EFFECT OF MULCHING AND MALEIC HYDRAZIDE ON GROWTH, YIELD AND QUALITY OF MUSKMELON

NUSHRAT NOURIN

DEPARTMENT OF HORTICULTURE

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

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EFFECT OF MULCHING AND MALEIC HYDRAZIDE ON GROWTH, YIELD AND QUALITY OF MUSKMELON

BY

NUSHRAT NOURIN

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APPROVED BY:

……..…...……	**…..……**
Dr. Md. Nazrul Islam	**Dr. Shormin Choudhury**
Professor	**Associate Professor**
Supervisor	**Co-Supervisor**

……..……
Dr. Khaleda Khatun
Professor and Chairman
Examination Committee

DEPARTMENT OF HORTICULTURE

Sher-e-Bangla Agricultural University

Sher-e-Bangla Nagar, Dhaka-1207

Ref:-SAU/HORT..... Date:-…….

CERTIFICATE

This is to certify that the thesis entitled ***'EFFECT OF MULCHING AND MALEIC HYDRAZIDE ON GROWTH, YIELD AND QUALITY OF MUSKMELON'*** *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 (MS)*** *in* ***HORTICULTURE****, embodies the result of a piece of bona fide research work carried out by* ***NUSHRAT NOURIN****, Registration number:* ***19-10176,*** *under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.*

I further certify that any help or source of information, received during the course of this investigation has duly been acknowledged.

Dated:December,2021
Place: Dhaka, Bangladesh

Prof. Dr. Md. Nazrul Islam
Department of Horticulture
Sher-e-Bangla Agricultural University
Sher-e-Bangla Nagar, Dhaka- 1207
Supervisor

Dedicated to
My Beloved
Parents

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The Author

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ABSTRACT

The experiment was carried out at the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during November 2020 to April 2021 to study the effect of mulching and maleic hydrazide on growth, yield and quality of muskmelon. The experiment consisted of two factors. Factor A: Three mulching practices *viz*., M_0= No mulch (control), M_b= Black polythene mulch, M_w= Clear polythene mulch and Factor B: Three maleic hydrazide (MH) solutions *viz.*, G_0= Control (no maleic hydrazide), G_1= 50 ppm MH and G_2= 100 ppm MH. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Data were recorded on growth, yield and quality of muskmelon and significant variation were observed for most of the studied characters. Under this investigation, it was revealed that the maximum percentage of female flowers per plant (21.49), individual fruit weight (1074.40 g), fruit yield (41.00 t ha^{-1}) with total soluble solids (10.93 °brix) and vitamin C contents (22.15 mg/100 g) were obtained from the treatment combination M_bG_2 (Black polythene mulch +100 ppm maleic hydrazide). On the other hand, the minimum percentage of female flowers per plant (8.44), individual fruit weight (702.00 g), fruit yield (11.60 t ha^{-1}) with total soluble solids (8.55 °brix) and vitamin C contents (17.81 mg/100 g) were recorded from control treatment combination (M_0G_0). So, the treatment combination M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) was more suitable than the other treatment combinations for the production of muskmelon.

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LIST OF ACRONYMS

Acronym		Full meanings
AEZ	=	Agro-Ecological Zone
%	=	Per cent
°C	=	Degree Celsius
BARI	=	Bangladesh Agricultural Research Institute
cm	=	Centimeter
cv.	=	Cultivar
CV%	=	Percentage of coefficient of variance
et al.	=	And others
FAO	=	Food and Agriculture Organization
g	=	Gram
GA_3	=	Gibberellic Acid
ha^{-1}	=	Per hectare
kg	=	Kilogram
LSD	=	Least Significant Difference
MH	=	Maleic Hydrazide
MoP	=	Muriate of Potash
NAA	=	1-Naphthalene Acetic Acid
No.	=	Number
NPK	=	Nitrogen, Phosphorus and Potassium
PE	=	Polyethylene
PGRs	=	Plant Growth Regulators
SAU	=	Sher-e-Bangla Agricultural University
SRDI	=	Soil Resources and Development Institute
t	=	Ton
TSP	=	Triple Super Phosphate
TSS	=	Total Soluble Solids
viz.	=	Videlicet (namely)
Wt.	=	Weight

CHAPTER I

INTRODUCTION

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INTRODUCTION

Muskmelon (*Cucumis melo* L.) belongs to the Cucurbitaceae family is one of the most important vegetables and fruit yielding family distributed mostly in the tropics, and a few species are also found in the warm temperate regions (Ibrarullah *et al*., 2019). The total area under muskmelon cultivation in world estimated to be 803 thousand hectare with an annual production of 13.8 million metric tons (Anonymous, 2014). *Cucumis melo* is the most diversified species of the genus *Cucumis*, it encompasses netted muskmelon, salmon-flesh cantaloupe, smooth-skinned and green-fleshed Honey Dew, wrinkle-skinned Cassaba, long shelf-life Hami melon, small and thin- pericarp makuwa, and several non-sweet pickling and cooking oriental melons (Liu *et al*., 2004). Melon plants are herbaceous, procumbent, hispid, tendril bearing climbing or creeping annuals having fibrous roots, angular, scabrous stem, simple soft hairy orbicular-reniform leaves and thriving in fertile, well-drained soils in warm, sunny locations (Paris *et al*., 2012). The fruit is famed for its nutritional values as it is a rich source of vitamins, carbohydrates, proteins and minerals. Beside these, it has great medicinal importance and work as an anti-cancer, antidiabetic, and anti-microbial (Danish *et al*., 2020; Khalil *et al*., 2020; Milind and Kulwant, 2011). Fruits are rich in vitamins and minerals and help to fight against hidden hunger (micronutrient deficiency) and to treat many other diseases e.g., kidney disorders, cough, bilious diseases, hot inflammation of the liver, liver and bile obstruction, eczema, etc. (Fahamiya *et al*., 2016).

Muskmelons grow best at average air temperatures between 18 and 24°C but the optimum temperature for germination of the seed is 27-30°C. Temperature above 35°C or below 10°C slows down the growth and maturation of the crop. This crop is very sensitive to cold temperatures and even a mild frost can damage the crop, therefore, should be planted after the last chance of frost has passed. With the increase in temperature, the plants complete their vegetative growth earlier. Muskmelons grow well on a wide range of soil types. Medium-textured soils (loams) will generally produce higher yields and better-quality melons but in order to get early harvesting, lighter soils where there is good air drainage are considered to be the best. It prefers a soil pH between 6.0 and 7.0 but should be above 5.8 and preferably near 6.2. Alkaline soils with high salt concentration are also not suitable. Soil beds should be raised 15

to 20 cm to facilitate soil drainage because well-drained soils that warm up quickly are best suited for muskmelon (Kaur *et al.*, 2016).

Wide diversity in size and shape of muskmelons exists in Bangladesh and becoming available in the market during March-July. In Bangladesh, cultivating of muskmelon encounters a lot of problems *viz.* lack of quality variety, lack of improved production technology, incidence of pest and diseases including soil borne diseases and climatic hazards (Rashid, 1999). Improved production technology can avoid these problems. Lalim is a newly developed variety of muskmelon which can be grown all the year round. Lalim can be consumed as both vegetables and fruit. During winter season there is less variation of fruit and lalim can be a great choice then. Rainfall is scarce in winter season and irrigation becomes essential for providing sufficient moisture to the growing crop. Irrigation facilities are not uniform in all the regions of Bangladesh due to costly establishment of pumps and due to downfall of underground water layer. To minimize the cultivation cost mulching could be effectively used instead of irrigation. Artificial mulch such as crop residues, plant species, or polyethylene sheet is generally practiced for production of horticultural crops (Wilhoit *et al.*, 1990).

The main objective of the grower is to produce maximum yield at the time when prices are high. This requires skillful decisions regarding selection of cultivars. Mulching is also a very important factor to influence the growth and yield (Barman *et al*., 2005). Mulching is the practice of covering the soil around the plant to make conditions more favourable for growth, development and efficient crop production (Nagalakshmi *et al*., 2002). Mulching also suppress weed infestation effectively. Furthermore it stimulates microbial activity in soil through increasing soil temperature, which improves agro physical properties of soil. Mulching used as a means of successful crop production mainly in place where irrigation facilities are scanty. It has a unique character of reducing the maximum soil temperature and increasing the minimum temperature (Solaiman *et al*., 2008). Organic mulches such as leaf, straw, dried leaves and compost have been used for centuries. When compared to other mulches plastic mulches are completely impermeable to water and prevents direct evaporation of moisture from soil and thus limits the water losses and soil erosion over the surface. Polyethylene (PE) films as mulch material provide many positive advantages for the user such as increased yields,

earlier maturing crops, higher quality produce, insect management and weed control (Lamont, 1993).

Flowering in cucurbits is very important phase of development because fruiting and yield depends on this process. Growth regulators have tremendous effects on sex expression and flowering in various cucurbits leading to either suppression of male flowers or increase in number of female flowers. Exogenous application of maleic hydrazide (MH) has shifted the sex expression towards femaleness by increasing the production of female flower and suppressing that of male flowers in cucurbits (AlMasoum and Al-Masri, 1999). Maleic hydrazide (MH) is a growth retardant generally used for enhancing flowering especially increasing female and male flower sex proportion, ultimately escalating the yield by better fruit setting. MH affected the growth and sex expression in bottle gourd (Kooner *et al.,* 2000). MH is different in nature than NAA and GA_3 may have influence on plant growth and also their success increases when applied at various stages (Sandra *et al.,* 2015). The increased number of female flowers was the consequence of MH that had sex balancing effect through lower respiration and higher accumulation of photosynthates in plants. Fruits number was decreased with the higher concentrations of MH that hampered the fruit setting. Similar type of result was found by Verma and Choudhury (1980), reporting a 12% increase in fruit set in cucumber with the application of MH. It was reported by Thappa *et al.* (2011) in cucumber; Bhat *et al.* (2004) in watermelon that lower concentration of MH facilitated the fruit yield. It was also reported that an increase in yield could be attributed to earliness and increased number of female flowers as well as narrowed male: female sex ratio with paclobutrazol in summer squash (Arora *et al.,* 1989) and with maleic hydrazide in bottle gourd (Ingle *et al.,* 2000).

Therefore, this experiment will be conducted to determine the combined effects of mulching and maleic hydrazide (MH) on flowering behaviour and yield of muskmelon. Considering above factors, the present study was undertaken with the following objectives:

1. To determine a suitable mulch for maximizing the production of muskmelon;
2. To determine the effect of maleic hydrazide on sex expression of muskmelon; and
3. To evaluate the combined effects of mulch and maleic hydrazide on flowering behavior and yield of muskmelon.

CHAPTER II

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

The growth and yield of muskmenlon may be increased through appropriate combination of different mulching and maleic hydrazide application. Though muskmelon is cultivated in many parts of our country, very little research work has so far been conducted on the appropriate mulching practices with suitable applications of maleic hydrazide. Research findings regarding the growth, yield and quality of muskmelon as influenced by different mulching practices and maleic hydrazide application under Bangladesh condition is very limited. With the above background, some of the pertinent works have been reviewed in this chapter.

2.1 Effect of mulching

Hallidri *et al*. (2001) investigated the effect of different mulches on yield, growth and quality of cucumber variety Shekulli f1 hybrid when grown under greenhouse conditions with different mulching material. The findings revealed that black film mulch gave a greater number of leaves and quality as compared to silver film and transparent film. No difference was recorded in yield in all the mulches which were used during experimentation.

Gebologlu and Saglam (2002) examined that effect of different mulches used in cucumber crop. The mulching materials like transparent polyethylene, black polyethylene and straw increased the yield in pickling cucumber and fruit yield. Transparent polyethylene mulching material along with 20 cm spacing within row combination gave better yield as compare to other mulches.

Alemayehu-Ambaye and Joseph (2002) conducted an experiment on effect of plastic mulch on growth and yield of watermelon and cowpea when are grown in rainfed condition of Western Sudan. Plastic mulch increases the plant height, fruit weight, fruit number, in watermelon where as in cow pea it increased number of pods, grain yield and 100 seed weight. Their findings concluded that plastic mulch increased the yield and vegetative growth in watermelon and cow pea.

Fonseca *et al*. (2003) conducted an experiment on effect of color polyethylene as soil covers and grafting effect on cucumber flowering and yield. In this experiment mulch

materials like black, white on black, green polyethylene along with one control treatment. The findings concluded that black polythene mulch in cucumber increase yield by 21% along with amount of fruits per plant as compare with the no mulch condition.

Kashi *et al.* (2004) reported that using dark polyethylene mulch increases watermelon plant wet weight twice as much as the control. Also, the total yield in dark polyethylene mulch treatment increased to 85%. The number of fruit per plant and the average fruit weight increased comparing with control. Earliness in dark polyethylene treatment was 32.6% of the total yield.

Siwek and Tipowiecka (2005) investigated the effect of different types of mulches on the yield of cucumber. Different mulches colors like clear, black and white polyethylene film during experimentation. The highest yield was recorded in clear polyethylene mulch as compare to other mulches.

Gordon *et al*. (2008) studied that effect of row covers, plastic mulches in the production of summer squash. Colored mulch like black, red, blue plastic were recorded with high soil temperature when they were used in summer squash whereas the use of silver mulch was recorded with the lowest soil temperature than other dark colored mulch.

Ibarra-Jimenez *et al*. (2008) examined that effect of colored mulches on photosynthesis, soil temperature yield in cucumber. In this experiment mulches like white on black. Blue on black, black embosed, silver on black, red, and brown. Increase in yield in cucumber due to mulches as compare to other mulches finally they concluded that specific colour plastic mulch should be used by farmers which can be affective in their location

Abdrabbo *et al*. (2009) investigated that effect of mulches and irrigation on cucumber yield and growth parameters. Colour mulches like transparent, red, green, blue, yellow, black, and control along with different irrigation level 0.60, 0.80, 1.00, and 1.20 by using drip irrigation method. Their findings concluded that transparent mulch along with 0.80 (ET) increase the plant growth and yield.

Melek and Atilla (2009) conducted an experiment to study the effect of different mulch material on plant growth, quality parameters and yield of melon (*Cucumis Melo L*

Their findings concluded that average marketable yields are higher in clear plastic mulch 25-28% in high altitude environmental conditions.). From experiment, it was concluded that clear mulch gave high soil temperature, average weight of melon and highest marketable yield.

Farias-Larios and Orozoco-Santos (2010) reported that watermelon marketable yield in treatment with polyethylene mulch (dark, clear and white) was 48.3, 43.2 and 38.3 t/ha respectively, and 22.8 t/ha in control.

Hassandokht *et al.* (2010) reported that the number of fruit per plant in tomato using dark polyethylene was 79.43% more than control. Earliness using clear and dark polyethylene was reported to be 140.4 and 113%, respectively, more than control. The average fruit weight was 13.27% and the total yield in dark and clear mulch was 105 and 98% more than control.

Tomasz *et al*. (2010) carried out an experiment to study the effect of black polyethylene mulch on yield of cucumber. It was concluded that black polythene has higher irrigation efficiency than non-mulched soils. There was no difference in total yield of cucumber which was recorded equal in both mulch and non-mulch condition.

Bhatt *et al*., (2011) carried out the experiment to study the effect of different mulches on characters, yield, and production economics of summer squash. Different mulches like black plastic, clear plastic, dry leaves, pine needles, green twigs of forest litter, fodder crop and farm yard manure were used during experimentation. Black plastic mulch recorded with maximum plant height, plant spread, root length, number of leaves and yield.

Luqman *et al*. (2013) studied that integrated weed control in bitter gourd under the Agro-ecological conditions of Peshawar. Different forms of mulch (Rumex crispus, Silybum marianum, newspapers and sawdust) and herbicide, Stomp 330 EC (pendimethalin) as a pre-emergence product. They concluded that the efficiency of mulching treatments was substantially more successful than weed check plots.

Parmar *et al*. (2013) examined the impact of mulching material on the yield, growth and quality of watermelon (*Citrullus lanatus* thunb) in *cv*. Kiran. The outcomes showed that various forms of mulching content had a major effect on parameters like the number of branches per vine, the length of the vine and the number of nodes per vine

over control. Silver on black polyethylene mulch recorded high yield and better quality characters whereas low yield is recorded in no mulch condition.

Ram *et al*. (2013) studied that the impact of mulching and training on growth, yield parameter and the economy of pointed gourd. They found that the use of organic mulches appeared to be helpful to both characters. They also recorded that the maximum length of the vine, number of branches, was developed among the organic mulches of paddy straw. Number of nodes, average fruit weight and yield per plant followed by typha excluding average fruit weight where water is present in hyacinth and mustard were next to straw paddy. They suggested that the use of organic mulches was seen to be helpful in increasing the yield of pointed gourd fruits compared to control.

Mahadeen (2014) studied the effect of polyethylene black plastic mulch on growth and yield of summer squash and okra crops under rainfed condition in semi-arid regions of Jordan. It was concluded that mulched plots recorded with high moisture content and positive effect on yield. The increase in fruit weight and yield in both crops of okra and summer squash was also recorded. Mulched plots produced both fresh and dry weights of both crops.

Mutetwa and Mtaita (2014) studied the effect of different color mulches on cucumber production. The findings revealed that the colored plastic mulch reduced weed population and increased production. Silvery grey colored mulch found to be suitable for producing superior branches, fruits, fruit size, and good yield in cucumber as compare to other mulches like wheat straw and blue colored mulch.

Atif (2014) examined that water use efficiency in agriculture is mostly increased by mulching process. This technique was implemented in summer vegetables production rainfed condition. Plots are covered with black plastic mulch in squash and okra vegetable increased fruit yield, weight and fruit number.

Aniekwe and Anike (2015) studied the impact of various mulching materials and plant densities on the environment, the growth and yield of cucumber. It results revealed that the rice hull mulch had the largest vine length (145.5 cm), leaf area (184.63 cm^2), fruit weight (1.27 kg), fruit length (62.7 cm) and fruit diameter (9.43 cm) than the control and increase the average daily soil temperature varied from 28.1

to 27.4 degree centigrade while clear plastic mulch has the largest number of vines (5.2), the number of leaves (32.5), the number of fruits (7.98) and the biggest change on average daily soil temperature (28.8°C). For small hold farming, mulching along with plant spacing have efficient production and management of cucumber.

Sageer *et al*. (2015) observed effect of different mulching material on growth and yield of Sponge gourd. It was observed that black polyethylene mulch increased the yield, length, flowering, vine spread, fruit length, fruit diameter, fruits per plant and yield when mulch was used in sponge gourd (Pusa Chikni variety). No mulch treatment gave low yield and poor-quality fruits. Black polyethylene mulches increases the TSS, total sugar contents, total carotenoids and vitamin C contents.

Haapala *et al*., (2015) examined that effect of paper mulched and biodegradable plastic mulches on the yield of cucumber. Paper mulch: brown kraft paper with underside coated and both side coated with black biodegradable film was used. It revealed that there was no difference in the yield between different types of mulches. The weed population in mulch was much less than in plots covered with mulch as compared to uncovered plot. Dark colored paper mulch was comparable to biodegradable film in terms of yield and quality parameters.

Roudan and Abbdosi (2015) studied the effect of mulch in cucumber basis of number of leaves, average yield of plant, number of fruits per plant, plant height, plant weight total yield and quality contributing parameters. The results showed that white mulch increased the earliness in cucumber and highest yield as compare to other mulches. Mulches helps to increases the TSS, total sugars and vitamin C contents in cucumber also.

Soleymani *et al*. (2015) studied the impact to determine the effect of mulches and planting method in cucumber crop variety Super Dominus. Mulches like clear and black polyethylene mulch, hydro flume mulch, and no mulch (control). The effect of planting method and mulches increased the no. of days to flower, plant length, earliness and harvest. The results showed that early yield and yield per plant is highest in clear mulch (186.42) and black mulch (183.12 g/plant). Total yield is highest in black mulch (1671.75 g) per plant and clear mulch most helpful in controlling broomrape.

Homez and Arouiee (2016) conducted an experiment on the plant cucumber in desert Najaf. The findings stated that highest heat accumulation was recorded in black polythene (1705) along with other mulches like transparent (1583), rice residues (1428) and in control (1194). The highest number of fruits and yield was recorded in black polythene mulch.

Torres *et al*. (2016) investigated on cucumber to determine its growth and yield by using various colors of plastic mulches like yellow, red, white on black plastic under shade house. Mulch color mostly affected leaf phosphorus, magnesium, nitrogen, calcium. The findings compared both side mulch in shade house condition and mulch in open field conditions. The best result was recorded under shade house mulches which recorded high yield and quality of cucumber.

Mahmood *et al*. (2017) examined that effect of mulching on vegetable production in tunnel farming. Under the investigation, cucumber and bitter gourd production was observed with mulch and non-mulch conditions. The findings revealed that average yield of bitter gourd was highest in mulch condition and the production was increased by 23.7% due to better bed mulching practice and it helped to decrease the weeds and conserve soil moisture due to which plants performed well under tunnel farming.

Mohammed *et al*. (2017) conducted an experiment on performance of Bottle Gourd (*Lagenaria siceraria*) in the greenhouse. The purpose of this research was to investigate the effects of polyethylene mulching (black and white) and *Mycorhizae* inoculation on plant growth, fruit production, seed yield and seed oil content. By using polyethylene mulching increased soil temperature and soil moisture content relative to bare soil moisture content. The results revealed that a great improvement in vegetative growth in the inoculated treatments compared with control and the black polyethylene mulch was more successful than the white mulch.

Bobby *et al*. (2017) examined that different inorganic mulches like black-black, black-silver, black-white and organic mulches like paddy straw, paddy husk, ground nut shells along with pre-emergence herbicide (pendimethalin @ 1.0kg a.i/ha^{-1}). The results revealed that black-black polythene mulch controlled the highest weed density and its dry weight at 30, 60, 80 days after sowing the crop. Whereas, black-black polythene mulch along with paddy straw mulch shows lowest weed control efficiency (55.93%, 56.02%, 56.88%) at 30, 60, 80 days. Weed index was highest at

pre- emergence herbicide (pendimethalin @ 1.0kg a.i/ha^{-1}) and less weed index noticed in black silver polythene mulch.

Kumar and Sharma (2018) conducted an experiment in which effect of mulching on growth, quality and yield parameters in different squash varieties. They laid out 20 different treatments along with five different mulches like black plastic mulch, blue plastic mulch, transparent mulch, rice straw mulch, and control and four varieties of summer squash like Arpit, Surya, Pratap, and Desi. This study revealed that black plastic mulch along variety Surya gave lowest male flowers and highest female flowers that led to maximum yield and shown good crop improvement.

Akhter *et al*. (2018) carried out an experiment to horticulture farm of Sher-e-Bangla Agriculture University to determine the effects of mulches and phosphorous on growth and yield of squash (*Cucurbita pepo*). Black polythene with 90kg P_2O_5 combination found to increase fruit yield and fruit weight.

Sharmila and Singh (2020) observed that white plastic mulch reflects twice amount of sunlight than black plastic mulch when it used as mulch in cucumber. The findings concluded that white plastic mulch help to keep soil temperature lower as compare to black plastic mulch and it is mostly preferred tunnel as better mulch than black due increase in yield factor.

Islam *et al.* (2021) conducted a study to identify the suitable mulch paper for different high-value vegetables during the winter season of November 2019 to March 2020 at the Olericulture research field of Bangladesh Agricultural Research Institute, Gazipur, Bangladesh. The study was a randomized complete block design with 3 replications. Four vegetable varieties viz., tomato, brinjal, capsicum and broccoli and 3 mulch treatments viz., T_1= Silver over black mulch; T_2= Black mulch; T_3= No mulch were included in this study. Different vegetables responded differently with the changes of mulches irrespective of different characters. It was clear that fruit number, average fruit weight, fruit length, fruit diameter were strongly related to soil moisture content. The effect of different plastic mulches on fruit weight per plant and yield (t/ha) was significant. Mulching produced higher fruit yield per plant and fruit yield per hectare than for the control, indicating that the mulch had a positive effect in generating increased fruit yield. Silver over black plastic mulch produced the highest fruit yield *viz.,* 98.05 t/ha (tomato), 54.11 t/ha (brinjal), 34.33 t/ha (capsicum), 26.09 t/ha

(broccoli) followed by black and no mulches, while the control plot produced the lowest fruit yield.

2.2 Effect of maleic hydrazide

Brantley and Warren (1960) reported that plant growth regulators have profound influence on fruit production in cucurbits. It can modify sex expression, improve fruit set, and ultimately increase the yield in number of cucurbits. A relationship between growth substances and sex expression probably exists in these plants. Sex modification shifts towards femaleness in sex expression by exogenous application of auxins, gibberellins, growth retardants, other plant growth regulators, macro and micro nutrient elements in muskmelon.

Mishra and Sharma (1965) recorded significant reduction in elongation of internodes and nodes with foliar application of maleic hydrazide @ 200 ppm.

Singh and Madan (1971) reported that like maleic hydrazide, application of ethrel at the rate of 200-500 ppm led to reduction in vine length in watermelon.

Arora *et al.* (1982) conducted a study on the effect of maleic hydrazide (MH) on vegetative growth, flowering and yield of bottle gourd (*Legenaria siceraria*) during the rainy and summer seasons of 1979 and 1980, respectively. MH at 150 mg/l stimulated the elongation of the main shoot, while MH at 50 mg/l induced more branches per plant. Staminate flowers appeared late and at the lowest node number in control plants, whereas MH at 150 mg/l had a profound effect on the earliest appearance of pistillate flowers at the lowest node number. Male: female ratio was lowered with MH at 50 mg/l and was most effective in producing the maximum number of fruits and fruit weight per plant and ultimately the yield. GA_3, NAA and ethrel did not influence yield, while MH did.

Singh and Singh (1984) noticed that early appearance of female flowers in cucumber with the foliar application of maleic hydrazide @ 50 ppm and 100 ppm.

Ries (1985) reported that the application of growth retardants like maleic hydrazide increased the endogenous ethylene level which triggered metabolic processes and affected the C:N ratio in plants they stimulate flowering, fruit set, sex ratio and thereby yield.

Pandya and Dixit (1997) reported that low temperature and short days facilitate to reduce respiration and photosynthates accumulation that might be probable reason for reducing male flowers.

Murthy *et al.* (2007) observed in gherkin that fruit weight recorded maximum with the use of maleic hydrazide.

Ouzounidou *et al.* (2008) reported that fruit diameter, fructose, glucose and ascorbic acid obtained with the application of GA_3 100 µM in cv. Galia.

Patil *et al.* (2008) conducted an experiment in randomized block design with four replications, in all there were eight treatments i.e. 50 ppm, 100 ppm and 150 ppm of gibberellic acid, 20 ppm, 40 ppm and 80 ppm of maleic acid, distilled water soaking and control or without soaking, seeds were soaked for 24 hours and sown directly in the field at 45 cm × 30 cm spacing. Regarding germination and vegetative characters, viz., plant height, number of internodes and length of internodes, seed treatment with gibberellic acid at 50 ppm concentration exhibit statistically maximum value amongst all other treatments. Whereas in respect of number of branches and number of leaves per plant, seed treatment with maleic hydrazide at 80 ppm exhibit significantly maximum number over remaining all other treatments. As concerned to reproductive and quality parameter viz., length of dried pod, weight of seeds per pod, yield per plant and yield per plot and weight of 100 seeds, the treatment GA_3 at 50 ppm showed significantly superior performance over remaining all other treatments.

Hidayatullah *et al.* (2009) noticed that pistillate flowers of cucumber increased with MH application at 450 µM/l concentrations.

Hadvani (2010) reported that highest total sugars, reducing sugar, ascorbic acid and lowest acidity were observed in MH 300 ppm in cv. Rasmadhuri.

Mollier (2010) reported that maleic hydrazide foliar application inhibits terminal plant growth, stem elongation and apical dominance in most of the cucurbits. Application of 100 ppm maleic hydrazide along with ethephon gave maximum results in cucumber.

Desai *et al.* (2011) revealed that the increased number of female flowers was the consequence of MH that had sex balancing effect through lower respiration and higher accumulation of photosynthates in plants.

Thappa *et al.* (2011) examined of altering the plant frame and inducing femaleness at early stages in the development of cucumber for productivity enhancement and early development using various plant growth regulators at the Vegetable Experimental Farm, Division of Vegetable Science and Floriculture, S.K. University of Agricultural Sciences and Technology of Jammu, India during the spring summer season of 2009. Three plant growth regulators were sprayed onto plants at the two-, four- and six-leaf and full-bloom stage using the cucumber variety Cucumber Long Green. Two of the growth regulators, maleic hydrazide and ethephon, were each applied at two different concentrations of 100 and 200 ppm and the third, naphthalene acetic acid, was applied at 50 and 100 ppm, and some combined applications of growth regulators were also tested. The experiment comprised 15 treatments and was laid out in a randomized block design with three replications. The results revealed that the influence of the plant growth regulators was variable on the morphological traits of cucumber but the floral and yield traits were significantly affected by a combined application of 100 ppm maleic hydrazide and 100 ppm ethephon. This treatment induced early development, maximized the sex ratio with regard to yield and was comparatively helpful in reducing plant expansion. This treatment also produced the best economic results for the production of cucumber. Plant growth regulators are beneficial to increase the growth parameters. The application of maleic hydrazide @ 100 ppm + Ethephon @ 100 ppm increased number of nodes per main stem, and number of nodes per unit length of vine in cucumber cv. Cucumber Long Green.

Chaurasiya *et al*. (2016) observed that maximum TSS and total sugar were found with the application of ethrel 200 ppm in muskmelon cv. Khushboo.

Kaur *et al.* (2016) conducted an experiment to study the effect of foliar application plant growth regulators i.e. maleic hydrazide and ethephon on vegetative growth, sex expression, fruit setting, and fruit yield of cucumber. The plant material included three cultivars of cucumber i.e. Poinsette, Punjab Naveen and Pant Khira 1 raised during summer season during 2014-2015. Growth regulators ethephon and maleic hydrazide were sprayed at different concentrations on two and four leaf stage. Foliar

application of Ethephon application @ 200 ppm reduced the vine length to the maximum, but it improved the number of secondary branches and fruit weight per vine. Application of maleic hydrazide and ethephon application @ 100 ppm led to early production and yield of cucumber. The investigation concludes that foliar application of maleic hydrazide and ethephon can help promote feminism and increase the yield of cucumber crop.

Moniruzzaman *et al.* (2019) conducted a field experiment to investigate the effect of plant growth regulators on growth, sex expression, yield and yield components of bottle gourd. The experiment consisted of different concentrations of Gibberellic acid (GA3), Naphthalene acetic acid (NAA), Maleic hydrazide (MH) and single concentration of cycocel (CCC) viz., GA3 @ 10 ppm, GA3 @ 30 ppm, NAA @100 ppm, NAA @ 150 ppm, MH @ 50 ppm, MH @ 150 ppm and CCC @ 500 ppm along with distilled water considered as control. All growth regulators were sprayed to the seedlings at two-leaf stage and 4 days after the first spray. Growth regulator treatments had significant effect on primary branches/plant, node number of 1st male and female flower appearance, number of days to 1st male and female flower appearance, number of male and female flowers, sex ratio (male:female flower) number of fruits/plant, individual fruit weight and fruit yield. Spraying of MH @ 150 ppm gave the highest primary branches/plant (17.0 and 18.0 in first and 2nd year, respectively) and induced maximum female flowers (37.3 and 40.0 in first and 2nd year, respectively) at lower nodes followed by CCC @ 500 ppm (36.3) in the first year and MH @ 50 ppm (40.0) in the 2nd year. Application of MH @ 150 ppm caused early appearance of female flowers on the nearest node (from bottom). Application of MH @ 150 ppm gave the lower number of male flowers (81.7 and 96.0 in first and 2nd year, respectively) and the highest number of female flowers/plant, thereby producing lower male:female sex ratio (2.2 and 2.5 in first and 2nd year, respectively) and the maximum number of fruits/plant (12.0 and 14.0 in first and 2nd year, respectively). The maximum fruit weight/plant was obtained from the application of MH @ 150 ppm (29.3 and 35.8 in first and 2nd year, respectively) followed by CCC @ 500 ppm (26.0 in the 1st year and 29.0 in 2nd year). The highest fruit yield per hectare was recorded significantly with the application of MH @ 150 ppm (97.6 t/ha and 89.6 t/ha in first and 2nd year, respectively) closely followed by CCC @ 500 ppm (88.5 t/ha in 2015) and GA3 @ 30 ppm (75.3 t/ha in 2016), as

compared to other treatments. The highest mean yield over the years was also recorded at MH @ 150 ppm (93.6 t/ha) followed by CCC @ 150 ppm (80.6 t/ha) and GA3 30 (74.1). Application of MH @ 150 ppm gave the maximum gross return and net return with the highest BCR of 5.24 followed by CCC 500 ppm (4.15) and GA3 30 ppm (3.86).

Sarkar *et al.* (2019) carried out an experiment aimed to evaluate the effect of maleic hydrazide (MH) with the concentration of (i) Control: 0 ppm (MH0); (ii) 150 ppm (MH150), (iii) 250 ppm (MH250) and (iv) 350 ppm (MH350) at the three stages of (i) Seed soaking (SS), (ii) Vegetative (VS) and (iii) Flowering (FS) on physiological growth, sex expression and nutrient composition of cucumber (*Cucumis sativus*). Sex modification and fruit setting was enhanced by MH. Number of leaves, leaf area, numbers of fruit, fruit length, fruit diameter and fruit yield were also remarkably increased except plant height after MH application at different stages. MH increased the dry biomass of fruit resulted from higher chlorophyll content in leaves transferred photosynthates to the fruit. Chlorophyll content and mineral nutrient concentration in fruits did not affect significantly by MH. As the effect on sex modification and yield attributes, MH @ 150 ppm at vegetative stage would be a good choice.

Verma *et al.* (2019) conducted a field experiment at Horticulture Research Farm, Department of Horticulture, RAK College of Agriculture Sehore during Kharif season of 2012-13. The experiment was laid out in Randomized Complete Block Design with three replications. Combination of gibberellic acid and maleic hydrazide, treatment T_9 (100 ppm MH + 60 ppm GA_3) was found significantly superior as compared to other treatments. Highest morphological characters (*viz.,* plant height, number of leaves per plant, number of branches per plant, stem girth per plant and leaf area index) and yield attributes (*viz.,* no of fruits per plant, fruit yield/plant and fruit yield/ha) were recorded in T_9 (100 ppm MH + 60 ppm GA_3). Maximum fruit yield of 125.29 q/ha obtained in treatment T_9 but maximum net return of Rs. 88698/ha and cost benefit ratio of 1:3.52 was observed in treatment T_8 (100 ppm MH + 40 ppm GA_3).

CHAPTER III

MATERIALS AND METHODS

CHAPTER III

MATERIALS AND METHODS

This chapter describes the materials and methods which were used in the field to conduct the experiment entitled "Effect of mulching and maleic hydrazide on growth, yield and quality of muskmelon" during the period from November 2020 to April 2021. The materials and methods that were used for conducting the experiment have been presented in this chapter. It comprises a short description of experimental site, soil and climate, variety, growing of the crops, experimental design and treatments and collection of data presented under the following headings:

3.1 Description of the experimental site

The research work was conducted at Horticulture Farm, Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka, during the period from November 2020 to April 2021. The location of the site was 23°74′ N Latitude and 90°35′ E Longitude with an elevation of 8.2 meters from the sea level (Anon, 1987) and presented in Appendix I.

3.2 Soil characteristics

The texture of the soil in the experimental field was silty loam. The soil in the experimental area is part of the Modhupur Tract (UNDP, 1988) and belongs to AEZ No. 28. Before conducting the experiment, a soil sample from the experimental plot was obtained from a depth of 0-30 cm and examined at the Soil Resources Development Institute (SRDI), Soil Testing Laboratory, Khamarbari, Dhaka which is shown in Appendix II.

3.3 Climate and weather

The climate of the experimental site was under the subtropical climate with three distinct seasons: winter from November to February, pre-monsoon or hot season from March to April, and monsoon season from May to October (Edris *et al.*, 1979). The Bangladesh Meteorological Department, Agargoan, Dhaka, provided details of the meteorological data collected during the experiment, which are presented in Appendix III.

3.4 Crop/plating material

The local cultivar “Lalim” of muskmelon was used in the experiment. The seed was collected from Khulna.

3.5 Treatments under the investigation

The experiment consisted of two factors *viz.* different mulching practices and maleic hydrazide (MH) levels.

Factor A: Mulching (3 types)
M_0= No mulching (control)
M_b= Black polythene mulch
M_w= Clear polythene mulch

Factor B: Maleic hydrazide (MH) (3 levels)
G_0= Control (No maleic hydrazide)
G_1= 50 ppm MH and
G_2= 100 ppm MH

There are 9 treatment combinations such as M_0G_0, M_0G_1, M_0G_2, M_bG_0, M_bG_1, M_bG_2, M_wG_0, M_wG_1 and M_wG_2.

3.6 Design and layout of the experiment

The two-factorial experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The total area of the experimental plot was divided into three equal blocks. Each block was divided into 9 plots where 9 treatments combination were distributed randomly. There were 27 unit plots altogether in the experiment. The size of each plot was 1.00 m × 1.00 m. The distance maintained between two blocks and two plots were 50 cm and 50 cm, respectively. The plots were raised up to 15 cm. In the plot 2 plants are allotted with maintaining distance between plant to plant were 50 cm.

3.7 Seed treatment

Seeds were treated by Provax 200WP @ 3g kg^{-1} seeds to protect some seed borne diseases.

3.8 Seed sowing on cocopeat tray

Seeds were sown on 21st November 2020 in 2 cocopeat trays which were filled with loose friable, dead roots free cocopeat. Light watering was done regularly. Complete germination of the seeds took place within 5 days after seed sowing. The tray was kept in shade to protect the seedlings from scorching sunshine or rain. No chemical fertilizer was used in the cocopeat tray.

3.9 Preparation of main field

The plot selected for the experiment was opened with a power tiller in the last week of November 2020 and left exposed to the sun for a week. To achieve good tilth, the land was harrowed, ploughed, and cross-ploughed several times after one week, followed by laddering. Weeds and stubbles were removed and a desirable tilth of soil was obtained for seedling transplanting. Drainage channels were built around the land to prevent water logging caused by rainfall during the study period. The land operation was completed on 10th December 2020. The individual plots were made by raising soil (20 cm high) from the ground level.

3.10 Application of manures and fertilizers

Manures and fertilizers were applied as per the treatment. Organic manure and inorganic fertilizer was used as the source of nitrogen, phosphorus and potassium. The N, P, K fertilizer were applied according to Krishi Projukti Hat Boi (BARI, 2015). The following doses of fertilizers and manures were used in this experiment:

Fertilizers	Manures	Doses
Urea		170 kg ha^{-1}
TSP		100 kg ha^{-1}
MoP		125 kg ha^{-1}
	Cowdung	10 t ha^{-1}

3.11 Application of mulch materials

Two types of mulch materials; *viz.,* black polythene and clear polythene mulch were used**.** Black polythene and clear polythene sheet with small opening which were made for maintaining proper plant to plant distance before placing over the plots.

3.12 Transplanting of seedlings

Healthy and uniform sized seedlings were taken separately from the cocopeat tray and were transplanted in the experimental field on 17 December, 2020. 50 cm × 50 cm plant spacing was maintained for transplanting. The tray was watered before uprooting the seedlings so as to minimize the damage of the roots. The seedlings were uprooted carefully. This operation was carried out during late hours in the evening. The seedlings were watered after transplanting.

3.13 Preparation of maleic hydrazide (MH) solution

The plant growth regulator "Maleic Hydrazide" was used in the experiment. Maleic hydrazide powder was used to prepare 50 ppm and 100 ppm solutions, respectively. The solutions were prepared through following procedures:

a) Maleic hydrazide 50 ppm (G_1): To make maleic hydrazide 50 ppm solution 0.05 g maleic hydrazide powder mixed with 0.5 ml NH_4OH solution. Then 0.5 ml surfactant was added with the solution for increasing the additive value. Then the solution was made up to 1000 ml by adding distilled water and shaked well.

b) Maleic hydrazide 100 ppm (G_2): To make maleic hydrazide 100 ppm solution 0.1 g maleic hydrazide powder mixed with 1 ml NH_4OH solution. Then 1 ml surfactant was added with the solution for increasing the additive value. Then the solution was made up to 1000 ml by adding distilled water and shaked well.

3.14 Application of maleic hydrazide

The prepared different maleic hydrazide solutions (50 and 100 ppm) were applied at four times during vegetative stage, flower initiation stage and 2 times at blooming flowers by a mini hand sprayer.

3.15 Intercultural operations

3.15.1 Gap filling

The experimental plot was taken under careful observation. Very few seedlings were damaged after transplanting. The damaged seedlings were replaced by new healthy seedlings. The seedlings were taken from the same stock. The seedlings were

transplanted to the soil with care to avoid any damages. The newly transplanted seedlings were under special care for their proper establishment.

3.15.2 Weeding

The plants were kept under careful observation. Weeding was done at two times. First weeding was done two weeks after transplanting. Another weeding was done after 30 days of first weeding.

3.15.3 Irrigation

For better establishment, light irrigation was applied immediately after transplanting around each seedling. Watering was done for up to five days until they could establish their own root system. Irrigation was given based on the moisture content of the soil. After well establishment of the seedlings watering was given with irrigation channels. At the reproductive stage no water stress was encountered. Proper drainage facilities were made surrounding the experimental plots for drainage of excess water.

3.15.4 Vine management

For proper growth and development of the plants the vines were managed by hand to spread them over the net of trellis.

3.15.5 Trellis

Four bamboo poles were set keeping 5 feet high from the ground level in every plot. These poles were connected to one another by bamboo. Bamboo, plastic rope and jute rope was used to make the trellis. A bamboo stick was placed near the seedling. Thus a trellis for each plot was made for creeping the vines of crop.

3.15.6 Pest control

During the period of establishment of seedling in the field insect infestation was a serious problem. Some plants were infested with Aphid, to control them Tafgar @ 2.5 ml/l was applied. Along with these some plants were infected with powdery mildew to control it S-dust (sulcox) was sprayed @ 5 g/l. At the reproductive stage fruit fly was seen to harm the fruit, to control them pheromone trap was set up 1 trap/10m. At different times diseased leaves were removed from the field.

3.15.7 General observation

The field was frequently observed to notice any changes in plants, pest and disease attack and necessary action was taken for normal plant growth.

3.16 Harvesting

Harvesting was done by hand picking. Fruits were harvested at full maturity. They were harvested when the fruits became yellowish in color. Harvesting of fruits was started at 65 DAT and continued up to final harvest based on the marketable size of fruits.

3.17 Collection of data

The data pertaining to following characters were recorded from the plants from each plot. The following parameters were studied for the present experiment.

3.17.1 Number of branches per plant

The total number of branches per plant was recorded from each plant of muskmelon. The data were recorded at final harvest and average was calculated.

3.17.2 Days to 50% flowering

The number of days required between the dates of transplanting to the dates of 50% flower emergence of a plant was recorded and average was calculated.

3.17.3 Number of male flowers per plant

The total number of male flowers per plant was counted from each plot after flowering and mean value was calculated.

3.17.4 Number of female flowers per plant

The total number of female flowers per plant was counted from each plot after flowering and mean value was calculated.

3.17.5 Female flowers percentage per plant

The total number of female flowers per plant was divided by the total number of male and female flowers per plant to count the female flowers percentage per plant.

3.17.6 Days to 1st fruit harvest

This data was recorded during the first harvest of fruit from every plant and plot. It was measured as the days taken from transplanting to first harvesting.

3.17.7 Fruit length

Length of each fruit was recorded during the harvesting from individual plant and average fruit length was calculated. Fruit length was calculated in centimeter (cm).

3.17.8 Fruit diameter

During harvesting diameter of each fruit was recorded from individual plant and average fruit diameter was calculated. Fruit diameter was calculated in centimeter (cm).

3.17.9 Number of fruits per plant

The total number of fruits per plant was counted after setting of fruits and average was calculated.

3.17.10 Individual fruit weight

The weight of individual fruit was recorded after each harvest and expressed in gram (g) and mean value was calculated.

3.17.11 Fruit yield per plant

The fruit weight of all the fruits harvested from a plant was recorded and the sum of all fruit of a plant was calculated. The fruit yield was expressed in kilogram (kg).

3.17.12 Fruit yield per hectare

Yield per hectare of muskmelon was calculated by converting the per plot yield into hectare and was expressed in ton.

3.17.13 Total soluble solids

For total soluble solids content, five mature fruits were chosen and a 1 inch by 1 inch center piece of each fruit was squeezed and the obtained juice was placed on a

digital hand-held pocket refractometer (ERMA- 0-32°B, Tokyo, Japan) at room temperature. Every single fruit was blended and juice was collected to measure °brix.

3.17.14 Total sugar content

Total sugar content was estimated in fresh fruit samples at the time of harvest. Dissolved 0.2 g of enthrone in 100 ml of concentrated sulphuric acid. Fresh solution was prepared just before use. One ml of the aliquot was taken in a test tube. The volume was made up to 2.5 ml with distilled water. All the test tubes were kept in the ice bath and to which, 5.0 ml of enthrone reagent was added slowly. Contents were stirred gently with a glass rod and heated on boiling water bath exactly for 7.5 minutes and cooled immediately on ice bath. After cooling, the absorbance of the solutions was measured at 630 nm against the blank in a spectrophotometer and the sugar content was calculated from the standard curve. The total sugar content was expressed in percentage (%).

3.17.15 Vitamin C content

Vitamin-C was measured by Oxidation Reduction Titration Method. The fruit was blend and its extract was filtrated by Whatman No.1 filter paper. It was then mixed with 3% metaphosphoric acid solution. The titration was conducted in presence of glacial acetic acid and metaphosphoric acid to inhibit aerobic oxidation with dye solution (2, 6-dichlorophenol indophenol). The solution was titrated with dye. The observations mean will give, the amount of dye required to oxidize definite amount of L-ascorbic acid solution of unknown concentration, using L-ascorbic acid as known sample. It was measured in Horticultural Biotechnology and Stress Management Lab, Sher-e-Bangla Agriculture University, Dhaka.

3.18 Data analysis technique

The collected data were compiled and tabulated. Statistical analysis was done on various plant characters to find out the significance of variance resulting from the experimental treatments. Data were analyzed using analysis of variance (ANOVA) technique with the help of computer package program MSTAT-C (software) and the mean differences were determined by least significant difference test (LSD) as laid out by Gomez and Gomez (1984).

CHAPTER IV

RESULTS AND DISCUSSION

CHAPTER IV

RESULTS AND DISCUSSION

The experiment was conducted to investigate the effect of mulching and maleic hydrazide on growth, yield and quality of muskmelon under the soil and agro climatic condition of Sher-e-Bangla Agricultural University (SAU), Dhaka. Data on different growth, yield and quality parameters were recorded. The analysis of variance (ANOVA) of the data on different growth and yield parameters are presented in Appendix (V-IX). This chapter comprises of the presentation and discussion of the results obtained from the present study. The results have been presented, discussed and possible interpretations were given in tabular and graphical forms. The results obtained from the experiment have been presented under separate headings and sub-headings as follows:

4.1 Number of branches per plant

Significant variation was recorded on number of branches per plant due to different mulching practices under the experiment (Table 1 and Appendix V). At harvest, the maximum number of branches per plant (11.66) was obtained from M_b (Black polythene mulch) treatment and the minimum number of branches per plant (9.32) was revealed from M_0 (No mulch) treatment. It was revealed that the number of branches per plant increased with the various mulching treatments. The results of the experiment was coincided with the findings of Parmar *et al*. (2013) who reported that various forms of mulching content had a major effect on parameters like the number of branches per vine, the length of the vine and the number of nodes per vine over control. Silver on black polyethylene mulch recorded high yield and better quality characters whereas low yield is recorded in no mulch condition. Mutetwa and Mtaita (2014) found the similar trends and reported that the colored plastic mulch reduced weed population and increased production. Silvery grey colored mulch found to be suitable for producing superior branches, fruits, fruit size, and good yield in cucumber as compare to other mulches like wheat straw and blue colored mulch.

Maleic hydrazide showed significant influence on number of branches per plant (Table 2 and Appendix V). At harvest, the maximum number of branches per plant (11.27) was observed from G_2 (100 ppm) treatment. On the other hand the minimum number of branches per plant (9.86) was observed from G_0 (Control) treatment. The

findings of the experiment were coincided with the findings of Kaur *et al.* (2016). They reported that application of maleic hydrazide and ethephon application @ 100 ppm improved the number of secondary branches and led to early production and yield of cucumber. The investigation concludes that foliar application of maleic hydrazide and ethephon can help promote feminism and increase the yield of cucumber crop. Verma *et al.* (2019) reported that the highest morphological characters *viz.,* plant height, number of leaves per plant, number of branches per plant, stem girth per plant and leaf area index were recorded in 100 ppm MH + 60 ppm GA_3.

Significant influence was recorded on number of branches per plant due to the combined effect of different mulching and maleic hydrazide (Table 3 and Appendix V). Results of the experiment showed that the maximum number of branches per plant at harvest (12.47) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which is statistically similar to M_bG_1 treatment combination. On the other hand the minimum number of branches per plant at harvest (8.67) was observed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which is statistically similar to M_0G_1 treatment combination.

4.2 Days to 50% flowerings

Days to 50% flowerings showed significant variation due to different mulching (Table 1 and Appendix V). Results from the experiment showed that the maximum days to 50% flowerings (38.69) was recorded from M_0 (no mulch) treatment where the minimum days to 50% flowerings (36.20) was revealed from M_b (Black polythene mulch) treatment. The findings of the experiment was coincided with the findings of Sageer *et al.* (2015) who reported that black polyethylene mulch increased the yield, vine length and flowering when mulch was used in sponge gourd (Pusa Chikni variety). No mulch treatment gave low yield and poor-quality fruits.

There was marked variation was noticed on days to 50% flowerings of muskmelon due to different levels of maleic hydrazide (Table 2 and Appendix V). It was revealed that the maximum days to 50% flowerings (38.02) were observed from G_0 (control) treatment. On the other hand the minimum days to 50% flowerings (36.74) were observed from G_2 (100 ppm) treatment which was statistically similar to G_1 treatment. Result from the experiment was coincided with the findings of Arora *et al.* (1982).

They reported that staminate flowers appeared late and at the lowest node number in control plants, whereas MH at 150 mg/l had a profound effect on the earliest appearance of pistillate flowers at the lowest node number.

Days to 50% flowerings were observed significant influence due to combined effect of different mulching practices and maleic hydrazide applications (Table 3 and Appendix V). From the results of the experiment showed that the maximum days to 50% flowerings (39.20) was observed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which was statistically similar with M_0G_1 and M_0G_2 treatment combinations. On the other hand the minimum days to 50% flowerings (35.48) was obtained from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which was statistically similar with M_bG_1 and M_wG_2 treatment combinations.

Table 1. Effect of mulching on number of branches per plant, days to 50% flowering and days to first fruit harvest of muskmelon

Treatments	No. of branches per plant	Days to 50% flowering
M_0	9.32 c	38.69 a
M_b	11.66 a	36.20 c
M_w	10.89 b	37.03 b
$LSD_{(0.05)}$	**0.52**	**0.70**
CV%	**4.96**	**1.90**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Table 2. Effect of maleic hydrazide on number of branches per plant and days to 50% flowering of muskmelon

Treatments	No. of branches per plant	Days to 50% flowering
G_0	9.86 c	38.02 a
G_1	10.73 b	37.16 b
G_2	11.27 a	36.74 b
$LSD_{(0.05)}$	**0.52**	**0.70**
CV%	**4.96**	**1.90**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Table 3. Combined effect of mulching and maleic hydrazide on number of branches per plant and days to 50% flowering of muskmelon

Treatment combinations	No. of branches per plant	Days to 50% flowering
M_0G_0	8.67 g	39.20 a
M_0G_1	9.36 fg	38.62 ab
M_0G_2	9.93 ef	38.25 abc
M_bG_0	10.67 cde	37.15 cde
M_bG_1	11.83 ab	35.97 ef
M_bG_2	12.47 a	35.48 f
M_wG_0	10.25 def	37.70 bcd
M_wG_1	11.00 bcd	36.90 de
M_wG_2	11.42 bc	36.50 def
$LSD_{0.05}$	**0.91**	**1.22**
CV%	**4.96**	**1.90**

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

Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch; G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

4.3 Number of male flowers per plant

Significant difference on number of male flowers per plant was noticed due to different mulching practices (Table 4 and Appendix VI). Results from the experiment showed that the maximum number of male flowers per plant (98.58) was recorded from M_0 (No mulch) treatment where the minimum number of male flowers per plant (71.41) was revealed from M_b (Black polythene mulch) treatment. Kumar and Sharma (2018) observed the similar results. This study revealed that black plastic mulch along variety Surya gave maximum female flowers that led to highest yield and shown good crop improvement.

Number of male flowers per plant showed significant difference due to different levels of maleic hydrazide application (Table 5 and Appendix VI). It was revealed that the maximum number of male flowers per plant (91.53) was observed from G_0 (control) treatment while the minimum number of male flowers per plant (76.69) was observed from G_2 (100 ppm) treatment. The findings of the present study was coincided with the findings of Arora *et al.* (1982) who reported that staminate flowers appeared late and at the lowest node number in control plants, whereas MH at 150 mg/l had a profound effect on the earliest appearance of pistillate flowers at the lowest node number.

Marked influence was exerted on number of male flowers per plant of muskmelon due to the combined effect of different mulching and maleic hydrazide applications (Table 6 and Appendix VI). From the results of the experiment showed that the maximum number of male flowers per plant (103.22) was observed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination. On the other hand the minimum number of male flowers per plant (63.23) was revealed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination.

4.4 Number of female flowers per plant

Significant difference on number of female flowers per plant was noticed due to different mulching practices (Table 4 and Appendix VI). Results from the experiment showed that the maximum number of female flowers per plant (15.20) was recorded from M_b (Black polythene mulch) treatment where the minimum number of female flowers per plant (10.27) was revealed from M_0 (No mulch) treatment. Kumar and Sharma (2018) observed the similar results. This study revealed that black plastic

mulch along variety Surya gave maximum female flowers that led to highest yield and shown good crop improvement.

Number of female flowers per plant showed significant difference due to different levels of maleic hydrazide application (Table 5 and Appendix VI). It was revealed that the maximum number of female flowers per plant (14.41) was observed from G_2 (100 ppm) treatment while the minimum number of female flowers per plant (11.48) was observed from G_0 (control) treatment. The findings of the present study was coincided with the findings of Thappa *et al.* (2011) who revealed that the influence of the plant growth regulators was variable on the morphological traits of cucumber but the floral and yield traits were significantly affected by a combined application of 100 ppm maleic hydrazide and 100 ppm ethephon. Arora *et al.* (1982) reported that staminate flowers appeared late and at the lowest node number in control plants, whereas MH had a profound effect on the earliest appearance of pistillate flowers at the lowest node number.

Marked influence was exerted on number of female flowers per plant of muskmelon due to the combined effect of different mulching and maleic hydrazide applications (Table 6 and Appendix VI). From the results of the experiment showed that the maximum number of female flowers per plant (17.31) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination. On the other hand the minimum number of female flowers per plant (9.51) was revealed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which was statistically similar to M_0G_1 treatment combination.

4.5 Female flowers percentage per plant

Significant difference on female flowers percentage per plant was noticed due to different mulching practices (Table 4 and Appendix VI). Results from the experiment showed that the maximum number of female flowers percentage per plant (17.55) was recorded from M_b (Black polythene mulch) treatment where the minimum female flowers percentage per plant (9.44) was revealed from M_0 (No mulch) treatment. Mutetwa and Mtaita (2014) observed the similar results.

Female flowers percentage per plant showed significant difference due to different levels of maleic hydrazide application (Table 5 and Appendix VI). It was revealed

that the maximum female flowers percentage per plant (15.82) was observed from G_2 (100 ppm) treatment while the minimum female flowers percentage per plant (11.14) was observed from G_0 (control) treatment. The findings of the present study was coincided with the findings of Thappa *et al.* (2011) who stated that certain growth regulating chemicals *viz*., NAA, GA_3, maleic hydrazide and 2,4-D have been reported to influence sex expression in various cucurbits, leading to either suppression of male flowers or an enhancement in the number of female flowers. The growth regulators suppress the number of male flowers on lateral branches. Therefore, they increase the female flower production on lateral branches and thereby finally increase the yield.

Marked influence was exerted on female flowers percentage per plant of muskmelon due to the combined effect of different mulching and maleic hydrazide applications (Table 6 and Appendix VI). From the results of the experiment showed that the maximum female flowers percentage per plant (21.49) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination. On the other hand the minimum female flowers percentage per plant (8.44) was revealed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which was statistically similar to M_0G_1 and M_0G_2 treatment combination, respectively.

4.6 Days to 1st fruit harvest

Days to first fruit harvest showed significant variation due to different mulching (Table 4 and Appendix VI). Results from the experiment showed that the maximum days to first fruit harvest (72.30) was recorded from M_0 (no mulch) treatment where the minimum days to first fruit harvest (66.77) was revealed from M_b (Black polythene mulch) treatment. The findings of the experiment were coincided with the findings of Soleymani *et al.* (2015). Torres *et al*. (2016) revealed that mulch color mostly affected on days to flowering and fruit harvest. The best result was recorded under shade house mulches which recorded high yield and quality of cucumber.

Statistically significant variation was noticed on days to first fruit harvest of muskmelon due to different levels of maleic hydrazide application (Table 5 and Appendix VI). It was revealed that the maximum days to first fruit harvest (70.83) were observed from G_0 (control) treatment. On the other hand the minimum days to first fruit harvest (67.80) were observed from G_2 (100 ppm) treatment which was statistically similar to G_1 treatment. Result from the experiment was coincided with

the findings of Kaur *et al.* (2016) who reported that application of maleic hydrazide and ethephon application @ 100 ppm led to early production and yield of cucumber. The investigation concludes that foliar application of maleic hydrazide and ethephon can help promote feminism and increase the yield of cucumber crop.

Days to first fruit harvest were observed significant influence due to combined effects of different mulching practices and maleic hydrazide applications (Table 6 and Appendix VI). From the results of the experiment showed that the maximum days to first fruit harvest (73.10) was observed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which was statistically similar to M_0G_1 treatment combinations. On the other hand the minimum days to first fruit harvest (65.30) was obtained from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which was statistically similar with M_bG_1 and M_wG_2 treatment combinations.

Table 4. Effect of mulching on number of male and female flowers per plant, female flowers percentage per plant and days to first fruit harvest of muskmelon

Treatments	Number of male flowers per plant	Number of female flowers per plant	female flowers percentage	Days to first fruit harvest
M_0	98.58 a	10.27 c	9.44 c	72.30 a
M_b	71.41 c	15.20 a	17.55 a	66.77 c
M_w	80.63 b	13.28 b	14.14 b	68.17 b
$LSD_{(0.05)}$	**2.26**	**0.63**	**1.49**	**0.83**
CV%	**2.72**	**4.95**	**10.84**	**1.20**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Table 5. Effect of maleic hydrazide on number of male and female flowers per plant, female flowers percentage per plant and days to first fruit harvest of muskmelon

Treatments	Number of male flowers per plant	Number of female flowers per plant	Female flowers percentage	Days to first fruit harvest
G_0	91.53 a	11.48 c	11.14 c	70.83 a
G_1	82.40 b	12.86 b	13.50 b	68.60 b
G_2	76.69 c	14.41 a	15.82 a	67.80 b
$LSD_{(0.05)}$	**2.26**	**0.63**	**1.49**	**0.83**
CV%	**2.72**	**4.95**	**10.84**	**1.20**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Table 6. Combined effect of mulching and maleic hydrazide on number of male and female flowers per plant, female flowers percentage per plant and days to first fruit harvest of muskmelon

Treatment combinations	Number of male flowers per plant	Number of female flowers per plant	Female flowers percentage	Days to first fruit harvest
M_0G_0	103.22 a	9.51 f	8.44 f	73.10 a
M_0G_1	98.37 b	9.81 f	9.07 f	72.30 ab
M_0G_2	94.14 c	11.49 e	10.88 ef	71.50 bc
M_bG_0	82.46 e	12.67 d	13.32 de	69.00 d
M_bG_1	68.55 g	15.61 b	18.55 b	66.00 f
M_bG_2	63.23 h	17.31 a	21.49 a	65.30 f
M_wG_0	88.92 d	12.27 de	12.13 de	70.40 cd
M_wG_1	80.29 e	13.15 d	14.07 cd	67.50 e
M_wG_2	72.69 f	14.42 c	16.55 bc	66.60 ef
$LSD_{0.05}$	**3.92**	**1.10**	**2.59**	**1.43**
CV%	**2.72**	**4.95**	**10.84**	**1.20**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch; G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

4.7 Fruit length

Statistically significant variation on fruit length was noticed due to different mulching practices during the present study (Fig. 1 and Appendix VII). Results from the experiment showed that the maximum fruit length (26.30 cm) was recorded from M_b (Black polythene mulch) treatment where the minimum length of fruit (22.90 cm) was revealed from M_0 (No mulch) treatment. Ram *et al*. (2015) concluded that mulching not only regulates the soil temperature, it also affects the chemical properties of soil as well as growth and development of summer squash. Homez and Arouiee (2016) reported that the highest number of fruits, fruit length, fruit diameter and fruit yield was recorded in black polythene mulch.

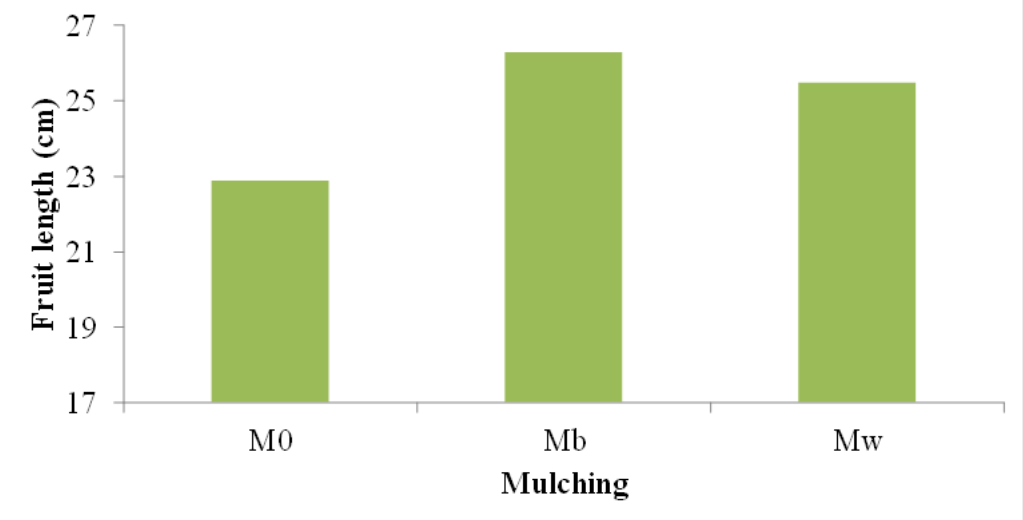

Figure 1. Effect of mulching on fruit length of muskmelon ($LSD_{0.05}$=0.43)
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Fruit length was significantly influenced by different levels of maleic hydrazide application (Fig. 2 and Appendix VII). It was revealed that the maximum fruit length (25.76 cm) was observed from G_2 (100 ppm) treatment while the minimum fruit length (23.81 cm) was recorded from G_0 (control) treatment. Sarkar *et al.* (2019) concluded that sex modification and fruit setting was enhanced by MH. Number of leaves, leaf area, and numbers of fruit, fruit length, fruit diameter and fruit yield were also remarkably increased except plant height after MH application at different stages.

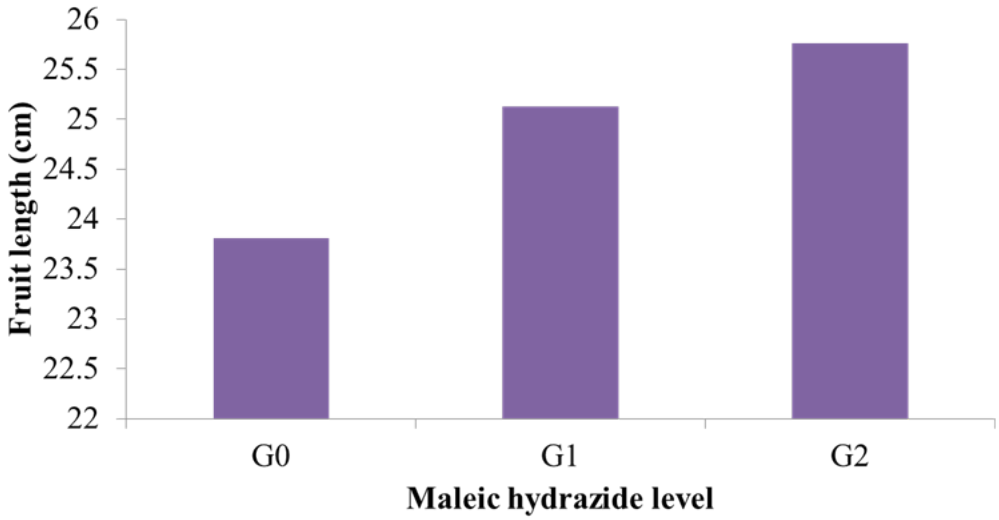

Figure 2. Effect of maleic hydrazide on fruit length of muskmelon ($LSD_{0.05}$=0.43)
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Marked variation was observed on fruit length of muskmelon due to the combined effect of different mulching and maleic hydrazide during the experimentation (Table 9 and Appendix VII). The maximum fruit length (27.28 cm) was obtained from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination. On the other hand the minimum fruit length (21.49 cm) was revealed from M_0G_0 (No mulch + no maleic hydrazide) treatment combination.

4.8 Fruit diameter

Statistically significant variation on fruit diameter was noticed due to different mulching practices (Fig. 3 and Appendix VII). Results from the experiment showed that the maximum fruit diameter (35.73 cm) was recorded from M_b (Black polythene mulch) treatment where the minimum diameter of fruit (31.29 cm) was revealed from M_0 (No mulch) treatment. Sageer *et al*. (2015) observed that black polyethylene mulch increased the yield, length, flowering, vine spread, fruit length, fruit diameter, fruits per plant and yield when mulch was used in sponge gourd (Pusa Chikni variety). No mulch treatment gave low yield and poor-quality fruits.

Fruit diameter was significantly influenced by different levels of maleic hydrazide application (Fig. 4 and Appendix VII). It was revealed that the maximum fruit diameter (34.98 cm) was observed from G_2 (100 ppm) treatment while the minimum fruit diameter (32.57 cm) was recorded from G_0 (control) treatment. Sarkar *et al.* (2019) reported that numbers of fruit per plant, fruit length, fruit diameter, and fruit

yield were also remarkably increased except plant height after MH application at different stages.

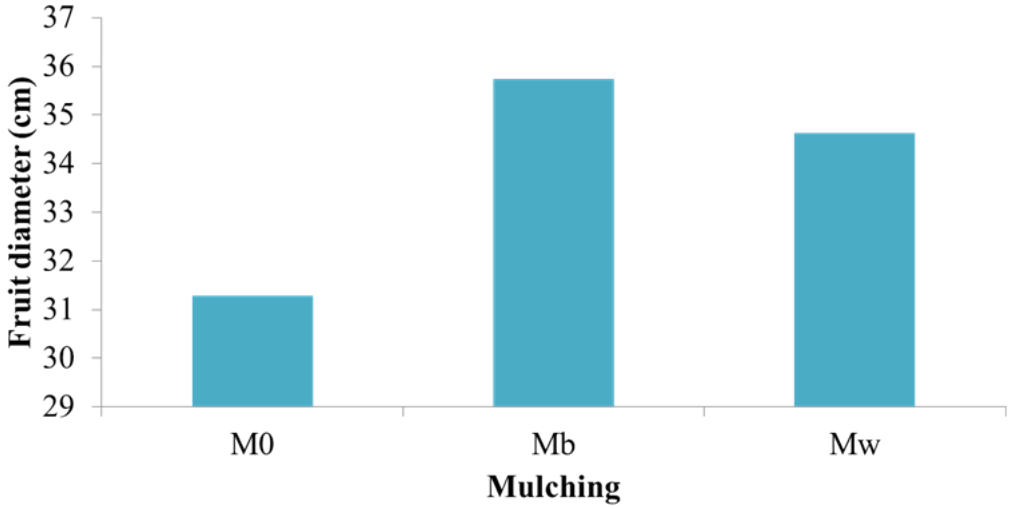

Figure 3. Effect of mulching on fruit diameter of muskmelon ($LSD_{0.05}$=0.69)
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

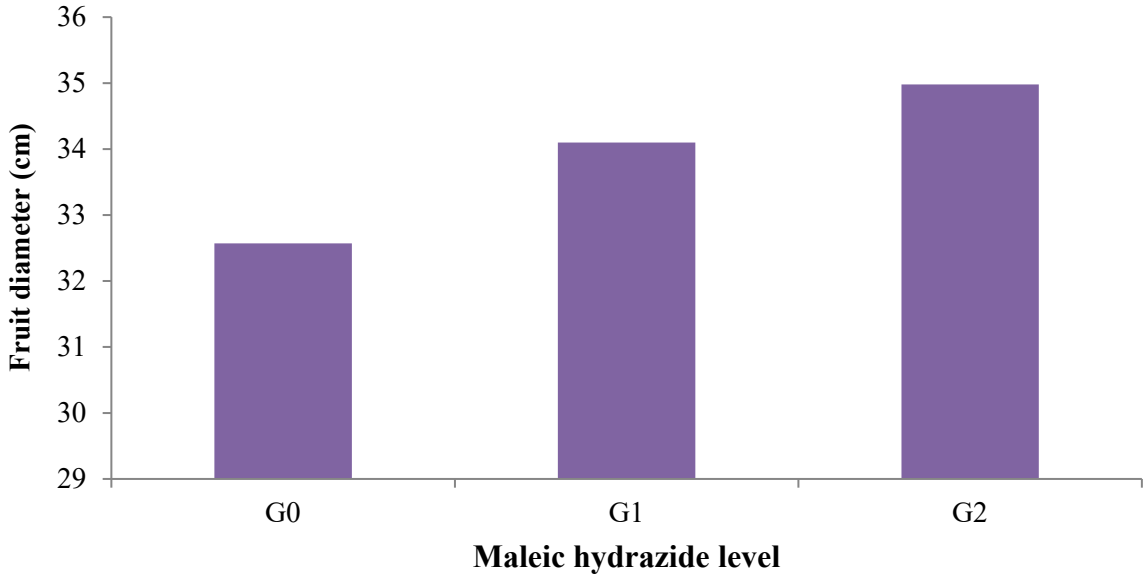

Figure 4. Effect of maleic hydrazide on fruit diameter of muskmelon ($LSD_{0.05}$=0.69)
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Significant variation was observed on fruit diameter of muskmelon due to the combined effects of different mulching and maleic hydrazide during the experimentation (Table 9 and Appendix VII). The maximum fruit diameter (37.02 cm) was obtained from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which was statistically similar to M_bG_1 treatment combination.

On the other hand the minimum fruit diameter (29.85 cm) was revealed from M_0G_0 (No mulch + control) treatment combination.

4.9 Number of fruits per plant

Significant difference on number of fruits per plant was noticed due to different mulching (Table 7 and Appendix VII). Results from the experiment showed that the maximum number of fruits per plant (3.45) was recorded from M_b (Black polythene mulch) treatment where the minimum number of fruits per plant (1.91) was revealed from M_0 (No mulch) treatment. Atif (2014) observed the similar result. He concluded that plots are covered with black plastic mulch in squash and okra vegetable increased fruit yield, weight and fruit number. Islam et al. (2021) revealed that fruit number, average fruit weight, fruit length, fruit diameter were strongly related to soil moisture content. The effect of different plastic mulches on fruit number, fruit weight per plant and yield (t/ha) was significant. Homez and Arouiee (2016) revealed that the highest number of fruits and yield was recorded in black polythene mulch.

Number of fruits per plant showed significant difference due to application of different levels of maleic hydrazide (Table 8 and Appendix VII). It was revealed that the maximum number of fruits per plant (3.13) was observed from G_2 (100 ppm) treatment while the minimum number of fruits per plant (2.32) was observed from G_0 (control) treatment. The findings of the present study were coincided with the findings of Arora *et al.* (1982). They reported that MH was most effective in producing the maximum number of fruits and fruit weight per plant and ultimately the yield. GA_3, NAA and ethrel did not influence yield, while MH did.

Marked influence was exerted on number of fruits per plant of fenugreek due to the combined effect of different mulching practices and application of maleic hydrazide (Table 9 and Appendix VII). From the results of the experiment showed that the maximum number of fruits per plant (3.83) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination. On the other hand the minimum number of fruits per plant (1.66) was revealed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination.

4.10 Weight of individual fruit per plant

Weight of individual fruit per plant revealed marked variation due to different mulching during the present experiment (Table 7 and Appendix VII). Results from the experiment showed that the maximum weight of individual fruit per plant (971.20 g) was obtained from M_b (Black polythene mulch) treatment where the minimum weight of individual fruit per plant (766.81 g) was noted from M_0 (No mulch) treatment. Alemayehu-Ambaye and Joseph (2002) found the similar trends and stated that plastic mulch increases the fruit weight, fruit number in watermelon where as in cow pea it increased number of pods, grain yield and 100 seed weight. Their findings concluded that plastic mulch increased the yield and vegetative growth in watermelon and cow pea. Mahadeen (2014) reported mulched plots recorded with high moisture content had positive effect on yield. The increase in fruit weight and yield in both crops of okra and summer squash were also reported.

Significant influence was observed on weight of individual fruit per plant due to different levels of maleic hydrazide application (Table 8 and Appendix VII). It was revealed that the maximum weight of individual fruit per plant (941.25 g) was observed from G_2 (100 ppm) treatment while the minimum weight of individual fruit per plant (803.91 g) was recorded from G_0 (control) treatment. Kaur *et al.* (2016) revealed that application of maleic hydrazide and ethephon application @ 100 ppm led to fruit weight and yield of cucumber. Thappa *et al.* (2011) reported that the influence of the plant growth regulators was variable on the morphological traits of cucumber but the floral and fruit yield traits were significantly affected by a combined application of 100 ppm maleic hydrazide and 100 ppm ethephon.

Weight of individual fruit per plant of muskmelon revealed statistically significant variation due to the combined effect of different mulching practices and application of maleic hydrazide during the experimentation (Table 9 and Appendix VII). From the results of the experiment showed that the maximum weight of individual fruit per plant (1074.40 g) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination while the minimum weight of individual fruit per plant (702.00 g) was obtained from M_0G_0 (No mulch + No maleic hydrazide) treatment combination.

Table 7. Effect of mulching on number of fruits per plant and weight of individual fruit per plant of muskmelon

Treatments	Number of fruits per plant	Weight of individual fruit per plant (g)
M_0	1.91 c	766.81 c
M_b	3.45 a	971.20 a
M_w	2.97 b	887.22 b
$LSD_{(0.05)}$	**0.07**	**15.55**
CV%	**2.58**	**1.78**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Table 8. Effect of maleic hydrazide on number of fruits per plant and weight of individual fruit per plant of muskmelon

Treatments	Number of fruits per plant	Weight of individual fruit per plant (g)
G_0	2.32 c	803.91 c
G_1	2.88 b	880.08 b
G_2	3.13 a	941.25 a
$LSD_{(0.05)}$	**0.07**	**15.55**
CV%	**2.58**	**1.78**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Table 9. Combined effect of mulching and maleic hydrazide on fruit length and fruit diameter, number of fruits per plant and weight of individual fruit per plant of muskmelon

Treatment combinations	Fruit length (cm)	Fruit diameter (cm)	Number of fruits per plant	Weight of individual fruit per plant (g)
M_0G_0	21.49 g	29.85 f	1.66 i	702.00 h
M_0G_1	23.38 f	31.55 e	1.93 h	776.80 g
M_0G_2	23.84 f	32.47 de	2.15 g	821.60 f
M_bG_0	25.19 de	34.23 c	2.81 e	867.90 de
M_bG_1	26.44 b	35.95 ab	3.70 b	971.30 b
M_bG_2	27.28 a	37.02 a	3.83 a	1074.40 a
M_wG_0	24.75 e	33.63 cd	2.50 f	841.80 ef
M_wG_1	25.56 cd	34.81 bc	3.00 d	892.20 d
M_wG_2	26.16 bc	35.44 b	3.41 c	927.70 c
$LSD_{0.05}$	**0.75**	**1.19**	**0.12**	**26.93**
CV%	**1.76**	**2.04**	**2.58**	**1.78**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch; G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

4.11 Fruit yield per plant

Significant variation was revealed on fruit yield per plant due to the effect of different mulch materials during the present study (Fig. 5 and Appendix VIII). Results from the experiment showed that the maximum fruit yield per plant (3.38 kg) was revealed from M_b (Black polythene mulch) treatment where the minimum fruit yield per plant (1.48 kg) was noted from M_0 (No mulch) treatment. Similar trends were observed by Islam *et al.* (2021). They stated that mulching produced higher fruit yield per plant and fruit yield per hectare than for the control, indicating that the mulch had a positive effect in generating increased fruit yield.

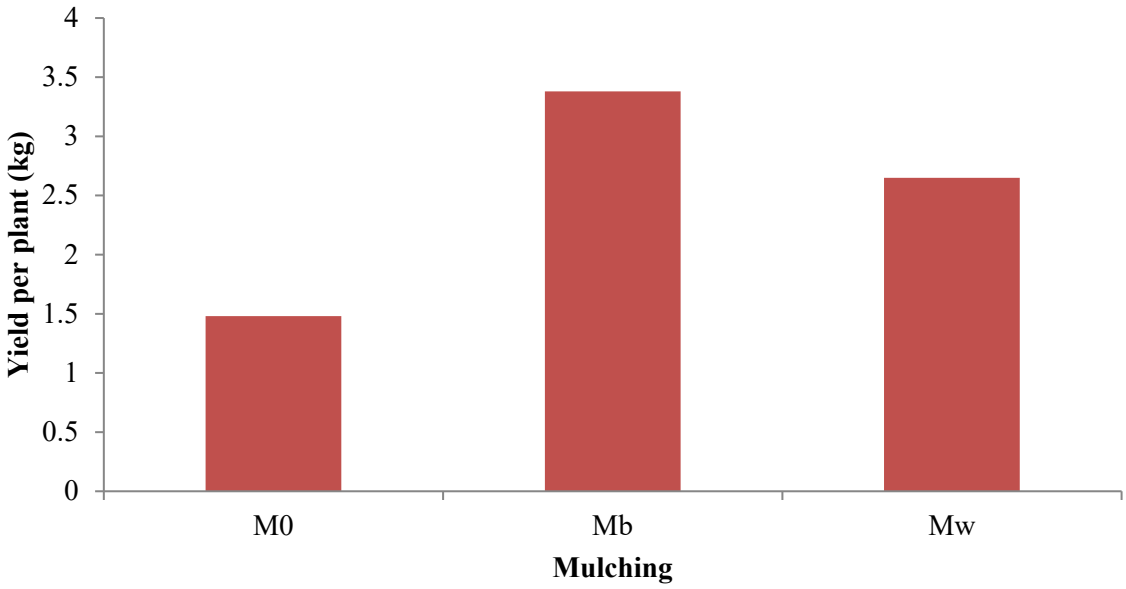

Figure 5. Effect of mulching on yield per plant of muskmelon ($LSD_{0.05}$=0.08)
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Significant influence was observed on fruit yield per plant due to application of different levels of maleic hydrazide during the experimentation (Fig. 6 and Appendix VIII). It was revealed that the maximum fruit yield per plant (3.01 kg) was observed from G_2 (100 ppm) treatment while the minimum fruit yield per plant (1.90 kg) was recorded from G_0 (control) treatment. Arora *et al.* (1982) reported that MH at 150 mg/l had a profound effect on the earliest appearance of pistillate flowers at the lowest node number. Male: female ratio was lowered with MH at 50 mg/l and was most effective in producing the maximum number of fruits and fruit weight per plant and ultimately the yield. GA_3, NAA and ethrel did not influence yield, while MH did. Verma *et al.* (2019) revealed that combination of gibberellic acid and maleic hydrazide, treatment T_9 (100 ppm MH + 60 ppm GA_3) was found significantly superior as compared to other treatments. Yield attributes (*viz.,* no of fruits per plant, fruit yield/plant and fruit yield/ha) were recorded maximum in T_9 (100 ppm MH + 60 ppm GA_3) treatment.

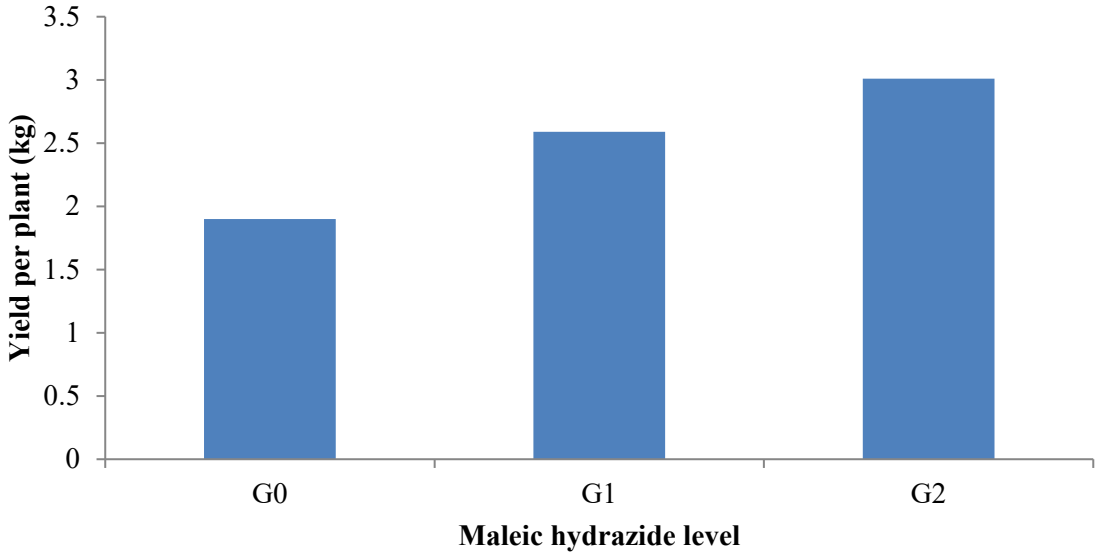

Figure 6. Effect of maleic hydrazide on yield per plant of muskmelon ($LSD_{0.05}$=0.08)
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Fruit yield per plant of muskmelon revealed statistically significant variation due to the combined effect of different mulching and maleic hydrazide (Table 12 and Appendix VIII). From the results of the experiment showed that the maximum fruit yield per plant (4.10 kg) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination while the minimum fruit yield per plant (1.16 kg) was revealed from M_0G_0 (No mulch + No maleic hydrazide) treatment combination.

4.12 Fruit yield per hectare

Significant variation was revealed on fruit yield per hectare due to different mulching practices (Fig. 7 and Appendix VIII). Results from the experiment showed that the maximum fruit yield per hectare (33.76 t) was revealed from M_b (Black polythene mulch) treatment where the minimum fruit yield per hectare (14.77 t) was noted from M_0 (No mulch) treatment. The result of the experiment was coincided with the findings of Islam *et al.* (2021) who stated that mulching produced higher fruit yield per plant and fruit yield per hectare than for the control, indicating that the mulch had a positive effect in generating increased fruit yield. Atif (2014) examined that water use efficiency in agriculture is mostly increased by mulching process. Plots are covered with black plastic mulch in squash and okra vegetable increased fruit yield, weight and fruit number. Luqman *et al*. (2013) reported that the efficiency of

mulching treatments was substantially more successful for fruit yield per hectare than weed check plots.

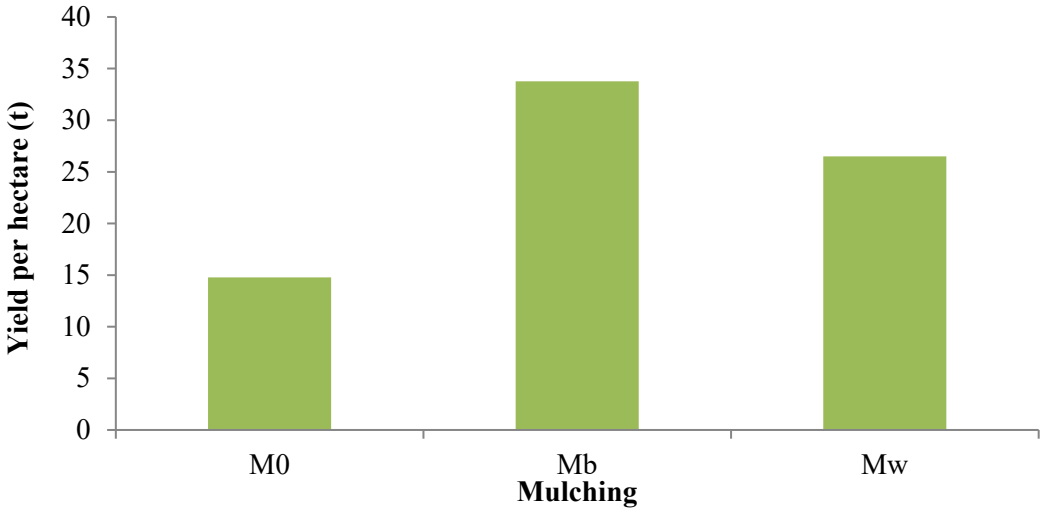

Figure 7. Effect of mulching on yield per hectare of muskmelon ($LSD_{0.05}$=0.82)
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Significant influence was exerted on fruit yield per hectare due to different levels of maleic hydrazide during the experimentation (Fig. 8 and Appendix VIII). It was revealed that the maximum fruit yield per hectare (30.10 t) was observed from G_2 (100 ppm) treatment while the minimum fruit yield per hectare (19.00 t) was recorded from G_0 (control) treatment. The result of the experiment was coincided with the findings of Sarkar *et al.* (2019) who reported that sex modification, fruit setting and fruit yield was enhanced by MH. Number of leaves, leaf area and fruit yield were also remarkably increased except plant height after MH application at different stages. MH increased the dry biomass of fruit resulted from higher chlorophyll content in leaves transferred photosynthates to the fruit. Kaur *et al.* (2016) also observed that application of Maleic hydrazide and ethephon application @ 100 ppm led to early production and fruit yield of cucumber. The investigation concludes that foliar application of maleic hydrazide and ethephon can help promote feminism and increase the yield of cucumber crop.

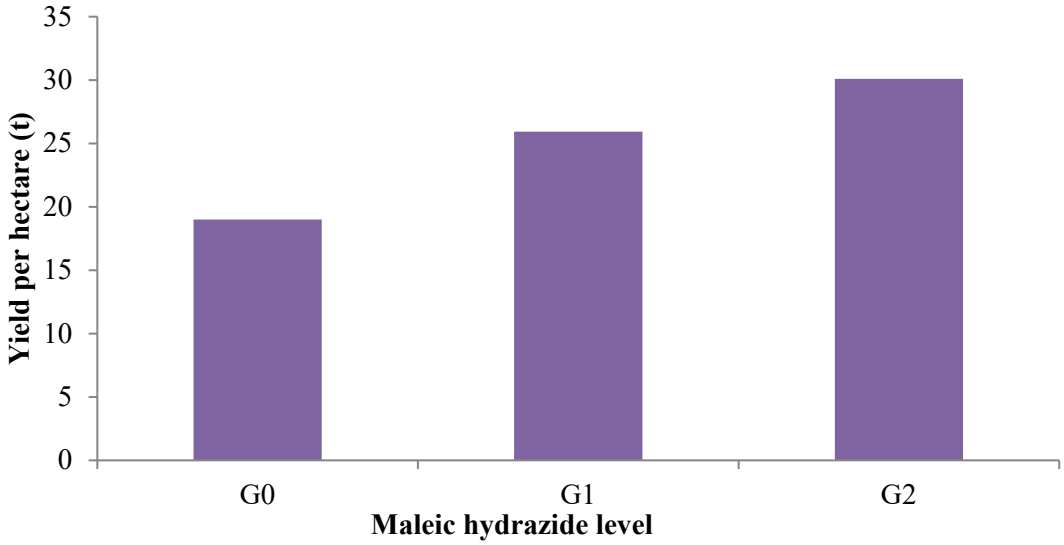

Figure 8. Effect of maleic hydrazide on yield per hectare of muskmelon ($LSD_{0.05}$=0.82)

Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Fruit yield per hectare of muskmelon revealed statistically significant variation due to the combined effect of different mulching and maleic hydrazide (Table 12 and Appendix VIII). From the results of the experiment showed that the maximum fruit yield per hectare (41.00 t) was observed from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination while the minimum fruit yield per hectare (11.60 t) was obtained from M_0G_0 (No mulch + No maleic hydrazide) treatment combination.

4.13 Total soluble solids

Total soluble solids showed significant variation on muskmelon influenced by mulching (Table 10 and Appendix IX). Results showed that the maximum amount of total soluble solids (10.37 °brix) was obtained from M_b (Black polythene mulch) treatment which was statistically similar to M_w. On the other hand the minimum amount of total soluble solids (8.91 °brix) was found from M_0 (No mulch) treatment. The results of the experiment was in agreement with the findings of Sageer *et al.* (2015) who reported that Black polyethylene mulches increases the TSS, total sugar contents, total carotenoids and vitamin C contents in sponge gourd.

Total soluble solids showed significant variation on muskmelon influenced by maleic hydrazide (Table 11 Appendix IX). Results showed that the maximum amount of total soluble solids (10.12 °brix) was obtained from G_2 (100 ppm) treatment which was

statistically similar to G_1. On the other hand the minimum amount of total soluble solids (9.31 °brix) was found from G_0 (control) treatment. Hadvani (2010) found the similar results that highest total sugars, reducing sugar, ascorbic acid and lowest acidity were observed in MH @300 ppm in cv. Rasmadhuri of muskmelon.

Significant variation on total soluble solids of muskmelon was observed due to combined effect of mulching and maleic hydrazide (Table 12 and Appendix IX). Results noted that the maximum amount of total soluble solids (10.93 °brix) was found from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which was statistically similar with M_bG_1 and M_wG_2. On the other hand the minimum amount of total soluble solids (8.55 °brix) was obtained from of M_0G_0 (control) treatment combination which was statistically similar with M_0G_1 and M_0G_2.

4.14 Total sugar contents

Total sugar contents showed significant variation on musk melon influenced by mulching (Table 10 and Appendix IX). Results showed that the maximum amount of total sugar contents (10.68%) was obtained from M_b (Black polythene mulch) treatment. On the other hand the minimum amount of total sugar contents (9.25%) was found from M_0 (No mulch) treatment. Similar result was observed by Sageer *et al.* (2015). Sageer *et al.* (2015) reported that black polyethylene mulches increases the TSS, total sugar contents, total carotenoids and vitamin C contents in sponge gourd.

Statistically significant influence on total sugar contents was observed on muskmelon due to the application of different levels of maleic hydrazide (Table 11 and Appendix IX). Results showed that the maximum amount of total sugar contents (10.41%) was obtained from G_2 (100 ppm) treatment. On the other hand the minimum amount of total sugar contents (9.53%) was found from G_0 (control) treatment. Hadvani (2010) found that highest total sugars, reducing sugar, ascorbic acid and lowest acidity were observed in MH 300 ppm in cv. Rasmadhuri of muskmelon.

Significant variation on total sugar contents of muskmelon was observed due to combined effect of mulching and maleic hydrazide (Table 12 and Appendix IX). Results noted that the maximum amount of total sugar contents (11.23%) was found from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment

combination while the minimum amount of total sugar contents (8.87%) was obtained from M_0G_0 (No mulch + No maleic hydrazide) treatment combination.

4.15 Vitamin C contents

Vitamin C contents showed significant variation on muskmelon influenced by mulching (Table 10 and Appendix IX). Results showed that the maximum amount of vitamin C contents (20.83 mg/100 g) was obtained from M_b (Black polythene mulch) treatment. On the other hand the minimum amount of vitamin C contents (18.40 mg/100 g) was found from M_0 (No mulch) treatment. Roudan and Abbdosi (2015) reported that mulches helps to increases the TSS, total sugars and vitamin C contents in cucumber.

Marked difference was observed on vitamin C contents influenced by application of different levels of maleic hydrazide (Table 11 and Appendix IX). Results showed that the maximum amount of vitamin C contents (20.39 mg/100 g) was obtained from G_2 (100 ppm) treatment which was statistically similar to G_1 treatment (19.70 mg/100 g). On the other hand the minimum amount of vitamin C contents (18.91 mg/100 g) was found from G_0 (control) treatment. Hadvani (2010) reported that highest total sugars, reducing sugar, ascorbic acid (vitamin C) and lowest acidity were observed in MH 300 ppm in cv. Rasmadhuri of muskmelon.

Significant variation on vitamin C contents of muskmelon was observed due to combined effect of mulching and maleic hydrazide (Table 12 and Appendix IX). Results noted that the maximum amount of vitamin C contents (22.15 mg/100 g) was found from M_bG_2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination which was statistically similar to M_bG_1 treatment combinations while the minimum amount of vitamin C contents (17.81 mg/100 g) was obtained from M_0G_0 (No mulch + No maleic hydrazide) treatment combination which was statistically similar to M_0G_1 treatment combinations.

Table 10. Effect of mulching on total soluble solids, total sugar and vitamin C contents of muskmelon

Treatments	Total soluble solids (°Brix)	Total sugar contents (%)	Vitamin C contents (mg/100g)
M_0	8.91 b	9.25 c	18.40 c
M_b	10.37 a	10.68 a	20.83 a
M_w	9.90 a	10.12 b	19.78 b
$LSD_{(0.05)}$	**0.47**	**0.19**	**0.88**
CV%	**4.92**	**1.97**	**4.48**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch

Table 11. Effect of maleic hydrazide on total soluble solids, total sugar and vitamin C contents of muskmelon

Treatments	Total soluble solids (°Brix)	Total sugar contents (%)	Vitamin C contents (mg/100g)
G_0	9.31 b	9.53 c	18.91 b
G_1	9.76 ab	10.10 b	19.70 ab
G_2	10.12 a	10.41 a	20.39 a
$LSD_{(0.05)}$	**0.47**	**0.19**	**0.88**
CV%	**4.92**	**1.97**	**4.48**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

Table 12. Combined effect of mulching and maleic hydrazide on yield per plant, yield per hectare, total soluble solids, total sugar contents and vitamin C contents of muskmelon

Treatment combinations	Yield per plant (kg)	Yield (t ha^{-1})	Total soluble solids (°Brix)	Total sugar contents (%)	Vitamin C content (mg/100g)
M_0G_0	1.16 i	11.60 i	8.55 e	8.87 g	17.81 e
M_0G_1	1.51 h	15.10 h	8.92 de	9.32 f	18.53 de
M_0G_2	1.76 g	17.60 g	9.25 cde	9.55 ef	18.85 cde
M_bG_0	2.44 e	24.40 e	9.75 bc	9.92 d	19.71 bcd
M_bG_1	3.59 b	35.90 b	10.43 ab	10.87 b	20.63 ab
M_bG_2	4.10 a	41.00 a	10.93 a	11.23 a	22.15 a
M_wG_0	2.10 f	21.00 f	9.62 bcd	9.81 de	19.22 b-e
M_wG_1	2.68 d	26.80 d	9.92 bc	10.11 cd	19.94 bcd
M_wG_2	3.17 c	31.70 c	10.17 ab	10.45 c	20.18 bc
$LSD_{0.05}$	**0.14**	**1.43**	**0.82**	**0.34**	**1.52**
CV%	**3.31**	**3.31**	**4.92**	**1.97**	**4.48**

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability.
Here, M_0= No mulching, M_b= Black polythene mulch and M_w= Clear polythene mulch; G_0= Control, G_1= Maleic hydrazide 50 ppm and G_2= Maleic hydrazide 100 ppm

CHAPTER V

SUMMARY AND CONCLUSION

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The experiment was carried out at the "Horticulture Farm" of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during November 2020 to April 2021 to study the effect of mulching and maleic hydrazide on growth, yield and quality of muskmelon. The experimental field belongs to the Agro-ecological zone (AEZ) of "The Modhupur Tract", AEZ-28. The soil of the experimental field belongs to the General soil type, Deep Red Brown Terrace Soils under Tejgaon soil series. The experiment consisted of two factors. Factor A: Three types of mulching viz., M0= No mulching (control), Mb= Black polythene mulch, Mw= Clear polythene mulch and Factor B: Three levels of maleic hydrazide viz., G0= No maleic hydrazide (Control), G1= 50 ppm MH and G2= 100 ppm MH. There were 9 treatment combinations. The total numbers of unit plots were 27. The size of unit plot was 1.00 m2 (1 m × 1 m). Data on different growth, yield contributing characters and yield were recorded to find out the best mulching practices and optimum levels of maleic hydrazide for the potential yield of muskmelon.

Statistically significant variation was recorded in terms of all the characters related to growth, yield and quality of muskmelon. In consideration of different mulch practices, the maximum number of branches per plant (11.66), female flowers per plant (15.20), female flowers percentage per plant (17.55), fruit length (26.30 cm), fruit diameter (35.73 cm), fruits per plant (3.45), weight of individual fruit per plant (971.20 g), fruit yield per plant (3.38 kg), fruit yield per hectare (33.76 t), amount of total soluble solids (10.37 °brix), total sugar contents (10.68%) and vitamin C contents (20.83 mg/100 g) were obtained from Mb (Black polythene mulch) treatment. But, the maximum days to 50% flowerings (38.69), number of male flowers per plant (98.58), days to first fruit harvest (72.30) was recorded from M0 (no mulch) treatment while the minimum days to 50% flowerings (36.20), number of male flowers per plant (71.41) and days to first fruit harvest (66.77) were revealed from Mb (Black polythene mulch) treatment. On the other hand, the minimum number of branches per plant (9.32), female flowers per plant (10.27), female flowers percentage per plant (9.44), length of fruit (22.90 cm), diameter of fruit (31.29 cm), fruits per plant (1.91), weight of individual fruit per plant (766.81 g), fruit yield per plant (1.48 kg), fruit yield per

hectare (14.77 t), amount of total soluble solids (8.91 °brix), total sugar contents (9.25%) and vitamin C contents (18.40 mg/100 g) were found from M0 (No mulch) treatment.

In case of different levels of maleic hydrazide, the maximum number of branches per plant (11.27), female flowers per plant (14.41), female flowers percentage per plant (15.82), fruit length (25.76 cm), fruit diameter (34.98 cm), fruits per plant (3.13), weight of individual fruit per plant (941.25 g), fruit yield per plant (3.01 kg), fruit yield per hectare (30.10 t), amount of total soluble solids (10.12 °brix), total sugar contents (10.41%) and vitamin C contents (20.39 mg/100 g) was obtained from G2 (100 ppm) treatment. But, maximum days to 50% flowerings (38.02), male flowers per plant (91.53) and days to first fruit harvest (70.83) were observed from G0 (control) treatment while the minimum days to 50% flowerings (36.74), male flowers per plant (76.69) and days to first fruit harvest (67.80) were observed from G2 (100 ppm) treatment. On the other hand the minimum number of branches per plant (9.86), female flowers per plant (11.48), female flowers percentage per plant (11.14), fruit length (23.81 cm), fruit diameter (32.57 cm), fruits per plant (2.32), weight of individual fruit per plant (803.91 g), fruit yield per plant (1.90 kg), fruit yield per hectare (19.00 t), amount of total soluble solids (9.31°brix), total sugar contents (9.53%) and vitamin C contents (18.91 mg/100 g) were found from G0 (control) treatment.

In case of combined effect of mulching and maleic hydrazide, the maximum number of branches per plant at harvest (12.47), female flowers per plant (17.31), female flowers percentage per plant (21.49), fruit length (27.28 cm), fruit diameter (37.02 cm), fruits per plant (3.83), weight of individual fruit per plant (1074.40 g), fruit yield per plant (4.10 kg), fruit yield per hectare (41.00 t), amount of total soluble solids (10.93 °brix), total sugar contents (11.23%) and vitamin C contents (22.15 mg/100 g) were recorded from MbG2 (Black polythene mulch + 100 ppm maleic hydrazide) treatment combination. But, the maximum days to 50% flowerings (39.20), male flowers per plant (103.22) and days to first fruit harvest (73.10) were observed from M0G0 (No mulch + No maleic hydrazide) treatment combination while the minimum days to 50% flowerings (35.48), male flowers per plant (63.23) and days to first fruit harvest (65.30) was obtained from MbG2 (Black polythene mulch + 100 ppm maleic

hydrazide) treatment combination. On the other hand the minimum number of branches per plant at harvest (8.67), female flowers per plant (9.51), female flowers percentage per plant (8.44), fruit length (21.49 cm), fruits per plant (1.66), weight of individual fruit per plant (702.00 g), fruit yield per plot (1.16 kg), fruit yield per hectare (11.60 t), amount of total soluble solids (8.55 °brix), total sugar contents (8.87%) and vitamin C contents (17.81 mg/100 g) were obtained from M0G0 (No mulch + No maleic hydrazide) treatment combinations.

CONCLUSION

The study revealed that the combination of MbG2 (Black polythene mulch + 100 ppm maleic hydrazide) were given the better performance of all the yield contributing parameters, yield and quality of muskmelon than the other treatment combinations. The treatment combinations of MbG2 (Black polythene mulch + 100 ppm maleic hydrazide) gave the highest fruit yield (41.00 t ha-1) than the other treatment combinations.

REFERENCES

REFERENCES

Abdrabbo, M., Farag, A. A. and Hassanein, M. K. (2009). Irrigation requirements for cucumber under different mulch colors. *Egyptian J. Hort.* **36**: 333-346.

Akhter, F., Mostarin, T., Islam, M. N., Akhter, S. and Parvin, A. (2018). Effect of mulches and phosphorus on growth and yield of squash (*Cucurbita pepo*). *The Agriculturists.* **16**(2): 25-34.

Alemayehu, A. and Joseph, P. A. (2002). Influence of drip irrigation and mulching on soil moisture retention, water use efficiency, growth and yield of oriental pickling melon (*Cucumis melo* L. var. conoman makino). *South Indian Hort.* **50**(4/6): 421-429.

Al-Masoum, A. and Al-masri, A. (1999). Effect of ethephon on flowering and yield of monoecious cucumber. *Egyptian J. Hort.* **26**: 229-236.

Aniekwe, N. L. and Anike, N. T. (2015). Effects of different mulching materials and plant densities on the environment, growth and yield of cucumber. *Iosr J. Agric. Vet. Sci.* **8**(2): 64-72.

Anonymous. (1987). Annual Report, Bangladesh Agricultural Research Institute, Joydebpur, Dhaka, p. 7.

Anonymous. (2014). USAD (National Agricultural Statistics Services) Production Year Book. USAD. California.

Arora, S. K., Pandita, M. L. and Kumar, J. (1989). Effect of paclobutrazol on growth, flowering and fruit set in summer squash (*Cucurbita pepo* L.) cv. "Hisar Selection". *Haryana Agric. Univ. Res.* **19**(3): 214-217.

Arora, S. K., Pandita, M. L. and Sidhu, A. S. (1982). Effect of maleic hydrazide on vegetative growth, flowering and fruiting of bottle gourd. *Sci. Hort.,* **17**(3): 211-215.

Atif, M. Y. (2014). Effect of polyethylene black plastic mulch on growth and yield of two summer vegetable crops under rain-fed and semi-arid region conditions. *American J. Agric. Biol. Sci.* **9**(2): 202-207.

BARI (Bangladesh Agricultural Research Institute). (2015). Krishi Projukti Hat Boi, 7th Edition. p.159.

Barman, D., Rajini, K. and Rampal, U. (2005). Effect of mulching on cut flower production and corm multiplication in gladiolus. *J. Ornamental Hort.* **8**(2): 152-154.

Bhat, K. L., Saleem, T. and Bhusan, A. (2004). Effect of ethrel, maleic hydrazide and gibberellic acid on growth, yield and quality of watermelon (*Citrullus lanatus* Thumb.). *J. Res. SKUAST.* **2**: 221-227.

Bhatt, L., Rana, R., Uniyal, S. P. and Singh, V. P. (2011). Effect of mulch material on vegetative characters, yield and economics of summer squash (*Cucurbita pepo*) under rainfed mid-hill condition of Uttarakhand. *Veg. Sci.* **38**(2): 165- 168.

Bobby, A., Prashanth, P., Seenivasan, N. and Mishra, P. (2017). Effect of different mulch materials on weed control in cucumber (*Cucumis sativus* L.) hybrid multistar under shade net conditions. *Intl. J. Pure Appl. Biosci.* **5**(5): 1246-1251.

Brantley, B. B. and Warren, G. F. (1960). Sex expression and growth in muskmelon. *Plant Physiol.* **35**: 741-745.

Chaurasiya, J., Verma, R. B., Ahmad, M., Adarsh, A., Kumar, R. and Pratap, T. (2016). Influence of plant growth regulators on growth, sex expression, yield and quality of muskmelon (*Cucumis melo* L.) *Ecol. Environ. Cons.* **22**: 39-43.

Danish, P., Ali, Q., Hafeez, M. M. and Malik, A. (2020). Antifungal and antibacterial activity of aloe vera plant extract. *Biol. Clin. Sci. Res. J*. p. e003.

Desai, K. D., Saravaiya, S. N., Patel, B. N. and Patel, N. B. (2011). Response of growth retardants on sex expression and fruit yield of bottle gourd [*Lagenaria siceraria* (Mol.)] cv. Pusa Naveen under South Gujarat conditions. *Asian J. Hort.* **6**(1): 22-25.

Edris, K. M., Islam, A. T. M., Chowdhury, M. S. and Haque, A. K. M. (1979). Detailed Soil Survey of Bangladesh. Department Soil Survey, Govt. of the People's Republic of Bangladesh. p. 118.

Fahamiya, N., Aslam, M., Siddiqui, A. and Shiffa, M. (2016). Review on *Cucumis melo*: ethnobotany and unani medicine. *World J. Pharm. Pharmac. Sci.* **5**: 621-636.

Farias-Larios, J. and Orozco-Santos, M. (2010). Effect of polyethylene mulch color on aphid populations, soil temperature, fruit quality, and yield of watermelon under tropical conditions. *New Zealand J. Crop Hort. Sci.* **25**: 369-374.

Fonseca, I. C., de, B., Klar, A. E., Goto, R. and Neves, C. S. V. J. (2003). Colored polyethylene soil covers and grafting effects on cucumber flowering and yield. *Sci. Agric*. **60**: 643-649.

Gebologlu, N. and Saglam, N. (2002). The effect of different plant spacing and mulching material on the yield and fruit quality of pickling cucumber. *Acta Hort.* **1**(579): 603-607.

Gomez, K. A. and Gomez, A. A. (1984). Statistical Procedure for Agricultural Research. *Second* Edition. A Willey Inter-Science Publication, John Viley and Sons. New York. pp. 680.

Gordon, G. G., Foshee, W. G., Reed, S. T., Brown, J. E., Vinson, E. and Woods, F. M. (2008). Plastic mulches and row covers on growth and production of summer squash. *Intl. J. Veg. Sci.* **14**(4): 322-338.

Haapala, T., Palonen, P., Tamminen, A. and Ahokas, J. (2015). Effect of different paper mulches on soil temperature and yield of cucumber (*Cucumis sativus* L.) in the temperate zone. *Agric. Food Sci.* **24**: 52-58.

Hadvani, V. G. (2010). Effect of plant growth regulators on growth, flowering, yield and quality of muskmelon (*Cucumis melo* L.) cv. Rasmadhuri. Thesis M.Sc (Hort.) Junagadh Agril. Univ. pp. 1-69.

Hallidri, M., Femandez, J. A., Martinez, P. F. and Castilla, N. (2001). Comparison of the different mulching materials on the growth materials on the growth, yield and quality of cucumber (*Cucumis sativus* L.). *Acta Hort.* **1**(559): 49-54.

Hassandokht, T., Jolaini, M. and Lipty, A. (2010). Investigation the effect of different water and colored plastic mulch levels on yield and water use efficiency of tomato in surface and sub-surface drip irrigation. *J. Water Soil.* **25**: 1025- 1032.

Hidayatullah, A. B., Bano, A. and Khokhar, K. M. (2009). Sex expression and level of phytohormones in monoecious cucumber as affected by plant growth regulators. *Sarhad J. Agric*. **25**: 173-177.

Homez, T. J. and Arouiee, H. (2016). Evalution of soil temperature under mulches and garlic extract on yield of cucumber (*Cucumis sativus* L.) in green house conditions. *J. Hort.* **3**:175.

Ibarra-Jimenez, L., Zermeno-Gonzalez, A., Munguia-Lopez, J., Quezada-Martin, M. A. R. and Roza-Ibarra, M. D. L. (2008). Photosynthesis, soil temperature and yield of cucumber as affected by colored plastic mulch. *Acta Agric. Scandiavica Section B-Soil Plant Sci.* **58**: 372-378.

Ibrarullah, R. H. U., Jilini, M. S., Gurmani, A. R. and Ullah, K. (2019). Tolerance response of muskmelon genotypes against salinity. *Pakistan J. Agric. Sci.* **56**: 63-70.

Ingle, V. G., Jadhao, B. J. and Joshi, P. S. (2000). Effect of plant growth regulators on growth, sex-ratio and yield of bottle gourd. *J. Soils Crops*, **10**(1): 101-104.

Islam, F. Quamruzzaman, A. and Mallick, S. (2021) Effect of different mulch paper on growth and yield of different high value vegetables in Bangladesh. *Agric. Sci.* **12**: 237-246.

Kashi, A., Hosseinzadeh, S., Babalar, M. and Lessani, H. (2004). Effect of black polyethylene mulch and calcium nitrate application on growth, yield and blossom end rot of watermelon, cv. Charleston Gray. *J. Sci. Technol. Agric. Nat. Res.* **7**: 1-10.

Kaur, A., Khurana, D. and Dhall, R. (2016). Sex modification in cucumber (*Cucumis sativus* L.) under the influence of ethephon and maleic hydrazide. *Intl. J. Adv. Res.* **4**(11): 2199-2205.

Khalil, R., Ali, Q., Nadeem, M., Azhar, M. M., Hafeez, M. M. and Malik A. (2020). Antibacterial, antioxidant activities and association among plant growth related traits of *Lepidiu draba*. *Biol. Clin. Sci. Res. J*. **2020**:e011.

Kooner, K. S., Jaskaran, S. and Saimbhi, M. S. (2000). Effect of plant growth substances on growth, sex expression and fruit yield in bottle gourd cv. Punjab Komal. *Haryana J. Hort. Sci.* **29**(3/4): 268-269.

Kumar, D. and Sharma, R. (2018). Effect of mulching on growth, yield and quality in different varieties of summer squash (*Cucurbita pepo* L.). *Intl. J. Curr. Microbiol. Appl. Sci.* **7**(6): 2113-2119.

Lamont, W. J. (1993). Plastic mulches for the production of vegetable crops. *Hort. Technol.* **3**: 35-39.

Liu, L., Kakihara, F. and Kato, M. (2004). Characterization of six varieties of *Cucumis melo* L. based on morphological and physiological characters, including shelf-life of fruit. *Euphytica,* **135**: 305-313.

Luqman, Hussian, Z. and Fahad, S. (2013). Integrated weed management in bitter gourd in the agro-ecological conditions of Peshawar. *The New Dev. Farm.* **19**(3): 341-347.

Mahadeen, A. (2014). Effect of polyethylene black plastic mulch on growth and yield of two summer vegetable crops under rain-fed condition under semi-arid region conditions. *American J. Agric. Biol. Sci.* **9**: 202-207.

Mahmood, N., Moazzam, A., Shahbaz, A. and Zakaullah. (2017). Effect of mulching on vegetables production in tunnel farming. *Mycopath.* **9**(1): 21-24.

Melek, E. and Atilla, D. (2009). Effect of different mulch material on plant growth some quality parameters and yield in melon (*Cucumis Melo* L.) cultivars in high Altitudes environmental condition*. Pakistan J. Bot.* **41**(4): 1891-1901.

Milind, P. and Kulwant, S. (2011). Musk melon is eat-must melon. *Intl. Res. J. Pharmacy.* **2**(8): 52-57.

Mishra, G. M. and Sharma, U. N. (1965). Effect of plant growth regulators on growth, sex expression and yield of bottle gourd. *J. Agric. Col.* **15**: 31-38.

Mohammed, A. S., Emad, S. A. and Alaaeldin, H. A. (2017). Impact of mycorrhizae and polyethylene mulching on growth, yield and seed oil production of bottle gourd (*Lagenaria siceraria*). *J. Hort. Sci. Ornamental Plants.* **9**(1): 28-38.

Mollier, M. (2010). Influence of plant growth regulator on growth, physiology and yield in cucumber (*Cucumis sativus* L.). *Karnataka J. Agric. Sci.* **23**: 13-69.

Moniruzzaman, M., Khatoon, R. and Qamruzzaman, A. K. M. (2019). Influence of plant growth regulators on vegetative growth, sex expression and yield of summer bottle gourd. *Bangladesh J. Agril. Res.* **44**(4): 577-590.

Murthy, T. C. S., Negegowda, V. and Basavaish (2007). Influence of growth regulators on growth, flowering and fruit yield of gherkin (*Cucumis anguria L.*). *Asian J. Hort.* **2**: 22-54.

Mutetwa, M. and Mtaita, T. (2014). Effect of different mulch colors on cucumber production. *J. Glob. Innovative Agric. Sci.* **2**(4): 178-184.

Nagalakshmi, S., Palanisamy, D., Eswaran, S. and Sree Narayana, V. V. (2002). Influence of plastic mulches on yield and economics. *South Indian Hort*. **50**(1-3): 262- 265.

Ouzounidou, G., Papadopoulou, P., Giannakoula, A. and Illias, I. (2008). Plant growth regulators treatments modulate growth, physiology and quality characteristics of *Cucumis melo* L. *Plants. Pakistan J. Bot.* **40**(3): 1185-1193.

Pandya, M. B. and Dixit, C. K. (1997). Effect of plant growth regulators and chemicals on the growth, sex behaviour and yield of bottle gourd [*Lagenaria siceraria* (Mol.)] cv. Pusa Summer Prolific Long. *J. Appl. Hort. Navsari*, **3**(1/2): 105-111.

Paris, H. S., Amar, Z. and Lev, E. (2012). Medieval emergence of sweet melons, *Cucumis melo* (Cucurbitaceae). *Ann. Bot.* **110**: 23-33.

Parmar, H. N., Polara, N. D. and Viradiya, R. R. (2013). Effect of mulching material on growth, yield and quality of watermelon (*Citrullus lanatus* thunb) cv. Kiran. *Univ. J. Agric. Res.* **1**(2): 30-37.

Patil, C. N., Mahorkar, V. K., Dod, V. N., Peshattiwar, P. D., Kayande, N. V. and Gomase, D. G. (2008). Effect of seed treatment with gibberellic acid and maleic hydrazide on growth, seed yield and quality of okra cv. Parbhani Kranti. *Asian J. Hort.* **3**(1): 74-78.

Ram, J. P., Dwivedi, S. P. and Anand, R. K. (2013). Studies on effect of mulching and training on growth, yield and economics of pointed gourd (*Trichosanthes dioica* Roxb.). *Asian J. Hort.* **8**(2): 645-647.

Rashid, M. M. (1999). Sabjibijnan (olericulture). Rashid publishing 2nd ed., Dhaka Bangladesh. pp.307-315

Ries, S. K. (1985). Regulation of plant growth with application of growth retardants. *Plant Sci*. **2**(3): 239-285.

Roudan, M. A. and Abbdosi, V. (2015). Mulch effect on the characteristics of the lays cucumber (*Cucumis sativus*) greenhouse in city Rudan. *J. Novel Appl. Sci.*, **8**: 864-867.

Sageer, K., Mahender, P. and Vijay, K. (2015). Influence of different mulches on growth and yield of sponge gourd (*Luffa cylindrica* L.). *Plant Arch.* **15**: 393-395.

Sandra, N., Kumar Lal, S., Chakrabarty, S. K. and Talukdar, A. (2015). Effect of plant growth regulators on sex expression, fruit setting, seed yield and quality in the parental lines for hybrid seed production in bitter gourd (*Momordica charantia*). *Indian J. Agric. Sci.* **85**(9): 1185-1191.

Sarkar, M. D., Moniruzzaman, M., Alam, M. S., Rahman, M. J., Quamruzzaman, R. N. R. and Subramaniam, S. (2019). Growth, sex expression and nutrient composition of cucumber (cucumis sativus) as influenced by maleic hydrazide. *Pakistan J. Bot.* **51**(1): 117-123.

Sharmila, S. and Singh, R. (2020). Response of mulching on cucurbitaceae crops: A review. *J. Pharmacog. Phytochem.*, **9**(6): 1889-1893.

Singh, O. S. and Madan, S. K. (1971). Induction of terminal flower in indeterminate watermelon (*Citrullus vulgaris*) by ethrel. *Sci. Cul.* **27**: 522-523.

Singh, R. K. and Singh, G. P. (1984). Effect of growth regulators on sex expression, sex ratio and yield in cucumber (*Cucumis sativus* L.). *Veg. Sci.* **11**: 15-20.

Siwek, P. and Tipowiecka, M. (2005). Cucumber cultivation under plastic covers economic results. *Folia-Hort.* **16**(2): 49-55.

Solaiman, A. H. M., Kabir, M. H., Jamal Uddin, A. F. M. and Hasanuzzaman, M. (2008). Black plastic mulch on flower production and petal coloration of Aster (*Callistephus chinensis*). *American-Eurasian J. Bot.* **1**(1): 05-08.

Soleymani, R., Hassandokht, M. R. and Abdoosi, V. (2015). Mulch and planting method on quantitative traits of cucumber. *Intl. J. Agron. Agril. Res.* **6**(1): 28-35.

Thappa, M., Kumar, S. and Rafiq, R. (2011). Influence of plant growth regulators on morphological, floral and yield traits of cucumber (*Cucumis sativus* L.). *Kasetsart J. Nat. Sci.* **45**: 177-188.

Tomasz, S., Barbara, F., Alina, K., Wlodzimierz, K. and Jolanta, L. (2010). The effect of black polyethylene mulch on yield of field grown cucumber. *Acta Hort. Sci. Polonorum.* **9**(3): 221-229.

Torres, V. O., Luis Alonso, V., Antonio, C. F., Hugo, L. S., Marcela, H. S. and Luis, I. J. (2016). Effect of colored plastic mulch on growth, yield and nutrient status in cucumber under shade house and open field conditions. *J. Plant Nut.* **39**(14): 2144-2152.

UNDP. (1988). Land Resources Appraisal of Bangladesh for Agricultural Development. Report No. 2. Agro-ecological Regions of Bangladesh.

Verma, H., Parihar, M. S., Nawange, D. D. and Yadav, P. K. (2019). Study on the effect of gibberellic acid and maleic hydrazide on growth and yield attributing

characters of okra (*Abelmoschus esculentus* L. Moench) cv. Varsha Uphar. *J. Pharmacog. Phytochem.* **8**(1): 2398-2400.

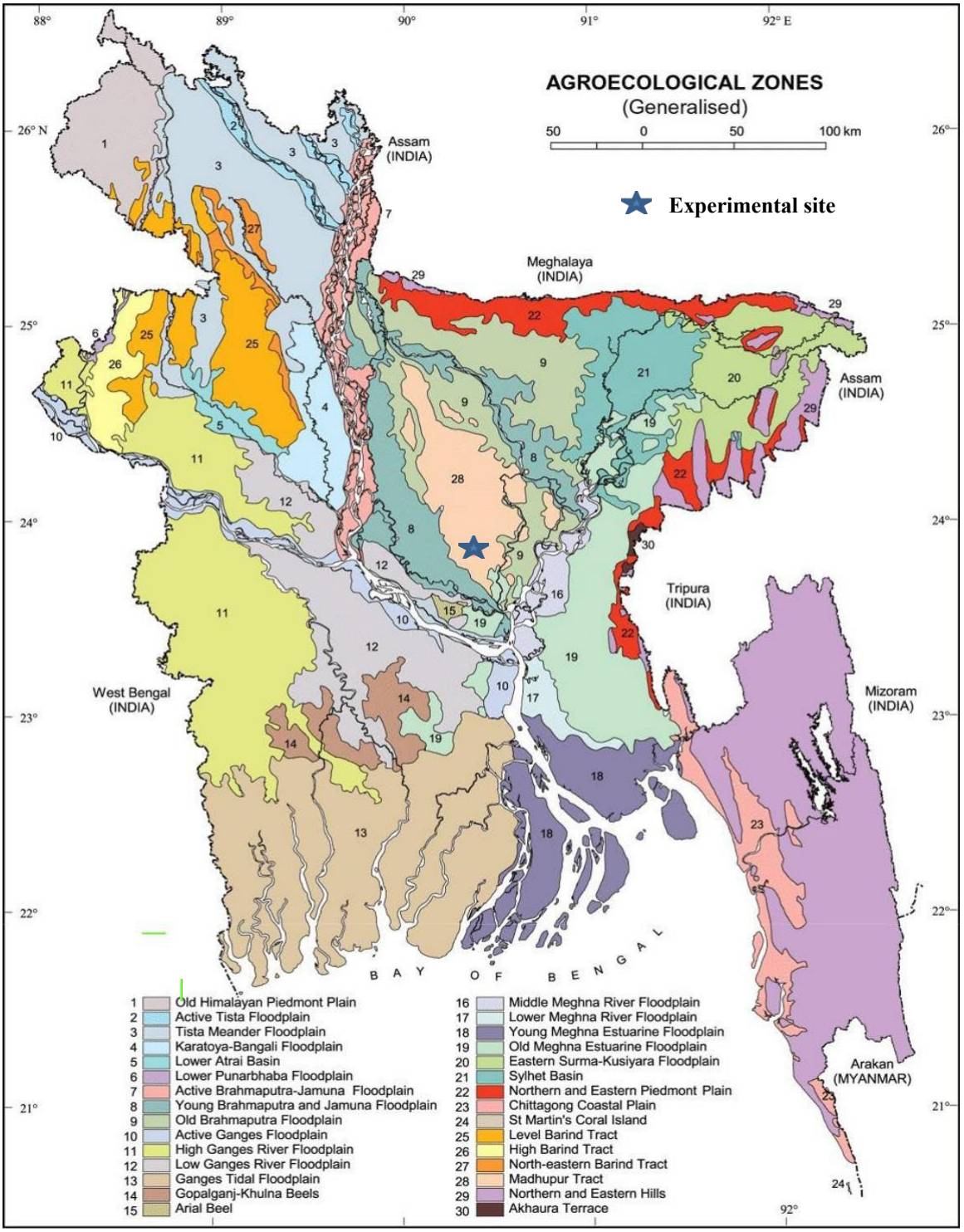
Verma, V. K. and Choudhury, B. (1980). Chemical sex modification in cucumber through growth-regulators and chemicals and their effect on yield. *Indian J. Agric. Sci.* **50**(3): 231-235.

Whilhoit, J. H., Morse, R. D. and Vaughan, D. H. (1990). Strip tillage production of summer cabbage using high residue levels. *Agric. Res.* **5**(4): 338-342.

APPENDICES

APPENDICES

Appendix I. Agro-Ecological Zone of Bangladesh showing the experimental location



Appendix II. Monthly records of air temperature, relative humidity and rainfall during the period from November 2020 to March 2021

Month and year	RH (%)	Air temperature (°C)			Rainfall (mm)
		Max.	*Min.*	*Mean*	
November, 2020	56.25	28.70	8.62	18.66	14.5
December, 2020	51.75	26.50	9.25	17.87	12.0
January, 2021	46.20	23.70	11.55	17.62	0.0
February, 2021	37.95	22.85	14.15	18.50	0.0
March, 2021	35.75	21.55	15.25	18.40	0.0

Source: Bangladesh Meteorological Department (Climate division), Agargaon, Dhaka-1212.

Appendix III. Characteristics of experimental soil analyzed at Soil Resources Development Institute (SRDI), Farmgate, Dhaka

A. Morphological characteristics of the experimental field

Morphological features	**Characteristics**
Location	Sher-e-Bangla Agricultural University, Dhaka
AEZ	Modhupur Tract (28)
General Soil Type	Shallow red brown terrace soil
Land type	High land
Soil series	Tejgaon
Topography	Fairly leveled
Flood level	Above flood level
Drainage	Well drained
Cropping pattern	Not Applicable

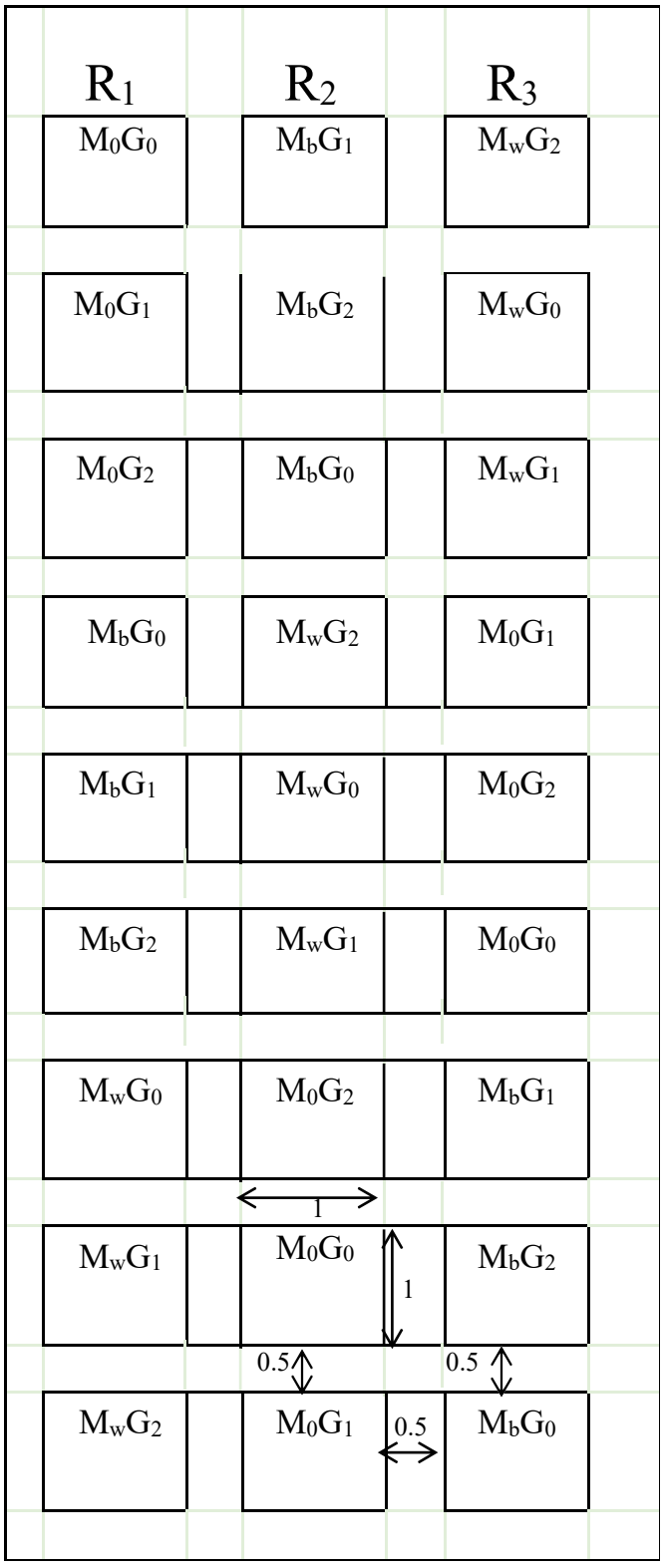
Source: Soil Resource Development Institute (SRDI)

B. Physical and chemical properties of the initial soil

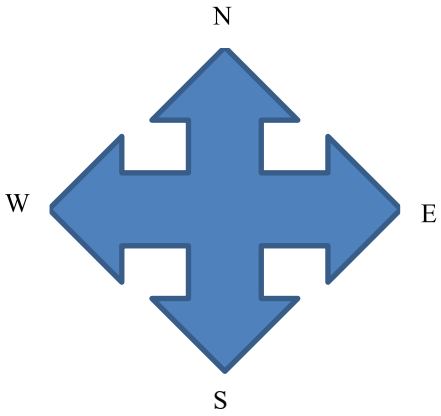
Characteristics	**Value**
Partical size analysis % Sand	27
%Silt	43
% Clay	30
Textural class	Silty Clay Loam
pH	6.2
Organic carbon (%)	0.45
Organic matter (%)	0.78
Total N (%)	0.03
Available P (ppm)	20
Exchangeable K (me/100 g soil)	0.1
Available S (ppm)	45

Source: Soil Resource Development Institute (SRDI)

Appendix IV. Layout of the experimental field



LEGENDS



Plot size: 1.0 m × 1.0 m
Factor A: Different Mulch (3)
M_0= No mulch (control)
M_b= Black polythene mulch
M_w= Clear polythene mulch

Factor B: Maleic hydrazide (3)
G_0= Control
G_1= 50 ppm maleic hydrazide
G_2= 100 ppm maleic hydrazide

Appendix V. Mean square values of number of branches per plant and days to 50% flowering of muskmelon

Sources of variation	Degrees of freedom	Mean square of	
		Number of branches per plant	Days to 50% flowerings
Replication	2	9.651	98.473
Factor A	2	12.769**	14.458**
Factor B	2	4.551**	3.788**
A × B	4	0.097*	0.115*
Error	16	0.278	0.503

* significant at 5% level of significance
** significant at 1% level of significance

Appendix VI. Mean square values of number of male and female flowers per plant, female flowers percentage per plant and days to first fruit harvest of muskmelon

Sources of variation	Degrees of freedom	Mean square of			
		Number of male flowers per plant	Number of female flowers per plant	Female flowers percentage	Days to first fruit harvest
Replication	2	422.02	28.049	30.250	97.503
Factor A	2	1717.23**	55.508**	157.047**	74.493**
Factor B	2	504.69**	19.251**	56.502**	22.243**
A × B	4	25.43**	2.100**	7.204*	1.548*
Error	16	5.15	0.408	2.250	0.690

* significant at 5% level of significance
** significant at 1% level of significance

Appendix VII. Mean square values of fruit length and fruit diameter, number of fruits per plant and weight of individual fruit per plant of muskmelon

Sources of variation	Degrees of freedom	Mean square of			
		Fruit length	Fruit diameter	Number of fruits per plant	Weight of individual fruits
Replication	2	29.811	65.718	0.889	2827.7
Factor A	2	28.368**	48.107**	5.542**	94987.9**
Factor B	2	8.905**	13.369**	1.531**	42605.9**
A × B	4	0.284*	0.210*	0.098**	2961.8**
Error	16	0.193	0.479	0.005	242.1

* significant at 5% level of significance
** significant at 1% level of significance

Appendix VIII. Mean square values of yield per plant and yield per hectare of muskmelon

Sources of variation	Degrees of freedom	Mean square of	
		Yield per plant	Yield per hectare
Replication	2	0.237	23.684
Factor A	2	8.272**	827.213**
Factor B	2	2.830**	282.963**
A × B	4	0.236**	23.633**
Error	16	0.006	0.687

* significant at 5% level of significance
** significant at 1% level of significance

Appendix IX. Mean square values of total soluble solids, total sugar and vitamin C contents of muskmelon

Sources of variation	Degrees of freedom	Mean square of		
		Total soluble solids	Total sugar contents	Vitamin C contents
Replication	2	3.920	4.667	58.778
Factor A	2	5.028**	4.672**	13.406**
Factor B	2	1.482**	1.783**	4.934**
A × B	4	0.082*	0.132*	0.610*
Error	16	0.228	0.039	0.778

* significant at 5% level of significance
** significant at 1% level of significance

SOME PICTORIAL VIEW DURING EXPERIMENTATION

Plate 1. Photograph of experimental plot

Plate 2. Photograph of making trellis

Plate 3. Photograph of male flower

Plate 4. Photograph of female flower

Plate 5. Photograph of mature fruit

Plate 6. Photograph of mature fruits (treatment wise)

Plate 7. Photograph of quality test at laboratory