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Effect of Different Mulch Materials on Weed Control in Cucumber (*Cucumis sativus* L.) Hybrid "Multistar" Under Shade Net Conditions

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ABSTRACT

Research conducted in an greenhouse during late rabi to determine the effect of different mulch materials on weed control in Cucumber seedlings (Cucumis sativus L. F1 hybrid "Multistar"). Among the different mulches i.e Black- black, Black-silver, Black-white, organic mulches like paddy straw, paddy husk, ground nut shells and pre-emergence herbicide (pendimithaline @ 1.0 kg a.i/ha^{-1}) on weed control study showed significant differences on weed density (5.00 m^{-2}, 7.33 m^{-2} and 6.00 m^{-2}) and weed dry weight (2.20 g m^{-2}, 2.43 g m^{-2} and 2.50 g m^{-2}) were the lowest with the use of Black-black polythene mulch whereas control recorded the highest weed density (37.00 m^{-2}, 40.00 m^{-2} and 39.00 m^{-2}) and weed dry weight (27.93 g m^{-2}, 28.20 g m^{-2} and 27.83 g m^{-2}) at 30, 60 and 80 days after sowing respectively. Highest weed control efficiency (92.12%, 91.38% and 91.01%) was registered with Black-black polythene mulch whereas lowest weed control efficiency (55.93%, 56.02% and 56.88%) was registered with paddy straw mulch at 30, 60 and 80 DAs respectively. Weed index (74.83%) was significantly highest in Pre-emergence herbicide (Pendimithaline @ 1.0 kg a.i/ha^{-1}), while lowest (3.65%) Weed index was registered with Black-silver polythene mulch.

Key words: *Weed Density, Weed dry weight, Weed control efficiency, Paddy straw mulch, Pendimithaline.*

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is an important summer vegetable in all parts of India. It is a thermophillic and frost-susceptible Horticultural crop usually cultivated in fields during spring-summer period[6] or in greenhouse in different seasons. It is considered as fourth most important vegetable crop after tomato, cabbage and onion in Asia[23].

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It closely resembles the wild form *Cucumis hardwicki*, which is a native of Himalayas and originated in India and belongs to the family cucurbitacea[3]. Now it is grown all around the world and is thought to be one of the oldest vegetable crops being grown for at least five thousand years[21,22]. European cucumber (*Cucumis sativus*) hybrid "Multistar" is a seedless type, commercially cultivated in countries like Canada, California, Arizona, and Ohio. In India it is also gaining importance at a quicker pace. It is a product that originated from European greenhouses and is called as English cucumber. In India it is cultivating in an area of 43,280 ha, with a production of 6.78 lakh MT[13]. Like many other vegetable crops, cucumber cultivation has several constraints in cucumber production, of which weeds often pose a serious problem by competing for space, light, water and nutrients, weakening crop stand and reduce harvest efficiency[1]. The losses due to weeds depend upon type of weed flora, their density, agro-climatic conditions, fertility, moisture status, soil type and type of growth of the crop etc.

Though manual weeding is the effective method of weed control, it is cumbersome and uneconomical due to hike in wages and labour scarcity in these days[26]. Mulches are effective alternatives to herbicides, and there are several materials commonly used. Studies have found that mulch treatment is effective for increasing soil moisture and temperature, which hastens earlier fruit maturity[2]. Early germination has also been observed with the application of black polyethylene as well as increased agricultural yields[12]. Non-synthetic "natural" mulches contain fibers or residues from plants or animals and are used as an alternative method which can provide many benefits including weed suppression, soil moisture conservation, improved water filtration, enhanced soil stabilization and porosity, microbial population activity and decreased plant disease[9]. Straw mulch which contributes organic matter to the soil[24] has additional advantages including reduced tillage, reduced soil evaporation and reduction of soil runoff and wind erosion[12].

Mulching is a non-chemical weed control crop production technique that involves placement of organic or inorganic materials on the soil surface so as to provide a more favourable environment for plant growth and development. This in turn may affect plant growth and yield[7]. Moreover, now-a-days most of the farmers showing interest to grow the cucumber under protected conditions to improve the yield, quality and for year round supply. Hence the present study is designed with the following objective to study the effects of different mulch materials for controlling weeds.

MATERIAL AND METHODS

A field experiment was conducted during *rabi*, 2015-16 laid out at the "College Farm", Sri Konda Laxman Telangana State Horticulture University, Mojerla in naturally ventilated greenhouse condition. The area of the shade net used for experimentation was 525 m^2 in which 24 beds of 15 m length and a width of 1 m each were prepared. The experiment was laid out in Randomized Block Design replicated thrice with eight treatments consisting Black-black polythene mulch-T_1, Black-silver polythene mulch-T_2, Black-white polythene mulch-T_3, Paddy husk-T_4, Paddy straw mulch-T_5, Ground nut shells-T_6, Pre-emergence herbicide (Pendimithaline @ 1.0 kg a.i/ha^{-1})-T_7 and Control-T_8 which replicated thrice.

Black polythene, silver and white, polythene mulch was spread over on raised beds on which the seedlings holes of 4–5 cm diameter were made with recommended spacing 50 × 50 cm and 3–5 cm of moist soil was put at the base of stem of transplanted seedling to conserve moisture. The organic mulches like paddy straw, paddy husk, ground nut shells mulch of 5cm thickness was created manually by spreading straw as carpet on raised beds on respective treatments at 5 days after planting. Mulch material was kept in the respective beds until the final harvest of cucumber.

All practical management included: mulching weeding and other agronomic treatments were

done mechanically. Drip system of irrigation was followed based on plant requirements. The data recorded at different growth stages were analysed by adopting the method of analysis of variance outlined by Panse and Sukhatma[15]. Statistical significance was tested with 'F' test at 5 percent level of probability and critical differences were worked out for the effects which were significant to facilitate treatment comparisons.

Weed density (number)

In each experimental plot, two quadrates of 1 x 1 m were selected in the middle of plot and the weeds from each quadrate were counted. The weed density was expressed as number per square meter.

Weed dry matter (g m^{-2})

Weed samples were taken from the sampling area and dried in shade for 2 days, followed by sun drying for three days. After sun drying, the samples were kept in oven at 70°C till they recorded the constant weight and dry weight of weeds was recorded for each treatment and expressed in g m^{-2}.

Weed Control Efficiency (%)

The weed control efficiency (WCE) was calculated by the following formula suggested by Patil and Patil[16] and expressed in percentage.

$$WCE = \frac{DMC - DMT}{DMC} \times 100$$

Where, DMC= Dry Matter of weed in control plot
DMT= Dry Matter of weed in treatment plot
WCE=Weed Control Efficiency

Weed control index (%)

The weed index (WI) defined as the reduction in yield due to the presence of weeds in comparison with no weed plot was worked out for each plot with the formula suggested by Gill and Vijay Kumar[10] and expressed in percentage.

$$WI = \frac{X - Y}{X} \times 100$$

Where, X = yield from minimum weed competition plot
Y = yield from the treated plot
WI= Weed index.

RESULTS AND DISCUSSION

Weed density (m^{-2})

The results on weed density (Table 1) revealed that Black-black polythene mulch (T_1) has recorded significantly lowest weed density at 30 DAS (5.00 m^{-2}), 60 DAS (7.33 m^{-2}) and 80 DAS (6.00 m^{-2}) which was on par with Black-silver polythene mulch -T_2 at 30 DAS (5.67 m^{-2}), 60 DAS (8.67 m^{-2}) and 80 DAS (8.33 m^{-2}). However, unweeded control (T_8) has recorded highest weed density of 37.00 m^{-2}, 40.00 m^{-2} and 39.00 at 30, 60 and 80 DAS respectively.

As black polythene mulch act as physical barrier and prevents light to enter the soil, which is required for germination and nourishment of weed seeds, the weed density was found minimum. The higher weeds density in weedy check plots may be attributed to the open soil surface and niches available to weeds for free and aggressive growth. These results are in line with the earlier workers, Ngouajio *et al.*[14] who reported complete elimination of weeds with the use of black polythene mulch and Schonbeck[18] reported black plastic mulch blocked the weeds, except a few, which emerged through the planting holes.

Weed dry matter (g m^{-2})

Black-black polythene mulch (T_1) has recorded significantly lowest weed dry matter

(Table 1) at 30 DAS (2.20 g m^{-2}), 60 DAS (2.43 g m^{-2}) and 80 DAS (2.50 g m^{-2}) which was on par with Black-silver polythene mulch (T_2) at 30 DAS (3.13 g m^{-2}), 60 DAS (3.27 g m^{-2}) and 80 DAS (3.00 g m^{-2}), while, unweeded control (T_8) has recorded highest weed dry matter of 27.93 g m^{-2}, 28.20 g m^{-2} and 27.83 g m^{-2} at 30, 60 and 80 DAS respectively.

The results showed that use of black polythene mulch could be an excellent method for weed control as minimum weed dry matter was observed. The results are in agree with the findings of Aniekwe and Nwite[4] in cucumber who reported that Black polythene mulch was effective totally in suppressing weed growth. Similar results are also reported by Sha and Karuppaiah[19] in brinjal, Vijay *et al*.[25] and Rajablariani *et al*[17]. in tomato, Ashrafuzzaman *et al*.[5] in chilli while Choudhary *et al*.[8] in capsicum.

Table 1: Effect of different mulch materials on weed density (number m^{-2}) and Weed dry matter (g m^{-2}) at different growth stages in cucumber hybrid "Multistar"

Treatment	Weed Density (number m^{-2})			Weed Dry matter (g m^{-2})		
	30 DAS	60 DAS	80 DAS	30 DAS	60 DAS	80 DAS
T_1	5.00	7.33	6.00	2.20	2.43	2.50
T_2	5.67	8.67	8.33	3.13	3.27	3.00
T_3	7.00	9.00	8.00	3.23	3.33	2.93
T_4	17.33	19.67	20.33	11.33	11.77	11.67
T_5	20.67	22.33	21.67	12.30	12.40	12.00
T_6	18.33	19.33	20.00	10.90	11.73	11.50
T_7	13.00	13.67	14.00	8.70	10.60	10.28
T_8	37.00	40.00	39.00	27.93	28.20	27.83
SE (m)±	1.05	0.98	0.99	0.57	0.49	0.54
CD at 5%	3.17	2.97	2.99	1.72	1.48	1.62

Weed Control Efficiency (WCE) (%)

Weed control efficiency (WCE) was calculated on the basis of weed dry matter recorded at 30, 60 and 80 DAS in comparison to unweeded control and presented in the Table 2.

The results on weed control efficiency indicated that highest weed control efficiency was observed at 30 DAS (92.12%), 60 DAS (91.38%) and 80 DAS (91.01%) in Black-black polythene mulch (T_1) which was followed by Black-silver polythene mulch (T_2) which has recorded 88.79%, 88.40% and 89.22% of weed control efficiency at 30, 60 and 80 DAS respectively. Among the organic mulches Ground nut shells (T_6) has recorded lowest weed control efficiency of 60.97%, 58.40% and 58.67% at 30, 60 and 80 DAS respectively. While under control T_8-Control zero WCE were recorded.

Lesser weed germination and weed infestation by restricting the penetration of solar radiation under black polythene mulch resulted in higher weed control efficiency. Similar results were reported by Aniekwe and Nwite[4] in cucumber, Hartmann *et al.*[11] in tomato and Choudhary *et al*.[8] in capsicum.

Weed Index (WI) %

The weed index was zero percent (Table 2) in T_1-Black-black polythene mulch followed by T_2-Black-silver polythene mulch (3.65 %) and T_3-Black-white polythene (11.45 %). The significantly highest (74.83 %) weed index was recorded in T_7-Pre-emergence herbicide (Pendimithalin @ 1.0 kg a.i/ha^{-1}) followed by control T_8-Control (49.68 %) respectively.

Among the organic mulch treatments T_6-Ground nut shells showed lowest weed index (34.07 %) followed by T_5-Paddy straw and T_4-Paddy husk (36.14% and 37.12%) respectively.

The lowest weed index observed in the treatments T_1-Black-black polythene mulch and T_2-Black-silver polythene mulch might be

due to suppression of all types of weeds at critical periods. Similar results were reported by Aniekwe and Nwite[4] in cucumber, Sha and Karuppaiah[19] in brinjal and Choudhary *et al*.[8] in capsicum.

Table 2: Effect of different mulch materials on Weed control efficiency (WCE) and Weed Index (WI) at different growth stages in cucumber hybrid "Multistar"

Treatment	Weed Control Efficiency (%)			Weed Index (%)
	30 DAS	60 DAS	80 DAS	
T_1	92.12	91.38	91.01	0.00
T_2	88.79	88.40	89.22	3.65
T_3	88.43	88.19	89.47	11.45
T_4	59.43	58.26	58.06	37.21
T_5	55.96	56.02	56.88	36.14
T_6	60.97	58.40	58.67	34.07
T_7	68.85	62.41	63.06	74.83
T_8	0.00	0.00	0.00	49.68
SE (m)±	1.44	1.30	1.23	1.63
CD at 5%	4.36	3.94	3.74	4.93

CONCLUSION

From the present investigation it can be concluded that use of Black-black polythene mulch resulted in minimum weed density, weed dry matter and maximum weed control efficiency and with minimum weed index followed by Black-silver polythene mulch and ground nut shells.

REFERENCES

1. Abbasi, N.A., Zafar, L., Khan, H.A. and Qureshi, A.A., Effects of naphthalene acetic acid and calcium chloride application on nutrient uptake, growth, yield and post harvest performance of tomato fruit. *Pakisthan Journal of Botany*. **45(5):** 1581-1587 (2013).
2. Abdul-Baki, A., Teasdale, J.R., Koreak, R., Chitwood, D.J. and Huettel, R.N., Fresh market tomato production in a low-input alternative system using cover-crop mulch. *HortScience*. **31:** 65-69 (1996).
3. Adams, P., Graves, C.J. and Winsor, G.W., Some responses of cucumbers, grown in beds of peat to N, K and Mg. *HortScience*. **67:** 877-84 (1992).
4. Aniekwe, N.L. and Nwite, P.O., Influence of Transparent and Black Plastic Mulches and Staking on the Environment, Growth and Yield of Cucumber (*Cucumis Sativus* L.) in Abakaliki, Southeastern Nigeria. *International Journal of Science and Research*. **9 (2):** 2319-7064 (2013).
5. Ashrafuzzaman, M., Abdul Halim, M., Mohd Razi Ismail, Shahidullah, S.M. and Alamgir Hossain, M., Effect of Plastic Mulch on Growth and Yield of Chilli (*Capsicum annuum* L.). *Brazilian archives of biology and technology*. **54:** 321-330 (2011).
6. Bacci, L., Picanco, M.C., Gonring, A.H.R., Guedes, R.N.C. and Crespo A.L.B., Critical yield components and key loss factors of tropical cucumber crops. *Crop Protection*. **25 (10):** 1117-1125 (2006).
7. Bhella, H.S. and Kwon. Evaluation of mulches for use in home garden. *HortScience*.**113 (4):** 543-546 (1988).
8. Choudhary, V.K., Bhambri, M.C., Pandey, N. and Sharma, H.G., Effect of drip irrigation and mulches on physiological parameters, soil temperature, picking patterns and yield in capsicum (*Capsicum annuum* L.). *Archives of Agronomy and Soil Science*. **58 (3):** 277-292 (2012).
9. Duppong, L.M., Delate, K., Liebman, L. and Horten, R., The effect of natural

mulches on crop performance, weed suppression and biochemical constituents of catnip and St. John's wort. *Crop Science*. **44:** 861-869 (2004).

10. Gill, H.S. and Vijay Kumar., Weed index a new method for reporting weed control trial. *Indian Journal of Agronomy.* **14 (1):** 96-98 (1966).
11. Hartmann, H.T., Kofranek, A.M., Rubatzky, V.E. and Flocker, W.J., Growth, Development and Utilization of cultivated plants. *Plant Science*. 2nd ed. Prentice-Hall, Inc. Simon and Schusfet, Englewood Cliffs, New Jersey (1981).
12. Liang, Y.L., Zhang, C.E. and Guo, D.W., Mulch types and their benefit in cropland ecosystems on the Loess Plateau in China. *Journal of Plant Nutrition.* **25:** 945-955 (2002).
13. National Horticulture Database. National Horticulture Board. Ministry of Agriculture, Government of India, Institutional Area, Sector-18, Gurgaon-122 015, India (2016).
14. Ngouajio, M., Auras, R., Fernadndez, R.T., Rubino, M., Counts, J.W. and Kijchavengkul, T., Field performance of aliphatic-aromatic copolyester biodegradable mulch films in a fresh market tomato production system. *Horticulture Technology*. **18:** 605-610 (2008).
15. Panse, V.G. and Sukhatma, P.V., Statistical methods for agricultural workers. Indian council of agricultural research, New Delhi (1985).
16. Patil, V.C. and Patil, S.V., Studies on weed control in bamboo. *Indian journal of weed science*. **75(1):** 83-86 (1993).
17. Rajablariani, H.R., Hassankhan, F. and Rafezi, R., Effect of colored plastic mulches on yield of tomato and weed biomass. *International Journal of Environmental Science and Development.* **3(6):** (2012).
18. Schonbeck, M.W., Weed suppression and labor costs associated with organic, plastic, and paper mulches in small scale vegetable production. *Journal of Sustainable Agriculture.* **13:** 13-33 (1999).
19. Sha, K. and Karuppaiah, P., Integrated weed management in brinjal *(Solanum melongena* L.). *Indian Journal of Weed Science.* **37 (1 & 2):** 137-138 (2005).
20. Shetty, N.V. and Wehner, T.C., Estimation of fruit grade weights based on fruit number and total fruit weight in cucumber. *Hort Science*.**37:**1117-1121 (2002a).
21. Shetty, N.V. and Wehner T.C., Screening the cucumber germplasm collection for fruit yield and quality. *Crop Science*. **42:** 2174-2183 (2002b).
22. Staub, J.E., Felix, C., Serquen, C., Horejsi, T. and Chen, J.F., *Genetic Resources of Crop Evaluation*. **46:** 297–310 (1999).
23. Tatlioglu, T., Cucumber (*Cucumis sativus* L.). In Genetic improvement in vegetable crops. Pergamon press. New York. 197-227 (1993).
24. Tindall, James, A., Beverly, R.B. and Radcliffe, D.E., Mulch effect on soil *properties and tomato growth using micro-irrigation. Agronomy Journal.* **83:** 1028-1034 (1991).
25. Vijay Pal Singh, Raj, P.S., Arora, S.K., Godara, A.K. and Yadav, B.S., Effect of black polythene mulch on growth and fruit yield of tomato. *Haryana Journal of Horticulture Science*. **35(3):** 323 (2006).
26. Warade, A.D., Gonge, V.S., Jogdande, N.D., Ingole, P.G. and Karunakar, A.P., Integrated weed management in onion. *Asian Journal of Horticulture.* **2(2):** 205-208 (2007).