



# Effect of Polythene Mulch on Growth, Yield and Economics of Green Chilli (*Capsicum annuum*)

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## ABSTRACT

The present investigation was conducted at farmer's field during *Zaid* season of 2019-20 and 2020-21 to assess the effect of plastic mulch on growth, yield and economics of chilli crop. Two treatments *i.e.* T<sub>1</sub> - Farmers' practice (without mulch) and T<sub>2</sub> (25 micron Silver black double coloured plastic mulch) replicated at twenty farmers' field. The use of plastic mulch as a soil cover was found effective in improving growth, yield and economics of chilli (*Capsicum annuum* L.). The Treatment T<sub>2</sub> (double coloured plastic mulch) recorded minimum weed intensity (5.06), maximum plant height (49.66 cm), number of primary branches/plant (11.62), green fruit yield/plant (530g) and yield/ha (256.59 q). The maximum net return per hectare (Rs 2,90,422/-) and benefit cost ratio (4.15) were also recorded under treatment T<sub>2</sub> whereas, in farmers' practices net return and benefit cost ratio were found Rs. 2,37,932/- and 3.90, respectively. Therefore, silver-black mulching appears to be a viable tool to increase the chilli production and recommended for cultivation.

**Key Words:** Chilli, Economics, Growth, Mulching, Yield.

## INTRODUCTION

Chilli (*Capsicum annuum* L.), the most widely used and universal spice of India, belongs to the family *solanaceae*. In India, chilli is grown in almost all the states across the length and breadth of the country. The major chillies growing states are Andhra Pradesh, Karnataka, Maharashtra, Orissa, Tamil Nadu, Madhya Pradesh and Rajasthan. Infestation of field with weeds is a limiting factor in the production of chilli. The presence of weeds in the crop reduces the availability of nutrient and water and thereby photosynthetic efficiency, dry matter production and its distribution to economical parts, reduces sink capacity of crop resulting in poor fruit yield (Prajapati *et al*, 2017). In hot dry and semi-bone-dry regions, use of mulching in vegetable cultivation has been prompted in order to cut-down the expense of production and acquire quality produce, return boost with increased benefits.

Mulching is referred as spreading various covering materials on the surface of soil to minimize

moisture losses and weed population and to enhance crop yield (Kader *et al*, 2019). It is a cultural practice of protective ground cover that can include organic and synthetic plastics and other natural products. When compared to other mulches plastic mulches are completely impermeable to water; it therefore prevents direct evaporation of moisture from the soil and thus limits the water losses and soil erosion over the surface. It also suppresses weed-flora and reduces weed competition with crop for water and nutrients making them available in greater quantities for crop plants. The microclimate surrounding the plant and soil is significantly affected by mulch *i.e.*, the thermodynamic environment, the moisture, the erosion, the physical soil structure, the incidence of pests and diseases, crop growth and yield. Mulches reduce weed growth by making conditions unfavorable for germination of weed seeds and by providing physical barrier for emerging weeds. A good mulch layer can save many hours of laborious weeding. Therefore, the present study was carried

to ascertain the effect of mulch on weed intensity, plant growth, yield and economics of chilli.

## MATERIALS AND METHODS

The present experiment was conducted for two consecutive years *i.e.*, 2019-20 and 2020-21 during *Zaid* season at twenty farmers' fields in Nagaur district of Rajasthan. The treatments comprised of T<sub>1</sub> Farmers' practice (without mulch) and T<sub>2</sub> (25micron silver black double coloured plastic mulch). The area of experiment plots was 0.2 ha of each farmer. The field was thoroughly ploughed, well decomposed farmyard manure was applied at the rate of 20t/ha and formed raised beds. 25micron thickness film was fixed tightly during the non-windy period without any crease to cover the soil surface. Both ends of the plastic were buried into the soil up to the depth of 10 cm. After laying the film, small circular holes were made with scissors as per the 90 x 45 cm spacing (Inter row spacing x Intra row spacing of the crop) in paired row system. Forty days old seedlings of chilli hybrid Krishna were transplanted in the last week of January to mid February. The farm yard manure (20t/ha) was applied in the bed at the time of preparation of raised bed. The fertilizers dose of NPK @ 70:50:50 kg/ha were applied. Water soluble fertilizers (19:19:19, 13:0:45 and 12:61:0) were given through fertigation twice in a week. All the plant protection measures were followed as per the recommended package of practices for Zone II-a. The observations on weed density, plant height and number of branches recorded after 90 days of transplanting. The plant height was measured from the base of the plant to the tip of the growing tip of the plant and the average height was worked out and expressed in centimeters. Similarly, numbers of branches/plant were counted and average number of branches/plants was worked out and expressed in number of branches/plant. The data were analyzed statistically by following standard procedures. Cost of cultivation (Rs/ha) was calculated considering the prevailing charges of agricultural operations and market price of inputs involved. Gross returns were obtained by converting the harvest into monetary

terms at the prevailing market rate during the course of studies. Gross return (Rs/ha) = (fruit yield/ha) x price), Net returns were obtained by deducting cost of cultivation from gross return. The benefit:cost ratio was calculated by dividing Gross returns (Rs/ha) and cost of cultivation (Rs/ha).

## RESULTS AND DISCUSSION

### Weed Density

The results of the experiment conducted over the two years were pooled and the mean value was presented (Table 1). The results revealed that weed density was minimum (5.07/m<sup>2</sup>) in silver-black polythene mulch (double coated 25 micron) and highest in farmer's practice (110.07/m<sup>2</sup>). Polythene mulch was very much effective in decreasing the weed density as compared to control. In raised beds with polythene mulch weeds only emerged through the punch and no weed was found under the plastic which might be due to lack of penetration of light through black plastic. Similar findings were reported by Narayan *et al* (2017) and Sathiyamurthy *et al* (2017) in chilli.

### Plant height

Plastic mulch showed superior performance in plant height (49.66 cm) than control (42.31 cm), indicating mulch had positive effect on the growth and development of chilli plant. The increased plant height in mulched plants was possibly due to moisture conservation, higher soil temperature, weed control and increased mineral nutrient uptake. Similar findings were reported by Tyagi and Kulmi (2019), Ashrafuzzaman *et al* (2011) in chilli.

### Number of primary branches/plant

The number of primary branches/plant recorded maximum in silver black plastic mulch (11.62) whereas, it was minimum (7.67) in farmers practices. Higher values for number of branches in mulch treatment may be attributed to a continuous supply and consequent, availability of plant nutrients to the root zone. This was in conformity with findings of Reddy *et al* (2017) in chilli crop.

**Table 1. Effect of plastic mulch on weed infestation, growth and yield of chilli.**

Technology Option	Weed density / m <sup>2</sup> at 90 DAT			Plant height (cm)			No. of primary branches			Green fruit yield (g/ plant)			Green fruit yield/ (q/ha)		
	2019-20	2020-21	Average	2019-20	2020-21	Average	2019-20	2020-21	Average	2019-20	2020-21	Average	2019-20	2020-21	Average
T <sub>1</sub> - Without mulch (Farmer's Practice)	96.93	123.20	110.07	43.50	41.11	42.31	8.20	7.13	7.67	448.8	474.7	461.75	221.71	205.50	213.34
T <sub>2</sub> - Silver-Black Polythene	5.32	4.80	5.06	51.87	47.45	49.66	12.23	11.00	11.62	526.0	534.0	530.0	262.81	251.00	256.59

**Table 2. Effect of plastic mulch on economics of chilli.**

Technology Option	Gross cost (Rs/ha)			Gross return (Rs/ha)			Net Returns (Rs./ha)			BC Ratio		
	2019-20	2020-21	Average	2019-20	2020-21	Average	2019-20	2020-21	Average	2019-20	2020-21	Average
T <sub>1</sub> - Without mulch (Farmer's Practice)	85700	78500	82100	332565	307500	320032	246865	229000	237932	3.88	3.91	3.90
T <sub>2</sub> - Black Polythene	94991	90880	92935	394215	376500	385357	295224	285620	290422	4.15	4.14	4.15

### Green fruit yield

Data (Table 1) indicate that the silver plastic mulch (double coated) recorded maximum green fruit yield/plant (530 g) and fruit yield/ha (256.59 q), whereas, it was minimum in farmers' practices. Mulching resulted in higher fruit weight and yield per plot than in control, indicating that mulch had positive effect in generating increased fruit yield. The increase in the fruit yield of mulched plot was probably associated with the conservation of moisture and improved microclimate both beneath and above the soil surface. The suitable condition enhanced the plant growth and development and produced increased fruit bearing nodes compared to the control. Similar finding was reported by Maida *et al* (2019) in chilli. Fruit yield increased in mulched bed because of increased number of fruit/plant and fruit weight which may be attributed to the better utilization of inputs due to lowest weed competition and better soil moisture. The results were in accordance with Narayan *et al* (2017) who reported maximum fruit yield in case of silver black plastic mulch in chilli.

### Economics

The economics of cultivation (Table 2) showed that among the treatments, application of 25 micron silver-black plastic mulch resulted in higher gross returns of Rs 3,85,357.5/ha, net returns Rs 2,90,422/ha and cost: benefit ratio (4.15) as compared to without mulch. Similar findings were reported by Tyagi and Kulmi (2019), Narayan *et al* (2017) in chilli.

### CONCLUSION

Based on the experimental results, it could be concluded that plastic mulches can prove as a boon to enhance productivity in arid regions. Silver-black plastic mulch (double coated 25 micron) could enhance soil moisture retention, suppress weed growth, enhanced crop yield and reduced the labour cost. Therefore, the cultivation of chilli using double colored plastic mulch could bring an ample scope for producing more vegetables.

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Received on 03/03/2021

Accepted on 15/05/2021