16 A N O	Tota Tota 1 .600 .000 .800 .200 .200 .400 .000 .600 .C E T Mean Square	Count	E F Value	Prob
y Va: Gr. 	for ==== riab and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * * * * 1 2 3 4 5 6 7 7 N A L purce	group HF-Lat 6.448 T A E	2: Grass L E 15 6. 6. 7. 7. 6. 6. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	0 and 5 371 286 686 733 600 067 467 667 533 533 5533 	.3530 Sum = 135 F M E 	Nun .400 A N S Tota .44 44 44 46 23 21 19 18 19 17 16 A N O	Tota 1 .600 .000 .800 .200 .200 .400 .000 .600 .C E T Mean Square 0.32	Count	= 21 E F Value 1.4909	Prob
y Va Gr 	for ==== riab and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce plicatic ctor A	group HF-Lat 6.448 T A E Y S I Degr Fr	2: Grass L E 15 6. 6. 7. 7. 6. 6. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	0 ==== 0.) and 5 0 286 686 286 686 733 067 600 067 467 667 533 Fof 1 	.3530 ======== Sum = 135 F M E V A R I Sum of Squares 0.621 10.952	Nun 	Tota Tota 1 .600 .000 .800 .200 .200 .400 .000 .600 .200 .400 .000 .600 .200 .400 .000 .200 .300 .200 .310 .311 .321 .331 .331 .332 .33	Count C A B L 2 25	= 21 E F Value 1.4909	Prob
y Va: Gr. 	for ==== riab and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce plicatic ctor A	group HF-Lat 6.448 T A E Y S I Degr Fr	2: Grass L E 15 6. 6. 7. 7. 6. 6. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	0 ==== 0.) and 5 0 286 686 286 686 733 067 600 067 467 667 533 Fof 1 	.3530 Sum = 135 F M E 	Nun 	Tota 1 .600 .000 .800 .200 .200 .400 .000 .600 .C E T Mean Square 0.32	Count C A B L 2 25	= 21 E F Value 1.4909	Prob
y Va: Gr. 	for ==== riab and 1 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 N A L burce ctor A cor	group HF-Lat 6.448 T A E	2: Grassing L E 15 6. 6. 6. 7. 7. 6. 6. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5	0 and 5 371 286 686 733 067 600 067 467 667 533 533 	.3530 ======== Sum = 135 F M E V A R I Sum of Squares 0.621 10.952	Nun 	Tota Tota 1 .600 .000 .800 .200 .200 .200 .400 .000 .600 .200 .400 .000 .600 .200 .400 .000 .200 .300 .200 .400 .000 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .200 .300 .300 .300 .200 .3000 .300 .300 .300 .300 .300 .3000 .300 .300	Count C A B L 2 25	= 21 E F Value 1.4909	Prob
y Va: Gr. 1e Le Co	for ==== riab and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce plicatic ctor A cor 	group HF-Lat 6.448 T A E 	2: Grassing L E 15 	0 and s 0 371 286 686 733 067 600 067 467 667 533 533 533 533 533 533 533 533 533 533 	.3530 Sum = 135 F M E 	Nun .400 A N S Tota 44 44 46 23 21 19 18 19 17 16 A N C	Tota 1 .600 .000 .800 .200 .200 .200 .200 .400 .000 .600 .200 .400 .000 .600 .20	Count 	E F Value 1.4909 8.7652	Prob 0.2641 0.0008
y Va: Gr. ue Co	for ==== riab and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L purce cient contents	group HF-Lat 6.448 T A E 	2: Grassing L E 15 	0 and s 0 371 286 686 733 067 600 067 467 667 533 533 533 533 533 533 533 533 533 533 	.3530 Sum = 135 F M E V A R I Sum of Squares 0.621 10.952 2.499 14.072	Nun .400 A N S Tota 44 44 46 23 21 19 18 19 17 16 A N C	Tota 1 .600 .000 .800 .200 .200 .200 .200 .400 .000 .600 .200 .400 .000 .600 .20	Count 	E F Value 1.4909 8.7652	Prob 0.2641 0.0008

	1	2		10			m - +	- 1				
	1	∠		16			Tota	a⊥ 				
	1	*		0.5	43			3.800				
	2	*		0.5	14			3.600				
	3	*		0.6	29		4	4.400				
	*	1		0.2	 67			 0.800				
	*	2		0.3				1.000				
	*	3		0.4	67			1.400				
	*	4		0.5	33			1.600				
	*	5		0.5	33			1.600				
	*	6		0.5			-	1.600				
	*	7		1.2	67			3.800				
	 I	ANAL	YSI	S O	F	VARI	A N	СE	Т	ABL	Е	
			Degr	ees of		Sum of Squares		Mea	an		F	
1e 	So 	ource	Fr 	eedom		Squares		Squa	are		Value	Prob
						0.050						
				6		1.943					28.3333	0.000
		ror 		12		0.137			.011			
	Tot	tal		20		2.130						
s_ y	_ foi	icient c r means					N	umber	of	Observ	vations:	7
у ==== Va	_ for / =====	======= ole 17: Mean =	*===== %Inf-I 8.201	2: ====== Jate Gran	0. === d S	0617 ======= um = 172 F M E	N1 ====: .214	===== Tot		=====		
y ==== Va Gr	_ for / =====	====== ole 17: Mean =	*===== %Inf-I 8.201	2: ====== Jate Gran	0. === d S	0617 ======== um = 172	Nu ===== .214 A N S	===== Tot S		=====		
y ==== Va Gr	for for arial and	ole 17: Mean = 2	*===== %Inf-I 8.201	2: Jate Gran 3 L E 17	0. === d S 0	0617 ======= um = 172 F M E	N1 ===== .214 A N S Tota	Tot S al		=====		
y ==== Va Gr	_ for / ariak cand 1 	ole 17: Mean = 2	*===== %Inf-I 8.201	2: Jate Gran 3 L E 17 8.0	0. === d S 0 32	0617 ======= um = 172 F M E	N1 ===== . 214 A N S Tota 	Tot S al 6.226		=====		
y ==== Va Gr	for for arial and	ole 17: Mean = 2	*===== %Inf-I 8.201	2: Jate Gran 3 L E 17	0. === d S 0 32 34	0617 ======= um = 172 F M E	Nu 50 54	Tot S al		=====		
y ==== Va Gr	_ for / ariak and 1 1 2 3	2 2 * *	*===== %Inf-I 8.201	2: Gran 3 L E 17 8.0 7.7 8.8	0. === d S 0 32 34 36 	0617 ======= um = 172 F M E 	N1 ===== . 214 A N S Tota 50 54 61 	Tot S al 6.226 4.136 1.851		=====		
y ==== Va Gr	_ for ==== ariak and 1 2 3 	2 2 * * 1	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3	0. ==== d S 0 32 34 36 14	0617 ======= um = 172 F M E 	N1 	Tot 5 al 6.226 4.136 1.851 9.942		=====		
y ==== Va Gr	_ for ==== ariak and 1 2 3 	2 2 * * 1 2	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5	0. === d S 0 32 34 36 14 36	0617 ======= um = 172 F M E 	N1 ====: . 214 A N S Tota 50 54 61 	Tot S al 6.226 4.136 1.851 9.942 3.609		=====		
y ==== Va Gr	_ for ==== ariak and 1 2 3 	2 * * 1 2 3	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5	0. ==== d S 0 32 34 36 14 36 52	0617 ======= um = 172 F M E 	Nu ====: . 214 A N S Tota 50 54 6: 9 1: 19	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657		=====		
y ==== Va Gr	_ for / ==== arial cand 1 2 3 * *	2 * * * 1 2 3 4	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0	0. ==== d S 0 32 34 36 14 36 52 30	0617 ======= um = 172 F M E 	N1 ====: . 214 A N S Tota 50 54 54 54 54 12 24	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091		=====		
y ==== Va Gr	_ for / ==== ariak cand 1 2 3 * * *	2 * * 1 2 3	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5	0. ==== d S 0 32 34 36 14 36 52 30 50	0617 ======= um = 172 F M E 	NT ====: . 214 A N S Tota 50 50 50 50 50 50 50 50 50 50	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657		=====		
y ==== Va Gr	_ for ===== arial arial 1 2 3 * * * * *	2 * * 1 2 3 4 5	*===== %Inf-I 8.201	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6	0. ==== d S 0 32 34 36 14 36 52 30 50 94	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 50 50 50 50 50 50 50 50 50 50 50 50 50	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950		=====		
у Vа Gr 	_ for ===== arial arial 1 2 3 * * * * * * *	2 * * * 1 2 3 4 5 6 7 A N A L	*Inf-I 8.201 T A E	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 18.6 18.6	0. === d S 0 32 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ====: . 214 A N S Tota 50 50 61 9 11 12 24 22 20 55 A N	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E	tal	Count	= 21 E	
у Vа Gr 	_ for ===== arial arial 1 2 3 * * * * * * *	2 * * * 1 2 3 4 5 6 7 A N A L	*Inf-I 8.201 T A E	2: Gran Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 18.6 18.6	0. === d S 0 32 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ====: . 214 A N S Tota 50 50 61 9 11 12 24 22 20 55 A N	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E	tal	Count	= 21 E	
y Va Gr 	for ==== ariak ariak 1 2 3 * * * * * * * * *	2 * * * 1 2 3 4 5 6 7 A N A L purce	%Inf-I 8.201 T A E Y S I Degr Fr	2: Gran L E 17 	0. === d S 0 32 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 50 50 61 9 20 20 20 20 20 55 20 20 20 20 20 20 20 20 20 20 20 20 20	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa	tal	Count	E F Value	Prob
y Va Gr 	for ==== ariak and 1 2 3 * * * * * * * * * *	2 * * * 1 2 3 4 5 6 7 A N A L purce	%Inf-I 8.201 T A E Y S I Degr Fr	2: Gran L E 17 	0. ==== d S 0 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ====: .214 A N S Tota 50 51 62 62 62 62 62 62 62 62 62 62	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa	tal	A B L	E F Value	Prob
y Va Gr 	for 1 2 3 * * * * * * * * * * * * *	2 * * * * 1 2 3 4 5 6 7 A N A L purce	%Inf-I 8.201 T A E Y S I Degr Fr	2: Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 18.6 18.6 18.6 	0. === d S 0 32 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 50 50 61 9 20 20 20 20 20 20 20 20 20 20 20 20 20	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa Squa 2.90	===== tal T an are 	A B L	E F Value 0.8441	Prob
y Va Gr 	for 	2 * * * * 1 2 3 4 5 6 7 A N A L purce	%Inf-I 8.201 T A E Y S I Degr Fr	2: Gran L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 18.6 18.6 18.6 	0. === d S 0 32 34 36 14 36 52 30 50 94 27 F	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 50 50 61 9 20 20 20 20 20 20 20 20 20 20 20 20 20	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa Squa 2.90	===== tal T an are .274 .659	A B L	E F Value 0.8441	Prob
y Va Gr 	_ for ===== ariak ariak 2 3 * * * * * * * * * * * * *	2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A ror tal	*Inf-I 8.201 T A E	2: Jate Gran 3 L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 12.5 12.5	0. ==== d S 0 34 36 14 36 50 94 27 F 	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 5	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa 2 74 2 74 2	===== tal T an are .274 .659 .694 	A B L	E F Value 0.8441 27.7097	Prob 0.000
y Va Gr 1e	for 	2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A ror tal	%Inf-I 8.201 T A F 	2: Jate Gran 3 L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 12.5 12.5	0. ==== d s 0 34 36 14 36 50 94 27 F 	0617 ======= um = 172 F M E 	Nu ===== . 214 A N S Tota 5	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa 2 74 2 74 2	===== tal T an are .274 .659 .694 	A B L	E F Value 0.8441 27.7097	Prob 0.000
y Va Gr 1e 2 2 CC	 _	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A ror tal	%Inf-I 8.201 T A E 	2: Jate Gran 3 L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 12.5 12.5	0. ==== d S 0 32 34 36 14 36 50 94 27 F 10	0617 ======= um = 172 F M E V A R I Sum of Squares 4.549 447.953 32.332 484.834 .02%	Nu ===== . 214 A N S Tota 50 62 93 19 24 22 20 59 A N	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa 2 74 2 74 2	==== tal T an are .274 .659 .694 	Count	E F Value 0.8441 27.7097	Prok
y Va Gr 1e Co s_ y	_ for _ ==== ariak ariak ariak 2 3 * * * * * * * * * * * * *	<pre>>>le 17: Mean = 2 * * * * * 1 2 3 4 5 6 7 7 A N A L purce >>licatic ctor A ror tal </pre>	%Inf-I 8.201 T A F 	2: Jate Gran 3 L E 17 8.0 7.7 8.8 3.3 4.5 6.5 8.0 7.6 8.6 12.5 12.5	0. ==== d s 0 32 34 36 14 36 50 94 27 F 10 0.	0617 ======= um = 172 F M E 	N1 ===== . 214 A N S Tota 5	Tot S al 6.226 4.136 1.851 9.942 3.609 9.657 4.091 2.950 6.083 5.882 C E Mea Squa 2 74 2 74 2 2 74	 tal T an are .274 .659 .694 of	A B L	E F Value 0.8441 27.7097 vations:	Prob 0.000

Variable 18: HF-Late (Wt.) Grand Mean = 611.125 Grand Sum = 12833.624 Total Count = 21 TABLE OF MEANS 18 1 2 Total _____ * 606.632 4246.426 1 * 2 601.246 4208.724 * 3 625.496 4378.474 _____ * 744.366 2233.099 1 * 668.241 2004.724 2 * 3 625.692 1877.076 * 4 573.658 1720.975 1831.273 * 5 610.424 6 538.417 1615.251 7 517.075 1551.226 _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean Freedom Squares Square K r. Value K Value Source Prob _____ Replication22270.1521135.0760.5995Factor A6110291.45018381.9089.7081Error1222721.4541893.454 1 2 9.7081 0.0005 -3 _____ 20 135283.056 Total _____ _____ Coefficient of Variation: 7.12% s_ for means group 1: 16.4467 Number of Observations: 7 У s_ for means group 2: 25.1227 Number of Observations: 3 У ______ Variable 19: IF-Late Grand Mean = 57.620 Grand Sum = 1210.015 Total Count = 21 TABLE OF MEANS 1 2 19 Total -----58.282 1 407.975 56.707 396.950 2 * 57.870 405.090 3 _____ _ _ _ _ _ _ _ _ * 34.122 1 102.365 * 2 43.767 131.300 * 3 48.583 145.750 4 53.833 161.500 5 152.150 50.717 53.750 6 161,250 118.567 355.700 _____ _____ ANALYSIS OF VARIANCE TABLE K Degrees of Sum of Mean F Value Source Freedom Squares Square Value Prob _____ 1Replication29.3404.6700.23772Factor A613851.6472308.608117.49810.0000-3Error12235.77619.648 - 3 _____ 20 14096.763 Total _____ ------Coefficient of Variation: 7.69% s_for means group 1: 1.6754 Number of Observations: 7 V 2.5592 s_ for means group 2: Number of Observations: 3 У _____

Gr	and		TAE									
	1	2		20			Total	_				
	1	*		8.9	 911		62.	379				
		*										
	3	*		8.	774		61.	415				
	*	1		4.3	 379		13.	136				
	*	2		6.3	L61		18.	483				
	*						21.	694				
	*	4		8.5				798				
	*	5 6		7.				244				
	*	б 7		9.0 18.0			27. 56.	266				
			YST			V A R I			 т	ABLE		
	-		Degr	rees of	-	Sum of		Mea	.n		F	
ue 	Sc	ource	Fr	reedom		Sum of Squares		Squa	ire	Va	lue	Prob
	Rep	plicatio	on	2		0.067		0.	033	0.	0459	
				6		382.799		63.	800	87.	8018	0.0000
	Er:	ror 		12		8.720		0.				
	Tot	cal		20		391.586						
						.3222						
у ==== Va	==== iriak	 ole 21:	 THF (N	2: 	0. ====	.4922	Nun =====		:===		=====	
y ==== Va Gr	, iriak and	ole 21: Mean =	THF (N 20.619	2: Jo.) Gra 3 L E	0. ==== and	.4922 ======= Sum = 43 F M E	Nun ====== 3.000 A N S	 To	:===		=====	
y ==== Va Gr	==== iriak	ole 21: Mean =	THF (N 20.619	2: 	0. ==== and	.4922 ======= Sum = 43	Nun ====== 3.000 A N S	 To	:===		=====	
y ==== Va Gr	, iriak and	ole 21: Mean =	THF (N 20.619	2: JO.) Gra 3 L E 21 20.6	0. ==== and 0 557	.4922 ======= Sum = 43 F M E	Nun ====== 3.000 A N S Total 144.	To To 	:===		=====	
y ==== Va Gr	, ===== ariak rand 1 1 2	ole 21: Mean = 2 *	THF (N 20.619	2: JO.) Gra 3 L E 21 20.6 20.6	0. and 0 557 529	.4922 ======= Sum = 43 F M E	Num 3.000 A N S Total 144. 144.	To 	:===		=====	
y ==== Va Gr	, eriak and 1 1	ole 21: Mean = 2	THF (N 20.619	2: JO.) Gra 3 L E 21 20.6	0. and 0 557 529	.4922 ======= Sum = 43 F M E	Nun ====== 3.000 A N S Total 144.	To 	:===		=====	
y ==== Va Gr	, ===== ariak rand 1 1 2	ole 21: Mean = 2 *	THF (N 20.619	2: JO.) Gra 3 L E 21 20.6 20.6	0. ==== and 0 557 529 571	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 75.	To 600 400 000 	:===		=====	
y ==== Va Gr	1 1 2 3 *	2 Mean = 2 * * * 1 2	THF (N 20.619	2: Jo.) Gra 3 L E 21 20.0 20.0 20.0 20.1 25.2 23.2	0. and 0 557 529 571 267 133	.4922 ======= Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 75.	To 600 400 000 	:===		=====	
y ==== Va Gr	1 2 3 * *	2 Mean = * * 1 2 3	THF (N 20.619	2: Jo.) Gra 3 L E 21 20.0 20.0 20.0 25.2 23.2 22.2	0. and 0 557 529 571 267 133	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 144. 69. 66.	To 600 400 000 800 400 400 400	:===		=====	
y ==== Va Gr	1 2 3 * *	2 Mean = 2 * * * 1 2 3 4	THF (N 20.619	2: No.) Gra 3 L E 21 20.0 20.0 20.0 25.2 23.2 22.1 19.2	0. and 0 557 529 571 267 133 232 267	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 144. 59. 69. 65.	To 600 400 000 800 400 400 800	:===		=====	
y ==== Va Gr	 1 2 3 * * * *	2 Mean = 2 * * * 1 2 3 4 5	THF (N 20.619	2: Jo.) Gra 3 L E 21 20.0 20.0 20.0 25.2 23.2 22.1 19.2 20.8	0. and 0 557 529 571 267 133 267 267 300	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 144. 57. 69. 66. 57. 62.	To 600 400 000 800 400 400 800 400 800 400	:===		=====	
y ==== Va Gr	1 2 3 * *	2 Mean = 2 * * * 1 2 3 4	THF (N 20.619	2: No.) Gra 3 L E 21 20.0 20.0 20.0 25.2 23.2 22.1 19.2	0. and 0 557 529 571 267 133 267 300 400	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 144. 59. 69. 65.	To 600 400 000 800 400 400 800 400 800 400 200	:===		=====	
У Чан Уа Сг	1 1 2 3 * * * * * * *	2 Mean = 2 * * 1 2 3 4 5 6 7 A N A L	THF (N 20.619 T A E	2: Jo.) Gra 3 L E 21 20.0 20.0 20.0 20.0 23.1 22.1 19.2 20.8 17.4 16.1	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E	Num ====== 3.000 A N S Total 144. 144. 144. 144. 144. 69. 66. 57. 62. 52. 49. A N C	To 600 400 000 400 400 400 400 200 000 E	 T	 Count = A B L E	21	
y ==== Va Gr 	 1 2 3 * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L Durce	THF (N 20.619 T A E Y S I Degr Fr	2: Jo.) Gra 3 L E 21 20.0 20.0 20.0 25.2 23.1 22.1 19.2 20.8 17.4 16.2 S O rees of	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E	Num 3.000 A N S Total 144. 144. 144. 144. 57. 69. 66. 57. 62. 52. 49. A N C	To 600 400 000 400 400 400 400 200 000 500 400 200 000 500 400 500 400 500 400 500 400 500 400 500 5	 T un ure	======= Count = A B L E Va	Flue	Prob
y Va Gr 	==== riak and 1 2 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Durce	THF (N 20.619 T A F 	2: Jo.) Gra L E 21 20.6 20.6 20.6 20.5 23.5 23.5 22.5 19.5 20.8 17.4 16.5 S O cees of ceedom	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E 	Num 3.000 A N S Total 144. 144. 144. 144. 57. 66. 57. 62. 52. 49. A N C	To 600 400 000 800 400 400 200 000 E Mea Squa 0.	 T 013	 Count = A B L E Va 0.	F 1ue 0090	Prob
у Ч Саг 	1 1 2 3 * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A	THF (N 20.619 T A F Y S I Degr Fr	2: Jo.) Gra L E 21 20.6 20.6 20.6 20.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 20.6 25.7 23.7 23.7 20.6	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E 	Num 3.000 A N S Total 144. 144. 144. 144. 144. 144. 144. 144	To 600 400 000 400 400 400 200 000 E Mea Squa 0. 30.	 T 013 403	Count = Count = A B L E Va 	F 1ue 0090	Prob
у Ч Саг 	==== riak and 1 2 3 * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A	THF (N 20.619 T A F Y S I Degr Fr	2: Jo.) Gra L E 21 20.6 20.6 20.6 20.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 20.6 25.7 23.7 23.7 20.6	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E 	Num 3.000 A N S Total 144. 144. 144. 144. 144. 144. 144. 144	To 600 400 000 800 400 400 200 000 E Mea Squa 0.	 T 013 403	Count = Count = A B L E Va 	F 1ue 0090	Prob
y Va Gr 	1 1 2 3 * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A cor cal	THF (N 20.619 T A E 	2: JO.) Gra 3 L E 21 20.6 20.6 20.6 20.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 20.8 17.4 16.7 S O cees of ceedom 22 23 22.7 19.7 20.8 17.4 16.7 20 20 20 20 20 20 20 20 20 20	0. and 0 557 529 571 267 133 267 300 400 333 F	.4922 Sum = 43 F M E 	Num 3.000 A N S Total 144. 144. 144. 144. 75. 69. 62. 57. 62. 49. A N C	To 600 400 000 400 400 400 200 000 E Mea Squa 0. 30. 1.	 T 013 403	Count = Count = A B L E Va 0. 20.	F lue 0090 6046	Prob 0.0000
y Va Gr ue Co	1 1 2 3 * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L 5 5 6 7 A N A L 5 5 5 6 7 7 A N A L 5 5 5 5 6 7 7 4 5 5 6 7 7 4 5 5 6 7 7 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	THF (N 20.619 T A F 	2: JO.) Gra L E 21 20.6 20.6 20.6 20.6 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 20.6 23.7 23.7 23.7 23.7 20.6 23.7 23.7 23.7 20.6 23.7 23.7 20.6 23.7 23.7 20.6 23.7 20.6 23.7 23.7 20.6 23.7 20.6	0. and 0 557 529 571 267 133 267 300 400 333 F 5. 5.	.4922 Sum = 43 F M E 	Num	To 600 400 000 400 400 400 200 000 E Mea Squa 0. 30. 1.	 T 013 403	Count = Count = A B L E Va 0. 20.	F lue 0090 6046	Prob 0.0000
y Va Gr ue 	1 1 2 3 * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 7 A N A L 5 5 6 7 A N A L 5 5 5 6 7 7 A N A L 5 5 5 5 6 7 7 4 5 5 6 7 7 4 5 5 6 7 7 4 5 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	THF (N 20.619 T A F 	2: JO.) Gra L E 21 20.6 20.6 20.6 20.6 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 23.7 20.6 23.7 23.7 23.7 23.7 20.6 23.7 23.7 23.7 20.6 23.7 23.7 20.6 23.7 23.7 20.6 23.7 20.6 23.7 23.7 20.6 23.7 20.6	0. and 0 557 529 571 267 133 267 300 400 333 F 5. 5.	.4922 Sum = 43 F M E 	Num	To 600 400 000 400 400 400 200 000 E Mea Squa 0. 30. 1.	 T 013 403	Count = Count = A B L E Va 0. 20.	F lue 0090 6046	Prob 0.0000

Grar								
1	2		22		Total			
	*		1.371		9.600			
2	*		1.371		9.600			
3	*		1.400		9.800			
			0.667	· — — — — — — — — — — — — — — — — — — —	2.000			
*	1 2		0.800		2.000			
*			1.067		3.200			
	4		1.333		4.000			
*			1.267		3.800			
*	-		1.467		4.400			
*			3.067		9.200			
					A N C E			
10	Sourco	Degree	s of dom	Sum of	Mean	1	F	Drob
					Squar			
					0.0			0 000
					1.9		12.3133	0.0000
E 		2⊥ 			0.0			
	[otal			11.752				
У				.0614				
s_ f y ====== Vari	for means Lable 23: 1d Mean =	group 2: TInf. 6.625	0 ====== Grand	.0937 ======= Sum = 139	Number c	of Obse	rvations:	3
s_ f y ====== Vari	For means Eable 23: ad Mean =	group 2: TInf. 6.625 T A B L	0 ====== Grand	.0937	Number c ======= .119 Tota A N S	of Obse	rvations:	3
s_f y Vari Gran	For means iable 23: ind Mean = 2	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 ======	.0937 ====================================	Number c .119 Tota A N S Total	of Obse	rvations:	3
s_ f y Vari Gran 1 	For means iable 23: id Mean = 2	group 2: TInf. 6.625 T A B L	0 Grand E C 23 6.577	.0937 ======== Sum = 139 OF ME	Number c 	of Obse	rvations:	3
s_f y Vari Gran	For means iable 23: ind Mean = 2	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 ======	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3	For means lable 23: ad Mean = 2 * * *	group 2: TInf. 6.625 T A B L	0 Grand E C 23 6.577 6.675 6.622	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 46.042 46.725 46.351	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3 	Eor means able 23: ad Mean = 2 * * * 1	group 2: TInf. 6.625 T A B L	0 Grand E C 23 6.577 6.675 6.622 2.566	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3	Eor means lable 23: nd Mean = 2 * * * 1 2	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 6.577 6.675 6.622 2.566 3.362	.0937 Sum = 139 F M E	Number c 	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3 	Eor means Lable 23: Ind Mean = 2 * * * 1 2 3	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593	.0937 Sum = 139 F M E	Number c ========== .119 Tota A N S Total 	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3 * *	Eor means lable 23: nd Mean = 2 * * * 1 2	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 46.042 46.725 46.351 7.697 10.085 13.778 19.400	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3 * *	Eor means able 23: ad Mean = 2 * * 1 2 3 4 5	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467 5.762	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 46.042 46.725 46.351 7.697 10.085 13.778 19.400 17.287	of Obse	rvations:	3
s_ f y Vari Grar 1 1 2 3 * * *	Eor means iable 23: id Mean = 2 * * * 1 2 3 4 5 6	group 2: TInf. 6.625 T A B L	0 ====== Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 46.042 46.725 46.351 7.697 10.085 13.778 19.400	of Obse	rvations:	3
s_ f y Vari Gran 1 1 2 3 * * * * *	Eor means Lable 23: Id Mean = 2 * * * 1 2 3 4 5 6 7	group 2: TInf. 6.625 T A B L	0 Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F	.0937 Sum = 139 F M E	Number c .119 Tota A N S Total 46.042 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E	of Obse	rvations: ====================================	3
s_ f y Vari Grar 1 1 2 3 * * * * * *	Eor means Lable 23: Id Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	group 2: TInf. 6.625 T A B L	0 Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F s of dom	.0937 Sum = 139 F M E 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar	TAB	rvations: ======= t = 21 t = 21 L E F Value	3
s_ f y Vari Grar 1 1 2 3 * * * * * * * * *	Eor means Lable 23: Id Mean = 2 2 * * * * 1 2 3 4 5 6 7 A N A L Source	group 2: TInf. 6.625 T A B L 	0 Grand E C 23 6.577 6.675 6.622 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F s of dom 	.0937 Sum = 139 F M E 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.0	TAB	rvations: ====================================	3 Prob
s_ f y Vari Gran 1 1 2 3 * * * * * * * *	Eor means Lable 23: A N A L Source Replication Factor A	group 2: TInf. 6.625 T A B L 	0 Grand E C 23 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F s of dom 	.0937 Sum = 139 F M E 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.00 59.1	of Obse	rvations: ====================================	3 Prob
s_ f y Vari Gran 1 1 2 3 * * * * * * * *	Eor means Lable 23: A N A L Source Replication Factor A	group 2: TInf. 6.625 T A B L 	0 Grand E C 23 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F s of dom 	.0937 Sum = 139 F M E 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.0	of Obse	rvations: ====================================	3 Prob
s_ f y Vari Grar 1 1 2 3 * * * * * * * * * * * * *	Eor means Lable 23: A N A L Source Replication Factor A Error	group 2: TInf. 6.625 T A B L Y S I S Degree Free on 2 6 12	0 Grand E C 23 2.566 3.362 4.593 6.467 5.762 7.779 15.845 O F s of dom 	.0937 Sum = 139 F M E 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.00 59.1	of Obse	rvations: ====================================	3 Prob
s_ f y Vari Grar 1 1 2 3 * * * * * * * * * * * * * *	Eor means Lable 23: A N A L Source Replication Factor A Error	group 2: TInf. 6.625 T A B L Y S I S Degree Free on 2 6 12 20	0 ====== Grand E C 23 2.566 3.362 4.593 6.467 5.762 7.779 15.845 O F s of dom 	.0937 Sum = 139 F M E V A R I Sum of Squares 0.033 355.112 9.937 365.082	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.00 59.1	of Obse	rvations: ====================================	3 Prob
s_ f y Vari Gran 1 1 2 3 * * * * * * * * * * * * *	Eor means Lable 23: A Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error Total Ficient of	group 2: TInf. 6.625 T A B L Y S I S Degree Free on 2 6 12 20 of Variat	0 ====== Grand E C 23 2.566 3.362 4.593 6.467 5.762 7.779 15.845 0 F s of dom ion: 1	.0937 Sum = 139 F M E V A R I Sum of Squares 0.033 355.112 9.937 	Number c .119 Tota A N S Total 46.042 46.725 46.725 46.351 7.697 10.085 13.778 19.400 17.287 23.337 47.535 A N C E Mean Squar 0.00 59.1	of Obse	rvations: ====================================	3 Prob 0.0000

Variable 24: THF-Wt. Grand Mean = 2033.541 Grand Sum = 42704.352 Total Count = 21 TABLE OF MEANS 24 1 2 Total _____ 2039.632 14277.425 * 1 * 2 2036.482 14255.371 * 3 2024.508 14171.557 _____ * 2489.628 7468.885 1 * 2 2331.464 6994.393 * 3 2208.283 6624.849 * 4 1900.501 5701.504 * 5 2060.609 6181.828 6 1707.729 5123.186 7 1536.569 4609.708 _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean Freedom Squares Square K Value K Value Source Prob _____ Replication2891.400445.700Factor A62096627.134349437.856Error12102111.4168509.285 1 0.0524 2 41.0655 0.0000 -3 _____ 20 2199629.949 Total _____ _____ Coefficient of Variation: 4.54% s_ for means group 1: 34.8656 Number of Observations: 7 У s_ for means group 2: 53.2581 Number of Observations: 3 У ______ Variable 25: TIF Grand Mean = 156.916 Grand Sum = 3295.235 Total Count = 21 TABLE OF MEANS 25 1 2 Total -----159.2391114.675155.8791091.150155.6301089.410 1 2 * 3 _____ _____ * 89.275 1 267.825 * 2 105.600 316.800 * 3 141.347 424.040 158.763 4 476.290 150.717 5 452.150 159.177 6 477.530 293.533 880.600 _____ _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean F Source Freedom Squares Square Value Prob Κ Value Source _____
 1
 Replication
 2
 56.894
 28.447
 0.2507

 2
 Factor A
 6
 78486.876
 13081.146
 115.2909
 0.0000

 -3
 Error
 12
 1361.545
 113.462
 2 - 3 _____ 20 79905.315 Total _____ _____ Coefficient of Variation: 6.79% s_ for means group 1: 4.0260 Number of Observations: 7 V 6.1499 s_ for means group 2: Number of Observations: 3 У _____

1	2	26	;		$T_{O} + 2^{1}$			
⊥ 	ے 	26 	, 		Total		-	
1	*	7	.602		53.21			
2			.578		53.04			
3	*	7	.505		52.53	5		
*	1	3	.458		10.37	3		
*	2	4	.352		13.05	б		
*	3	6	.021		18.06	3		
*	-	7	.704		23.11	1		
*	5		.828		20.48	4		
*	0		.533		25.59			
*	7	16	.037		48.11	2	_	
	ANAL	Y S I S	O F	VARI	ANCE	T	ABLE	
ue	Source	Freedo	m	Squares	Sq	uare	F Value	Prob
							0.0811	
		б		308.573	5	1.429	233.5271	0.000
	Error	12		2.643		0.220)	
	Total	20		311.251				
C C			0	0700	NT 1-			
y ===== Var	======================================	Length-HF	:====		========	=====	Observations:	
y Var Gra:	========== iable 27: nd Mean =	Length-HF 23.377 G T A B L E	rand 0	Sum = 49 F M E	======= 0.912 ' A N S	=====		
y Var Gra:	======================================	Length-HF 23.377 G T A B L E	rand		======= 0.912 ' A N S	=====		
y Var Gra:	iable 27: nd Mean = 2	Length-HF 23.377 G T A B L E 27	rand 0	Sum = 49 F M E	======= 0.912 ' A N S	Iotal		
y Var Gra: 1	======================================	Length-HF 23.377 G T A B L E 27 23	rand 0	Sum = 49 F M E	0.912 ' A N S Total	===== Total		
y Var Gra: 1 	======================================	Length-HF 23.377 G T A B L E 27 23 23 23	Frand C 0	Sum = 49 F M E	0.912 A N S Total 162.75	===== Total 0 2		
y Var Gra: 1 1 2	======================================	Length-HF 23.377 G T A B L E 27 23 23 23 23	rand 0 200 320 320 3560	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92	Fota] 0 2 1		
y Var Gra: 1 1 2 3	iable 27: nd Mean = 2 * * * 1	Length-HF 23.377 G T A B L E 27 23 23 23 23 23	rand 0 2 0 3 250 3 220 3 560 5 248	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74	===== Fotal 0 2 1 4		
y Var Gra: 1 1 2 3 *	iable 27: nd Mean = 2 * * * 1 2	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 24 26 24	rand 0 200 320 320 3560	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92	===== Total 0 2 1 4 7		
y Var Gra: 1 1 2 3 *	iable 27: nd Mean = 2 * * * 1 2	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 24 24 24 24	Frand C 0 C 250 C 250 C 250 C 250 C 248 C 248 C 248 C 248 C 248 C 29	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48	===== Fotal 2 1 4 7 2		
y Var Gra: 1 1 2 3 * *	iable 27: nd Mean = 2 * * * 1 2 3 4	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 24 24 24 24 24 24	Frand C 0 C 250 C	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87	 D 2 1 4 7 2 0		
y Var Gra: 1 1 2 3 * *	======================================	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 24 24 24 24 24 24 22 23	Frand Contraction	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05	 D 2 1 4 7 2 0 0		
y Var Gra: 1 1 2 3 * * *	======================================	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 22 23 21	Frand Control	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59	 D 2 1 4 7 2 0 0 0 0		
y Var Gra: 1 1 2 3 * * * * * *	iable 27: nd Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 24 24 24 24 24 24	rand 2 0 .250 .320 .560 .248 .829 .291 .683 .197 .457 .933 .0 F	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80	 2 1 2 0 0 0 0 T	- Count = 21 A B L E	
y Var Gra: 1 1 2 3 * * * * * *	iable 27: nd Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 24 24 24 24 24 24	rand 2 0 .250 .320 .560 .248 .829 .291 .683 .197 .457 .933 .0 F	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80	 2 1 2 0 0 0 0 T	- Count = 21 A B L E	
y Var Gra: 1 1 2 3 * * * * * *	iable 27: nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	Length-HF 23.377 G T A B L F 27 23 23 23 23 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 24 24 24 24 24 24	rand 2 0 320 560 248 829 291 683 197 457 933 0 F of m	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E Manuella Squeenee	 D D D D D D D D D D D D D D D D D	Count = 21 - A B L E F Value	
y Var Gra: 1 1 2 3 * * * * * *	iable 27: nd Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatio	Length-HF 23.377 G T A B L F 27 23 23 23 23 23 23 23 23 23 23 23 23 23	rand 2 0 3250 320 560 248 829 291 683 197 457 933 0 F of m	Sum = 49 F M E	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E M Sq	 D 2 1 2 1 2 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.0568	Prob
y Var Gra: 1 1 2 3 * * * * *	<pre>iable 27: nd Mean = 2 </pre>	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 23 23 23 23 23	rand 2 0 .250 .320 .560 .248 .829 .291 .683 .197 .457 .933 .0 F of m	Sum = 49 F M E	<pre>0.912 A N S Total Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E Ma Squeenee 1</pre>	Fotal Fotal 2 1 2 1 0 T ean uare 0.185 0.675	L Count = 21	Prob
y Var Gra: 1 1 2 3 * * * * * * * * *	<pre>iable 27: nd Mean = 2 </pre>	Length-HF 23.377 G T A B L F 27 23 23 23 23 23 23 23 23 23 23 23 23 23	rand 2 0 320 560 248 829 291 683 197 457 933 0 F of m	Sum = 49 F M E V A R I Sum of Squares 0.370 64.074 39.106	<pre>0.912 A N S Total Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E Ma Squeenee 1</pre>	 D 2 1 2 1 2 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	L Count = 21	Prob
y Var Gra: 1 1 2 3 * * * * *	<pre>iable 27: nd Mean = 2 </pre>	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 24 24 24 24 24 24	rand 2 0 320 320 248 229 2291 2683 291 2683 291 2683 291 2683 291 2683 291 2683 291 2683 291 2683 291 2683 297 293 207 291 2683 207 291 2683 207 291 267 291 201 201 201 201 201 201 201 201 201 20	Sum = 49 F M E V A R I Sum of Squares 0.370 64.074 39.106 103.549	<pre>0.912 A N S Total Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E Ma Squeenee 1</pre>	Fotal Fotal 2 1 2 1 0 T ean uare 0.185 0.675	L Count = 21	Prob
y Var Gra: 1 1 2 3 * * * * * * *	<pre>iable 27: nd Mean = 2 </pre>	Length-HF 23.377 G T A B L E 27 23 23 23 23 23 23 23 23 24 24 24 24 24 24 24 24 24 24 24 24 24	rand 2 0 320 320 248 829 291 683 291 683 197 .457 .933 0 F of m	Sum = 49 F M E V A R I Sum of Squares 0.370 64.074 39.106 103.549 .72%	0.912 A N S Total 162.75 163.24 164.92 78.74 74.48 72.87 68.05 69.59 64.37 62.80 A N C E Mu Sq	 Fotal 2 1 2 2 1 2 2 2 0 2 2 	L Count = 21	Prob 0.0380

Variable 28: Length-IF Grand Mean = 19.686 Grand Sum = 413.398 Total Count = 21 TABLE OF MEANS 1 2 28 Total _____ * 20.057 140.400 1 * 2 19.554 136.875 * 3 19.446 136.123 _____ 22.292 * 1 66.875 * 21.592 2 64.775 * 3 21.058 63.175 * 4 19.250 57.750 * 5 19.083 57.248 6 17.458 52.375 7 17.067 51.200 _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Freedom Squares Mean Square r Value K K Value Source Prob _____ Replication21.4900.7450.5690Factor A674.04512.3419.4287Error1215.7061.309 1 9.4287 0.0006 2 -3 _____ 20 91.241 Total _____ _____ _____ Coefficient of Variation: 5.81% s_ for means group 1: 0.4324 Number of Observations: 7 У s_ for means group 2: 0.6605 Number of Observations: 3 У ______ Variable 29: Girth_Healthy Grand Mean = 8.291 Grand Sum = 174.102 Total Count = 21 TABLE OF MEANS 1 2 29 Total -----* 8.291 1 58.034 8.425 58.976 2 8.156 * 57.092 3 _____ _____ * 9.308 1 27,924 * 2 9.092 27.276 * 3 8.630 25.890 * 8.012 24.036 4 5 8.288 24.864 22.596 7.532 6 21.516 7.172 7 _____ ANALYSIS OF VARIANCE TABLE K Degrees of Sum of Mean F Value Source Freedom Squares Square Value Prob _____ 1Replication20.2540.1270.52802Factor A611.0911.8487.6989-3Error122.8810.240 2 7.6989 0.0015 -3 _____ 20 14.225 Total _____ _____ Coefficient of Variation: 5.91% s_ for means group 1: 0.1852 Number of Observations: 7 V s_ for means group 2: 0.2829 Number of Observations: 3 У _____

	1	2		30		Total				
	-	*		7.742		54.195				
	2 3	*		7.854		54.980				
	3 	~		7.630) 	53.410				
		1		8.590		25.770				
		2 3		8.410) 5	25.230 24.075				
		3 4		7.510		24.075				
		5		7.740)	23.220				
		6 7		7.110 6.810		21.330 20.430				
	 A	NAL	YSIS	 3 O F	 V A R T	ANCE	 T	ABL	E	
2			Degre	ees of	Sum of	Mea	an		F	
.ue 	Sc 	urce	F're	edom 	Squares	Squa	are 		Value	Prob
					0.176					0 001
	Fac Err		-	6	7.702 2.001	1 0	.284		7.6989	0.0019
· ·										
	Tot	al	2	20	9.879					
s_ ==== Va	y ===== ariab	======= le 31:	Single	2: (======= fruit V			of ====	======		
s_ :===: Va	_ for y ===== ariab	======= le 31:	====== Single 76.848	2: (======= fruit W Grand		======================================	of ====	Observ		
s_ :===: Va	_ for y ariab rand	======= le 31:	====== Single 76.848	2: (======= fruit W Grand		======== 13.805 ' A N S	of ====	Observ		
s_ ==== Va	_ for y ariab rand	====== ble 31: Mean =	====== Single 76.848	2: (fruit V Granc L E (Jeight 1 Sum = 16) F M E	======== 13.805 ' A N S	of ==== Tota	Observ		
s_ ==== Va	_ for y ariak rand 1 2	2 2 *	====== Single 76.848	2: (fruit V Granc L E (31 76.604 76.566	Weight 1 Sum = 16 0 F M E	13.805 A N S Total 536.226 535.960	of ==== Tota 	Observ		
s_ ==== Va	_ for y ariab rand 1 1	2 *	====== Single 76.848	2: (fruit V Grand L E (31 76.604	Weight 1 Sum = 16 0 F M E	13.805 A N S Total 536.226	of ==== Tota 	Observ		
s_ ==== Va	_ for y ===== ariab rand 1 1 2 3 	2 2 *	====== Single 76.848	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342	Veight 1 Sum = 16 0 F M E 	13.805 A N S Total 536.226 535.960	of ==== Tota 	Observ		
s_ ==== Va	_ for y ===== ariab rand 1 2 3 *	2 Mean = 2 * * * 1 2	====== Single 76.848	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820	Veight 1 Sum = 16 0 F M E 1 5 4 	======================================	of ==== Tota 	Observ		
s_ :===: Va	_ for y ===== ariab rand 1 2 3 \$ * *	2 Mean = 2 * * * 1 2 3	====== Single 76.848	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389	<pre>veight l Sum = 16 D F M E</pre>	======================================	of ==== Tota 	Observ		
s_ :===: Va	_ for y ===== ariab rand 1 2 3 * * * * *	2 Mean = 2 * * * 1 2 3 4 5	====== Single 76.848	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820	<pre>veight l Sum = 16 D F M E</pre>	======================================	of ==== Tota 	Observ		
s_ ==== Va	_ for y ===== ariak rand 1 2 3 * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6	====== Single 76.848	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.767 75.689 68.956	<pre>veight l Sum = 16 D F M E </pre>	======================================	of ==== Tota 	Observ		
s_ :===: Va	_ for y ===== ariak rand 1 2 3 * * * * * *	2 Mean = 2 * * * 1 2 3 4 5	====== Single 76.848	2: (fruit M Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.767 75.689	<pre>veight l Sum = 16 D F M E </pre>	======================================	of ==== Tota 	Observ		
s_ Qa 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * *	2 Mean = 2 * * * * * * * 2 3 4 5 6 7 	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 75.689 68.956 66.973 50 F	Veight Sum = 16 F M E 	======================================	of ==== Tota 	Observ	E	
s_ Qa 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * *	2 Mean = 2 * * * * * * * 2 3 4 5 6 7 	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 75.689 68.956 66.973 50 F	Veight Sum = 16 F M E 	======================================	of ==== Tota 	Observ	E	
s_ Qa 	_ for y ===== ariab rand 1 1 2 3 * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 N A L urce	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 50 F ees of eedom	Veight Sum = 16 F M E 	<pre>13.805 A N S Total 536.226 535.960 541.619 256.025 254.460 247.166 221.300 227.066 206.867 200.920A N C E Mea Square</pre>	of ==== Tota - T an are	Observ	E F Value	Prob
s. 	_ for y ===== ariab rand 1 1 2 3 * * * * * * * * * * * * * * * *	<pre>2 2 2 2 3 4 5 6 7 7 N A L ource licatic</pre>	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 5 O F ees of eedom 	Veight Sum = 16 F M E V A R I Sum of Squares 2.913	13.805 A N S Total 	of ==== Tota an are .456	Observ ====== 1 Cour A B L	E F Value 0.1186	Prob
s. V3 G: 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * * 2 3 4 5 5 6 7 7 N A L ource clicatic tor A	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 5 O F eedom 2 6	V A R I Sum of Squares 2.913 1011.110	======================================	of ==== Tota an are .456 .518	Observ ====== 1 Cour A B L 1	E F Value 0.1186	Prob
s. V3 G: 	_ for y ===== ariab rand 1 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * * 2 3 4 5 5 6 7 7 N A L ource clicatic tor A	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 5 O F eedom 2 6	Veight Sum = 16 F M E V A R I Sum of Squares 2.913	======================================	of ==== Tota an are .456 .518	Observ ====== 1 Cour A B L 1	E F Value 0.1186	Prob
s. V& G: 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * * * 2 3 4 5 5 6 7 7 N A L ource clicatic tor A or al	Single 76.848 T A B	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 50 F eedom 2 6 2 6 2	V A R I Sum of Squares 2.913 1011.110 147.342 1161.364	======================================	of ==== Tota an are .456 .518 .279 	Observ ====== 1 Cour A B L 1	E F Value 0.1186 .3.7246	Prob 0.0001
s. VX G: 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 2 3 4 5 5 6 7 7 N A L ource citor A for al	Single 76.848 T A B 	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 50 F eedom 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 6 7 2 6 6 7 2 6 6 7 2 6 6 7 2 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	V A R I Sum of Squares 2.913 1011.110 147.342 1161.364	13.805 A N S Total 536.226 535.960 541.619 256.025 254.460 247.166 221.300 227.066 206.867 200.920 A N C E Mea Squa 1 168 12	of ==== Tota an are .456 .518 .279 	Observ ====== 1 Cour A B L 1	E F Value 0.1186 .3.7246	Prob 0.0001
s Va G: 	_ for y ===== ariab rand 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 2 3 4 5 5 6 7 7 N A L ource citor A for al	Single 76.848 T A B 	2: (fruit W Grand L E (31 76.604 76.566 77.374 85.342 84.820 82.389 73.765 68.956 66.973 50 F eedom 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 2 6 6 7 2 6 6 7 2 6 6 7 2 6 6 7 2 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	V A R I Sum of Squares 2.913 1011.110 147.342	13.805 A N S Total 536.226 535.960 541.619 256.025 254.460 247.166 221.300 227.066 206.867 200.920 A N C E Mea Squa 1 168 12	of ==== Tota an are .456 .518 .279 	Observ ====== 1 Cour A B L 1	E F Value 0.1186 .3.7246	Prob 0.0001

		Mean =	88.800	portic Gran L E	id S	um = 18 M E	364.802 ANS	Tot	al Cour	nt = 21	
	1	2		32			Total		_		
	1 2	*		89.82 88.08			628. 616.	776			
	∠ 3	*		88.49			619.				
	 *	1		95.77	·		287.	 311	_		
	*	2		94.17	7		282.	530			
	*	3 4		92.36 88.15			277. 264.	083			
	*	5					268.	980			
	*	6 7		85.15 76.32			255. 228.	460 985			
		ANAL	v c t						- л р т	F	
K		ANAL									
Value		ource								Value	Prob
1											0.0016
2 - 3	Fa Er	ctor A ror		6 12	7	80.528		130.08	8 3	7.5928	0.0016
					· 						
	0'I'0	tal		20 	9	97.758					
	У			0.		000	Maria		Obcorr		3
=====	y ===== Varia	r means ====================================	Non Ed.	====== ible Pc	erti nd S	====== on um = 23	======= 35.198	=====	======		
=====	y ===== Varia	ble 33: Mean =	Non Ed.	====== ible Po Gran	erti nd S	====== on um = 23	======= 35.198	===== Tota	======		
	y ===== Varia Grand	ble 33: Mean =	Non Ed.	====== ible Po Gran L E	orti d S O F	====== on um = 23	35.198 A N S	===== Tota	======		
	y ===== Varia Grand 1	ble 33: Mean = 2	Non Ed.	ible Pc Gran L E 33	e=== orti od S O F 25 .9	====== on um = 23	35.198 A N S Total	Tota Tota 224 436	======		
=====	y ===== Varia Grand 1 1 2	======================================	Non Ed.	ible Pc Gran L E 33 10.17 11.91 11.50	 orti of S O F 5 .9 5 .9	====== on um = 23	35.198 A N S Total 71. 83. 80.	Tota Tota 224 436 537	======		
	y ===== Varia Grand 1 1 2 3 	2 	Non Ed.	ible Pc Gran L E 33 10.17 11.91	==== orti d S 0 F 25 .9 05 30	====== on um = 23	35.198 A N S Total 71. 83.	Tota Tota 224 436 537 689	======		
=====	y ===== Varia Grand 1 1 2 3 * *	ble 33: Mean = 2 * * * 1 2 3	Non Ed.	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63	=== prti d S 0 F 5 .9 5 .9 5 .9 5 .9 5 .9 5 .9 5 .9 5	====== on um = 23	85.198 A N S Total 71. 83. 80. 12. 17. 22.	Tota Tota 224 436 537 689 470 917	======		
	y ===== Varia Grand 1 1 2 3 *	2 	Non Ed.	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84	e=== orti 0 F 25 25 25 20 23 29 	====== on um = 23	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35.	Tota Tota 224 436 537 689 470 917 546	======		
=====	y ===== Varia Grand 1 1 2 3 * * * * *	======================================	Non Ed.	====== ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 10.34	e=== orti d S 0 F 5 9 5 5 9 5 5 9 5 5 5 5 5 5 5 5 	====== on um = 23	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44.	Tota Tota 224 436 537 689 470 917 546 020 540	======		
=====	y ===== Varia Grand 1 1 2 3 * * * * *	ble 33: Mean = 2 * * * 1 2 3 4 5 6 7	Non Ed. 11.200 T A B	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67	erti d S 0 F 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 5 5 9 9 9 5 5 9 9 9 9 5 5 9	on um = 23 M E	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 		=== 21	
 K	y ===== Varia Grand 1 1 2 3 * * * * *	ble 33: Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	Non Ed. 11.200 T A B	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F ees of	erti d S 0 F 5 9 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 5 5 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 5 5 9 9 9 9 5 5 9 9 9 5 5 9	Dn um = 23 M E	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean	- - - A B L	E	
K Value	y ===== Varia Grand 1 2 3 * * * * * * * * * *	ble 33: Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Cource	Non Ed. 11.200 T A B	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F ees of eedom	erti d S 0 F 5 9 5 9 5 9 5 9 5 9 5 9 5 9 9 9 5 9 9 5 9 9 5 9 9 9 5 9 9 9 5 9 9 9 5 9 9 9 5 9 9 9 5 9 9 9 5 9	Dn Um = 23 M E	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean Square	- - A B L	E F Value	Prob
K Value 	y ===== Varia Grand 1 1 2 3 * * * * * * * * * * * * *	ble 33: Mean = 2 * * * 1 2 3 4 5 6 7 	Non Ed. 11.200 T A B	====== ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F eed om 2	e=== prti d S 0 F 5 9 5 2 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	 on M E M E	85.198 A N S Total 71. 83. 80. 12. 17. 22. 31. 44. 71. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean Square 5 81	- - A B L	E F Value 0 3394	Prob
K Value 	y ===== Varia Grand 1 2 3 * * * * * * * * * * * * * * * *	ble 33: Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L Cource 	Non Ed. 11.200 T A B	====== ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F ees of eedom 2 6	erti d S 0 F 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 7 5 9 5 5 9 7 5 9 5 5 9 7 5 9 5 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 7 7 7 7	UM = 23 M E 	85.198 A N S Total 71. 83. 80. 12. 17. 22. 31. 44. 71. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean Square 5.81 130.08	- Count A B L 6 8	E F Value 0 3394	Prob
K /alue 1 2	y ===== Varia Grand 1 2 3 * * * * * * * * * * * * * * * *	ble 33: Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L Cource 	Non Ed. 11.200 T A B	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F ees of eedom 2 6 12	erti d S 0 F 5 9 5 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 7 5 9 9 5 5 9 7 5 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 7 9 9 5 5 9 9 5 5 9 9 5 5 7 9 9 5 5 9 9 5 5 7 9 9 5 5 9 9 7 7 2 2 9 9 7 7 2 9 9 5 5 9 9 7 7 2 2 9 9 5 5 7 7 9 9 5 5 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 7 7 9 9 7 7 7 9 9 7 7 7 7	UM = 23 M E 	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean Square 5.81 130.08	- Count A B L 6 8	E F Value 0 3394	Prob
K Value 1 2 -3 	y ===== Varia Grand 1 2 3 * * * * * * * * * * * * * * * *	ble 33: Mean = 2 * * * * 1 2 3 4 5 6 7 	Non Ed. 11.200 T A B	ible Pc Gran L E 33 10.17 11.91 11.50 4.23 5.82 7.63 11.84 10.34 14.84 23.67 S O F ees of eedom 2 6 12 20 20 20 	erti d S 0 F 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 9 5 5 7 2 2 2 2 7 2 2 9 7 7 2 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 9 9 5 5 7 9 9 7 7 2 2 9 9 7 7 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 7 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 7 7 2 2 9 9 9 7 7 2 2 9 9 9 7 7 2 9 9 9 7 7 2 9 9 9 7 2 2 9 9 9 7 2 2 9 9 9 9	Dn um = 23 M E 	85.198 A N S Total 71. 83. 80. 12. 17. 22. 35. 31. 44. 71.	Tota Tota 224 436 537 689 470 917 546 020 540 015 E T Mean Square 5.81 130.08 17.13 	- Count 	E F Value 0 3394	Prob 0.0016

Variable 34: Yield/Plot Grand Mean = 26.307 Grand Sum = 552.444 Total Count = 21 TABLE OF MEANS 1 2 34 Total _____ * 26.307 184.150 1 * 2 25.726 180.082 * 3 26.888 188.213 _____ 29.954 * 89.863 1 * 28.985 2 86.954 * 28.500 85.500 3 * 4 25.591 76.774 * 5 27.773 83.318 6 25.105 75.314 54.720 7 18.240 _____ ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean Square K Value ਸ K Value Source Freedom Squares Prob _____ Replication24.7232.361Factor A6283.39847.233Error1247.5673.964 1 0.5957 2 11.9156 0.0002 -3 _____ 20 335.688 Total _____ _____ Coefficient of Variation: 7.57% s_ for means group 1: 0.7525 Number of Observations: 7 У s_ for means group 2: 1.1495 Number of Observations: 3 У ______ Variable 35: Yield/Hectare Grand Mean = 43.845 Grand Sum = 920.740 Total Count = 21 TABLE OF MEANS 1 2 35 Total ------1 43.845 306.916 42.877 300.136 2 * 313.688 44.813 3 _____ _____ * 49.924 1 149.772 * 2 48.308 144.924 * 3 47.500 142.500 * 4 42.652 127.956 5 46.288 138.864 41.841 125.524 6 30.400 91.200 7 _____ _____ ANALYSIS OF VARIANCE TABLE K Degrees of Sum of Mean F Value Source Freedom Squares Square Value Prob _____ 1Replication213.1186.5590.59572Factor A6787.217131.20311.9156-3Error12132.13211.011 2 11.9156 0.0002 -3 _____ 20 932.468 Total _____ ------Coefficient of Variation: 7.57% s_for means group 1: 1.2542 Number of Observations: 7 V 1.9158 s_ for means group 2: Number of Observations: 3 У _____

Source eplication actor A rror otal ficient of or means g for means g able 37: I d Mean = 1	19.65 22.20 21.40 21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 f Variation: group 1: group 2:	29 57 00 00 57 57 00 33 57 7 V A R = Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 	137.600 66.600 64.200 63.600 55.400 52.200 48.400 I A N C E Me Squ 0 1 2 Number Number 600 Tot	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
* * 1 2 3 4 5 6 7 A N A L Y Source eplication actor A fror 'otal ficient of or means g cor means g able 37: I d Mean = 1 2	19.42 19.65 22.20 21.40 21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom P 2 6 12 20 F Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	29 57 00 00 57 57 00 33 57 7 V A R = Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 	136.000 137.600 66.600 64.200 63.600 55.400 60.200 52.200 48.400 I A N C E Me Squ .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
* 1 2 3 4 5 6 7 A N A L Y Source eplication actor A fror 'otal ficient of or means g able 37: I d Mean = 1 2	19.65 22.20 21.40 21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	57 00 00 57 57 00 33 57 V A R = Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 O F M E	137.600 66.600 64.200 63.600 55.400 60.200 52.200 48.400 I A N C E Me Squ 0 15 2 2 0 15 2 2 0 15 2 2 0 15 2 2 0 15 2 2 0 0 15 2 2 0 0 15 2 2 0 0 15 2 2 0 0 15 2 2 0 0 48.400 55.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 48.400 52.200 52.200 48.400 52.200 52.	0 0 0 0 0 r of (r of (=====:	F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
1 2 3 4 5 6 7 A N A L Y Source eplication actor A fror 'otal ficient of or means of able 37: I id Mean = 1 2	22.20 21.40 21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	00 00 00 07 07 00 33 7 V A R = Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	66.600 64.200 63.600 55.400 60.200 52.200 48.400 I A N C E Me Squ 0 15 2 2 Number Number 600 Tot A N S	 0 0 0 0 vare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
2 3 4 5 6 7 A N A L Y Source ceplication actor A ficient of for means g cor means g cor means g able 37: I d Mean = 1 2	21.40 21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	00 00 07 07 00 33 F V A R 1 Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	64.200 63.600 55.400 60.200 52.200 48.400 I A N C E Me Squ Number Number 600 Tot A N S	0 0 0 0 ean uare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
3 4 5 6 7 A N A L Y Source eplication actor A fror cotal ficient of or means g for means g cor means g able 37: I d Mean = 1	21.20 18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	00 57 57 00 33 57 57 57 57 57 57 57 57 57 57	63.600 55.400 60.200 52.200 48.400 I A N C E Me Squ 0 15 2 0 15 2 0 15 2 0 15 2 2 0 15 2 2 0 15 2 0 0 15 2 0 0 15 2 0 0 15 2 0 0 15 2 0 0 15 2 0 0 15 2 0 0 15 2 0 0 15 0 0 0 15 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 ean uare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
4 5 6 7 A N A L Y Source eplication actor A ficient of for means of for means of able 37: Ind Mean = 1 2	18.46 20.06 17.40 16.13 Y S I S O F Degrees of Freedom 2 6 12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	57 57 50 53 57 57 57 57 57 57 57 57 57 57 57 57 57	55.400 60.200 52.200 48.400 I A N C E Me Squ 0 15 2 	0 0 0 ean uare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
5 6 7 A N A L Y Source eplication actor A fror or means g for means g cor means g able 37: I d Mean = 1 2	20.06 17.40 16.13 Y S I S O F Degrees of Freedom 12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	57 00 33 5 V A R : Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4 Sum = 25 O F M E	60.200 52.200 48.400 I A N C E Squ 15 2 Number Number 600 Tot A N S	0 0 0 ean 1 2.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
6 7 A N A L Y Source eplication actor A fror otal ficient of for means of for means of able 37: I d Mean = 1	17.40 16.13 Y S I S O F Degrees of Freedom 12 20 Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	<pre>00 33 F V A R 1 Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4 Sum = 25 O F M E</pre>	52.200 48.400 I A N C E Squ 15 2 Number Number 600 Tot A N S	0 0 uare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
A N A L Y Source eplication actor A fror otal ficient of for means g for means g able 37: I d Mean = 1	16.13 Y S I S O F Degrees of Freedom 12 20 Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	33 V A R Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 O F M E	48.400 I A N C E Me Squ (15) 2 	0 T 2 ean 0.093 5.452 2.524 r of (r of (======	F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
Source eplication actor A rror otal ficient of or means of or means of able 37: I d Mean = 1	Degrees of Freedom 1 2 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	Sum of Squares 0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 ====================================	Me Squ 15 2 	ean uare 0.093 5.452 2.524 r of (r of (F Value 0.0370 6.1210 Observations: Observations:	0.0039 7 3
eplication actor A rror otal ficient of or means g for means g able 37: I d Mean = 1	n 2 6 12 20 f Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	0 15 2 	0.093 5.452 2.524 r of (r of (0.0370 6.1210 Observations:	0.0039 7 3
eplication actor A rror otal ficient of or means g for means g able 37: I d Mean = 1	n 2 6 12 20 f Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	0.187 92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	0 15 2 	0.093 5.452 2.524 r of (r of (0.0370 6.1210 Observations:	0.0039 7 3
actor A fror otal ficient of or means o for means o able 37: I d Mean = 1	6 12 20 f Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	92.712 30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	15 2 Number Number 	5.452 2.524 r of (r of (6.1210 Dbservations:	0.0039 7 3
rror otal ficient of or means g for means g able 37: I d Mean = 1	12 20 E Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	30.293 123.192 8.13% 0.6005 0.9173 4.Sum = 25 0 F M E	2 Number Number .600 Tot A N S	2.524 r of (r of (======)bservations:)bservations:	7 3
otal ficient of or means o for means o cor means o cable 37: I d Mean = 1	20 f Variation: group 1: group 2: IS_Early 1.219 Grand T A B L E	123.192 8.13% 0.6005 0.9173 4 Sum = 25 0 F M E	Number Number .600 Tot A N S	 r of (r of (Dbservations:	3
ficient of or means g or means g able 37: I d Mean = 1	f Variation: group 1: IS_Early 1.219 Grand T A B L E	8.13% 0.6005 0.9173 d Sum = 25 O F M E	Number Number ======= .600 Tot A N S	r of (Dbservations:	3
for means g for means g able 37: I d Mean = 1 2	group 1: group 2: IS_Early 1.219 Grand T A B L E	0.6005 0.9173 ============ d Sum = 25 O F M E	Number ======= .600 Tot A N S	r of (Dbservations:	3
able 37: I d Mean = 1 2	IS_Early 1.219 Grand T A B L E	ISum = 25 OF ME	.600 Tot ANS			:=====:
*						
	1.22	29	8.600	 0		
*	1.25	57	8.800	0		
*	1.17	1	8.200	0		
1	0.80	0	2.400	0		
2	0.93	33	2.800	0		
3	1.00		3.000			
4	1.06		3.200			
5	1.06		3.200			
6 7						
	YSIS OF	VAR 2	I A N C E	 Т 2	ABLE	
Source	Degrees of Freedom	Sum of Squares	Me Squ	ean uare	F Value	Prob
	6	5.726	C			0.000
rror	12	0.240	C			
'otal						
	20	5.992				
	20 E Variation:					·
ficient of		11.60%				
e le le	6 7 A N A L S Source eplication actor A	6 1.20 7 2.46 ANALYSIS OF Degrees of Source Freedom eplication 2 actor A 6	61.20072.467ANALYSIS OF VAR Degrees of Sum of SourceDegrees of Sum of SquarescourceFreedom Squarescplication20.027 5.726	61.2003.6072.4677.40A N A L Y S I SO FV A R I A N C EDegrees ofSum ofMSourceFreedomSquareseplication20.027actor A65.726	6 1.200 3.600 7 2.467 7.400 A N A L Y S I S 0 F V A R I A N C E T A Degrees of Sum of Mean Source Freedom Squares Square eplication 2 0.027 0.013 actor A 6 5.726 0.954	6 1.200 3.600 7 2.467 7.400 ANALYSIS OF VARIANCE TABLE Degrees of Sum of Mean F Source Freedom Squares Square Value eplication 2 0.027 0.013 0.6667 actor A 6 5.726 0.954 47.7143

	1	2		38		Тс	otal 			
	1	*		6.09	3		42.653			
	2	*					43.600			
	3	*		5.89	2		41.243			
	*	1		3.48	1		10.443			
	*	2		4.18	7		12.560			
	*						13.525			
	*	4 5		5.46 5.07			16.403 15.234			
	*			6.52			19.573			
	*	7		13.25			39.758			
									ABLE	
ue	S	ource	Degr Fr	ees of eedom	Sum d Squai	res	Mea Squa	an are	F Value	Prob
									0.6364	
	Fac	ctor A		6	197.4	497	32.	916	104.2593	0.000
	Er			12	3.7	789	0.	.316		
	Tot	tal		20	201.0	587				
s_ y	foi		group	1:	0.2124				Observations:	
	===:	======================================							Observations:	3
 Va	rial	======= ole 39: Mean =	HS_Mid		====== d Sum =	=======================================	====== 300 Tc			3
==== Va Gr	rial	====== ole 39: Mean =	HS_Mid	====== Gran	====== d Sum = O F 1	=======================================	300 Tc 3 S			3
==== Va Gr	rial and	====== ole 39: Mean =	HS_Mid	Gran L E	====== d Sum = O F 1	======= = 531.8 M E A N Tc	300 Tc 3 S			3
	rial and 1 1 2	ole 39: Mean = 2 *	HS_Mid	Gran L E 39 25.48 24.97	====== d Sum = O F 1 6 1	= 531.8 4 E A N Tc 1 1	300 Tc N S Dtal 178.400 174.800			3
	rial and 1 1	ole 39: Mean = 2	HS_Mid	Gran L E 39 25.48	====== d Sum = O F 1 6 1	= 531.8 4 E A N Tc 1 1	300 Tc N S Dtal 178.400			3
	rial and 1 1 2	ole 39: Mean = 2 *	HS_Mid	Gran L E 39 25.48 24.97 25.51	====== d Sum = O F P 6 1 4 	====== = 531.8 4 E A N TC 1 1 1 1	300 Tc N S Dtal 178.400 174.800			3
	1 2 3	2 * *	HS_Mid	Gran L E 39 25.48 24.97	====== d Sum = 0 F P 6 1 4 7	= 531.8 4 E A N Tc 1 1 1	300 To N S Dtal 178.400 178.400 174.800			3
	1 2 3 *	2 Mean = 2 * * 1 2 3	HS_Mid	Gran L E 39 25.48 24.97 25.51 29.46 28.53 26.60	====== d Sum = 0 F N 6 1 4 7 3 0	= 531.8 4 E A N Tc 1 1 1	300 To 1 S 0tal 178.400 178.600 178.600 88.400 85.600 79.800			3
	1 2 3 **	2 Mean = 2 * * * 1 2 3 4	HS_Mid	Gran L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66	====== O F P 6 1 4 7 3 0 7	= 531.8 4 E A N Tc 1 1 1	300 To N S Dtal 178.400 178.600 178.600 88.400 85.600 79.800 71.000			3
	1 2 3 *	2 Mean = 2 * * 1 2 3	HS_Mid	Gran L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46	====== d Sum = 0 F N 6 1 4 7 3 0 7 7 7	= 531.8 4 E A N Tc 1 1 	300 To N S Dtal 178.400 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400			3
	==== rial and 1 2 3 	2 Mean = 2 * * * 1 2 3 4 5 6	HS_Mid	Gran L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66	====== d Sum = 0 F N 6 1 4 7 3 0 7 7 3 3	= 531.8 4 E A N Tc 1 1 1	300 To N S Dtal 178.400 178.600 178.600 88.400 85.600 79.800 71.000			3
 Va Gr	====: rial and 1 2 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	HS_Mid 25.324 T A B	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F	d Sum = O F M 6 1 4 7 3 0 7 7 3 0 7 7 7 3 0 V A	= 531.8 4 E A N Tc 1 1 1 R I A	300 To N S Dtal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 	 T	Count = 21	
 Va Gr	====: rrial and 1 2 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Durce	HS_Mid 25.324 T A B Y S I Degr Fr	Gran L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F ees of eedom	<pre>d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Sum o Squad</pre>	= 531.8 4 E A N Tc 1 1 1 1 R I A of ces	300 To N S Dtal 178.400 178.400 178.600 178.600 88.400 85.600 79.800 71.000 76.400 67.600 63.000 N C E Mea Squa	tal Tan	ABLE F Value	Prob
 Va Gr 	====: rial and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Durce	HS_Mid 25.324 T A B 	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F ees of eedom 2	<pre>d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Sum o Squan 1.2</pre>	= 531.8 4 E A N TC 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S Dtal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 63.000 N C E Mea Squa	 T an are 	Count = 21 A B L E F Value 0.2743	Prob
 Va Gr 	====: rial and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Durce	HS_Mid 25.324 T A B Y S I Degr Fr	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F eedom 2 6	<pre>d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Sum o Squan 1.2 175.0</pre>	= 531.8 4 E A N To 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S Dtal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 63.000 N C E Mea Squa	 T an are 	Count = 21 A B L E F Value 0.2743	Prob
 Va Gr 	====: rial and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A	HS_Mid 25.324 T A B Y S I Degr Fr	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F eedom 2 6	<pre>d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Sum o Squan 1.2</pre>	= 531.8 4 E A N To 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S Dtal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 63.000 N C E Mea Squa	 T are .653	Count = 21 A B L E F Value 0.2743 12.2452	Prob
 Va Gr 	====: rial and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A	HS_Mid 25.324 T A B Y S I Degr Fr	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F eedom 2 6 12	<pre>d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Sum o Squar 1.2 175.0 28.9</pre>	= 531.8 4 E A N TC 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S otal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 07.600 63.000 N C E Mea Squa	 T are .653	Count = 21 A B L E F Value 0.2743 12.2452	Prob
 Va Gr 	====: rial and 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A ror	HS_Mid 25.324 T A B 	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F eedom 2 6 12 20 20	d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Squar 1.2 Squar 1.2 1.7 5.0 28.5 	= 531.8 4 E A N TC 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S otal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 07.600 63.000 N C E Mea Squa	 T are .653	Count = 21 A B L E F Value 0.2743 12.2452	Prob
ue 	I I 2 3 * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L purce plicatic ctor A ror tal	HS_Mid 25.324 T A B Y S I Degr Fr Don	Gran. L E 39 25.48 24.97 25.51 29.46 28.53 26.60 23.66 25.46 22.53 21.00 S O F ees of eedom 2 6 12 20 20 20 20 20 	d Sum = O F P 6 1 4 7 3 0 7 7 3 0 V A Squar Squar 1.2 175.0 28.9 204.9	= 531.8 4 E A N To 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	300 To N S otal 178.400 174.800 174.800 174.800 174.800 88.400 85.600 79.800 71.000 76.400 67.600 63.000 M C E Mea Squa 0. 29. 2.	 T an 653 171 382 	Count = 21 A B L E F Value 0.2743 12.2452	Prob 0.0002

1	2		40		Total			
	*		 1.91	4	13.40	 0	-	
2	*			7				
3	*			9				
*	 1		 1.06	 7	3.20	 0	-	
*			1.33		4.00			
*	3			3	4.60	0		
*			1.66	7	5.00			
*	5		1.60	0	4.80	0		
*	б		2.00	0	6.00			
*	7		3.86	7	11.60	0		
	ANAL	YSIS	50F	V A R I	ANCE	 Т	- A B L E	
ie	Source	Degre Fre	ees of eedom	Sum of Squares	M Sa	ean uare	F Value	Prob
							0.2727	
	Error			0.587		0.049	2 52.8182	0.0000
							, 	
Г 	Total	2	20	16.107				
s_ f	ficient c for means				Numbe	r of	Observations:	7
y c f								
~	or means	group 2	2:	0.1277	Numbe	r of	Observations:	3
Vari	able 41:	*===== %IS_Mic 7.092	====== d Grand	======================================	.941 т		Observations: Count = 21	
Vari Gran	able 41:	*===== %IS_Mic 7.092	====== d Grand	======================================	.941 т			
Vari Gran	able 41: nd Mean = 2	*===== %IS_Mic 7.092	====== d Grand L E 41	======================================	.941 T A N S Total	===== otal		
 Uari Gran 1 	able 41: ad Mean = 2 *	*===== %IS_Mic 7.092	Grand L E 41 7.25	======================================	.941 T A N S Total 50.74	===== otal 7		
 Vari Gran 1 1 2	able 41: nd Mean = 2	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13	======================================	5.941 T A N S Total 50.74 49.97	===== otal 7 1		
Vari Gran 1 2 3	able 41: ad Mean = 2 * * *	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88	======================================	5.941 T A N S Total 50.74 49.97 48.22	 7 1 4		
Vari Gran 1 1 2 3 	able 41: ad Mean = 2 * * * 1	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 3.48	======================================	5.941 T A N S Total 50.74 49.97 48.22 10.46	===== otal 7 1 4 6		
Vari Gran 1 1 2 3 	able 41: ad Mean = 2 * * 1 2	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 3.48 4.45	======================================	3.941 T A N S Total 50.74 49.97 48.22 10.46 13.37	 7 1 4 6 8		
Vari Gran 1 1 2 3 * *	able 41: ad Mean = 2 * * 1 2 3	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 3.48 4.45 5.46	======================================	3.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40	===== otal 7 1 4 6 8 7		
Vari Gran 1 1 2 3 * * *	able 41: ad Mean = 2 * * 1 2 3 4	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60	======== O F M E 0 9 9 9 9 9 9 9 9 5	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81	===== otal 7 1 4 6 8 7 6		
Vari Gran 1 1 2 3 * * * *	able 41: ad Mean = 2 * * 1 2 3 4 5	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91	======== O F M E 0 9 9 9 9 9 9 5 1	3.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73	===== otal 7 1 4 6 8 7 6 3		
Vari Gran 1 1 2 3 * * *	able 41: ad Mean = 2 * * 1 2 3 4	*===== %IS_Mic 7.092	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60	======== O F M E 0 9 9 9 9 9 9 9 9 9 9 5 1 8	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81	===== otal 7 1 4 6 8 7 6 3 3 3		
Vari Gran 1 1 2 3 * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L	%IS_Mic 7.092 T A B	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 5 O F	============ O F M E 0 9 9 9 9 9 9 9 9 9 9 9 9 9 9 5 1 8 6 	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66	===== otal 7 1 4 6 8 7 6 3 3 8 	Count = 21	
Vari Gran 1 1 2 3 * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L	%IS_Mic 7.092 T A B	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 5 O F	============ O F M E 0 9 9 9 9 9 9 9 9 9 9 9 9 9 9 5 1 8 6 	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66	===== otal 7 1 4 6 8 7 6 3 3 8 	Count = 21	
 Vari Gran 1 1 2 3 * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 	<pre></pre>	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq	===== otal 7 4 6 8 7 6 3 3 8 7 6 3 3 8 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 6 8 7 7 1 4 7 1 4 7 1 4 6 8 7 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 7 1 	Count = 21 	Prob
Vari Gran 1 1 2 3 * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 50 F ees of eedom	<pre></pre>	3.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq	===== otal 7 4 6 8 7 6 3 3 8 7 6 3 3 8 7 1 4 7 1 4 7 1 4 7 1 4 7 1 4 6 8 7 7 1 4 6 8 7 7 1 4 7 1 4 7 1 4 6 8 7 7 6 8 7 7 7 1 4 6 8 7 7 6 8 7 7 7 7 7 7 7 7 7 	Count = 21	Prob
 Vari Gran 1 1 2 3 * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatio	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 15.55 5 O F ees of eedom 2	========= O F M E O F M E 0 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq	===== otal 7 1 4 6 8 7 6 3 3 8 7 1 4 6 3 3 8 7 1 4 7 1 4 6 8 7 6 3 3 8 7 0 1 2 4 6 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 2 3 3 8 7 3 3 8 	Count = 21 	Prob
Vari Gran 1 1 2 3 * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replicatio	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 15.55 5 O F ees of eedom 2	<pre></pre>	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq	===== otal 7 1 4 6 8 7 6 3 3 8 7 1 4 6 3 3 8 7 1 4 7 1 4 6 8 7 6 3 3 8 7 0 1 2 4 6 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 0 2 3 3 8 7 0 2 3 3 8 7 3 3 8 	Count = 21 	Prob
Vari Gran 1 1 2 3 * * * * * * * * * * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 5.55 5.55 5.55 5.55 5.55 5.	<pre>Sum = 148 O F M E O F M E O 9 9 9 9 5 1 8 6 0 V A R I Sum of Squares 0.477 290.863 8.449 299.789</pre>	2.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq 	<pre>===== otal 7 1 4 6 8 7 6 3 3 8 T ean uare 0.239 8.477 0.704</pre>	Count = 21 	Prob 0.0000
Vari Gran 1 1 2 3 * * * * * * * * * * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 5.55 5.55 5.55 5.55 5.55 5.	<pre>Sum = 148 O F M E O F M E O 9 9 9 9 5 1 8 6 7 V A R I Sum of Squares 0.477 290.863 8.449 299.789</pre>	2.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq 	<pre>===== otal 7 1 4 6 8 7 6 3 3 8 T ean uare 0.239 8.477 0.704</pre>	Count = 21 	Prob 0.0000
Vari Gran 1 1 2 3 * * * * * * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error Cotal ficient of	%IS_Mic 7.092 T A B 	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 50 F ees of eedom 2 6 12 20 20 	<pre></pre>	2.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq 4	===== otal 7 1 4 6 8 7 6 3 3 8 7 0.239 8.477 0.704 7	Count = 21 	Prob 0.0000
Vari Grar 1 1 2 3 * * * * * * * * * * * * * * * *	able 41: ad Mean = 2 * * * 1 2 3 4 5 6 7 A N A L Source Replication Factor A Error Cotal ficient of for means	%IS_Mic 7.092 T A B T A B Y S I S Degre Fre on	Grand L E 41 7.25 7.13 6.88 4.45 5.46 6.60 5.91 8.15 15.55 5.55 5.55 5.55 5.55 5.55 5.	<pre></pre>	8.941 T A N S Total 50.74 49.97 48.22 10.46 13.37 16.40 19.81 17.73 24.47 46.66 A N C E M Sq 4 	===== otal 7 1 4 6 8 7 6 3 3 8 0.239 8.477 0.704 0.239 8.477 0.704 r of	Count = 21 	Prob 0.0000

G									
	1	2		42		Total			
	1	*		29.68	6	207.80	0		
	2	*		29.62		207.40	5		
	3	*		28.74	.4				
	*	1		33.73	3	101.20	0		
	*	2		32.86		98.60			
	*	3		31.60		94.80			
	*	4 5		28.53 30.26		85.60 90.80			
	*	6		25.66		77.00			
	*	7		22.80	0	68.40			
					'VARI				
ue	S	ource	Fre	eedom	Sum of Squares	Sq	uare	F Value	Prob
	Rej	plicatio	n	2	3.909		1.955	0.7168	
								17.3501	0.0000
	Er:				32.724		2.727		
	-				320.517				
s	У _ fo: У	r means g	group 2	2:	0.9534	Numbe	r of	Observations:	3
s_ ==== Va	_ fo: y ====: arial	======= ble 43: Mean =	====== IS_Late 2.657	e===== Grand		в04 то	=====		
s_ ==== Va	_ fo: y ====: arial	ole 43: Mean =	====== IS_Late 2.657	e===== Grand	l Sum = 55. OF ME	в04 то	=====		
s ==== Va	_ fo: y arial rand	ole 43: Mean =	====== IS_Late 2.657	Grand L E 43		804 To ANS Total	===== tal C		
s_ ==== Va	fo: y arial rand 1 	ole 43: Mean = 2	====== IS_Late 2.657	Grand L E 43 2.57	I Sum = 55. OF ME	804 To A N S Total 18.00	===== tal C 4		
s ==== Va	_ fo: y arial rand	ble 43: Mean = 2 *	====== IS_Late 2.657	Grand L E 43	I Sum = 55. OF ME 2 4	804 To ANS Total	===== tal C 4 0		
s_ ==== Va	_ fo: y arial rand 1 2	2 *	====== IS_Late 2.657	Grand L E 43 2.57 2.71	I Sum = 55. OF ME 2 4 56	804 To A N S Total 18.00 19.00	===== tal C 4 0 0		
s_ ==== Va	_ fo: y arial rand 1 2 3	2 2 * *	====== IS_Late 2.657	Grand L E 43 2.57 2.71 2.68	I Sum = 55. OF ME 2 4 6 8	804 To A N S Total 18.00 19.00 18.80	===== tal C 4 0 0 4		
s_ ==== Va	fo: y ====: arial rand 1 1 2 3 3 *	2 Mean = 2 * * * 1 2 3	====== IS_Late 2.657	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40	Sum = 55. OF ME 2. 4. 6. 5. 8. 3. 0.	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20	===== tal C 4 0 0 4 0 0 0		
s_ ==== Va	fo: y ====: arial rand 1 1 2 3 3 *	2 Mean = 2 * * * 1 2 3 4	====== IS_Late 2.657	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66	Sum = 55. OF ME 2. 4 6 	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00	===== tal C 4 0 0 4 0 0 0 0 0		
s_ ==== Va	fo: y ====: arial rand 1 1 2 3 3 *	2 Mean = 2 * * * 1 2 3 4 5	====== IS_Late 2.657	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53	I Sum = 55. OF ME 2. 4. 6. 5.8 5.3 10 5.7 5.3	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60	===== tal C 4 0 0 4 0 0 0 0 0 0 0		
s_ ==== Va	fo: y ====: arial rand 1 2 3 * *	2 Mean = 2 * * * 1 2 3 4	====== IS_Late 2.657	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66	I Sum = 55. O F M E 2 4 6 6 7 7 3 3 7 7	804 To A N S Total 18.00 19.00 18.80 4.60 7.20 8.00 7.60 8.80 15.80	===== tal C 4 0 0 4 0 0 0 0 0 0 0 0 0 0		
s s v G G	fo: y ====: arial rand 1 3 * * * * * *	<pre>ble 43: Mean = 2 * * * * 1 2 3 4 5 6 7</pre>	====== IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.0 F	Sum = 55. OF ME 2 4 6 5 7 3 3 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80	===== tal C 4 0 0 4 0 0 0 0 0 0 0 0 0 7 T	eount = 21	
s ===== Va G: 	fo: y ====: arial rand 1 3 * * * * *	Dle 43: Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L	====== IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.0 F ees of	Sum = 55. OF ME C C C C C C C C C C C C C C C C C C C	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80 CANCE M	===== tal C 4 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	20unt = 21 A B L E F	
s ===== Va G: 	fo: y ====: arial rand 1 1 2 3 * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	====== IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.26 5.0 F ees of eedom	I Sum = 55. O F M E 2. 4. 66 77 3. 3. 77 7 V A R I Sum of Squares	804 To A N S Total 18.00 19.00 18.80 4.60 7.20 8.00 7.60 8.80 15.80 5.80 CANCE M	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Count = 21 A B L E F Value	Prob
s 	fo: y ====: arial rand 1 3 * * * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.0 F ees of eedom 	I Sum = 55. O F M E 2 4 6 6 7 7 3 3 3 7 7 7 7 7 8 8 8 3 9 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80 5.80	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.4943	Prob
s_ s_ 	fo: y ====: arial rand 1 1 2 3 * * * * * * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.0 F ees of eedom 2 6	<pre>Sum = 55. O F M E C F M E C F C F M E C F M E M E C F</pre>	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80 5.80	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.4943 63.3704	Prob
s_ ==== Va G: 	fo: y ====: arial rand 1 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L 5 0 0 0 0 1 catio: ctor A ror	IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.26 5.26 5.26 5.26 5.26 5.26 5.26	<pre>Sum = 55. O F M E C F M E C A C A C A C A C A C A A A A</pre>	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80 5.80	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.4943 63.3704	Prob
s_ G: 	fo: y ====: arial rand 1 1 2 3 * * * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 A N A L 5 0 0 0 0 1 catio: ctor A ror	IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 5.26 5.26 5.26 5.26 5.26 5.26 5.26	<pre>Sum = 55. O F M E C F M E C F C F M E C F M E M E C F</pre>	804 To A N S Total 18.00 19.00 18.80 3.80 4.60 7.20 8.00 7.60 8.80 15.80 5.80	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.4943 63.3704	Prob
s Vi G: 	fo: y ====: arial rand 1 2 3 * * * * * * * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	IS_Late 2.657 T A B 	Grand L E 43 2.57 2.71 2.68 1.26 1.53 2.40 2.66 2.53 2.93 5.26 2.53 5.26 5.0 F ees of eedom 2.6 6 12 2.53 2.93 5.26 5.26 5.26 5.26 5.26 5.26 5.26 5.26	<pre>Sum = 55. O F M E C C C C C C C C C C C C C C C C C C C</pre>	804 To A N S Total 18.00 19.00 18.80 7.20 8.00 7.60 8.80 15.80 5.A N C E M Sq	===== tal C 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	A B L E F Value 0.4943 63.3704	Prob 0.0000

	aria rand	Mean =	ТАВ	LE	0		ANS					
	1	2		44			Total					
_	1	 *		8.3	 201		58.	100				
		*										
	3	*										
_	*	 1			 522		10.	 866				
	*	2		4.4			13.					
	*	3		7.0	060							
	*	4		8.5	565		25.	695				
	*	5		7.7			23.	218				
	*	6		10.2			30.					
	*	7 		18.7	/4 ⁻ /		.56 	241				
K	1	ANAL	Y S I Degr	S 0 ees of	F	VARI Sum of	A N C	E Mean	ΤŻ	ABL	E F	
alue	S	ource	Fr	eedom		Sum of Squares		Squar	e		Value	Prob
	Rep	plicatic	n	2		1.184		0.5	92		1.1467	0.3502
2				6		452.480		75.4	13	14	46.1170	0.0000
3	Er:	ror 		12		6.193		0.5	16			
	Tot	tal		20		459.857						
9	_ 101 У	r means	group	T .	0.			WCI 0	т ,		acrond.	,
s_ ===== Va	_ for y ===== arial	======= ble 45: Mean =	====== Plant 113.68	===== height 3 Gi	0. ==== : : : :	.4148 ===================================	Num ====== 387.35	ber o	f (Observ	vations:	3
s_ ===== Va	_ for y ===== arial	====== ble 45: Mean =	====== Plant 113.68	===== height 3 Gi	0. ==== : : : :	.4148	Num ====== 387.35 A N S	ber o ===== 0 T	f (Observ	vations:	3
s_ ===== Va	_ for y ariak rand	ole 45: Mean = 2	====== Plant 113.68	===== height 3 G1 L E 45	0. ==== canc 0	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total	ber o ===== 0 T	f (Observ	vations:	3
s ===== Va	_ for y ariak rand 1 	ole 45: Mean = 2 *	====== Plant 113.68	===== height 3 G L E 45 	0. ==== canc 0 346	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807.	ber o ===== 0 T 422	f (Observ	vations:	3
s_ ===== Va	_ for y ariak rand	ole 45: Mean = 2	====== Plant 113.68	===== height 3 G1 L E 45	0. canc 0 346 782	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total	ber o ===== 0 T 422 475	f (Observ	vations:	3
s_ ===== Va	_ for y ===== ariak rand 1 2	2 2 * *	====== Plant 113.68	++++++++++++++++++++++++++++++++++++++	0. ===== canc 0 346 782 922	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797.	ber o ===== 0 T 422 475 454 	f (Observ	vations:	3
s ===== Va	_ for y ariak rand 1 3 	ble 45: Mean = 2 *	====== Plant 113.68	++++++++++++++++++++++++++++++++++++++	0, ===== cranc 0 346 782 922 	.4148 ======= d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797. 372.	ber o ===== 0 T 422 475 454 233	f (Observ	vations:	3
s_ ===== Va	_ for y arial rand 1 1 2 3 	2 Mean = 2 * * 1	====== Plant 113.68	++++++++++++++++++++++++++++++++++++++	0, ===== cano 0 346 782 922 922 978 988	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797.	ber o ===== 0 T 422 475 454 233 965	f (Observ	vations:	3
s_ ===== Va	_ for y arial rand 1 1 2 3 *	2 Mean = 2 * * 1 2 3 4	====== Plant 113.68	+eight 3 G L E 45 115.2 111.2 113.9 124.0 120.9	0. 346 782 078 988 519	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362.	ber o ===== 0 T 422 475 454 233 965 858	f (Observ	vations:	3
s ===== Va	_ for y ===== arial rand 1 1 2 3 * * * *	2 Mean = 2 * * 1 2 3 4 5	====== Plant 113.68	++++++++++++++++++++++++++++++++++++++	0) ==== canc O 346 782 222 078 88 519 233 498	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 352.	ber o ===== 0 T 422 475 454 233 965 858 700	f (Observ	vations:	3
s ===== Va	_ for y arial rand 1 1 2 3 * *	2 Mean = 2 * * 1 2 3 4	====== Plant 113.68	+eight 3 Gi L E 45 115.2 111.2 113.9 124.0 120.9 117.0 111.2	0, ==== canc O 346 782 922 922 928 98 519 233 498 367	.4148 ======== d Sum = 2 F M E	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 352. 333.	ber o ===== 0 T 422 475 454 233 965 858 700 495 600	f (Observ	vations:	3
	for y ===== arial rand 1 3 * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 	Plant 113.68 T A B	====== height 3 Gi L E 45 115.3 111.7 113.9 124.0 117.6 111.2 115.4 104.8 101.9 S O	0. 	.4148 ======== d Sum = 2 F M E 	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 352. 333. 346. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 		Observ ====== al Cou	E	3
	for y ===== arial rand 1 1 2 3 * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	Plant 113.68 T A B Y S I Degr Fr	====== height 3 Gi L E 45 115.3 111.7 113.9 124.0 120.9 117.0 111.2 115.4 104.8 101.9 S O ees of eedom	0. 346 782 348 519 233 498 367 500 F	.4148 ======== f M E 	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 352. 333. 346. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 500 E Mean Squar	f (===: T 1	Observ ====== al Cou	E F Value	3 =======
S S G G K lue	for y ===== ariah rand 1 3 * * * * * * * * * * * *	Dle 45: Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L Durce	Plant 113.68 T A B Y S I Degr Fr	====== height 3 Gr L E 45 115.3 111.7 113.9 124.0 120.9 117.6 111.2 115.4 104.8 101.9 S O ees of eedom	0, 346 782 78 988 519 233 498 367 500 F 	.4148 ======= f M E V A R I Sum of Squares	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 352. 333. 346. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 E Mean Squar 	f (===: 'ota T 2	Observ al Cou A B L	E F Value	3 =======
S S S G G S S S S S S S S S S S S S S S	for y ===== ariah rand 1 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L purce	Plant 113.68 T A B Y S I Degr Fr	====== height 3 Gi L E 45 115.2 111.7 113.9 124.0 117.6 111.2 104.8 101.9 S O ees of eedom 2 6	0, 346 782 922 78 988 519 233 498 367 500 F	.4148 ======== d Sum = 2 F M E V A R I Sum of Squares 45.053 1237.071	Num ====== 387.35 A N S Total 807. 782. 797. 372. 372. 352. 333. 346. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 E Mean Squar -22.5 206.1	f (==== ?ota T 2 re 26 78	Observ al Cou A B L	E F Value 0.5556	3 Prob
S S S G G S S S S S S S S S S S S S S S	for y ===== ariah rand 1 3 * * * * * * * * * * * *	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	Plant 113.68 T A B Y S I Degr Fr	====== height 3 Gr L E 45 115.2 111.7 113.9 124.0 124.0 120.9 117.6 111.2 115.4 104.8 101.9 S O ees of eedom 2	0, 346 782 922 78 988 519 233 498 367 500 F	.4148 ======== f M E V A R I Sum of Squares 45.053	Num ====== 387.35 A N S Total 807. 782. 797. 372. 372. 352. 333. 346. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 E Mean Squar 22.5	f (==== ?ota T 2 re 26 78	Observ al Cou A B L	E F Value 0.5556	3 Prob
K lue 	for y ====: arial rand 1 1 2 3 * * * * * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L purce plicatic ctor A ror tal	Plant 113.68 T A B Y S I Degr Fr	====== height 3 GJ L E 45 115.3 111.7 113.9 124.0 124.0 124.0 117.6 117.6 117.6 117.6 117.6 104.8 101.9 S O ees of eedom 2 6	0. 	.4148 d Sum = 2 F M E 	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 372. 352. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 E Mean Squar 22.5 206.1 40.5 	f (==== T 2 26 78 46 	Observ al Cou A B L	E F Value 0.5556 5.0850	3 Prob 0.0082
K lue 2 3 	for y ===== ariah rand 1 3 * * * * * * * * * * * *	2 Mean = 2 * * * 1 2 3 4 5 6 7 7 A N A L purce plicatic ctor A ror tal	Plant 113.68 T A B Y S I Degr Fr on	====== height 3 GJ L E 45 115.3 111.7 113.9 124.0 124.0 120.9 117.0 110.0 100.0 110.0 1000	0. 	.4148 d Sum = 2 F M E V A R I Sum of Squares 45.053 1237.071 486.556 	Num ====== 387.35 A N S Total 807. 782. 797. 372. 362. 372. 362. 314. 304. 314. 304. A N C	ber o ===== 0 T 422 475 454 233 965 858 700 495 600 500 E Mean Squar 22.5 206.1 40.5 22.5 206.1 40.5 	f (==== Pota T 2 e 26 78 46 	Observ al Cou A B L	E F Value 0.5556 5.0850	3 Prob 0.0082

Appendix III. Analysis of variance of the data on shoots per plant by number and weight as influenced by some botanicals and biocontrol agents in controlling BSFB at early harvesting stage

Source of	Degrees		Mean square						
variation	of	В	Brinjal fruit by number Brinjal fruit by weight (g)				(g)		
	freedom	Healthy	Infested	% infestation	Healthy	Infested	% infestation		
Replication	2								
Treatment	6								
Error	12								

**: Significant at 0.01 level of probability

Appendix IV.	Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and bio-
	control agents in controlling BSFB at early harvesting stage

Source of	Degrees			square			
variation	of	В	rinjal fruit by numb	injal fruit by number Brinjal fruit by weight (g)			
	freedom	Healthy	Infested	% infestation	Healthy	Infested	% infestation
Replication	2						
Treatment	6						
Error	12						

Appendix V. Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and biocontrol agents in controlling BSFB at mid harvesting stage

Source of	Degrees						
variation	of	В	Brinjal fruit by numb	er	Brinjal fruit by weight (g)		
	freedom	Healthy	Infested	% infestation	Healthy	Infested	% infestation
Replication	2						
Treatment	6						
Error	12						

**: Significant at 0.01 level of probability

Appendix VI. Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and biocontrol agents in controlling BSFB at late harvesting stage

Source of	Degrees		Mean square						
variation	of	Brinjal fruit by number Brinjal fruit by weight (g)			(g)				
	freedom	Healthy	Infested	% infestation	Healthy	Infested	% infestation		
Replication	2								
Treatment	6								
Error	12								

Appendix VII. Analysis of variance of the data on fruit per plant by number and weight as influenced by some botanicals and biocontrol agents in controlling BSFB at throughout the growing season

Source of	Degrees						
variation	of	В	rinjal fruit by numb	er	Bri	njal fruit by weight	t (g)
	freedom	Healthy	Infested	% infestation	Healthy	Infested	% infestation
Replication	2						
Treatment	6						
Error	12						

**: Significant at 0.01 level of probability

Appendix VIII. Analysis of variance of the data on healthy and infested fruit per plant as influenced by some botanicals and biocontrol agents

Source of	Degrees	Plant height (cm)	Mean square					
variation	of		Len	ıgth	Gi	rth		
	freedom		Healthy	Infested	Healthy	Infested		
Replication	2							
Treatment	6							
Error	12							

Appendix IX. Analysis of variance of the data on yield contributing characters and yield of brinjal gourd as influenced by some botanicals and bio-control agents in controlling BSFB at throughout the growing season

Source of	Degrees	Mean square				
variation	of	Single fruit weight	Edible portion	Non edible portion	Yield per plot	Yield per hectare
	freedom					
Replication						
Treatment	6					
Error	12					