



Effect of Plastic Mulch on Growth, Yield and Economics of Chilli (*Capsicum annuum* L.) under Nimarplains Conditions of Madhya Pradesh

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ABSTRACT

A field experiment was conducted at farmers' fields in Khargone during *kharif* 2016 and 2017 with view to assess the effect of plastic mulch on growth, yield and economics of chilli. Two treatments were T₁ Farmers practice (without mulch) and T₂ (30 micron silver on black plastic mulch) replicated at five farmers field. Thirty two days old seedlings of chilli hybrid Sonal were transplanted on raised beds at a spacing of 1.20 m between row to row and 0.40 m plant to plant spacing. The Treatment T₂ (Silver on black plastic mulch) recorded significantly maximum plant height (104.56 cm), number of structural branches/plant (9.93), fruit length (16.48 cm), fruit girth (1.29 cm), green chilli weight (8.19g), number of fruits/plant (212.80), dry chilli weight/plant (267.50g) and dry chilli yield (53.50q/ha). The maximum net return per hectare (Rs 2,87,856/ha) and benefit cost ratio (2.71) were recorded under treatment T₂. However the minimum net return and benefit cost ratio were recorded in control (T₁).

Key Words: Chilli, Economics, Growth, Plastic mulch, Yield

INTRODUCTION

Chilli (*Capsicum annuum* L.) is an important spice essentially used in every Indian cuisine for its pungency, taste, colour and aroma. It is rich in proteins, lipids, carbohydrates, fibres, mineral salts (Ca, P, Fe) and vitamins like A, D, E, C, K, P, B₂ and B₁₂ with good medicinal properties. Keeping the high export potential chilli, production can be increased by a combination of advance production technologies viz., high yielding hybrids, mulching, application of growth regulators, staking, drip fertigation and integrated pest and disease management. Chilli, being a long duration and energy rich crop require proper manuring and balanced fertilizers along with sufficient moisture level for higher yield and quality produce (Prasad *et al* 2009). Mulching stimulates the microbial activity in soil through improvement of soil agro-physical properties. It also minimizes the use of N fertilizer, warms the soil, improves the soil physical

condition and suppresses weed growth and could account for increased yield (Nagalakshmi *et al* 2002).

To increase the productivity, developing comprehensive package of practices of chilli using plasticulture techniques is necessary. With this in view, experiments were conducted to study the Effect of plastic mulch on growth, yield and economics of chilli under Nimar Plains conditions of Madhya Pradesh.

MATERIALS AND METHODS

The field experiment was conducted for two consecutive years *i.e.* 2016 and 2017 during *Kharif* season at five farmers' field in Khargone. The Khargone district comes under Nimar Plains Zone of Madhya Pradesh which is situated at the Latitude of 21.833525 (DMS Lat 21° 50' 0.6900" N) and longitude of 75.614990 (DMS Long 75°

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36' 53.9640" E). The maximum temperature ranges from 43 to 46°C during summer season and minimum temperature fluctuates between 6 to 10°C during winter season. The average annual rainfall of the region is 835 mm. The treatments comprised of T₁ Farmers' practice (without mulch) and T₂ (30 micron Silver on black plastic mulch) replicated at five farmers field. The area of experiment plots were 0.40 ha of each farmers. Thirty two days old seedlings of chilli hybrid Sonal were transplanted on raised beds with the spacing of 1.20 m between row to row and 0.40 m plant to plant spacing. The farm yard manure (25t/ha) was applied in the bed at the time of preparation of raised bed. The recommended dose of fertilizers (180:80:80 kg NPK/ha) was applied. The 75 per cent of recommended dose of P applied through single superphosphate as basal application. Water soluble fertilizers (Urea, 19:19:19, 13:0:45 and 12:61:0) were given through drip twice in a week as per recommendation of TNAU, Tamil Nadu. The raised beds were covered with silver on black polythene sheet (mulch) in treatment T₂ and Treatment T₁ remained without mulch. The data on plant growth, yield and yield attributes, cost of cultivation, gross return, net return and benefit cost ratio were estimated as per paired "t" test of significance.

RESULTS AND DISCUSSION

Growth Attributes

Plant height

Plant height was measured from 30 DAT to 90 DAT at 30 days interval. The data (Table 1) revealed the maximum plant height (104.56 cm) in treatment T₂ and minimum plant height (85.96 cm) in treatment T₁ at different growth stages and increased with plant age. Plastic mulch showed superior performance in plant height over control, indicating mulch had positive effect on the growth and development of chilli. The increased plant height in mulched plants was possibly due to moisture conservation, higher soil temperature, weed control, and increased mineral nutrient uptake. Changes in the plant height

of chilli have been observed with different mulches and plastic mulch found to increase plant height than other mulches (Shinde *et al*, 1999).

Number of structural branches

The value (Table 1) showed that the plastic mulch had a significant effect on the number of structural branches per plant. The number of structural branches per plant continually increased with plant age. The highest number of structural branches (9.93 at 90 DAT) per plant was observed in T₂. However T₁ showed the least number of structural branches (7.89 at 90 DAT). Favourable weather condition and moisture of the soil are the important factors affecting the number of branches per plant. It was reported that mulched tomato plants had more branches than that of unmulched plants, which supported the present results .

Yield and Yield Attributes

Fruit length and girth

The data (Table 2) indicated that silver on black plastic mulch (T₂) records highest mean fruit length (16.48 cm), fruit girth (1.29 cm) and minimum fruit length (13.79 cm), fruit girth (1.20 cm) in comparison to (T₁). Nagalakshmi *et al* (2002) reported the maximum number of fruits per plant (97.67), length of fresh fruit (6.93 cm) and circumference of fruit (3.57 cm) with the application of black plastic mulch compared to organic and no mulch (control). These researchers observed that plants under polyethylene mulch produce larger fruit and have higher fruit yield per plant because of the better plant growth that due to favourable hydro-thermal regime of soil and complete weed free environment.

Fruits per plant and green chilli weight

The perusal of result indicated that silver on black plastic mulch (T₂) produced more number of fruits per plant as compared to control (T₁) indicating the positive influence on fruit setting in chilli. The highest number of fruits per plant (212.80) and average green chilli weight (8.19g) were recorded in silver on black plastic mulch (T₂)

Effect of Plastic Mulch

Table 1. Effect of plastic mulch on average plant height and primary branches at different ages of chilli . (Av. data of 24r)

Particular	Plant height (cm) at 30 DAT		Plant height (cm) at 60 DAT		Plant height (cm) at 90 DAT		No. of Primary branches/ plant at 30 DAT		No. of Primary branches/ plant at 60 DAT		No. of Primary branches/ plant at 90 DAT	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
		26.12	38.38	54.46	63.18	85.96	104.56	3.84	4.69	4.82	6.08	7.89
<i>t</i> -value	10.825		6.224		6.802		4.388		5.212		4.836	
<i>p</i> -value	0.00041		0.00339		0.00244		0.01179		0.00646		0.00842	

The result was significant at $p \leq 0.05$. Significant at 5% level of significance

however control (T_1) recorded the lowest fruits per plant (178.80) and average green chilli weight (7.84 g Table 2). The increase in the number of fruits per plant in mulched plot was probably associated with the conservation of moisture and improved micro climate both beneath and above the soil surface. The micro climate condition improved by the mulches might have provided a suitable condition for producing higher number of leaves and fruit bearing nodes in the plant compared to the control.

This was due to higher availability of soil moisture, optimum NPK nutrients and uptake when nutrients supplied through fertigation with mulching which helped in establishing the roots, initiating more fruiting points, their subsequent retention and development in the plant leading to the higher number of fruits per plant and other parameters as compared to conventional fertilizer application.

Similar findings were reported by Krishnamoorthy and Noorjehan (2014) and Leela Rani *et al* (2015) in chilli.

Fruit weight and yield

The effect of plastic mulch on fruit weight per plant and yield per hectare was significant (Table 2). Mulching produced higher fruit yield per plant and fruit yield per hectare over the control, indicating that the mulch had positive effect in generating increased fruit yield. Silver on black plastic mulch produced the highest dry chilli weight per plant (267.50 g) and dry chilli yield (53.50q/ha) however control plot showed the lowest fruit yield both in per plant (192.40 g) and (38.40 q/ha). Fruit yield increased in mulched plot 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.

Table 2. Effect of plastic mulch on average yield and yield attributes of chilli.

Particular	Green chilli fruit length (cm)		Green chilli fruit girth (cm)		Green chilli fruit weight (g)		Number of fruits/plant		Dry chilli yield/ plant (g)		Dry chilli yield (q/ha)	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
		13.79	16.48	1.20	1.29	7.84	8.19	178.80	212.80	192.40	267.50	38.40
<i>t</i> -value	4.674		8.581		5.490		16.791		18.011		17.042	
<i>p</i> -value	0.00949		0.00101		0.00536		0.00007		0.00006		0.00007	

The result was significant at $p \leq 0.05$. Significant at 5% level of significance

Table 3. Effect of plastic mulch on economics of chilli. (Av. data of 24r)

Particular	Cost of cultivation (Rs./ha)		Gross return (Rs./ha)		Net return (Rs./ha)		Benefit Cost: ratio	
	T1	T2	T1	T2	T1	T2	T1	T2
		136809	167544	307200	455400	170391	287856	2.25
<i>t</i> -value	19.434		18.926		13.712		7.472	
<i>p</i> -value	0.00004		0.00005		0.00016		0.00171	

The result is significant at $p \leq 0.05$. Significant at 5% level of significance

The results were in accordance with Narayan *et al* (2017) who reported recorded highest number of fruits with maximum fruit weight and total fruit yield in case of black plastic mulch (double coated) in chilli. The maximum yield attributes *viz.*, green chilli length, 100 green chilli weight, number of fruits per plant and dry matter production were observed in black plastic mulch of 25 micron thickness and fertigation with 120% RDF have also been reported by Pandian *et al* (2017).

Economics

The economics of cultivation (Table 3) showed that among the treatments, application of 30 micron silver on black plastic mulch (T₂) resulted in higher gross returns of Rs455400/ha ,net returns Rs287856/ha and cost: benefit ratio (2.71) as compared to without mulch (T₁). Narayan *et al* (2017) reported the higher B:C ratio with double coated black polythene mulch.

CONCLUSION

It may be concluded that plastic mulches can boost productivity in Nimar plains conditions of Madhya Pradesh. A favourable soil, water-plant relation is created by placing mulch over the soil surface which improves microclimate surrounding the plant and soil. Silver on black plastic mulch (30 micron) could enhance soil moisture retention suppress weed growth and enhanced crop yield. Therefore, mulching could be incorporated to enhance yield in chilli.

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