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# Effect of time of planting and mulching on weed intensity in the tomato (*Solanum lycopersicum*) crop

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ABSTRACT

Field experiment was carried out in the 2016-17 and 2017-18 to determine the effect of time of planting and mulching on weed intensity in the tomato (*Solanum lycopersicum* L.) crop under field condition at Vegetable Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The different time of planting and application of mulch significantly influenced the weed intensity in the tomato crop. The maximum number of weeds per square metre were found with planting on 30th November and without mulching (control), whereas minimum population of weeds were recorded with planting on 30th October and application of bio-mulch (Paddy straw). The planting on 30th November and without mulching (control) recorded maximum weed bio-mass (fresh and dry weight) at harvest stage. The minimum weed biomass were recorded with planting on 30th October and application of bio-mulch (Paddy straw) during both the years of experiments.

**Key words:** Mulching, Planting time, Tomato, Weed intensity

Tomato (*Solanum lycopersicum* L.) is an important fruit vegetable of solanaceae family. It is a rich source of vitamins like A & B and iron. It is grown for fresh market and tops the list of canned vegetables. It is day neutral, self pollinated and annual fruit vegetable crop which is extensively grown in Asian and European countries.

Tomato can be planted from November to February. Due to day neutral behaviour of tomato plant, many varieties are planted round the year. Among various cultural practices followed during tomato cultivation, planting time is considered one of the most important practices that greatly influence growth and yield of the crop. There is a wide range of planting time, which may affect its yield and quality due to varying climatic conditions at different stages of crop.

Mulching is the most valuable practice to conserve the soil moisture, organic matter and reduced weed intensity. When straw from plants is left in the field as mulch, it reduces soil erosion, the biological activity of the soil microbes increases and soil physical and chemical properties are also improved, which efficiently inhibit the growth of weeds (Duppong *et al.* 2004, Ramakrishna *et al.* 2006, Teasdale and Mohler 2000). Anyszka and Dobrzański (2008) found that organic mulch reduces the weed seed germination and growth of weeds through the less light penetration into the soil. Weeds reduce crop productivity by interfering with crop growth. Besides reduction of crop yield, weeds also contaminate and taint farm product which ultimately reduce their market values and change their end use.

Therefore, it was considered enviable to find out a suitable date of transplanting and the best mulching material to obtain maximum crop growth and yield. Keeping this in view the present study was undertaken.

## MATERIALS AND METHODS

The field experiments were conducted at Vegetable Farm, Department of Vegetable Science, Kalyanpur, Chandra Shekhar Azad University of Agricultural and Technology, Kanpur during the two consecutive *rabi* seasons of 2016-17 and 2017-18. Geographically the experimental site lies between the course of Ganga river (Gangetic alluvium). The site falls under sub tropical climate in Indo-gangetic plains having alluvial soil and is located at 260 49′ N latitude and 800 30′ E longitudes and an altitude 113 m above mean sea level. The climatic condition of Kanpur district comes under the semi arid comprising three distinct seasons, viz. rainy or wet, winter and summer or hot. The rainy season starts

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from the end of June and last in September or extends up to mid October with average annual rainfall of 1200 mm. Sporadic rains also occurs during winter. The winter season starts from November and continues up to the first week of March with mean temperature ranging from 15-25ºC.The study consisted of four different dates of transplanting ($D_1$-15th October, $D_2$-31st October, $D_3$-15th November and $D_4$-30th November) and four treatments of mulches ($M_1$-Black polyethylene, $M_2$-White polyethylene, $M_3$-Bio-Mulch, i.e. paddy straw and $M_4$-Control). The experiments were laid out in Factorial Randomized Block Design with tomato cultivar Azad T-6.

## RESULTS AND DISCUSSION

Pooled data presented in Table 1 revealed that the different dates of transplanting and mulch significantly reduce the number of weeds during the experimentation period.

The pooled data revealed that the minimum number of weeds (12.30 $m^{-2}$) recorded from crop transplanted on 31st October along with paddy straw ($D_2M_3$) followed by crop transplanted on 31st October under black polythene mulch (13.10 $m^{-2}$) and the maximum from crop transplanted on 30th November without any mulch (68.35 $m^{-2}$). The crop transplanted on 31st October with bio-mulch infested significantly lesser weed population than rest of the dates of transplanting.

The pooled data pertaining to fresh and dry weight (g) of weed as infested by different dates of transplanting presented in Table 1. The maximum fresh and dry weight recorded at last harvest (322.24 and 94.02 g, respectively) in crop transplanted on 30th November without any mulch, followed by crop transplanted on 15th October without any mulch (276.27 and 82.87 g, respectively); however, the minimum values of weed fresh and dry weight (56.40 and 16.92 g, respectively) were recorded with crop transplanted on 31st October with bio-mulch, i.e. paddy straw.

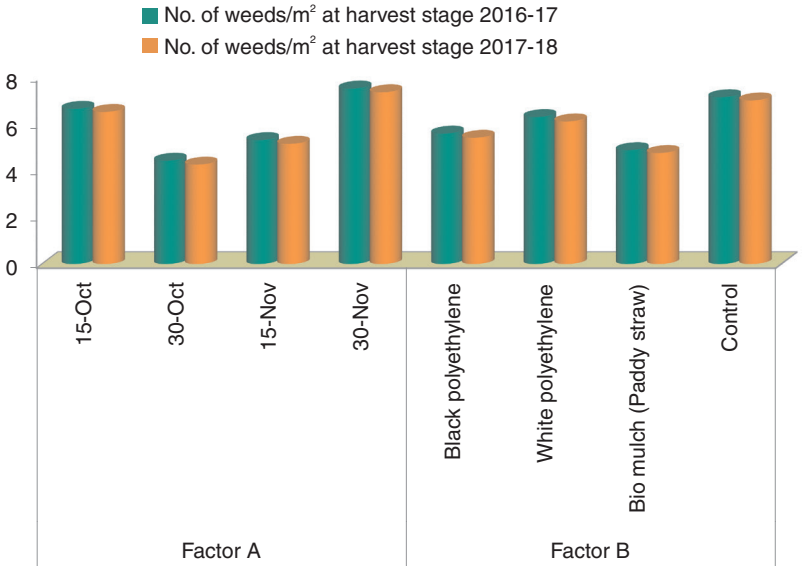


Fig 1 Number of weeds/$m^2$ at harvest stage.

Table 1 Number of weeds/$m^2$ and weed biomass at harvest stage

| Factor A | Factor B | No. of weeds/$m^2$ at harvest stage | Weed biomass at harvest stage | |
|---|---|---|---|---|
| | | | Fresh weed biomass weight (gm) | Dry weed biomass weight (gm) |
| 15 October | Black polythene | 39.40 | 180.66 | 54.20 |
| 15 October | White polythene | 49.38 | 227.66 | 68.30 |
| 15 October | Bio mulch (Paddy straw) | 27.85 | 127.70 | 38.31 |
| 15 October | Control (No mulching) | 60.25 | 276.27 | 82.87 |
| 31 October | Black polythene | 13.10 | 60.07 | 18.02 |
| 31 October | White polythene | 20.35 | 93.31 | 27.99 |
| 31 October | Bio mulch (Paddy straw) | 12.30 | 56.40 | 16.92 |
| 31 October | Control (No mulching) | 33.20 | 152.23 | 45.67 |
| 15 November | Black polythene | 23.15 | 71.15 | 21.34 |
| 15 November | White polythene | 32.15 | 147.42 | 44.21 |
| 15 November | Bio mulch (Paddy straw) | 15.40 | 70.62 | 21.26 |
| 15 November | Control (No mulching) | 42.75 | 196.02 | 58.81 |
| 30 November | Black polythene | 53.45 | 245.09 | 73.52 |
| 30 November | White polythene | 57.90 | 254.99 | 79.65 |
| 30 November | Bio mulch (Paddy straw) | 43.45 | 199.23 | 59.77 |
| 30 November | Control (No mulching) | 68.35 | 322.24 | 94.02 |
| CD (P=0.05) | | 2.91 | 13.62 | 1.10 |
| CV | | 3.64 | 14.76 | 1.01 |

Table 2 Individual weed species at harvest stage

| Factor A | Factor B | *Cyperus rotundus* (Motha) | *Phalaris minor* | *Parthenium hysterophorus* | *Rumex dentatus* (Jangali Palak) | *Melilotus alba* (Sengi) | *Artabotrys odoratissimus* (Kathari) | *Cynodon dactylon* (Doob) | *Chenopodium album* (Bathua) |
|---|---|---|---|---|---|---|---|---|---|
| 15 October | Black polythene | 5.35 | 5.20 | 3.10 | 3.40 | 4.21 | 4.40 | 3.40 | 10.55 |
| 15 October | White polythene | 6.75 | 6.60 | 3.90 | 4.30 | 5.05 | 5.55 | 4.30 | 13.20 |
| 15 October | Bio mulch (Paddy straw) | 3.80 | 3.75 | 2.19 | 2.40 | 2.80 | 3.10 | 2.40 | 7.40 |
| 15 October | Control (No mulching) | 8.15 | 8.00 | 4.75 | 5.20 | 6.10 | 6.70 | 5.19 | 16.16 |
| 31 October | Black polythene | 1.80 | 1.70 | 1.05 | 1.15 | 1.35 | 1.45 | 1.15 | 3.45 |
| 31 October | White polythene | 2.75 | 2.70 | 1.60 | 1.75 | 2.05 | 2.25 | 1.75 | 5.50 |
| 31 October | Bio mulch (Paddy straw) | 1.65 | 1.65 | 0.95 | 1.05 | 1.25 | 1.35 | 1.05 | 3.35 |
| 31 October | Control (No mulching) | 4.50 | 4.40 | 2.65 | 2.85 | 2.35 | 3.65 | 2.85 | 8.95 |
| 15 November | Black polythene | 3.15 | 3.05 | 1.85 | 1.85 | 2.35 | 2.55 | 2.00 | 6.23 |
| 15 November | White polythene | 4.30 | 4.30 | 2.55 | 2.75 | 3.25 | 3.55 | 2.75 | 8.70 |
| 15 November | Bio mulch (Paddy straw) | 2.05 | 2.05 | 1.25 | 1.35 | 1.55 | 1.70 | 1.30 | 3.81 |
| 15 November | Control (No mulching) | 5.80 | 5.60 | 3.40 | 3.70 | 4.35 | 4.75 | 3.70 | 11.45 |
| 30 November | Black polythene | 7.25 | 7.00 | 4.25 | 4.60 | 5.45 | 5.95 | 4.63 | 14.30 |
| 30 November | White polythene | 7.85 | 7.60 | 4.60 | 4.85 | 5.85 | 6.45 | 5.19 | 15.55 |
| 30 November | Bio mulch (Paddy straw) | 5.90 | 5.70 | 3.45 | 3.75 | 4.40 | 4.80 | 3.75 | 11.70 |
| 30 November | Control (No mulching) | 9.35 | 8.95 | 5.06 | 5.73 | 6.95 | 7.65 | 5.95 | 18.20 |
| CD (P=0.05) | | 1.38 | 0.88 | 0.99 | 1.12 | 1.16 | 1.14 | 1.05 | 1.01 |
| CV | | 12.93 | 8.42 | 15.82 | 16.59 | 14.62 | 13.06 | 15.39 | 4.79 |

The data presented in Table 2 shows that the different dates of sowing and different mulching materials used, significantly differed individual weed species.

Pooled data revealed that the minimum weed population (1.65, 1.65, 0.95, 1.05, 1.25, 1.35, 1.05 and 3.35) of *Cyperus rotundus, Phalaris minor, Parthenium hysterophorus, Rumex dentatus*, *Melilotus alba, Artabotrys odoratissimus*, *Cynodon dactylon* and *Chenopodium album,* respectively, were recorded from crop transplanted on 31st October with paddy straw as mulch, followed by the crop transplanted on 31st October with black polythene mulch (1.80, 1.70, 1.05, 1.15, 1.35, 1.45, 1.15 and 3.45). The minimum weed population in crop transplanted on 31st October with paddy straw mulch was found significant over all other transplanted dates except transplanting on 31st October and 15th November with black polythene mulch. Whereas, the maximum population (9.35, 8.95, 5.06, 5.73, 6.95, 7.65, 5.95 and 18.20) of *Cyperus rotundus, Phalaris minor, Parthenium hysterophorus, Rumex dentatus*, *Melilotus alba, Artabotrys odoratissimus*, *Cynodon dactylon* and *Chenopodium album,* respectively, were recorded from crop transplanted on 30th November without any mulch.

The minimum weeds of individual found with the application of bio-mulch, it may due to the covering of ground with bio-mulch did not allow the light to pass through it, which is essential for photosynthesis. The minimum weed fresh and dry weight per square metre area was recorded under bio-mulch followed by black polythene and the maximum weed dry weight per square metre area recorded under no mulch treatment. This might be because of the inhibition of sunlight transmission by the bio-mulch, as light is an integral part of photosynthesis essentially required for the growth of weed plants.

The present results are in agreement with the findings of Grassbaugh *et al*. (2004) who reported 80% reduction in weed biomass under black plastic mulch, Ngouajio and Ernest (2004) who reported the highest and lowest weed biomass under white and black plastic mulches, respectively and Rajablariani *et al*. (2012) who reported that the silver/ black and black plastic mulch blocked the weeds, except a few, which emerged through the planting holes.

Soil coverage with organic mulch is one of the natural methods of preventing weed infestation (Liebman and Davis 2000, Barberi 2002). In tomato, most of the weed species can be controlled by using mulching materials except purple nut sedge, which can be controlled only by using paper mulch, and the best weed control and the lowest weed biomass can be achieved by paper mulch followed by polyethylene and biodegradable plastic mulch as reported by Anzalone *et al*. ( 2010).

*Conclusion*

Finally it may be concluded from the present investigation that the crop transplanted on 30th October significantly reduces the weed intensity, weed biomass (fresh and dry weight) and individual weed species at harvest stage during both the years of experimentation. Among various

mulch treatments, application of bio-mulch ($M_3$) reduces the weed intensity; weed bio mass (fresh and dry weight) and individual weed species at harvest stage during both the years of experimentation.

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