EFFECTS OF MULCHING AND PRUNING ON GROWTH AND YIELD OF TOMATO

(*Lycopersicon esculentum* Mill.)

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BY

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CERTIFICATE

This is to certify that thesis entitled *"Effects of mulching and pruning on growth and yield of tomato (Lycopersicon esculentum Mill.)"* submitted to the Faculty of Agriculture, Department of Horticulture and Postharvest Technology, Sher-e-Bangla Agricultural University, Dhaka-1207, in partial fulfillment of the requirements for the degree of *MASTER OF SCIENCE* in *HORTICULTURE*, embodies the result of a piece of *bona fide* research work carried out by *Md. Aminul Islam*, Roll No. 01512, Registration No. 01512, under my supervision and guidance. No part of the thesis has been submitted for any other degree in any other institutes.

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

Date:

December 2005

(Dr. Md. Abdur Rashid)

Supervisor

DEDICATED
TO
MY
BELOVED PARENTS

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The Author

EFFECTS OF MULCHING AND PRUNING ON GROWTH AND YIELD TOMATO
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ABSTRACT

A field experiment was conducted with three mulching treatments eg. mulching with black polyethylene, mulching with straw and control (no mulch) and three pruning treatments eg. single stem pruning, pruning up to 1st flower cluster and control (no pruning) at the research farm of Olericulture Division of the Horticulture Research Center (HRC), Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during the period from 20 October 2004 to 20 March 2005 to find out the suitable mulching and pruning practices on growth and yield of tomato (BARI-6).

The result of the experiment revealed that the plant height, number of flower cluster per plant, number of fruits per plant, fruit breadth, yield of fruit per plant and yield tons per hectare were significantly influenced by different mulching and pruning treatments.

The highest yield (94.37 t/ha) was obtained from straw mulch followed by mulch with black polyethylene (88.47 t/ha) and no mulch (72.43 t/ha) respectively. The pruning up to 1st flower cluster produced highest yield (89.57 t/ha) than no pruning (89.17 t/ha) and the single stem pruning (76.53 t/ha).

The highest fruit yield (103.5 t/ha) was recorded from the combination of mulching with straw and pruning up to 1st flower cluster, which may be recommended for high yield of tomato.

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ABBREVIATION AND ACRONYMS

ABA = Abscisic Acid

BARI = Bangladesh Agricultural Research Institute

BARC = Bangladesh Agricultural Research Council

BRRI = Bangladesh Rice Research Institute

BBS = Bangladesh Bureau of Statistics

CD = Cowdung

CV = Co-efficient of Variance

^0C = Degree of Centigrade

e.g = Example

et al = and others

etc = Etcetera

FAO = Food and Agricultural Organization

FYM = Farm Yard Manure

g = Gram

HRC = Horticulture Research Center

LSD = Least Significance Difference

Max. = Maximum

Min. = Minimum

MP = Muriate of potash

No. = Number

RCBD = Randomized Completed Block Design

SAU = Sher-E-Bangla Agricultural University

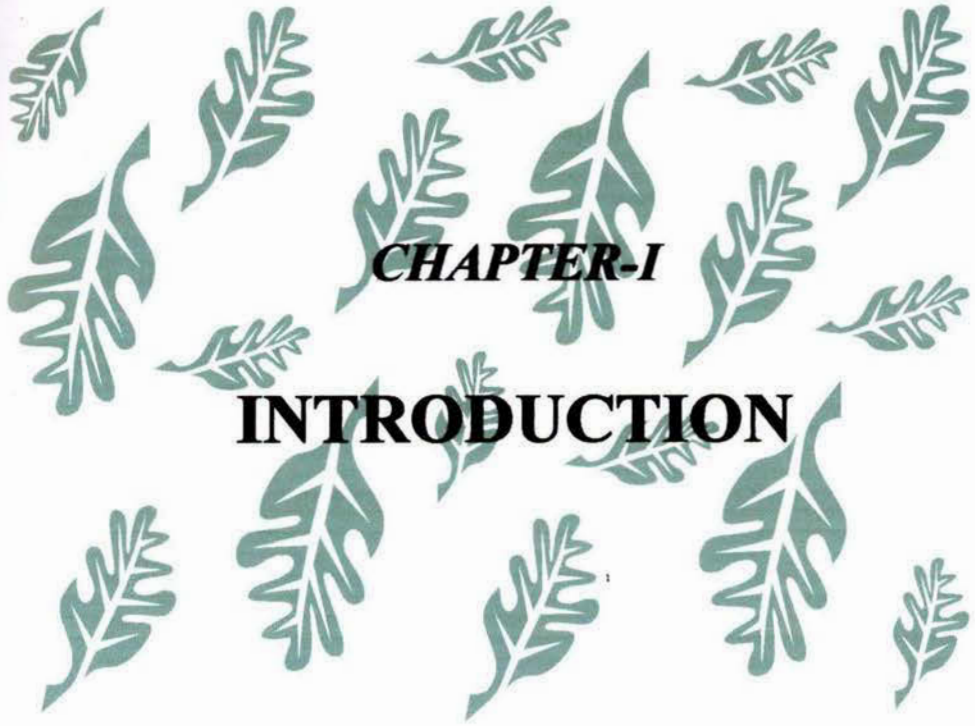
TSP = Triple Super Phosphate

t/ha = Tones Per Hectare

USA = United States of America

Viz. = Namely

% = Percentage



CHAPTER-I

INTRODUCTION

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill.), belonging to the family Solanaceae, is one of the most popular and quality vegetable grown in Bangladesh. It is popular for its taste, nutritional status and various uses. It was originated in tropical America (Salunke *et al.*,1987), particularly in Peru, Ecuador, Bolivia of the Andes (kallo, 1986). Tomato is cultivated all over the country due to its adaptability to wide range of soil and climate(Ahmad, 1976). It ranks third, next to potato and sweet potato, in terms of world vegetable production (FAO, 2002) and tops the list of canned vegetables (Choudhury, 1979). The crop is adapted to a wide variety of climate ranging from the tropics to a few degree of the Arctic Circle. The present leading tomato producing countries of the world are China, United States of America, India, Egypt, Turkey, Iran, Italy, Mexico, Brazil and Indonesia (FAO, 2002).

In Bangladesh, tomato has great demand throughout the year, but its production is mainly concentrated during the winter season. Recent statistics showed that tomato was grown in 15,790 hectares of land and the total production was approximately 102,000 metric tons in 2002-2003. Thus the average yield of tomato in Bangladesh is 6.46 tons/ha (BBS, 2004), while it is 69.41 t/ha in USA, 14.27 t/ha in India, 26.13 t/ha in China, 13.25 t/ha in Indonesia and 59.26 t/ha in Japan (FAO, 2002). The low yield of tomato in Bangladesh, however, is not an indication of low yield potentiality of this crop, but of the fact that the lower yield may be attributed to a number of reasons. Viz., unavailability of

quality seeds of improved varieties, improper management of fertilizer, irrigation, disease control and efficient use of soil moisture and lack of suitable pruning practices. Out of these, efficient use of soil moisture and use of appropriate pruning practices may improve this situation greatly.

Efficient use of soil moisture is very important. Because of scanty rainfall during the rabi season in Bangladesh. Growers have to depend either on natural precipitation or supplemental irrigation water for growing their tomato crop. Moreover, many of the farmers cannot afford to buy irrigation pump as well as water. As a result, the production of tomato is hampered to a greater extent. Under such condition mulches may be an alternative to irrigation. Materials like rice straw, sawdust, water hyacinth, polythene sheets and crop residues are generally used as cover mulches in the production of horticultural corps (Wilhoit *et al.*, 1990)

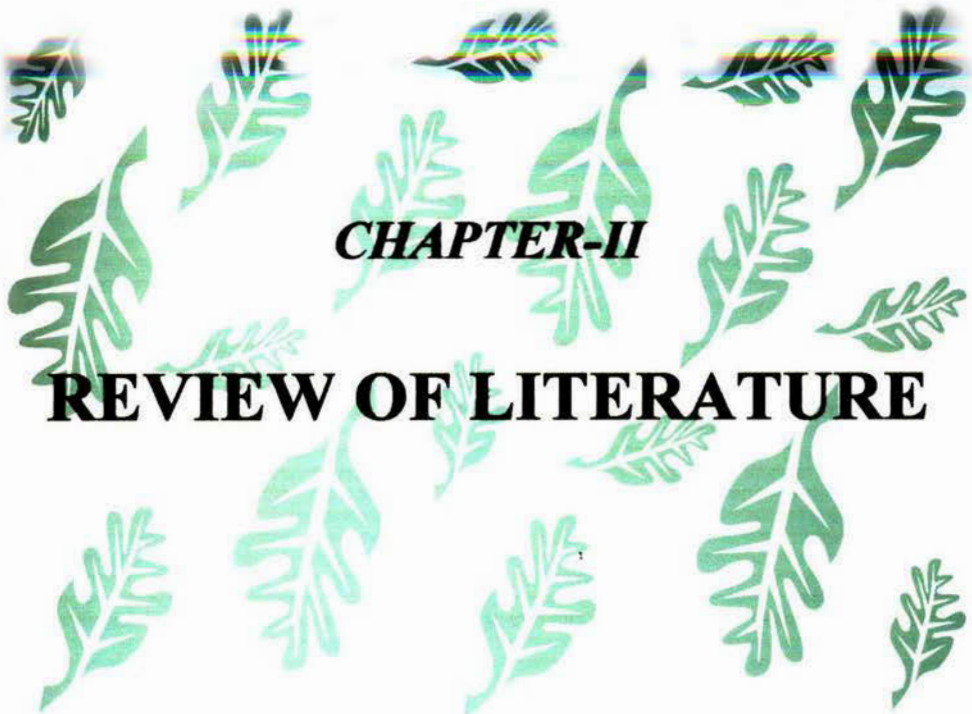
Mulching conserves soil moisture and controls the weed and pests. Different types of mulch play an important role in conserving soil moisture than non-mulched one (Suh and Kim, 1991). Mulching is a desirable management practice which is reported to regulate soil temperature, improve soil moisture, suppress weed growth and save labour cost (Patil and Basod, 1972). The practice has been reported to increase yield by creating favourable temperature and moisture regimes in different parts of the world (Ma and Han, 1995).

Proper pruning practices may lead to the production of relatively large sized fruit with better quality, increased yield, early harvest, easy harvesting of fruits and conveniences in intercultural operation without damage to the fruits or plants. Appropriate pruning method gives the best quality and early fruit in tomato (Lopez and Chan, 1974). But in Bangladesh, majority of the growers do not get good quality fruit and high yield because of their ignorance about proper pruning practices. In a fertile soil with favourable environmental conditions, tomato plants particularly of indeterminate type grow continuously and produce large number of branches. In that case, pruning is necessary because the branch bend down to the ground due to heavy load of fruits. Tomato plant can be severely pruned without affecting the yield (Patil *et al.*, 1973). Pruning could reduce production costs, increase yields and improve the quality of fruits (Davis and Estes, 1993). Pruning and training in tomato plants are practiced in certain areas of United States, especially in some parts of the Southern States and in few other regions (Thompson and Kelly, 1957).

The present study was therefore undertaken to study the following objectives

i) Effect of mulching on growth and yield of tomato

ii) Effect of pruning on growth and yield of tomato



CHAPTER-II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Tomato is one of the most important vegetable crops grown under field and greenhouse condition, which received much attention of the researchers throughout the world. The mulching and pruning practices play an important role in tomato production. Since then, few numbers of works were being done on the effect of mulching, pruning, planting method and variety on growth and yield of tomato in various parts of the world. However, the relevant literature on tomato and some other related crops have been reviewed here in this chapter.

2.1 Effect of mulching on growth and yield tomato

Mulches have various effects on the plant growth and yield. Many researchers noted that plants were greatly influenced by mulching.

Collins (1977) studied in a mulching experiment, which was conducted on a riverbank sandy loam soil with the cultivars Netted Gem and Kennebec. He observed that all mulch treatments substantially advanced plant emergence compared to plants from seed pieces in bare soil. This was apparently in response to higher soil temperatures under the mulches compared to bare soil during the first three weeks from planting.

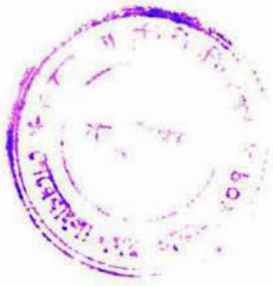
An experiment was conducted by Gonzalez and Vives (1980) with tomato and mulches (black polythene, blue polythene, red polythene, rice husk and saw dust). They found that black, blue and red polythene mulches increased tomato yield and

quality more than rice husk or sawdust mulches. While conducting an experiment on tomato using black and clear plastic and grass clipping mulches, Geneva (1981) reported that the plastic mulches yielded the highest whereas grass clipping reduced it.

Famoso and Bautista (1983) conducted an experiment on tomato production, mulching with sugarcane truss and straw. They stated that mulching with rice straw increased the number of flowers and the chlorophyll content of the leaves in tomato as a result enhanced the yield of tomato. On the other hand, Petrov and Al-Amiri (1976) reported that black or transparent films for mulching led to higher early and over all yields of tomato.

An experiment was performed by Perrella *et al.* (1983) on mulching with photodegradable plastic films. They used photodegradable plastic mulches including 0.05 mm Alkatene (brick colored) and Fertene (black, ranging in thickness from 0.03 to 1.0 mm). These were compared with crops mulched with black, brown and colorless polythene films and with un-mulched controls. The tomatoes ripened earlier and yielded best (452 q/ha) with black Fertene.

Al-Jebori *et al.* (1987) studied on the effectiveness of black polythene, silver polythene, newspaper, straw and no mulch or control, mulching treatments under two nitrogen fertilizer sources (Amonium sulphate and Urea) at 100 kg N/ha on tomato plants (Super Marmando cultivar), the result indicated that black and silver polythene mulches significantly increased early production and total yield. Similarly, Perry and



Sanders (1986) reported that black polythene mulch increased early and total yield of large and marketable fruits of tomato.

A 2-year field study with the cv. Sunny was conducted on a fine sandy loam soil near Vincennes, India. Use of trickle irrigation with mulching, Bhella, (1988) stated that Mg concentrations were higher in soils mulched with polyethylene than in soils without mulch. The use of trickle irrigation increased plant height whereas polyethylene mulch increased plant spread and dry matter production. Early, late and total yields were improved with all trickle irrigation and polyethylene mulch treatment. Total yields were 66, 70 and 123% greater for plants grown with polyethylene mulch, trickle irrigation and polyethylene mulch plus trickle irrigation, respectively, than in the control plants.

In greenhouse trials, plants of the cv. Mountain Pride grown in sunlight over black polythene mulch had fewer auxillary shoots and were taller than plants grown over white polyethylene mulch. The black surface reflected less total light and less blue light, but a higher ratio of far-red (FR) to red (R) light. The effect of FR on plant height could be reversed by R (Decoteau *et al*, 1988).

In an investigation on mulch surface color affects yield of fresh market tomatoes, Decoteau *et al*. (1989) reported that mulch color affected the yield and growth of plant. Plants grown under mulch generally had the greatest early marketable yield and produced the least amount of foliage.

Polythene mulch has positive effect on plant growth. Black polythene mulch in cauliflower induced maximum growth (Singh and Mishra, 1975). From another trial with potato at Bangalore, India, Khalak and Kumaraswamy, (1992) found that mulching with straw and polythene gave average tuber yields of 18.2 and 16.7 t/ha higher than without mulching.

Choudhary and Prihar (1974) reported significant increase in plant height of maize in plots covered with water hyacinth or straw mulch than those in the soil-mulched plot or control at Regional Agricultural Research Station, Jamalpur.

Shaheen *et al.* (1993) from their experiment at SRTI, Ishurdi, Pabna, reported that straw mulch played a positive role to increase the yield of both potato and sugarcane. Similarly, Imam *et al.* (1990) reported that sugarcane and potato yields were increased by the use of rice straw mulch.

Biswas, (1993) observed that all mulches increased plant height, number of branches and fruits, fruit size (by weight), enhanced earlier flowering, fruit setting and ripening and yield more than double over the control.

While working with tomato plant grown on polythene mulch in New York state Wien *et al.* (1993) reported that the plants had more branches and higher mineral nutrient uptake and yield than the plants not mulched. They also found that mulching increased branching, hastened flowering on basal branches and increased the concentration of major nutrients in the above ground parts. Trials with organic and white polythene mulches on tomato had very little effect on plant height (Shrivastava *et al.*,1981) but clear plastic mulch resulted in most rapid growth (Geneva, 1981).

Both polythene and straw mulches appeared to have considerable increasing effect on plant height (Olasanta, 1985); Gunadi and Suwanti, 1988 and Buitellar, 1989).

Mulches had a significant effect on plant height of maize (Quayyum and Ahmed, 1993). Water hyacinth mulch produced taller plants in potato (Rashid *et al.*, 1981). Straw mulching was found to increase plant heights in many crops like cotton (Villamayor, 1976) and potato (Miedmore, 1983).

Rice straw, rice hulls, mature maize leaves and dried grass mulches increased the leaf number of potato as compared to control in Peru (Miedmore, 1983). Baten *et al.* (1995) reported that garlic treated with water hyacinth mulches produced the higher number of leaves/plant and higher leaf lengths than control plants.

Kaniszewski (1994) found that mulching increased marketable and total yield of potato but higher yield was obtained with black polythene mulch than with white and nonwoven black polythene. Total yield was 36% and marketable 53% higher for plants grown with black polythene mulch and trickle irrigation than for control. Brown or black biodegradable paper or black plastic improved marketable yields of potato by over 50% compared with no mulched plants (Paterson and Earhart, 1975). Elkner and Kaniszewski (1995) noticed that black polythene mulch increased total and marketable yield of tomato by about 20 and 24% respectively. They also reported that black polythene mulch increased fruit comparison resistance Gunadi and Suwanti (1988) recorded that mulch increased 16% yield over non-mulched plant spaced at 60X50 cm in single row.

Kumar *et al.* (1995) observed that mulching significantly improved the number of fruits per plant and fresh weight per fruit and reduced the percentage of unmarketable fruit compared with the unmulched control. Significant increases in percent early and total fruit yield were recorded due to mulching. Black polyethylene of 200 gauge was the best mulch. The volume and specific gravity of fruits were significantly influenced by mulching but total soluble solids and ascorbic acid content did not respond to mulching materials.

Mulch application also produced the taller plant in tobacco (Murty and Rao, 1969, cotton (Villamayor, 1976, sorghum (Ravindranath *et al.*, 1974; Mane and Umrani, 1981), wheat (Kapur *et al.*, 1978; Sharma and Chakor, 1989; Kataria and Bassi, 1997), barley (Agarwal and Rajat, 1977), moong (Kumar *et al.*, 1995), Garlic (Baten *et al.*, 1995) and Potato (Rashid *et al.*, 1981).

The growth analysis of tomatoes in black polythene and hairy vetch production systems were studied by Teasdale and Baki, (1997) and described that growth was better and early in the season for plants grown with black polythene than with hairy vetch mulch. The rate of fruit growth per unit leaf area was higher with black polythene than with hairy vetch.

In West Virginia during 1993 and 1994 an experiment was conducted by Monks *et al.*, (1997) on tomato and mulches (shredded newspaper, chopped newspaper, wheat straw, black plastic and plastic landscape fabric). They observed that chopped newspaper provided higher tomato yield than shredded newspaper applied at the same rates.

An experiment was conducted by Pramanik (1997) at the horticulture Farm, BAU, Mymensingh in order to study the effect of mulching and starter and its form of application on the plant growth, fruits and seed yield of tomato. Black polythene mulch gave the highest yield than water hyacinth and control treatment.

Water hyacinth and rice straw mulches had significant promotive effect on root spread and development (Awal and Khan, 1999). Mulching induced increased root growth was also reported in barley (Agarwal and Rajat, 1977). Mulches improved the root development of maize as compared to unmulched plot (Aina, 1981). But Wang *et al.* (1994) obtained the greatest root weight and spread of the root system without plastic cover in a field trial.

Jelonkiewicz and Borowy (2005), conducted experiments from 1998 to 2002, in Felin, southeastern Poland, to compare the growth of weeds in vegetable crops (cabbage, carrot, clearly, cucumber, leek, red beet, snap bean tomato and turnip) under conventional and no-tillage cultivation with rye cover crop. Rye mulch was 3-4 cm thick and entirely covered the soil surface at planting. Sixteen weeks later, only 10-20% of the soil surface was covered by rye residue. Based on the 3-year mean data, 664 weeds from 22 species grew on 1 m2 conventional plots, while only 41 weeds of the same 22 species were observed in plots covered with rye mulch. The population of these weeds was reduced by 76% (Capsella bursa-pastoris) to 100% (Galinsoga spp.) in plots covered with rye mulch.

Jamiokowska (2005) emphasized the importance of cover crops for protection of soil from water and aerial erosion, as well as leaching of nutrients from soil. Use of green manures as a mechanical barrier against weeds, and beneficial effects of exudates of green manures on control of weeds, pests and diseases of vegetables were discussed. Recommendations are included for autumn and spring sowing of cover crops (e.g. rye, wheat, oat, barley, sorghum, vetch, rape and mustard), which are cut or desiccated in the spring and are left in the field as mulch. It is also stated that yield of some vegetables, can be lower in the no-tillage cultivation compared with traditional cultivation. However, the dry matter content in Lublin, Poland, to study the effect of cover crops, such as rye, while and red clover, and field pea on health of tomato. Data are tabulated on fungi isolated from soil under tomato grown with rye and field pea as mulch crops compared with the traditional cultivation system during 1998-2000. The results showed that use of cover crop resulted in a good control of plant pathogens, especially *Fusarium oxysporum* f.sp. lycopersici, and an increase in the number of antagonistic fungi, e.g. *Trichoderma* spp. They concluded that use of cover crops allows decrease of the number of mechanical cultivations, as well as decrease of use of fertilizers, fungicides, insecticides and herbicides.

2.2 Effect of pruning on growth, yield components and yield of tomato

Experimental evidence on the value of pruning and training seems to be rather contradictory. An experiment was conducted with 1,2 or 3 stems combined with plant spacing remaining from 20 to 1.5 cm by Homme (1965). In this experiment 2 and 3 stemmed plans gave the best yield then others. Single stemmed plants gave the lowest yield in both trials irrespective of plant density.

An experiment was carried out by Aranjo and Nissio (1974) to observe the effect of pruning on yield from two field trials with 11 tomato cultivars. They reported that side shoot removal significantly reduced the total and marketable yield and the number of first grade fruit.

Lopez and Chan (1974) carried out an experiment to investigate the effect of plant spacing and training on the yield of tomato. The spacing were 15,30 and 45 cm in row with 1.2, 1.5 and 1.8 cm between rows. Pruning with 1 or 2 stem was started 45 day after sowing and was repeated every 8-13 days. The higher first yield was decreased with wider spacing but fruit size increased appreciably.

To find out the response of tomato plants to different pruning methods a field experiment was done by Orzeo *et al.* (1975). They reported that unpruned plant with the removal of 30% flowers gave the highest yield (58.09 t ha^{-1}) followed by 54.44 t ha^{-1} in unpruned plants and 43.47 t ha^{-1} from pruned plants where the shoots were pinched after 3 months. Whereas contradictory result was reported by Samundri (1964) who observed decreased yield and did not find induced earliness in tomatoes.

In Bulgaria, an experiment was carried out by Belichki (1977) to study the effect of plant training on the reproductive behavior of tomato plant. From the study, he reported that both the trained plants produced similar yields of standard fruit, which increased by 5.8-12.3%, compared to removal of all but 2 or 3 lowest laterals, and returns rose by 14.6-27.8%.

In a greenhouse experiment Borisov *et al.* (1978) studied the effect of training tomatoes with 1 or 2 stem (s) leaving 28 or 36 trusses m^{-2} and spacing maintained at

2.8-6.0 plants m^{-2}. From this study they reported that 2 stems yield 10-15% more fruit. Again they stated that in winter cultivation the highest yield was obtained from 4.7 plants m^{-2} with one stem and 6 trusses $plant^{-1}$ or form 2.8 plants m^{-2} with 2 stems and 10 trusses $plant^{-1}$.

Kusumo (1978) obtained larger and smooth skin fruit in cvs. Moneymaker and Geraldton when the plants were restricted to single stem. It was found that fruit size increased when fruits were thinned to 4 fruit $truss^{-1}$.

Pruning is important to get higher yield of tomato stated by Adrinace and Brison (1979). They found that where tomatoes are to be staked it is necessary to prune the plants 1,2 or 3 stems with closer spacing.

Ramirez *et al.* (1979) showed that 10% flower removal resulted in a higher yield (68 t ha^{-1}) than any other methods of pruning. They obtained best quality fruit from pruned plants of 2 or 3 stems.

Rajendra and Patil (1979) obtained higher yield from unpruned tomato plants than pruned plants. Maximum fruit weight (89.19g) was obtained in case of single stem pruned plant while fruit weight was lowest (63.07g) in unpruned plants. Other characters, like plant height, days to flowering and first fruit picking did not differ significantly among the treatments.

Atherton and Rudich (1986) stated that one or two side-shoots under the first truss on the main stem were found profitable in some growing areas.

An experiment was conducted by Sharfuddin and Ahmed (1986) under the field conditions of Bangladesh Agricultural Research Institute, Joydebpur during winter, 1985-86. They noted that plants under unpruned treatment produced maximum number (36) of fruits plant^{-1}. The highest yield of 120.50 t ha^{-1} was obtained from unpruned plants followed by one time pruning (100.43 t ha^{-1}) two times pruning (98.33 t ha^{-1}) and single stem pruning (73.41 t ha^{-1}), respectively. Overall, the highest yield of 123.36 t ha^{-1} was obtained from plants pruned to 3 stems and grown at a plant density of 27777 ha^{-1}.

In an experiment, Baki (1987) found that that pruning showed a significant effect on plant height. Unpruned plants exhibited higher plant height and highest number of inflorescence. Higher number of fruits was also obtained from unpruned plants. But maximum yield of tomato (96.08) t ha^{-1}) was obtained from unpruned plants with two stems at the closest spacing (75x50cm). The pruned plant produced fruits relatively earlier than other treatments.

In Brazil, Campos *et al.* (1987) carried out an experiment to observe the effect of stem pruning and plant population on tomato productivity. They found that stem pruning increased the early yield ant fruit weight but decreased both yield and fruit number plant^{-1}. The highest yield of marketable fruits was obtained in the control (54.8 t ha^{-1}) followed by the variant pruned above the 7th truss (53.07 t ha^{-1}). Marketable yields rose from 46.8 t ha^{-1} with 20,000 plants ha^{-1} to 54.49 t ha^{-1} at the highest density.

While working with the tomato var. Manik, Rahman *et al.* (1988) reported that unpruned plants gave the highest yield (120.5 t ha^{-1}) and the lowest yield (39.0 t ha^{-1}) was obtained from the single stem pruning. Other characters like plant height, first flower opening and first harvesting time were not influenced by the pruning operation. Number of flower clusters, number of flowers and number of fruits plant-1 were maximum in unpruned plant, whereas fruit length, fruit diameter and individual fruit weight were the highest from single stem pruning followed by two time pruning (21 and 35 day after transplanting).

Tomato grown in hydrophonic culture in a basic greenhouse, Hernandez *et al.* (1992) found that fruit diameter and fruit length were greatest in plants for pruning one stem and the number of fruits was higher. Yield was highest in unpruned plants followed by plants pruned 2 stems and one stem (3.826, and 3.093 kg m^{-2}, respectively).

Dhar *et al.* (1993) carried out an experiment of pruning and number of plants hill-1 on tomato. It was found that highest yield (96.25 t ha^{-1}) was produced in the double-branched plants followed by that in unpruned plants (66.21 t ha^{-1}) and single branched (61.29 t ha^{-1}) plants. In case of number of plants $hill^{-1}$, three plants $hill^{-1}$ produced highest yield (75.51 t ha^{-1}) followed by that from two plants (62.58 t ha^{-1}). The interaction effect was found significant for fruit size, weight and yield of tomato.

Davis and Estes (1993 found that early season yields were highest using early pruning (lateral shoots were 5-10 cm long) or delayed pruning (when lateral shoots were 30-60 cm long) opposed to no pruning and in row spacing of 46 cm. Total season yields $hectare^{-1}$ of pruning plants increased as in row spacing decreased. For

unpruned plants, however, total season yields were high at all spacing. Total season yields were lower from delayed pruning plants than from unpurned plants. Unpruned plants produced low yields of fruits>72 mm diameter but their total yield was greater than those of pruning plants. Net return hectare^{-1} was highest when i) plants spaced closely in row spacing were pruned early or ii) plants were spaced 46-76 cm apart and either pruned early or not pruned.

In Bangladesh condition, a field experiment was carried out by Rahman *et al.* (1994) to assess the effect of pruning on yield of tomato (*Lycopersicon esculentum Mill*) cv. Manik. They observed that the highest yield (120.50 t ha^{-1}) was found from unpruned plants and the lowest yield (69 t ha^{-1}) from the single stem pruning plants.

A field trial was conducted by Cruces and Valdes (1995) with fruit thinning treatment consisted of leaving all 6, 4 or 3 fruits truss^{-1}. Average individual fruit and seed weight was significantly increased compared to controls when 4 or 3 fruits were left truss^{-1}.

Hossain *et al.* (1996) conducted an experiment on mulching and pruning on the growth and yield of tomato and they found that combined effect was insignificant. However mulching with black polythene and two times pruning (21 and 35 days after transplanting) in combination gave the highest yield (76.32 t ha-1 from cv. Ratan). Individual fruit weight was maximum (62.64 g) with three times pruning (21, 35 and 49 DAT) followed by two times pruning (61.51 g), one time pruning (59.02 g) and without pruning (47.21 g) respectively.

In a trial with spring tomatoes, Cuifen and Yanping (1997) found that leaving up to 4 fruits had no significant effects on fruit bud development and gave higher yields than leaving 2 or 3 fruits.

A field trial was conducted by Srinivasan *et al.* (1999) in Tamil Nadu, India, during the kharif seasons of 1997 and 1998 to study the effect of spacing, training and pruning method (pinching or no pinching of the side branches) on the growth and yield of hybrid tomato ARTH-4. They found that pruned plants were significantly taller than non-pruned plants.

Navarrete and Jeannequin (2000) conducted an experiment to determine the effect of deshooting frequency on vegetative growth and fruit yield, in order to help growers to determining the optimal frequency. Four deshooting frequencies were compared on two cultivars: every 7, 9, 10, 14 and 21 days. Deshooting frequency affected both vegetative growth and yield: when deshooting was performed seldom (every 21 day), the stem diameter was decreased; the number of fruit m^{-2} was also reduced, leading to significantly lower yield. When the auxiliary buds were eliminated frequently (7 day), even those located near the apex, it reduced vegetative growth, but not yields. Therefore, from biological point of view, the optimal deshooting frequency lies between 7 and 14 days, probably depending on climate, season and cultivar vigour.

Luo-LaiXin *et al.* (2005), conducted top pruning, a new inoculating method of bacterial canker of tomato, developed based on the traditional methods including leaf shearing, root soaking and needle penetrating. Disease rates increased by leaf

shearing, root soaking and needle penetrating. These results indicate that top pruning, as a convenient and efficient inoculation method is applicable for further evaluation as against the effects of chemical control of this disease.

Going through the above reviews, it is concluded that the mulching and pruning is important considering growth and yield. The literature reveals that the effects of mulching and pruning have not been studied well for the production of tomato under Bangladesh condition.

CHAPTER-III

MATERIALS AND METHODS

MATERIALS AND METHODS

This chapter deals with the materials and methods used in the experiment. It includes a short description of location of the experimental plot, climate, characteristics of soil, materials used for the experiment and others. The details of the experiment are described below-

3.1 Location of the experimental plot

The present experiment was carried out at the Horticulture Farm-2, Bangladesh Agricultural Research Institute, Joydebpur (BARI), Gazipur during October, 2004 to Mach, 2005 to find out the effect of mulching and stem pruning on the yield of tomato.

3.2 Climate of the experimental site

The area is characteristic by hot and humid climate. The average rainfall of the locality during experimental period was 58.35 mm; the minimum and maximum temperature were at 17.82°C and 29.08^{0}C, respectively. The average relative humidity was 73.68% during October to March 2005.

3.3 Characteristics of soil

The land was medium high with good drainage facilities. The soil of the experimental area belonging to the grey, terrace soil tract. The texture of the soil was silt loam having pH 6.4, organic matter content of 1.88 % (Anonymous, 2004).

3.4 Plant material used

The tomato cultivar used in the experiment was Chaity "BARI-6". This is a high yielding indeterminate variety, seeds of which were collected from Horticulture Research Centre, Bangladesh Agricultural Research Institute(BARI), Joydebpur, Gazipur.

3.5 Raising of seedlings

Tomato seedlings were raised in seedbed of 3 m ×1 m size. The soil was well prepared and converted into loose friable and dried mass by spading. All weeds and stubbles were removed and 5 kg/seedbed well rotten cowdung was mixed with the soil. Ten gram of seeds was sown on 20 October 2004. After sowing, seeds were covered with light soil. Heptachlor 40 WP was applied @ 1.2g/seedbed, around each seedbed as precautionary measure against ants and worm. The emergence of the seedlings took place with 5 to 6 days after sowing. Weeding, mulching and irrigation were done when required.

3.6 Treatments and layout of the experiment

The experiment consisted two of factors, eg. mulching and pruning. There were three treatments of mulch eg. mulch with black polyethylene(M_1), mulch with straw (M_2) and control (Mo). It included three treatments of pruning eg. Single stem pruning (P_1), pruning up to 1st flower cluster (P_2) and control (Po). The experiment consisting of 9 treatment combinations was laid out in the Randomized Complete Block Design (RCBD) with four replications. The whole field was divided into four blocks each containing 9 plots. In total, there were 36 unit plots. The size of unit plot was 4m x 2.5m. Two adjacent unit plots and blocks were separated by 0.7 m and 1 m,

respectively. The treatments were randomly assigned to the unit plots of each block so as to allot one treatment only once to a block.

3.7 Land preparation

The experimental plot was first opened with a tractor on 5 November 2004. Thereafter, it was gradually ploughed and cross- ploughed several times with power tiller. Each ploughing was followed by laddering to break the clods and to level the soil. During land preparation, weeds and other stubbles of the previous crops were collected and removed from the land. These operations were done to bring the land under a good tilth conditions. The land was finally prepared through addition of the basal dose of manures and fertilizers. Irrigation channels were prepared around the plots four days before transplanting the seedlings.

3.8 Application of manure and fertilizers

Manures and fertilizers were applied uniformly in the experimental plots as per following doses in accordance with the recommendation of BARI (1996).

Manure and fertilizers	Dose per hectare	Dose per plot
Cowdung	5 tons	5 kg
Urea	550kg	550g
TSP	450kg	450g
MP	250kg	250g

A common dose of cowdung @ 5 t /ha was applied during final land preparation in the respective plots. 200kg Urea, Entire amount of TSP and MP per hectare was applied in the pit a week before transplanting; 175kg/ha Urea was applied as top dressing in rows after 3 weeks of transplanting and 175kg /ha was applied after 5 weeks of transplanting as top dressing.

3.9 Transplanting of seedlings

Healthy seedlings were taken separately from the seedbeds and were transplanted in the experimental plots during the late hours in the evening of 20 November 2004, maintaining a spacing of 50 cm between the rows and 50 cm between the plants. This allowed an accommodation of 40 plants per plot and one plant per hill treatment. Just after plantation the seedlings were watered. Seedlings were also grown around the experimental area for gap filling and to check the border effect.

3.10 Intercultural operations

After transplanting the seedlings, various kinds of intercultural operations were accomplished for better growth and development of the plants, which are as follows -

3.10.1 Gap filling

When the seedlings were well established, the soil around the base of each seedling was pulverized. A few gap filling was done by healthy seedlings of the same stock where initial planted seedling failed to survive.

3.10.2 Weeding and Mulching

Weeding was accomplished as and whenever necessary to keep the crop free from weeds, for better soil aeration and to break the crust. It also helped in soil moisture utilization. Two types of mulches viz. straw and black polyethylene were placed on the respective plots immediately after transplanting as per the layout of the experiment. No irrigation was given to mulched plots.

3.10.3 Staking and Pruning

When the plants were well established, staking was given to each plant by bamboo sticks to keep them erect. When the plants grew up, the plants were pruned as per the treatment, in case of single stem pruning, all the side shoots were removed and only the main stem was allowed to grow. In case of pruning up to 1st flower cluster the main and all the auxiliary stems were kept. Pruning started from 35 days after transplanting and continued throughout the whole period of plant growth as per treatments.

3.10.4 Irrigation

Two irrigation were given throughout the growing period by watering cane. The first irrigation was given at 40 day after planting followed by second irrigation at 20 days after the first irrigation. Mulching was also done after each irrigation at appropriate time for breaking the soil crust.

3.10.5 Plant protection

Insect pests: Malathion 57 EC was applied @ 2ml l^{-1} against the insect pests like cutworm, leaf hopper, fruit borer and others. The insecticide application was made fortnightly from a week after transplanting to a week before first harvesting. Furadan 10 G was also applied during final preparation as soil insecticide.

Disease: During foggy weather precautionary measure against disease infection of tomato was taken by spraying Dithane M-45 fortnightly @ 2g l^{-1}, at the early vegetative stage. Ridomil was also applied @ 2 g l^{-1} against blight disease of tomato.

3.11 Harvesting

Fruits were harvested at 3-day intervals during mature and ripe stage. The maturity of the crop was determined on the basis of red coloring of fruits. Harvesting was started from 16 February 2005 and was continued up to 20 March 2005.

3.12 Data collection

Data were collected from the plots throughout the experimental period. One plant was present in a hill in this experiment. In this case five plants were selected at random from each unit plot to collect the following parameters.

3.12.1 Plant height

Plant height at final harvest was measured from five randomly selected plants in centimeter from the ground level to tip of the longest stem and mean value was calculated. Plant height was also recorded from 1st harvest and last harvest.

3.12.2 Days to 50% flowering

Different dates of the 50 % flowering were recorded and then the observations were calculated.

3.12.3 Number of flower clusters per plant

The number of flower clusters was counted from the five sample plants and the average number of cluster produced per plant was recorded.

3.12.4 Number of flower per cluster

It was calculated by the following formula

$$\text{Number of fruits per cluster} = \frac{\text{Total number of flower from five sample plant}}{\text{Total number of flower clusters from five sample plant}}$$

3.12.5 Number of fruits per plant

It was recorded by the following formula

$$\text{Number of fruits per plant} = \frac{\text{Total number of fruits from five samples plant after final harvest}}{5}$$

3.12.6 Fruit length (cm) and breadth (cm)

The length of fruit was measured with a slide calipers from the neck of the fruit to the bottom of 5 selected marketable fruits from each plot and their average was taken in cm as the length of fruit.

Breadth of fruit was measured at the middle portion of 5 selected marketable fruit from each plot with a slide calipers and there average was taken in cm as the diameter of fruit.

3.12.7 Yield of fruits (kg) per plant

The total weight of fruit per plant was calculated out by weight, total weight of harvested fruits of 5 randomly selected plants and then divining it with 5.

3.12.8 Yield of fruits (tons) per hectare

It was measured by the following formula

$$\text{Fruit yield (t/ha)} = \frac{\text{Fruit yield per plot (kg) X 10000}}{\text{Area of plot in Square meter X 1000}}$$

3.13 Statistical analysis

The recorded data of different characters was analyzed by following the ANOVA technique and the mean value was adjusted by the Duncan's New Multiple Range Test (DMRT) at.05 level of probability for interpretation of the results.

CHAPTER-IV

RESULTS AND DISCUSSION

RESULTS AND DISCUSSION

This chapter comprises the presentation and discussion of the results obtained from the effect of mulching and pruning on the growth and yield of tomato, different yield contributing characters and yield of tomato as influenced by different levels of mulching and pruning. The result on main effects of mulching and pruning, and their interactions have been presented and discussed under the following headings

4.1 Main effect of mulch on the yield and yield contributing character of tomato

4.1.1 Plant height

The result on the main effects of mulch on the height of plant has been presented in Table 1. The main effects of all the factors on plant height were found to be significant.

Among the mulch treatments, the maximum plant height at last harvest (122.0 cm) was recorded in the mulch with black polyethylene and the minimum (107.9 cm) was recorded in no mulch (Table 1)

4.1.2 Days to 50% flowering

The days to 50% flowering as influenced by mulching did not vary significantly; it was earlier (36.08) in no mulching and late (36.67) in mulch with straw. The days to 50% flowering were shown very similar (Table 1).

4.1.3 Number of flower cluster per plant

The effect of mulching in respect of number of flower clusters per plant was found to be significant. The maximum number of flower cluster per plant (8.25) was found in mulch with black polyethylene and the minimum (6.50) was found in no mulching (Table-1). Significant variation was observed on number of flower cluster per plant due to different mulch treatments.

4.1.4 Number of flower per cluster

The number of flower per cluster for different mulching did not vary significantly. The maximum number of flower per plant (7.67) was obtained from no mulching and the minimum number of flower per cluster (6.92) was found from mulching with straw, this might be one kind of criteria of this variety.

Table 1 Main effect of mulch on the yield and yield contributing character of tomato

Treatment	Days to 50% flowering	Plant height (cm)		No. of flower cluster/ plant	No. of flower/ cluster	No. of fruits/ plant	Yield of fruit/ plant (kg)	Yield t/ha
		1st harvest	Last harvest					
M_1	36.25a	115.4a	122.0a	8.25a	7.25a	24.83b	2.13b	88.47b
M_2	36.67a	114.2a	120.9a	7.0b	6.92a	27.17a	2.36a	94.37a
Mo	36.08a	98.33b	107.9b	6.50b	7.67a	21.42c	1.85c	72.43c
CV%	3.30	9.22	6.99	8.68	13.01	10.57	11.81	2.37

Means followed by common letters do not differ significantly at 5% level of significance.

M_1=Mulch with black polyethylene

M_2=Mulch with straw and

Mo= No mulching

4.1.5 Number of fruits per plant

Analysis of variance showed that the mulching had significant influence on the number of fruits per plant. It was revealed from the Table 1 that the maximum number of fruits per plant (27.17) was obtained from straw mulch treatment and the minimum (21.42) from the no mulching due to conservation of soil moisture around the root surface of plant.

4.1.6 Yield of fruit per plant

The mulch had significant effect on the yield of fruit per plant. The maximum yield of fruit per plant (2.36 kg) was obtained from mulch with straw whereas the minimum (1.85 kg) was obtained from no mulching treatment. Significant effect on the yield of fruit per plant was observed due to number of fruits per plant and size of fruit.

4.1.7Yield of fruit per hectare

The yield of fruit of tomato was converted into per hectare basis and was expressed in ton. The mulch with straw produced significantly highest yield (94.37 tons/ha) and lowest yield (72.43 tons/ha) was obtained from no mulching treatment.

4.2 Main effect of pruning on the yield and yield contributing character of tomato

4.2.1 Plant height

A marked variation in plant height was observed due to the influence of different pruning levels. The variation in plant height was not significant. The highest plant height was observed from pruning up to 1st flower cluster at last harvest (117.1cm) and the lowest plant height was observed from unpruned plant at last harvest (116.7cm) (Table 2).

4.2.2 Days to 50% flowering

The days to 50% flowering as influenced by pruning exhibited did not have significant effect on days to 50% flowering. It was earlier (36.00) in pruning upto 1st flower cluster and late (36.83) in unpruned plants.

4.2.3 Number of flower cluster per plant

The effect of pruning in respect of number of flower clusters per plant was significant. From Table 2, it was recorded that number of flower clusters decreased as the severity of pruning increased. Unpruned plant produced the highest number of flower clusters per plant (9.25), which was probably due to the presence of more side branches. Single stem pruning plants produced the lowest number of flower clusters (5.16). Similar results were also reported by Baki (1987) and Rahman *et al.* (1988).

Table 2 Main effect of pruning on the yield and yield contributing character of tomato

Treatment	Days to 50% flowering	Plant height (cm)		No. of flower cluster/ plant	No. of flower / cluster	No. of fruits/ plant	Yield of fruits/ Plant (kg)	Yield t/ha
		1st harvest	Last harvest					
P_1	36.17	108.8a	116.7a	5.17c	7.58a	22.25b	1.91b	76.53b
P_2	36.00	110.6a	117.1a	7.33b	7.17a	24.50a	2.28a	89.57a
Po	36.83	108.5a	117.1a	9.25a	7.08a	26.67a	2.15a	89.17a
CV%	3.30	9.22	6.99	8.68	13.01	10.57	11.81	2.37

Means followed by common letters do not differ significantly at 5% level of significance.

P_1= The single stem pruning

P_2= Pruning unto 1st flower cluster and

Po= No pruning

4.2.4 Number of flower per cluster

Number of flower per cluster was observed due to the effect of different pruning levels showed non-significant variation. The highest number of flower per cluster (7.58) was obtained form the single stem pruning (Table 2) and the lowest (7.08) number of flower per cluster was obtained from unpruned plants, this might be one kind of criteria of this variety.

4.2.5 Number of fruits per plant

Number of fruits per plant showed significant variation due to different pruning levels. The highest number of fruits per plant (26.67) was produced by unpruned plant and then decreased with higher intensity of pruning practices. The lowest number of fruits per plant (22.25) was harvested from one stem plant (Table 2). The higher number of fruits in unpruned plants appeared to be related with the increased number of flowers cluster per plant.

4.2.6 Yield of fruit per plant

There was significant variation in the yield of fruit per plant due to the different pruning levels. Data in Table 2 showed that the maximum yield of fruit per plant (2.28kg) was obtained from pruning up to 1st flower cluster due to fruit size and the minimum yield (1.91kg) was obtained from one stem plant due to the number of fruit per plant and size of fruit. Baki (1987) found that maximum yield of tomato was obtained form pruning up to 1st flower cluster. This is in agreement with the results of Meijndert (1986).

4.2.7 Yield of fruit per hectare

Different pruning levels were found to influence significantly the yield of fruit per hectare. The highest yield of fruit (89.57 tons/ha) was obtained from pruning up to 1st flower cluster than one stem plants (76.53 tons/ha). This is in agreement with the

results of Homme (1965), Lopez and Chan (1974), Ramirez *et al.* (1970) and Baki (1987).

4.3 Interaction effect of mulch and pruning on the yield and yield contributing character of tomato

4.3.1 Plant height

There was a significant interaction effect of different mulching and stem pruning on the plant height. At last harvest the plant height varied from 111.5cm to 137.5cm (Table 3). The tallest plant (137.5cm) was recorded in the treatment combination of mulch with black polyethylene and the single stem pruning, and the lowest (111.5cm) in the treatment combination of no mulching and the single stem pruning. The less moisture conservation in soil in case of no mulch, so the lower nutrient uptake to the single stem plants probably less with plant height than other treatment combinations.

4.3.2 Days to 50% flowering

The days to 50% flowering as influenced by interaction effect between mulching and pruning was considered, the shortest time days to 50% flowering (35.25) was found in pruning up to 1st flower cluster and no mulching treatment (Mo P_2), and late (37.25) was found in no pruning and mulching with straw (M_2Po), which did not significantly different from other treatments.

4.3.3 Number of flower cluster per plant

The interaction effect of mulching and stem pruning was also significant. The maximum number of flower clusters per plant (11.0) was recorded from the treatment combination of mulch with black polyethylene and unpruned plants and it was statistically different from other treatment combinations (Table 3). In all the cases, it was found that unpruned plants produced higher number of flower clusters plant-1, which was probably due to the presence of more side branches.

4.3.4 Number of flower per cluster

In case of, number of flower per cluster, the interaction effect was not significant. The highest number of flower per cluster (7.75) was found from no mulching & no pruning (MoPo), pruning up to 1st flower cluster & no mulching (M_0P_2) and the single stem pruning and straw mulch (M_2P_1) and the lowest number of flower per cluster (6.25) was found from mulch with straw and no pruning treatment(M_2 Po), this might be one kind of criteria of this variety (Table 3).

4.3.5 Number of fruits per plant

The interaction effect due to the mulching and pruning was found to be significant in number of fruits per plant. It ranged from 20.25 to 29.00. The highest number of fruits per plant (29.00) was obtained from mulch with straw and no pruning (M_2Po) treatment because of higher number of sight branches and the lowest number (20.25) was obtained from no mulching and single stem pruning (Mo P_1) plants due to less number of sight branches (Table -3).

Table 3 Interaction effect of mulch and pruning on the yield and yield contributing character of tomato

Treatment	Days to 50% flowering	Plant height (cm)		Fruit Length (cm)	Fruit Breadth (cm)	No. of flower cluster/ plant	No. of Flower/ cluster	No. of Fruits/ plant	Yield of fruit/ plant (kg)	Yield t/ha
		1st harvest	Last harvest							
MoPo	37.0 a	113.3 bc	122.4 bc	4.85 a	5.20 b	8.25 b	7.75 a	23.50 bcd	1.93 d	77.0 e
MoP_1	36.0 a	101.5 c	111.5 c	4.95 a	5.68 ab	4.25 e	7.50 a	20.25 d	1.71 d	68.20 g
MoP_2	35.25 a	109.0 c	118.70 bc	5.08 a	5.80 ab	7.0 bcd	7.75 a	20.50 cd	1.92 d	72.10 f
M_1P_o	36.25 a	118.3 ab	128.1 ab	4.96 a	6.03 a	11.0 a	7.25 a	27.50 ab	2.07 bcd	92.70 c
M_1P_1	36.50 a	127.6 a	137.5 a	4.75 a	5.45 ab	6.0 cde	7.50 a	22.50 cd	2.0 cd	79.60 de
M1P2	36.00 a	120.3 ab	130.7 ab	4.78 a	5.38 ab	7.75 bc	7.0 a	24.50 bc	2.33 abc	93.10 c
M_2Po	37.25 a	119.8 ab	128.9 ab	4.95 a	5.68 ab	8.5 b	6.25 a	29.0 a	2.45 ab	97.80 b
M_2P_1	36.00 a	121.0 ab	133.1 ab	4.83 a	5.30 ab	5.25 de	7.75 a	24.0 bcd	2.05 cd	81.80 d
M_2P_2	36.75 a	122.0 ab	135.8 ab	5.0 a	6.60 a	7.25 bcd	6.75 a	28.50 a	2.59 a	103.5 a
CV%	3.30	9.22	6.99	7.38	8.08	8.68	13.01	10.57	11.81	2.37

Means followed by common letters do not differ significantly at 5% level of significance.

4.3.6 Fruit breadth and length

The analysis of variance given in table 3 revealed that the interaction effect of mulching and pruning on the fruit length was found to be insignificant, but the fruit breadth was found to be statically significant. However, the highest fruit length (5.08cm) and breadth (6.68cm) were observed from pruning up to 1st flower cluster and no mulching (MoP_2), and mulching with straw and no pruning (M_2Po) respectively. The minimum length (4.75cm) was found from the treatment combination of mulching with black polyethylene & the single stem pruning (M_1P_1), and the minimum fruit breadth (5.20cm) was found from the treatment combination of no mulching and no pruning (MoPo). This was probably depends upon the nutrient uptake and moisture absorption during the period of plant growth and fruit setting.

4.3.7 Yield of fruit per plant

The data showed that the interaction between different mulch and pruning levels had significant effect on the yield of fruit per plant. It ranged from 1.71 to 2.59 kg. The highest yield per plant (2.59 kg) was obtained from much with straw and pruning up to 1st flower cluster (M_2P_2) this was probably because of the higher nutrient and moisture absorption from soil and the lowest (1.71kg) was obtained from no mulching and the single stem pruning (MoP_1), this was probably because of the lower nutrient and moisture absorption from soil and less side branched; as a result they gave lower yield per plant.

4.3.8Yield of fruit per hectare

The interaction effect of mulching and pruning practices on the yield of fruit per hectare was statistically significant. When the total yield of fruit per plot was transformed into calculated total yield of fruit per hectare it was found that the maximum yield

(103.50 tons/ha) was recorded from the treatment combination mulch with straw and pruning up to 1st flower opening (M_2P_2) because of maximum yield of fruit per plant and the minimum (68.20 tons/ha) was recorded from no mulch and the single stem pruning (MoP_1) due to minimum yield of fruit per plant, this result is in agreement with Dhar *et al.* (1993).

It is evident from the results presented here on the above mentioned parameters that both mulching and pruning practices showed significant influence on yield components and yield of tomato. It was clear that generally straw mulch produced higher total yield than other mulching treatments. This was possibly due to better use of nutrient and moisture.

On the other hand, it was also apparent that pruning helped to provide sufficient nutrients, water and sunshine to the plants. It appeared from the present findings that pruning up to 1st flower cluster produced highest total yield with in the pruning treatments.

But the combination of mulch with straw and pruning up to 1st flower cluster produced the highest total fruit yield. So, in order to achieve higher yield the treatment combination of mulch with straw and pruning up to 1st flower cluster.

CHAPTER-V

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

An investigation was conducted at the research farm of Olericulture Division of the Horticulture Research Center, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during the period from September 2004 to March 2005, to study the effect of mulching and stem pruning on growth and yield of tomato. The experiment consisted of mulch with black polyethylene, mulch with straw, & control and three pruning levels, namely the single stem pruning, pruning up to 1st flower cluster and no pruning.

The experiment was laid out in Randomized Complete Block Design (RCBD) with four replications. The size of each unit plot was 4 m X 2.5 m and the spacing was 50cm X 50cm. The seedlings of tomato cv. Chaity were transplanted in the field on 20, November 2004. From each plot 5 plants were randomly selected for collection of data on growth, yield of tomato with mulching and stem pruning. Data on growth and yield parameters were recorded and statistically analyzed by the Duncan's New Multiple Range Test (DMRT), at 5% levels of probability to evaluate the treatment effects.

The plant height and number of leaves per plant differed significantly due to mulching and pruning. The tallest plants during last harvest were produced by mulching with black polyethylene and the single stem pruning (137.5cm) while the lowest plant height was observed from the single stem pruning and no mulching (111.5cm) of BARI Tomato-6, which is indeterminate type and high yielding variety.

The result showed that the single effect of mulching had significant effect on plant height, number of fruits per plant, yield of fruit per plant and fruit yield. The highest fruit yield was obtained from mulching with straw (94.36 t/ha) followed by black polyethylene mulch (88.47 t/ha) and control (72.43 t/ha). On the other hand, the main effect of pruning was significant for number of cluster per plant, number of fruit per plant, yield of fruit per plant and fruit yield. The highest yield was obtained from pruning up to 1st flower cluster (89.57 t/ha) followed by non-pruning control (89.17 t/ha) and the lowest yield was obtained from single stem pruning (76.53 t/ha).

Significant interaction effect of mulching and pruning was obtained for plant height, fruit breadth, number of cluster per plant, number of fruits per plant, yield of fruit per plant and yield tons per hectare. The highest yield was obtained from straw mulch and pruning up to 1st flower opening (103.5 t/ha) followed by straw mulch and no pruning (97.80 t/ha), mulch with black polyethylene and pruning up to 1st flower cluster (93.10 t/ha), and mulch with black polyethylene and no pruning (92.70 t/ha) respectively.

The maximum shoot fresh weight per plant was obtained from the combination of mulching and pruning. The minimum fresh weight of shoot was obtained from no mulching and no pruning. Different mulching and pruning exhibited significant influence on fruit weight and fruit yield of tomato.

It was evident from the results that successful tomato cultivation is possible by both pruning and mulching. However, under large-scale commercial situation tomato can be produced using mulches and pruning.

On the basis of the results obtained from this study it may be suggested that mulching with straw and pruning up to 1st flower cluster would give better performance is respect of tomato yield.

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APPENDIX

Appendix I Monthly temperature, relative humidity and rainfall during the period October, 2004 to March, 2005

Month	**Air temperature (^{0}C)			**Humidity (%)	*Rainfall (mm)
	Maximum	Minimum	Average		
October'04	31.45	23.12	27.28	75.25	17.4
November'04	29.60	17.68	23.63	68.5	0.00
December'04	27.14	14.93	21.03	73.41	0.00
January'05	24.91	13.02	18.96	72.67	0.08
February'05	29.15	16.96	23.06	69.07	0.01
March'05	32.24	21.22	26.73	76.16	17.52

* = Monthly total

** =Monthly Average

Source : Plant Physiology Division, Bangladesh Rice Research Institute, Joydebpur, Gazipur-1701