

Effect of mulches on soil moisture and fruit yield in summer tomato

■ V.K. PANDEY, A.C. MISHRA, V.P. RAI AND R.K. SINGH

SUMMARY

Present experiment was conducted in participatory mode among ten tomato growers of Chatra district of Jharkhand during late *Rabi* of 2009-10 to summer 2010 including three technology options *viz.*, Farmers practices *i.e.* plots provided with required number of irrigations without mulching (TO₁), use of black plastic mulch (TO₂) and use of rice straw mulch applied @ 10 t/ha to maintain 2 inch thickness (TO₃). Mulched plots were also irrigated whenever required to maintain soil moisture. Data were recorded on moisture content after one week of irrigation (%), number of irrigations during 130 days of crop duration, irrigation intervals (days) required to maintain at least 20-22 per cent soil moisture, weed population per m² area, fruit weight (g), fruit yield per plant (kg), yield (q/ha) and C:B ratio. Results indicated that black plastic mulch was promising for increasing soil moisture content after one week of irrigation, fruit weight and reducing number of irrigations and weed population per m² area but rice straw mulch increased number of fruits per plant and fruit yield. Rice straw mulching also exhibited maximum B:C ratio due to higher fruit yield and lower initial input required in application of this locally available mulch material. Therefore, it is recommended for large scale application in summer tomato crop for remunerative yield.

Key Words : Mulches, Soil moisture, Fruit yield, Tomato

How to cite this article : Pandey, V.K., Mishra, A.C., Rai, V.P. and Singh, R.K. (2013). Effect of mulches on soil moisture and fruit yield in summer tomato. *Internat. J. Plant Sci.*, 8 (1) : 148-150.

Article chronicle : Received : 01.09.2012; Revised : 10.10.2012; Accepted : 25.11.2012

Tomato is an important crop of Chatra district of Jharkhand grown throughout the year. In addition to September planted main (*Rabi*) crop, January planted summer and June planted *Kharif* crops are also grown by the farmers in extensive area. The *Rabi* and *Kharif* crops do not suffer water stress but summer crop is more prone to dry spell during the months of February to May. The growers suffer more irrigation requirement of the crop due to low longevity of soil moisture during summer season. In spite of limitations, this crop is highly remunerative to the farmers. Therefore, soil moisture conservation techniques are more

useful for facilitating the farmers. Mulching of crop is one of the efficient means of conserving the moisture (Shock *et al.*, 1988; Singh *et al.*, 1975; Uniyal and Mishra, 2004, regulating soil temperature (Sood, 1988; Uniyal and Mishra, 2003), checking soil erosion (Aarstad and Miller, 1973; Shock *et al.*, 1988; Rees *et al.*, 2002) and efficient use of nutrients through soil solution. Sood, 1989; Stieber *et al.*, 1991; Yoder, 1991). Maintaining the optimum soil moisture during growth and development of crop is one of the factors promoting proper uptake of nutrients. Crop production supplying the required number of irrigations is a tedious and uneconomic job particularly in rainfed and water scarce areas. In such areas, application of mulch has special importance to reduce number of irrigations. Many types of mulches have been utilized in agriculture with varying degree of beneficial results. Mulch materials should have easy and economical reach of farmers with affirmative impact on yield and environment. Therefore, evaluation of some mulch materials with good soil moisture conservation

MEMBERS OF THE RESEARCH FORUM

A.C. MISHRA, Department of Vegetable Science, G. B. Pant University of Agricultural and Technology, Hill Campus, Ranichauri, TEHRI GARHWAL (UTTARAKHAND) INDIA
Email: vinod.bau@rediffmail.com

Address of the Co-authors:

V.K. PANDEY, V.P. RAI AND R.K. SINGH, Krishi Vigyan Kendra (Birsā Agricultural University), CHATRA (JHARKHAND) INDIA

and economical yield ability is imperative to promote remunerative summer tomato cultivation for this region.

MATERIALS AND METHODS

A trial was conducted on farm in participatory mode among ten tomato growers of Chatra district of Jharkhand during late *Rabi* of 2009-10 to summer 2010. The soils of experimental field were sandy loam to red loam with 0.68 per cent organic carbon, pH value of 6, 410 kg/ha N, 15 kg/ha P₂O₅ and 205 kg/ha K₂O. The experiment was laid out in randomized block design including three technology options *viz.*, Farmers practices *i.e.* plots provided with required number of irrigations without mulching (TO₁), use of black plastic mulch (TO₂) and use of rice straw mulch applied @ 10 t/ha to maintain 2 inch thickness (TO₃). Mulched plots were also irrigated whenever required to maintain soil moisture. The plot size was kept 100 m² with a gross experimental area of 3000 m². Data were recorded on moisture content after one week of irrigation (%), number of irrigations during 130 days of crop duration, irrigation intervals (days) required to maintain at least 20-22% soil moisture, weed population per m² area, fruit weight (g), fruit yield per plant (kg), yield (q/ha), gross income (Rs./ha), net income (Rs./ha) and C:B ratio.

RESULTS AND DISCUSSION

Analysis of the data indicated that treatments varied significantly for all the parameters studied (Table 1). Results indicated that rice straw mulching resulted in maximum number of fruits per plant (20.59), fruit yield per plant (1.41 kg) and total fruit yield (282.0 q/ha) whereas, plots mulched with black plastic exhibited maximum soil moisture content after one week of irrigation (28%), irrigation intervals (13 days) and fruit weight (75 g) and minimum number of irrigations required during crop duration of 130 days (10) and weeds per m² area (12). Mulched plots in general had favourable edaphic environments plant growth and fruit yield *viz.*, high and prolonged soil moisture content and low weed population. Black plastic mulch resulted in higher degree of soil moisture conservation and weed control because black plastic sheets entirely check the evaporation and light transmission across as compared to rice straw. Higher level of soil moisture conservation and weed control led to more fruit weight and comparatively less number of fruits per plant. Number of fruits per plant appeared as principal yield attributing character in tomato which was increased in rice straw mulching probably due to release of some additional nutrients from partially decomposed straw and creation of environment for beneficial soil micro-organism during the course of crop growth and development. It could therefore, be concluded that in addition to high level of soil moisture conservation and weed control, mulch materials should be associated with improved soil solution and efficient use of nutrients and fertilizers (El-Hady and Lotfy, 1990; Stieber *et al.*, 1991; Yoder, 1991).

Table 1: Effect of different mulches on performance of summer season tomato in rainfed plateaus of Chatra district of Jharkhand

| Technology options | Technical parameters | | | | | Economic parameters | | | | | |
|--|---|-----------------------|-----------------------------|---|----------------------------|----------------------|----------------------|--------------|----------------------|--------------------|-----------|
| | Moisture content after one week of irrigation (%) | Number of irrigations | Irrigation intervals (days) | Weed population per m ² area | Number of fruits per plant | Weight of fruits (g) | Yield per plant (kg) | Yield (q/ha) | Gross income (Rs/ha) | Net income (Rs/ha) | B:C ratio |
| TC ₁ – Farmers practices (without mulching) | 12 | 21 | 6 | 58 | 19.36 | 62 | 1.20 | 240 | 168000 | 126000 | 4.00 |
| TC ₂ - Black plastic mulching. | 28 | 10 | 13 | 12 | 17.86 | 75 | 1.34 | 269 | 188300 | 145300 | 4.82 |
| TC ₃ – Rice straw mulching (2inch thick). | 19 | 14.4 | 9 | 27 | 20.59 | 70 | 1.41 | 282 | 197400 | 156400 | 5.33 |
| C.D. (P = 0.05) | 1.95 | 1.40 | 1.20 | 3.15 | 1.25 | 1.85 | 0.62 | 13.65 | - | - | - |

Mulching with rice straw resulted in maximum gross and net income per hectare (Rs.197400/- and Rs. 156400/-, respectively) and B:C ratio (5.33) as compared to black plastic mulching. High initial cost of black polythene/plastic was also one of the factors adversely affecting the gross and net income and profitability in black plastic mulching whereas local availability of rice straw at cheaper rate reduces the cost of cultivation with considerable increase in soil moisture conservation and fruit yield. Therefore, application of 2 inches thick Rice straw mulching @ 10t/ha in late *Rabi*-summer tomato cultivation is recommended for agro climatic and socio economic conditions of Chatra district of Jharkhand.

Conclusion :

Rice straw mulching in interspaces of summer tomato crop in 2" thickness applied @ 10 t/ha available locally at cheaper rate resulted in highest fruit yield and B: C ratio by conserving soil moisture and controlling weed to a great extent. Therefore, its application may be recommended in biophysical and socioeconomic conditions of Chatra district of Jharkhand.

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