

EFFECT OF PLASTIC MULCH ON COTTON YIELD AND ITS ECONOMICS**P. S. Jayswal¹, N. S. Joshi² and K. N. Sondarva³**

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ABSTRACT

Krishi Vigyan Kendra, Junagadh Agricultural University, Amreli, Gujarat has conducted an On Farm Trial under Agricultural Engineering discipline with two treatments, i) Farmers Practice - No use of mulching materials and ii) University recommended practice - Black Plastic Mulch (25 micron) under drip irrigation system. Main aim of this OFT was to find out effect of plastic mulch on yield of cotton, bolls per plant and economics of cotton cultivation. This OFT was conducted for three years: 2014-15, 2015-16 and 2016-17. Data of this three year were taken and analyzed. Result of three year data shown that, there was 28.93 % increase in yield under plastic mulch. Under plastic mulch 18.37 % more bolls per plant were found. Avg. gross return and avg. net profit was 29.01% and 33.15% higher under plastic mulch. B:C ratio was found 3.52 for plastic mulch in cotton crop. These results showed that plastic mulch in cotton crop is beneficial for farmers.

Keynotes: plastic mulch, cotton, KVK, OFT, drip irrigation

INTRODUCTION

In India, one of the most important cash as well as fibre crop is cotton. Cotton crop provides the cotton fibre which is a basic raw material for cotton textile industry in the country (Rathwa *et al.*, 2021). Therefore, it plays a key role in the agricultural and industrial economy of India. About 6 million farmers are earning their livelihood from cultivation of cotton in India and 40-50 million people are employed in cotton processing and trade. (Anon., 2021)

In India, major cotton growing states are ten which can be divided into three zones, viz. north zone, central zone and south zone. North zone contain Punjab, Haryana and Rajasthan state; central zone consists of Madhya Pradesh, Maharashtra and Gujarat state and south zone includes Andhra Pradesh, Telangana, Karnataka and Tamil Nadu. Besides these ten states, noticeable cotton cultivation has seen in the Eastern State of Orissa. States like Uttar Pradesh, West Bengal & Tripura also cultivate cotton but only in small areas (Anonymous, 2021).

As per first advance estimates of major *kharij* crop by Directorate of Agriculture, Gujarat of year: 2021-22 Gujarat state, with 22.56 lakh ha area under cotton will produce 80.95 lakh bales i.e. 1 bale is equal to 170 kg cotton, which shows productivity of 609.96 kg cotton per ha.

In general, mulch is used to cover soil surface to

reduce soil moisture transpiration and also to balance soil temperature within a root zone area (Vinaya *et al.*, 2013). There are various materials which can be used as mulch like agro waste, saw dust, stubble, pebbles, sand different coloured plastic mulch; non degradable and bio degradable (Pedda *et al.*, 2020). Purpose of application of mulch in any crop is mainly to conserve moisture in soil and indirectly modifying microclimate of soil layer. Pedda *et al.* (2020) also indicated that mulch helps in limiting first stage of drying, improvement in seedling viability and crop stand, less weed in field. Many research reports have shown positive impact on plant growth and yield.

Isal *et al.* (2019) found significantly higher yield attributes, seed cotton yield per plant, and per ha and stalk yield per ha in Bt. Cotton under plastic mulch as compare to without plastic mulch cotton cultivation at study area Akola, Maharashtra, India. Deng *et al.* (2019) got 69.4 – 76.2 % increase in yield of maize and 65.2 – 71.9 % in cotton crop under biodegradable mulch film as compare to the bare soil condition at experiment site Shangsanqi village of China.

OBJECTIVES

- (1) Effect of plastic mulch on yield of cotton
- (2) Effect of plastic mulch on number of bolls per plant
- (3) To find out benefit cost ratio

METHODOLOGY

Krishi Vigyan Kendra, Junagadh Agricultural University, Amreli has conducted an On Farm Testing on plastic mulch application in cotton crop to demonstrate its effect on cotton yield and number of bolls per plant. Three year: 2014-15, 2015-16 and 2016-17 data has been taken to find conclusion.

Cotton crop is mainly cultivated as *kharif* crop in Gujarat. Silver black plastic mulch (25 micron) under drip irrigation system was used as one treatment for cotton cultivation against farmer's without mulch cultivation practices. Cotton yield and number of bolls per plant (50 healthy plants) were observed during three year study period on three farmers' field of Amreli district.

Benefit-cost analysis was also undertaken. It included the input costs of seed, fertilizer, pesticides, and plastic film, labor cost, mechanical operations and output income from yield sales. Yield income refers to income from

Table 1: Effect of treatments on yield of cotton

Year	Average yield (Q/ha)		% increase in yield	Significance
	With mulch	Without mulch		
2014-15	29.38	23.75	24.35	<0.05
2015-16	30.45	23.52	29.52	<0.05
2016-17	30.21	22.71	32.92	<0.05
Pooled of three years	30.01	23.33	28.93	<0.05

Effect on no. of bolls per plant

The number of bolls per plant is considered as one of the important factors which significantly affects cotton yield under drought stress condition which affects the boll formation and retention in cotton crop (Iqbal *et al.*, 2021). Data of no. of bolls per plant are as shown in table 2. Plants under mulch showed higher no. of bolls per plant as compare to without mulch plant which was 18.37 % higher average of three year data. The higher number of bolls per plant under

Table 2: Effect of treatments on bolls per plant

Year	No. of Bolls per plant		% increase in No. of Bolls per plant	Significance
	With mulch	Without mulch		
2014-15	65.6	55.5	18.19	Non Significant
2015-16	120	101	18.81	Non Significant
2016-17	66.5	56.3	18.12	Non Significant
Pooled of three years	84.03	70.93	18.37	Non Significant

Economics

Economics data showed that comparatively higher cost of cultivation under mulch gives higher gross and net income with higher B:C ratio as compare to without mulch cultivation practices. Under mulch condition B:C ratio varied from 3.18 to 4.25 which was found higher as

cotton yield (Ma *et al.*, 2018). The benefit cost ratio was calculated by ratio of present value of benefit to present value of costs (Baranchuluun *et al.*, 2016).

RESULTS AND DISCUSSION

Effect on yield

Yield data of conducted OFT are as shown in table 1, which shows that mulching significantly increases yield of cotton. Average increase in yield noted as 28.93 % in cotton under plastic mulch as compare to without mulch cultivation process. Similar result were obtained by Haque *et al.* (2018) for yield in maize, Qin *et al.* (2015) for yield in wheat and maize, Wang *et al.* (2019) observed 12.1 – 21.3 % increase in yield of cotton under plastic mulch as compare to without mulch treatment at Xinjiang, China study area. Isal *et al.* (2019) also obtained higher ginning out turn of cotton under wheat and plastic mulch condition as compare to bare soil condition.

mulch might be due to the mulch which have conserved and utilized more moisture (Isal *et al.*, 2019). Similar results also were obtained by Isal *et al.* (2019). Singh *et al.* (2021) obtained higher number of bolls per plant under wheat straw mulch as compare to bare soil condition. The study result of Iqbal *et al.* (2021) obtained was also found higher number of bolls per plant under mulch condition as compare to without mulch soil, for which they advocate that under mulch condition water retention was found high and lower weeds, which are favourable condition for plant growth.

compare to without mulch condition. Prajapati (2017) also obtained similar result of higher B:C ratio under silver black plastic mulch as compare to without mulch condition in Bt. Cotton crop. Ma *et al.* (2018) found mulching economical for maize crop as they suggested possible reason for higher yield because of increase in the nitrate content in the topsoil layer.

Year	Avg. cost of cultivation (Rs.)		Avg. gross return (Rs.)		Avg. net profit (Rs.)		B:C ratio	
	WM	WTM	WM	WTM	WM	WTM	WM	WTM
2014-15	36975	31425	121172	97969	84197	66544	3.28	3.12
2015-16	43750	35750	139020	107415	95270	71665	3.18	3.01
2016-17	37333	31567	158594	119219	121260	87652	4.25	3.78
Pooled of three years	39353	32914	139595	108201	100242	75287	3.57	3.30

WM= With Mulch, WTM= Without Mulch

CONCLUSION

KVK, Amreli conducted on on farm test at farmers' filed of Amreli district of Gujarat State. Obtained results were in favour of farmers, as cotton under silver black plastic mulch performed better. Cultivation of cotton with mulch was found beneficial in terms of higher number of bolls per plant, yield of cotton and final financial return.

POLICY IMPLICATION

The results of presents study conclude that plastic mulching is beneficial for cotton crops, as it helps in growth of crop. But among farmers it is still a concern about its cost. Therefore, if government may provide more subsidies on plastic mulch to farmers, its adoption may increase. Also, training programmes shall be organized to create awareness about benefits of mulching among farmers.

CONFLICT OF INTEREST

There is no conflict between author.

REFERECNES

Anonymous, (2021). Report on Cotton Cultivation Practices. http://nfsm.gov.in/BriefNote/BN_Cotton.pdf

Baranchuluun, S., Bayanjargal, D. and Adiyabadam, G. (2016). A Cost Benefit Analysis of Crop Production with Various Irrigation Systems. *IFEAMA SPSCP*, 5:146-156.

Haque, M. A., Jahiruddin, M. and Clarke, D. (2018). Effect of Plastic Mulch on Crop Yield and Land Degradation in South Coastal Saline Soils of Bangladesh. *International Soil and Water Conservation Research*, <https://doi.org/10.1016/j.iswcr.2018.07.001>

Iqbal, R., Muhammad, H., Muhammad, A. S. R., Muhammad, W., Rao M. I., Muhammad Z. A., Toleikiene, M., Muhammad, A., Farhan, M., Ahmad, S., Muhammad, U. A., Muhammad M. W., Muhammad, T. K., Muhammad, M. A., and Haider, I. (2021). Assessing the Potential Of Partial Root Zone Drying And Mulching For Improving The Productivity Of Cotton Under Arid Climate. *Environmental Science and Pollution Research*, 28:66223–66241.

Isal, R. L., Wanjari, S. S., Bhale, V. M., Wadtkar, S. B., Paslawar, A. N. And Parlawar, N. D. (2019). Effect of polythene mulch and irrigation levels on

yield of Bt cotton. *Journal of Pharmacognosy and Phytochemistry*, 8(5): 2030-2033.

Lu D., Yu Y., Zhang, H., Wang Q. and Yu, R. (2019). The Effects of Biodegradable Mulch Film on the Growth, Yield, and Water Use Efficiency of Cotton and Maize in an Arid Region. *Sustainability*, 11:7039.

Ma, D., Chen, L., Qu, H., Wang, Y., Misselbrook, T., Jiang, R. (2018). Impacts of plastic film mulching on crop yields, soil water, nitrate, and organic carbon in Northwestern China: a meta-analysis. *Agricultural Water Management*, 202:166–173.

Pedda, G. P. S. K., Subhankar, D. And Sagar, M. (2020). Mulching: Materials, Advantages and Crop Production. *Protected Cultivation and Smart Agriculture*. Pp 55-66.

Prajapati, G. V. (2017). Influence of Irrigation Regimes, Frequency and Mulching on Productivity of Bt. Cotton. *Madras Agric. J.*, 104 (7-9):242-246.

Qin, W., Hu, C. And Oenema, O. (2015). Soil Mulching Significantly Enhances Yields and Water and Nitrogen Use Efficiencies of Maize and Wheat: A Meta-Analysis. *Scientific Reports*, 5:16210.

Rathwa, Y. H., Bochalya, B. C. and Reddy, S. Y. (2021) Knowledge of cotton growers about integrated pest management. *Guj. J. Ext. Edu.*, 32(1):165-167.

Singh, K., Dhillon, B. S. And Limba, V. (2021). Effect of Mulching on Growth and Productivity of Bt Cotton (*Gossypium hirsutum* L.). *Int. J. Curr. Microbiol. App. Sci.*, 10(01): 2610-2615.

Vinaya Kumar, H. M, Mahatab Ali, K. M. and Sujay Kumar, S. (2013). Personal and socio-psychological characteristics of the Beneficiary farmers of Community Based Tank Management Project and their relationship with socioeconomic status. *International Journal of Advanced Biological Research*. 3(2): 184-187.

Wang, Z., Wu, Q., Fan, B, Zheng, J., Li, W. and Li, G. (2019). Effects of mulching biodegradable films under drip irrigation on soil hydrothermal conditions and cotton (*Gossypium hirsutum* L.) yield. *Agricultural Water Management*, 213:477-485.