Effect of Different Type Mulch on Growth, Yield Attributes and Yield of Brinjal (Solanum melogena)

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Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Field experiment was conducted at Krishi Vigyan Kendra, Aurangabad and at farmer's field during 2012 and 2013 to Effect of different type mulch on growth, yield attributes and yield of Brinjal (Solanum melogena). The experiment was conducted in randomized block design with three treatments viz; Black polyethylene mulch, Wheat straw mulch and no mulch (control). The result revealed that maximum plant height 78.0 cm, maximum no. of leaves per plant 366.8 and maximum number of shoots per plant 32.60 were observed in plot mulching with Black polyethylene. Maximum yield 29.5 t/ha⁻¹ of brinjal was obtained with black polyethylene mulch while, minimum yield recorded 16.5 t ha⁻¹ in control plot. Wheat straw mulch recorded 50.30% more brinjal yield as compared with control. The benefit-cost ratio was highest (3.7) with black polythene mulch as compared to control which was (2.7). Economic comparison indicate that polythene mulch were more efficient than wheat straw mulch.

Keywords: Mulching; Brinjal; Yield; Net return; Economics; Solanum melogena.
1. INTRODUCTION

Eggplant is an important *solanaceous* vegetable grown in tropical and subtropical regions of the world, but it is grown during warm season in temperate regions of the world [1]. The eggplant (*Solanum melongena*) is one of the most widely grown vegetable crops all over the world, including the Indian sub-continent. Brinjal is an important vegetable crop of the Far East, Bangladesh, India, China and the Philippines. The name brinjal is popular in Indian subcontinents and is derived from Arabic and Sanskrit whereas the name eggplant has been derived from the shape of the fruit of some varieties which are white and resemble in shape to chicken eggs. It is also called aubergine (French word) in Europe [2]. Purple colour of brinjal is due to pigment anthocyanin. It is of great importance because its fruits have medicinal properties, white brinjal contain highest Vitamin-A so it is effective for diabetic patients [3]. India grows brinjal in an area 711.3 hectare with production of 13557.8 MT and productivity 19.1 MT per hectare (NHB, 2014-15). Crop yield will be reduced day by day due to biotic and abiotic factors. The crop is reported to be attacked by several insect pest like aphid, brinjal fruit and shoot borer. Other factors that reduce yield to larger extent are high temperature, excessive soil humidity, excessive salinity, water stress, weed competition. Salinity is one of the most brutal environmental factors limiting the productivity of crop plants because most of the crop plants are sensitive to salinity caused by high concentrations of salts in the soil, and the area of land affected by it is increasing day by day [4]. Increasing human population and reduction in land available for cultivation are two threats for agricultural sustainability [5]. Due to weed hindrances 10 to 70% annual crop loss reported (Mani et al., 1968) and 45% annual loss reported in sole brinjal crops [6]. So all these factors are can be managed by the use of mulch [7]. There are two types of mulches that we used in agriculture. Organic mulch like straw, newspaper, dry leaves, saw dust, grass clipping, compost etc. and it can be found beneficial because these are the natural materials which requires restoration because organic mulches decay very easily. Inorganic mulching is generally used in perennial crops like Plastic mulch, synthetic mulch, polyethylene film etc [8].

Plastic mulch like HDPE, LDPE AND LLDPE is considered useful for better growing condition like weed control, temperature control, reduced salinity which reduces water loss from soil due to increased water resistance. Desirable effects of plastic mulching are Weed control, temperature moderation, salinity reduction, which increases the utilization of plastic mulching in vegetable cultivation [9]. In agricultural for more plant height, crop growth, yield farmers use different type of mulch like plastic sheet, biodegradable films etc. It is to be reported that mulching showed good influence on crop growth, crop yield and cropping species [10]. In grafted brinjal mulching with plastic mulch of thickness 25µ gives higher yield [11]. Earliness, yield and quality of the vegetables crop can be improved by the use of plastic mulch [12,13].

In organic mulching soil surface is covered with crop remains of harvested crop such as leaf stubble, maize stalk, paddy straw and husk. Mulching with crop residue is reported to be best for more yield in crop likes groundnut and cassava [14 and 15]. Organic mulches improves soil properties, add organic matter to the soil and attracts many insects like cut worm, slugs etc. that’s why these are used in agriculture on large scale [8].

2. MATERIALS AND METHOD

A field experiment was conducted on clay loam soil during *kharif* seasons of 2012 and 2013 at the Krishi Vigyan Kendra, Aurangabad and at farmer’s field at 24.50 N, 84.70’ E, and at 332’above mean sea level. The maximum temperature remained above 36.92°C and 36.04°C. Soil of the experimental field was clay loam in texture and slightly alkaline in reaction (pH 7.8), low in organic C (0.52%), and available N (208.6 kg/ha), medium in available K (196.7 kg/ha) and P (18.5 kg/ha). The total rainfall received was 794.85 and 729.15 mm during 2012 and 2013, respectively (Fig 1). The experiment was conducted in randomized block design with three treatments ($T_1$) Black polyethylene mulch, ($T_2$) Wheat straw mulch and ($T_3$) without mulch. The treatments were replicated five time to avoid any effect of heterogeneity and the treatments were randomly allocated as per standard procedure. The Brinjal variety ‘Pusa hybrid-6’ was transplanted in raised bed of all treatments. The raised nursery beds (15-20 cm), 1.0 m wide and of convenient length was well prepared by mixing fully decomposed FYM (3-4 kg/m²). The seeds were sown in rows at 10 cm distance of shallow depth, 5.0 cm apart
and then lightly covered with finely sieved leaf mould. The surface of beds was kept covered with paddy straw till germination. Initially water cane was used to irrigate the beds to avoid any possible displacement of seeds. All the possible precautionary measures were taken to control insect-pest and diseases. The stocky and healthy seedlings of 10 to 15 cm height with 3 to 4 leaves were ready for transplanting after one month.

The experimental field was thoroughly prepared by two ploughing followed by harrowing before transplanting of Brinjal seedlings. The required quantity of FYM (20 t/ha), 50% of Nitrogen, full dose of Phosphorus and Potassium (100:50:50 kg/ha) were incorporated in experimental plot during the land preparation and rest of 50% Nitrogen was split into two equal doses. Raised bed plot size of 5.0 m x 1.5 m was constructed and 30 days old seedling of Brinjal was transplanted during July month of 2012-2013. All the mulching materials were applied after 20 days of transplanting. The 10 cm thick wheat straw and 25 micron of black plastic mulch were applied. At the first fruiting stage, five plants/plot were tagged randomly from each treatments and all the growth parameters were recorded.

3. RESULTS AND DISCUSSION

3.1 Effect of Different Mulch on Vegetative Growth and Yield Attributes

The findings of the present investigation indicated profound effect of different types of mulching in brinjal on yield attributes and yield (Table 1). Table shows that different types of mulching caused marked variations in number of leaves per plant, plant height, no. of shoots per plant, shoot length and plant spread. Highest values of all these parameters were found in Black polyethylene mulch. Maximum fruit yield was recorded under Black polyethylene mulch which was significantly more over wheat straw mulch.

Significantly higher no. of leaves/plant (366.80) was recorded with black polyethylene mulch which was 7.8% and 53.5% more over wheat straw mulching and without mulch, respectively. Plant height was recorded significantly higher with black polyethylene (78.0 cm) over wheat straw mulch and without mulch. No. of shoot/plant (32.6) was also recorded maximum with black polyethylene mulch which was significantly higher over wheat straw mulch and without mulch. Maximum shoot length (58.2 cm) recorded with black polyethylene mulch being at par with wheat straw mulch both were significantly more over without mulch.

Maximum plant spread (E-W) 60.4cm and plant spread (N-S) 67.2 cm recorded in black polyethylene mulch which was significantly more over wheat straw mulch and without mulch. This might be due to black polythene mulches provide favorable environmental conditions for brinjal growth and development and thus inducing early flowering. The pronounced effect in terms of all the above mentioned growth parameters have also been reported by Singh et al. [16] and Samaila et al. [17].
Table 1. Effect of different types of mulching on vegetative growth and yield attributes of Brinjal

<table>
<thead>
<tr>
<th>Treatments</th>
<th>No. of leaves / plant</th>
<th>Plant height (cm)</th>
<th>No. of shoots/ plant</th>
<th>Shoot length (cm)</th>
<th>Plant spread (E-W) (cm)</th>
<th>Plant spread (N-S) (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Black polyethylene mulch</td>
<td>366.8</td>
<td>78.0</td>
<td>32.6</td>
<td>58.2</td>
<td>60.4</td>
<td>67.2</td>
</tr>
<tr>
<td>T2 - wheat straw mulch</td>
<td>340.2</td>
<td>70.4</td>
<td>20.4</td>
<td>57.0</td>
<td>55.6</td>
<td>64.2</td>
</tr>
<tr>
<td>T3 - without mulch (control)</td>
<td>221.6</td>
<td>55.2</td>
<td>11.4</td>
<td>41.2</td>
<td>34.0</td>
<td>42.6</td>
</tr>
<tr>
<td>LSD=0.05</td>
<td>38.8</td>
<td>5.7</td>
<td>1.4</td>
<td>3.3</td>
<td>3.9</td>
<td>2.1</td>
</tr>
</tbody>
</table>

*Poll data of two years kharif 2012 and 2013

Table 2. Effect of different types of mulching on yield and economics Brinjal

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Fruit yield (t/ha)</th>
<th>Gross return (Rs/ha)</th>
<th>Net return (Rs/ha)</th>
<th>B:C</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 - Black polyethylene mulch</td>
<td>29.5</td>
<td>295000</td>
<td>216270</td>
<td>3.7</td>
</tr>
<tr>
<td>T2 - wheat straw mulch</td>
<td>24.8</td>
<td>248000</td>
<td>178600</td>
<td>3.6</td>
</tr>
<tr>
<td>T3 - without mulch (control)</td>
<td>16.5</td>
<td>165000</td>
<td>104800</td>
<td>2.7</td>
</tr>
<tr>
<td>LSD=0.05</td>
<td>1.43</td>
<td>5899</td>
<td>5899</td>
<td>0.05</td>
</tr>
</tbody>
</table>

*Poll data of two years kharif 2012 and 2013

3.2 Effect of Different Mulch on Yield of Brinjal

The data with respect to the fruit yield per hectare were significantly influenced by different types of mulches during the period of investigation. Among different treatments, black polyethylene mulch (25 micron) found best and produced maximum fruit yield per hectare over wheat straw mulch and without mulch.

Significantly maximum fruit yield was recorded with black polyethylene mulch (28.5 tone) over wheat straw mulching (26.8 tone) whereas, the lowest fruit yield per hectare (16.50 tone) obtained from without mulching (Table 2). Black polyethylene mulch produced significantly 19.0% and 50.3% more fruit yield over wheat straw mulch and without mulch, respectively. Similar results also reported by Ahmed et.al. [18] in eggplant and Rudich et al. [19], Quadir [20], Farias and Orozco [21], Romic et al. [22] and Wolsk [23] in watermelon.

3.3 Effect of different mulch on Economics of Brinjal

The gross return, net return and benefit cost ratio were worked out and the data are presented in (Table 2). Among different types of mulch maximum gross return (Rs. 29500), net return (216270) and benefit cost ratio (3.7) obtained with Black polyethylene mulch being at par with wheat straw mulch both were significantly higher over without mulching. Black polyethylene mulch and wheat straw mulch earn 106.4% and 70.4% more net return, respectively over without mulch. B:C ratio was also 37.0% and 33.3% more with Black polyethylene mulch and wheat straw mulch, respectively over without mulch. Similar views in the direction of present findings were also expressed by Shrivastava et al. [4], Hasan et al. [24], Singh [25], Singh et al. [26] and Singh et al. [27].

4. CONCLUSION

Mulching caused marked variations in number of leaves per plant, plant height, no. of shoots per plant, shoot length and plant spread. Highest values of all these parameters were found in Black polyethylene mulch. Black polythene mulch produced significantly 19.0% and 50.3% more fruit yield over wheat straw mulch and without mulch, respectively. Black polyethylene mulch and wheat straw mulch earn 106.4% and 70.4% more net return, respectively over without mulch. B:C ratio was also 37.0% and 33.3% more with Black polyethylene mulch and wheat straw mulch, respectively over without mulch.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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