Environment and Ecology 37 (1) : 139—142, January—March 2019
Website: environmentandecology.com ISSN 0970-0420

# Effect of Different Weed Management Practices on Growth and Yield of Tomato CV GT-2

**Chaudhari H. C., Patel S. Y., Arvadiya L. K., Gamit D. R., Patel A. J.**

Received 24 July 2018; Accepted 27 August 2018; Published on 15 September 2018

**Abstract** Field experiment was conducted during the year 2016-17. The treatment weed free check significantly influenced the growth characters like plant height and no. of branches per plant and it was at par with treatments $T_5$, $T_3$ and $T_7$ for both characters at harvest. Average weight of fruits was significantly higher with treatment $T_5$ but, it was at par with all the weed management practices except weedy check. The treatment weed free check ($T_2$) noted significantly the highest marketable fruit yield (31.67 t/ha) and statistically remained at par with treatments $T_5$ and $T_3$. The highest WCE (78.22%) was recorded in treatment $T_2$ and lowest WI (8.34%) was recorded under the treatment $T_5$, as well as both followed by treatment $T_3$. Treatment $T_2$ gave highest net return which was followed by the treatments $T_5$, $T_3$ and $T_{10}$. However, the B : C ratio of the treatment $T_5$ was highest, which was closely followed by the treatments $T_2$ and $T_{10}$. Effective and economical weed control in tamato crop might be secured under treatment $T_2$, which is equally effective as weed free condition.

**Keywords** Weed management, Tomato, Pendimethalin, Interculture, Hand Weeding.

Chaudhari H.C[1]., Patel S. Y.[2], Arvadiya L. K.[3],
Gamit D. R.[4], Patel A. J[5].
[1] MSc Horticulture (Vegetable Science), [2]Assistant Professor (Vegetable Science), [3]Associate Professor (Agronomy),
[4]MSc Horticulture (Floriculture and Landscape Architecture),
[5]MSc Horticulture (Vegetable Science).
ASPEE College of Horticulture and Forestry, NAU,
Navsari, Gujarat 396450, India
e-mail : hiralchaudhari4695@gmail. com
*Corresponding author

## Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most important vegetable crops grown all over the world. It is warm season crop reasonable resistant to heat, drought and grows on wide range of soil and climatic conditions. India is the second largest producer of vegetables in the world. It covers an area of 809 thousand hectares and produced 19.7 lakh MT with a productivity of 24.3 t/ha. It is cultivated more or less in all the districts of Gujarat. In Gujarat, it occupies an area of 46.40 thousand hectares and production of 1.32 lakh MT with a productivity of 28.43t/ha (Anon 2016-17)

Weed is the major constraint that limiting the crop production and have most deleterious effect and ultimately causing the yield reduction of tomato by 53 to 67% (Sanok et al. 1979). Present study was undertaken with a view to reduce the losses of economic production through effective weed control and solve the scarcity of labors to some extent.

## Materials and Methods

The present study was conducted on Regional Horticultural Research Station, Navsari Agricultural University, Navsari during the winter season of 2016-17. The soil of the experimental site was dark greyish brown with more clay content. The tomato variety GT-2 was used in the experiment, proper size and healthy seedlings were transplanted at 60 cm × 45cm in open field. The treatments comprised of twelve weed management practices viz, $T_1$ (Weedy check), $T_2$ (Weed free check (Pendimethalin 30% EC @ 1.0 kg/ha as PE + IC and HW at 20 DATP + 2 HW at 40 and 60 DATP), $T_3$ (IC and HW at 20 and 40 DATP), $T_4$ (Pendimethalin 30% EC @ 1.0 kg/ha as PE), $T_5$ ($T_4$ + IC and HW at 40 DATP), $T_6$ (Metribuzin 70% WP @ 0.5kg/ha as PE), $T_7$ ($T_6$ + IC and HW at 40 DATP) , $T_8$ (Oxadiargyl 6% EC @ 0.09 kg/ha as PE), $T_9$ ($T_8$ + IC and HW at 40 DATP), $T_{10}$ ($T_4$ + Quizalofopethyl 5 % EC @ 0.05 kg/ha at 20 DATP), $T_{11}$ ($T_6$ + Quizalofop-ethyl 5% EC @ 0.05 kg/ha at 20 DATP) and $T_{12}$ ($T_8$ + Quizalofop-ethyl 5% EC @ 0.05 kg/ha at 20 DATP), which were arranged in randomized block design with three replications.

The required quantity of herbicides were applied as per treatment by knapsack sprayer with spray volume of 500 L/ha. Hand weeding and inter-culturing were carried out with the help of *khurpi* and power weeder, respectively. The recommended dose of fertilizer 100 : 50 : 50 kg NPK/ha in the form of urea, single super phosphate and muriate of potash were applied to all plots uniformly. Full dose of SSP and MOP with half dose of urea were applied at 30 DATP, while remaining half dose of urea was applied at 60 DATP. The periodical plant height and number of branches per plant at 30,60,90 DATP and at final harvest was recorded from the five selected plants of each net plot. The average values from each plot at each stage were computed and recorded. The tomato fruits were harvested in six pickings approximately at weekly interval and summed up for total yield. At fourth picking, five marketable fruits were selected randomly for average fruit weight and the mean value was noted. The WCE and WI were calculated by formula given by Kondap and Upadhyay (1985) and Gill and Kumar (1969), respectively. The data recorded were statistically analyzed for interpretation (Gomez and Gomez 1984). The economics based on the prevailing market prices was calculated.

**Table 1.** Different weed species observed at the experimental field.

| Monocot weeds | Dicot weeds | Sedges |
|---|---|---|
| *Cynodon dactylon* L. | *Boerhavia diffusa* L. | *Cyperus* |
| *Echinochloa* | *Digera arvensis* L. | *rotundus* L. |
| *crus-galli* L. | *Portulaca oleraceae* L. | |
| | *Tridax procumbens* L. | |
| | *Partheium hysterophorus* L. | |
| | *Euphorbia hirta* L. | |

## Results and Discussion

### Effects on weed and weed parameters

The different weed species observed at the experimental field during the experiment are presented in the Table 1. Among which the predominant monocot weed species were : *Cynodon dactylon* L., dicot weeds were *Digera arvensis* L., *Portulaca oleraceae* L. and *Euphorbia hirta* L. and among sedges *Cyperus rotundus* L. As in Table 2, the overall minimum weed index (8.34 %) was worked out with treatment $T_5$ while highest value was under the weedy check (41.11%). The highest weed control efficiency (78.22%) was obtained under weed free check ($T_2$) followed by treatments $T_3$ and $T_5$ with 55.30 and 51.52 %, respectively. This is attributed to luxurious crop growth dominated over the weeds under $T_2$ and $T_5$. The findings were in conformity with results by Samant and Prusty (2014) who reported that the treatment of two HW was gave significantly lowest weed dry biomass (27.6 g/m$^2$) with highest WCE (80.9%) were recorded with two HW as farmer practice. Bangi et al. (2014), Elizabeth and Geetha (2007) in brinjal showed that the weed count and dry weight were the lowest at with weed index (4.24%) were recorded with pendimethalin (30% EC) @ 1.5 kg a.i./ha + 1IC at 30 DATP.

### Growth attributes

Weed management practice has significant effect on growth characters of tomato crop. Significantly, the highest plant height (63.30, 87.10, 100.13 and 106.00 cm) at 30,60,90 DATP and at harvest, respectively was recorded with treatment $T_2$ (Weed free), which

**Table 2.** Effect of different weed management practices on weed characters, yield and BCR in tomato cv GT-2.

| Treat-ments | Plant height (cm) 30 DATP | 60 DATP | 90 DATP | At final harvest | No. of primary branches/plant 30 DATP | 60 DATP | 90 DATP | AT final harvest | Avg fr/ unit | Yield (t/ha) | WCE (%) | WI (%) | Net return (Rs/ha | BCR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | 43.93 | 68.50 | 81.30 | 85.80 | 2.07 | 5.47 | 6.93 | 7.73 | 33.41 | 18.65 | - | 41.11 | 85580 | 0.85 |
| $T_2$ | 63.30 | 87.10 | 100.13 | 106.00 | 2.67 | 6.53 | 8.13 | 8.93 | 40.95 | 31.67 | 78.22 | – | 176013 | 1.41 |
| $T_3$ | 57.07 | 80.77 | 91.97 | 97.67 | 2.53 | 6.20 | 7.73 | 8.53 | 40.80 | 27.98 | 55.30 | 11.65 | 153241 | 1.31 |
| $T_4$ | 53.70 | 73.03 | 89.70 | 90.37 | 2.13 | 5.67 | 7.20 | 8.00 | 38.31 | 22.36 | 33.40 | 29.40 | 117112 | 1.12 |
| $T_5$ | 62.17 | 83.87 | 94.90 | 100.83 | 2.53 | 6.33 | 7.93 | 8.73 | 41.08 | 29.03 | 51.52 | 8.34 | 168379 | 1.47 |
| $T_6$ | 53.40 | 71.23 | 88.43 | 88.40 | 2.27 | 5.73 | 7.13 | 7.93 | 37.97 | 22.29 | 34.71 | 29.62 | 116507 | 1.11 |
| $T_7$ | 56.23 | 80.03 | 91.67 | 97.40 | 2.47 | 6.13 | 7.60 | 8.47 | 40.03 | 26.93 | 42.29 | 14.97 | 148743 | 1.31 |
| $T_8$ | 50.17 | 69.93 | 86.17 | 87.53 | 2.13 | 5.47 | 7.00 | 7.80 | 38.07 | 20.52 | 21.72 | 35.21 | 95960 | 0.91 |
| $T_9$ | 53.57 | 79.17 | 88.93 | 95.00 | 2.47 | 6.00 | 7.47 | 8.27 | 39.73 | 26.86 | 39.63 | 15.19 | 144105 | 1.25 |
| $T_{10}$ | 59.43 | 77.60 | 85.50 | 94.97 | 2.40 | 5.93 | 7.40 | 8.27 | 39.31 | 26.49 | 37.58 | 16.36 | 152886 | 1.40 |
| $T_{11}$ | 58.43 | 76.40 | 83.73 | 93.73 | 2.33 | 5.87 | 7.40 | 8.20 | 38.84 | 23.38 | 36.65 | 26.18 | 123756 | 1.16 |
| $T_{12}$ | 56.63 | 73.87 | 82.83 | 91.37 | 2.20 | 5.60 | 7.07 | 7.93 | 38.94 | 23.10 | 32.78 | 27.06 | 117231 | 1.08 |
| SEm ± | 2.57 | 3.01 | 3.04 | 3.03 | 0.08 | 0.19 | 0.23 | 0.25 | 1.13 | 1.38 | | | | |
| CD@5% | 7.53 | 8.81 | 8.90 | 8.90 | 0.24 | 0.57 | 0.69 | 0.73 | 3.32 | 4.03 | | | | |
| CV% | 7.99 | 6.78 | 5.92 | 5.59 | 6.06 | 5.59 | 5.47 | 5.23 | 5.03 | 9.55 | | | | |

was statistically at par with treatments $T_5$, $T_{10}$,$T_{11}$, $T_3$,$T_{12}$ and $T_7$ at 30 DATP. Whereas, in case of plant height at 60 ,90 DATP and at harvest, it was at par to treatments $T_5$, $T_3$, $T_7$ and $T_9$ except $T_9$ at 90 DATP and at harves. While, significantly the lowest plant height was noted under $T_1$ (Weedy check) at all the stages of the crop growth observation than all the rest of treatments. The significantly highest number of primary branches per plant (2.67, 6.53, 8.13 and 8.93) was noted under treatment $T_2$ (Weed free), which was at par with treatments $T_3$, $T_5$, $T_7$ and $T_9$ at 30, 60 and 90 DATP, insddition to these, treatments $T_{10}$ and $T_{11}$ were also at final harvest. The lowest value was recorded with treatment $T_1$ (Weedy check) at all the stages. Thus, the increase in plant height was rapid during initial phase of crop growth up to 60 DATP, later on, it showed slow down the growth rate due to initiation of reproductive phase. The superiority of treatment $T_2$ to produce taller plants and more number of primary branches may be due to the fact that herbicide provide better weed free condition from the very beginning of crop emergence and later by hand weeding and inter culturing thus weeds are managed during critical period of crop weed competition. Bangi et al. (2014) also noted that significantly highest plant height was noted underweed free treatment in brinjal crop. Patel et al. (2017) also found that the plant height (48.5 cm) and number of nodes/ stem (19.0) were significant highest with three HW at 20, 40 and 60 DAS in okra.

Yield and yield attributes

All the weed management treatments recorded significant effect on marketable fruit yield and average fruit weight over weedy check. The treatment $T_2$ gave significantly the highest marketable fruit yield (31.67 t/ha) which was at par with treatments $T_5$ and $T_3$. Significantly the highest average fruit weight (41.08 g) was found under treatment ($T_5$) which was found at par with all the treatments except weedy check. Whereas, treatment $T_1$ recorded significant minimum average fruit weight(33.41 g). The herbicide followed by IC and HW resulted high enough quantitative traits as higher plant growth, nutrients uptake by plant moves towards the fruits in respective treatments. Kumar et al. (2015) also noted that application of pendimethalin @ 1.5 kg/ha, fluchloralin @ 1.0 kg/ ha being equally effective with two hand weeding at 30 and 60 DATP for average fruit weight and yield in tomato. Shil and Adhikary (2016) also reported that the significant maximum yield/ha (3.46 t) were recorded in hand weeding in chilli. Singh et al. (2016) also reported that significantly the highest average bulb weight (70.5 g) and marketable bulb (35.65 t/ ha) and total bulb yield (36.20 t/ha) were noted in weed free check. Nandal and Sharma (2005), Ved and

Srivastava (2006) also reported that the significant highest tomato fruit yield was noted in weed free check, which was at par with pendimethalin @ 1.0 kg/ha *fb* hand weeding at 40 DAT.

Economics

The highest net income of Rs 1,76,013 was obtained with treatment $T_2$ followed by treatments $T_5$ (Rs 1,68,379) and $T_3$ (Rs 1,53,241). However highest returns per rupee (1.47) obtained with treatment $T_5$ followed by treatments $T_2$ (1.41) and $T_{10}$ ((1.40). while the lowest net return and returns per rupee (Rs 85,580 and 0.85 respectively) noted with the treatment weedy check ($T_1$). Because od less treatment cost of $T_5$ as compared to treatment $T_2$, as the treatment cost of $T_2$ was elevated by two additional IC and HW by power weeder and manual labor. Kumar et al. (2015) also reported that the highest B : C ratio (5.01) under the treatment pendimethalin @ 1.5 kg a.i. /ha (PE) in tomato. The result was also supported by earlier workers; Samant and Prusty (2014) and Singh et al. (1984) in tomato and Gare et al. (2015) in chilli.

## Conclusion

The treatment $T_2$ pendimethalin 30% EC @ 1.0 kg/ha as a PE + IC and HW at 20 DATP + 2 HW at 40 and 60 DATP secured effective weed control with maximum tomato fruit yield and net returns as well as treatment $T_5$ pendimethalin 30% EC @ 1.0 kg/ha coupled with IC and HW at 40 DATP equally effective for economical higher returns per rupee, solved the labor crises and fruit yield under the South Gujarat agro climatic condition.

### References


Anonymous (2017) Indian Horticulture Database, *www.nhb.gov.in.*

Bangi SS, Lal EP, Bangi SS, Sattigeri UT (2014) Effect of herbicides on weed control efficiency and yield attributes in brinjal (*Solanum melongena* L.). J Agric Vet Sci 7 (6) : 50—65.

Elizabeth KS, Geetha K (2017) Evaluation of pre-emergence and post-emergence herbicides and soil solarization for weed management in brinjal (*Solanum melongena* L.). I J Weed Sci 39 (1 & 2) : 109—111.

Gare BN, Raundal PU, Burli AV (2015) Integrated weed man agement in rainfed chilli (*Capsicum annum* L.). Karnataka J Agric Sci 28 (2) : 164—167.

Gill GB, Kumar V (1969) Weed index : A new method of reporting weed control trials. I J Agron 14 (1) : 96—98.

Gomez KA, Gomez AA (1984) Statistically procedure for Agricultural Research 2nd edn. An International Rice Research Institute Book , John Willey and Sons, Inc., New York.

Kondap SM, Upadhyay UC (1985) A practical manual on weed control, Oxford and IBH Co., New Delhi, pp 55.

Kumar A, Manuja S, Singh J, Chaudhary DR (2015) Integrated weed management in tomato (*Lycopersicon esculentum* Mill.) under dry temperate climate of western Himalayas. J Crop and Weed 11 (1) : 165—167.

Nandal TR, Sharma R (2005) Integrated weed management studies in tomato crop of submontane and low hills sub-tropical conditions of Himachal Pradesh. I J Weed Sci 37 (3 & 4) : 283—284.

Patel TU, Zinzala MJ, Patel HH, Patel DD, Patel HM, Italiya AP (2017) Summer okra as influenced by weed management. AGRES Int e-J 6 (1) : 129—133.

Samant TK, Prusty M, (2014) Effect of weed management on yield, economics and nutrient uptake in tomato (*Lycopersicon esculentum* Mill.). Adv Res J Crop Improv 5 (2) : 144—148.

Sanok WJ, Shelleck GW, Greighton JF (1979) Weed problems and phytotoxicity with herbicides in five tomato varieties. Proc of the North Eastern Weed Sci Soc Dept of Rort Uni of Maryland, College Park 20742, USA 33 : 332—335.

Shil Subhra, Adhikary Pabitra (2016) Weed management in transplanted chilli. I J Weed Sci 46 (3) : 261—263.

Singh G, Bhan VM, Tripathi SS (1984) Effect of herbicides alone and in combination with weeding on tomato and associated weeds. I J weed Sci 16 (4) : 262—266.

Singh SK, Shyam R, Chaudhary Shnata, Yadav LM (2016) Weed management in onion. I J Weeds Sci 48 (2) : 199—201.

Ved P, Srivastava A (2006) Crop-weed competition studies in tomato (*Lycopersicon esculentum* L.) under Mid-Hills of North-West Himalayas. I J Weed Sci 38 (1 & 2) : 86—88.