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Effect of Mulching Materials on Weed Control and Yield Performance of Watermelon

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Abstract

The field experiment was conducted on watermelon at Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Lebukhali, Dumki, Patuakhali during winter season of 2017 and 2018 to study the effect of different mulching material on weed control performance, yield and quality of water melon. All the weed control parameter, plant growth, yield and quality characters were superior with silver on black polyethylene mulch and ash color polyethylene mulch while, plants without mulch (control) resulted poor growth and yield for poor weed control. With economic point of view, silver on black polyethylene mulch and ash color polyethylene mulch resulted in the highest net return and found to be more economical with highest cost: benefit ratio.

Keywords: Watermelon, Mulching, Weed-control, yield performance.

INTRODUCTION

Watermelon (*Citrullus lanatus* Thunb.) is one of the important cucurbits vegetable crops grown extensively in southern region of Bangladesh. It is a major river-bed crop of Patuakhali, Barguna and Bhola. It is a popular dessert fruit in summer. Mulching in general is a beneficial practice for crop production. Mulch conserves soil moisture, retained heat as well as it suppresses weed growth (Ahmad *et al*., 2007, Sharfuddin and Siddique, 1985). The greatest benefit from plastic mulch is that the soil temperature in the planting bed is raised, promoting faster crop development and earlier harvest. Soil water loss is reduced under plastic mulch. As a result, a more uniform soil moisture is maintained and irrigation frequency can be reduced. The growth of plants on mulch can be twice that of plants in unmulched soil. Because larger plants will require more water, mulching is not a substitute for irrigation. Ash color polyethylene mulch will reduce light penetration to the soil. Weeds cannot generally survive under such mulch.

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Excess water runs off the impervious mulch. Fertilizer are optimally used and not wasted. The soil under plastic mulch remains loose, friable and well-aerated. Roots have access to adequate oxygen, and microbial activity is enhanced. Therefore, considering the importance of different mulching in various crops, the present investigation was carried out to study the effect of different mulching material on weed control, growth and yield of watermelon. The study was undertaken to fulfill following *Objectives:*

- To find out effective and economically viable mulching material for watermelon.
- To find out the effect of mulching material on weed control, growth and yield of watermelon.

MATERIALS AND METHODS

The field experiment was conducted on water melon at Regional Horticulture Research Station, Bangladesh Agricultural Research Institute, Lebukhali, Dumki, Patuakhali during winter 2018. The experiment was laid out in Randomized Block Design with three replications. There were total four treatment of mulching materials viz., ash color polyethylene mulch (T_1), silver on black polyethylene mulch (T_2), Blue polythene mulch(T_3), Rice straw mulch(T_4), two hand weeding (T_5) and Control (T_6) without mulch. Mulching applied up to 25 cm both the side from the stem of watermelon. The thickness of three polyethylene much was 30 micron while rice straw much was applied at 4 inch thick. 15 days old single seedling of cv. Big Family was planted on 25 January 2018 at 1.5 m x 1 m spacing. The fertilizers were applied at the rate of 75:40:40 NPK kg/ha (M.M Islam et. Al. 2014-15). Full dose of P_2O_5 and K_2O was applied as basal dose and nitrogen was given in two equal split as basal and top dressing at 20 DAS. The farmyard manure @ 20 tones per hectare was mixed in soil uniformly to all the treatments. The observations on growth, flowering, yield and quality parameters were recorded and subjected to statistical analysis of variance technique as described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Effect on weed control

Effect of different mulching treatments (Table 1) significantly influenced the weed characters *viz*., weed density and weed dry weight at both 40 days after transplanting and 60 days after transplanting. Among the different mulches, ash polythene mulch and silver on black polyethylene recorded the nil weed density and weed dry weight, respectively at 40 and 60 days after transplanting. This may be due to the suppression of weeds by increasing the soil temperature resulting in killing the weed seeds in the early stages. The effectiveness of black color polythene sheet as mulching material in restricting weed growth has been reported by Chirstopher Lourduraj *et al.* (1997) in brinjal and Agrawal *et al.* (2000) in banana cv. Dwarf Cavendish. But the blue color polyethylene torn and tired after 15 days of transplanting. So there were weed presence under the blue color polyethylene mulch. Among the treatments, the nil weed dry weight was observed in ash color polythene mulch and silver on black polyethylene which may be due to the polythene sheet mulch acts as a barrier between sunlight and soil which further leads to a reduction in the weed growth under the mulches. At the early growth stage weed density and weed biomass was lower in rice straw mulch but

later stage both weed density and weed biomass increased simultaneously (22.67 and 60 gm/m^2). Two hand weeding treatment controlled weed density and weed biomass effectively when weeding was done (59.67 and 60.33 g/m^2) but later weed density and weed biomass increased sharply (87 and 923.03 g/m^2). Highest weed number and weed biomass was found in control (no weeding) treatment. Weed number was 138.67 and 164.33. Weed biomass was 86.17 g/m^2 159.67 g/m^2.

Table 1. Effect of different mulching material on weed control in watermelon

Treatment	Weed no. in 0.25m^2 at 40 DAT	Weed no. in 0.25m^2 at 60 DAT	Weed biomass in0.25m^2 at 40 DAT	Weed biomass in 0.25m^2 at 60 DAT
T_1 (ash color polyethylene)	0	0	0	0
T_2 (silver on black polyethylene)	0	0	0	0
T_3 (blue color polyethylene)	18	20.67	15.35	22.66
T_4 (Straw mulch)	14.33	22.67	48.7	60
T_5 (two hand weeding)	59.67	87	60.33	92.03
T_6 (without weeding)	138.67	164.33	86.17	159.67
CV%	30.64	20.18	24.97	20.37
LSD	44.3	28.1	24.85	32.19
level of significance	*	*	*	*

Effect on Growth and Yield

There was statistically significant difference among the treatments on main vine growth rate in terms of mulching materials. Longest vine was found in silver on black polyethylene mulch treatment 357 cm at 60days after transplanting which was statistically similar with ash color polyethylene mulch treatment. However without weeding treatment recorded the minimum growth rate. The increase in vine length was attributed to sufficient soil moisture near root zone, minimized the evaporation loss due to mulching and lack of weed competition. Similar findings have also been obtained by Dean ban*et al.* (2004), Ansary and Roy (2005) in watermelon, Al-Majali and Kasrawi (1995) in muskmelon. Ash color polyethylene mulch(T_1) and silver on black polyethylene(T_2) was found to have significantly better effect on the extent of fruit number than other mulching materials (1.16 and 1.33 fruits/plant). This two mulch increased fruit set than other mulch and no mulch. This might have been influenced by favorable soil temperature, moisture conditions and weed control. The present finding was in accordance with Andino and Motsenbocker (1998), Johnson *et al.* (2000) and Ansary and Roy (2005) in watermelon. Blue color polyethylene mulch gave only 0.89 fruit per plant. There was no significant difference in terms of days to first female flowering among the treatments. There was significant difference in terms of fruit length and breadth among the treatments. Longest fruit was found in silver on black polyethylene mulch(T_2) a length of 28 cm. Highest fruit breadth was also found in silver on black polyethylene mulch 20.5 cm followed by 21.17 cm length and 17.67 cm wide in ash color polyethylene mulch(T_1).

Table 3. Effect of different mulching material on growth, yield and quality of watermelon

Treatment	Plant height at 20DAT	Plant height at 40DAT	Plant height at 60DAT	Days to female flower	No. of Fruit per Plant
T_1 (ash color polyethylene)	83.28	218.33	314	43.41	1.16
T_2 (silver on black polyethylene)	111.67	272.33	357	44	1.33
T_3 (blue color polyethylene)	80	169	244	42	0.89
T_4 (Straw mulch)	79.33	168.33	249	44.69	0.66
T_5 (two hand weeding)	71.33	161.67	227.33	46.5	0.55

T_6 (without weeding)	52.67	123.33	170.33	47.11	0.44
CV%	12.18	13.27	14.03	6.81	21.3
LSD	27.53	69.83	103.55	-	0.5
level of significance	**	*	*	ns	**

DAT=Days after transplanting

Table 3. Continued

Treatment	Average fruit weight(g)	Average fruit length (cm)	Average fruit breadth (cm)	TSS	Yield (ton per hectare)
T_1 (ash color polyethylene)	3.82	25.17	17.67	9.67	25.07
T_2 (silver on black polyethylene)	4.43	28	20.5	10	26.6
T_3 (blue color polyethylene)	2.93	23	17	8.33	16.2
T_4 (Straw mulch)	2.38	17.97	14.5	8.67	13.39
T_5 (two hand weeding)	1.9	14.17	11.07	8.17	13.11
T_6 (without weeding)	1.47	15.17	11	7.17	4.8
CV%	15.97	12.42	11.82	7.3	8.83
LSD	1.27	7.01	5.12	1.79	4.13
level of significance	**	**	**	*	**

DAT=Days after transplanting

Among all mulching treatments, maximum average fruit weight was recorded in treatment silver on black polyethylene (T_2) (4.43 kg). It appears that silver on black polyethylene (T_2) might have induced favorable conditions to attainment of big fruits. The above results were in agreement with those of Ansary and Roy (2005), Arancibia and Motsenbocker (2008) in watermelon. Among all mulching treatments, maximum fruit yield recorded in treatment silver on black polyethylene (T_2), an average yield of 26.6 ton per hectare, which is statistically similar with ash color polyethylene mulch (T_1) result. The above results were in consonance with those of Rudich *et al.*(1978), Battikhi and Ghawi (1987), Bhella (1988), Qadir (1992), Al-Majali and Kasrawi (1995), Johnson *et al*. (2000), Dean ban *et al.* (2004), Ansary and Roy (2005), Cenobio*et al.* (2007) and Arancibia and Motsenbocker (2008) in watermelon, Siwek and Kunicki (1998), Ibarra–Jimenez *et al*. (2008), Hallidri (2001) in cucumber, Ibarra *et al.* (2001) in muskmelon. It was found that application of mulching material had produced a significant effect on total soluble solid in fruit of watermelon than control which indicates the sweetness of fruit. Among the treatments silver on black polyethylene (T_2) and ash color polythene mulching (T_1) gives the sweetest fruit. The present findings were in close confirmation with Ansary and Roy (2005) in watermelon.

CONCLUSIONS

It is concluded that the application of silver on black and ash color polythene mulch is beneficial than other organic mulches in improving the yield quality and economically beneficial of water melon production. This polythene mulch reduces the labor for weeding. So,ultimately reduce the production cost. Increase in yield along with other advantages of mulching may further help the farmers to grow water melon on a large scale.

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