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Effect of Water Regime and Coloured Mulchs on Productivity of Tomato (*Solanum lycopersicon* Mill.)

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A B S T R A C T

An experiment was conducted at experimental field of Precision Farming Development Center, Agricultural Research Center, Swami Keshwanand Rajasthan Agricultural University, Beechwal, Bikaner during the year 2014-15 and 2015-16. The experiment was carried out in Completely Randomized Block Design (Factorial) with three replications. The experiment consist of three water regime *viz.* 0.6 V, 0.8 V and 1.0 Volume of water through drip irrigation and four treatment of mulch *viz.* Black, silver, Dark red and without mulch . Result revealed that the maximum average yield per plant and yield per ha. were found under 0.8 V of water whereas no. of fruit per plant found non significant. Further, maximum no. of fruit per plant, average yield per plant and yield per ha were found under dark red mulch.

Introduction

Growing water crises and need to produce more food per drop of water requires water efficient irrigation method to enhance crop productivity. Tomato plants are sensitive to water stress and show high correlation between evapotranspiration and crop yield. Under limited water availability, optimal irrigation management and scheduling are necessary in order to increase the efficient use of water for agriculture. Another option is deficit irrigation: exposing the plant to a certain level of water stress during a particular growing period, or throughout the whole growing season, without significant reduction in yield. Although, the effects on yield may be different, many of the research results have shown that regulated deficit irrigation saves substantial amounts of irrigation water and increases water use efficiency (Nuruddin *et al*., 2003 and Topcus, *et al*., 2006). Plastic mulch is a best option for minimizing the water requirement as well as increase in yield. Decoteau (2008) reported that the biomass accumalation and fruit production affected by mulch colour and may be due to mulch effects on the plant light environment and root zone temperature. Plastic mulches directly impact the microclimate around the plant by modifying the radiation budget (absorbitivity vs. reflectivity) of the surface and decreasing the soil water loss. The colour of a mulch largely determines its energy-radiating behavior and its influence on the microclimate around a vegetable plant. Colour affects the surface temperature of the mulch and the underlying soil temperature. The degree o f contact between the mulch and soil, often quantified as a thermal contact

resistance, can affects greatly the performance of a mulch. If an air space is created between the plastic mulch and the soil by a rough soil surface, soil warming can be less effective than would be expected from a particular mulch. The present study was undertaken to evaluate the differernt water regime and coloured mulch on yield of tomato crop.

Materials and Methods

An experiment was conducted in at experimental field of Precision Farming Development Center, Agricultural Research Center, Swami Keshwanand Rajasthan Agricultural University, Beechwal, Bikaner during the year 2014-15 and 2015-16. The experiment was carried out in Completely Randomized Block Design (Factorial) with three replications.

The experiment consist of three water regime *viz.* 0.6 V, 0.8 V and 1.0 Volume of water through drip irrigation and four treatment of mulch *viz.* Black, silver, Dark red and without mulch. One month aged healthy seedlings were of variety S-600 transplanted at the spacing of 40 cm x 40 cm and irrigated through drip irrigation. The recommended package of practices was followed. Water requirement determined by PFDC, Bikaner was used for irrigation scheduling. The periodical observations on yields were recorded.

Results and Discussion

Data from table 2 revealed that the different water regime non significant effect on number of fruit during both year and pooled data. The Significantly higher average fruit yield per plant (838.95 gm/plant) and yield (507.48 q/ha) was found with 0.8 volume of water whereas it was minimum under 0.6 volume of water. Mahmoud *et al*., (2011) reported that the application of irrigation at a lower amount (water deficit) of the water requirement resulted in lower yield, however, increasing the irrigation water over a certain level (over-irrigation) did not increase the tomato yield above the maximum yield. Similar findings were also observed by Singh and Kumar (2007). It might also be due to avoidance of surface run off and deep percolation below the effective root zone under 0.8 V . This could have increased water application efficiency. Further, efficiency of water application depends on the hydraulics of the moisture advancement pattern under 0.8 V . Ultimately, higher water use efficiency because of precise application directly to the root zone and lower losses due to the reduced evaporation, runoff, and deep percolation, reduced fluctuations in the soil-water content resulting with avoidance of water stress (Dasberg and Or, 1999), reflected in better physiological activities of plants and ultimately increased dry matter accumulation and there by increased the yield. Such results were also reported by Raina *et al*., (1999).

Table.1 Irrigation schedule of tomato

Stage	No. of days	Water requirement in (mm)
Initial	35 days	37.01
Crop development	45 days	83.54
Mid Season	45 days	246.29
Last Season	25 days	179.93
Total	150	546.77

Table.2 Effect of water regime and coloured mulch on production of tomato. (2014-16 Pooled)

Treatment	Number of fruit/plant			Average Yield/plant (gm)			Yield (q/ha)		
	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled	2014-15	2015-16	Pooled
water regime									
0.6 V	46.64	39.19	42.91	834.10	759.53	796.81	521.31	442.90	482.11
0.8 V	46.27	38.79	42.53	878.22	799.68	838.95	548.89	466.06	507.48
1.0 V	46.47	38.84	42.66	866.52	789.03	827.78	541.58	459.92	500.75
S.Em. ±	**0.52**	**0.45**	**0.28**	**10.14**	**5.72**	**5.64**	**6.34**	**5.72**	**3.406**
C.D. (5%)	**1.54**	**1.31**	**0.80**	**29.75**	**9.23**	**15.94**	**18.59**	**5.33**	**9.62**
Mulch colour									
Black	47.56	41.60	44.58	919.30	837.06	878.18	574.56	487.63	531.10
Silver	47.11	41.21	44.16	910.45	829.01	869.73	569.03	482.99	526.01
Dark Red	51.51	45.00	48.25	995.50	906.41	950.95	622.19	527.64	574.91
Without mulch	39.66	27.95	33.807	613.20	558.51	585.854	383.25	326.93	355.091
S.Em. ±	**0.60**	**0.51**	**0.327**	**11.71**	**10.66**	**6.5**	**7.32**	**6.15**	**3.93**
C.D. (5%)	**1.77**	**1.51**	**0.92**	**34.35**	**31.26**	**18.40**	**21.47**	**18.04**	**11.11**

In accordance of different mulches, the dark red mulch showed maximum number of fruit (48.25), average fruit yield per plant (950.95 gm/plant) and yield (574.91 q/ha) during both years and pooled data followed by black mulch. The increase in yield of mulched treatment was probably associated with the conservation of moisture and improved microclimate both beneath and above the soil surface and great weed control sp ecially under dark red mulch. Similar results found by singh *et al.* , 2009. Gough 2001 reported that the tomato in red mulch set fruit earlier produced more ripe fruit than plants grown in black mulch.

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