IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 1 Ver. I (Jan. 2015), PP 10-13
www.iosrjournals.org

Effect of Drip Irrigation and Fertilizer Management on Capsicum (Capsicum Annum L)

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Abstract: *An experiment was conducted during the rabi season of 2008-09 to study the effect of drip irrigation and fertilizer management on Capsicum at Research area farms of Assam Agriculture University Jorhat (Assam) India. Result reviled that the effect of drip irrigation and fertilizer management treatments (T3) were significant in respect of percent nitrogen content both in plant (2.18%) and fruits (1.19%). Similarly the highest uptake af p_2o_5 by plants (7.37 kg/ha) and by fruits (3.64 kg/ha) k_2o by plant (47.05 kg/ha) and by fruits (26.07 kg/ha) recorded in treatment T_3 at 100% EPR alone with the application of 75% RD of N and K through drip. The total Uptake of N (69.16 kg/ha) p_2o_5 (11.0 kg/ha) and K20 (73.12 kg/ha) were also significant over the treatment T9 (N-48.27 kg/ha)p_2o_5 (7.41 kg/ha) and K_2o (48.85 kg/ha) respectively. The nutrient status determined in terms of available N, p_2o_5, and K+O in kg/ha was significantly influenced by different drip irrigation and fertilizer management significantly highest fruit yield (87.20 q/ha) was recorded in drip irrigation at 100 EPR along application of 75 % Rd of N through drip irrigation over treatments.*

I. Introduction

Water supply is major constraint to crop production and efficient use of water in any irrigation system is becoming important particularly in arid and semiarid region where water is a source commodity. Water is the source of life and has a special place in our planet. However the world now faces very serious global warming problem and therefore, concern of newer and more efficient irrigation methods is in demand. Drip irrigation is an advanced system through which water can be applied precisely, judiciously and uniformly with the help of regulatory system direct to the root of the crop. At the same time, adequate fertilization both in time and through method application to maintain optimum nutrient supply for optimum growth and development of the crop are also equally important towards the higher productivity. The primary advantage of this system is that fertilizer can be injected through irrigation water Nijamodeen and Dharmasena(2002).Drip irrigation include improves the water use efficiency, nutrient uptake and quality of the produce, increase plant growth and development, higher yield and improved quality and its flexibility in scheduling water application. Application of water soluble fertilizer through micro-irrigation system like drip (fertigation) is gaining importance in present day agriculture to boost the production and productivity of various crops. The fertigation of chilli with 100 % recommended N saved 40% water and produced 52% higher yield over check-basin furthermore, only 50% N applied through fertigation fruit yield was equivalent to that obtained using a check-basin. Fertilizer through drip irrigation system can efficiently place nutrients in wetted zone where in the roots are at the highest concentration. Capsicum requires high demand of water and fertilizer and is very sensitive to water stress condition particularly during the establishment period and fruit setting. As Capsicum is energy rich crop the nutrient requirement is very high throughout its growing period. judicious application of irrigation at a regulated interval through drip irrigation which aims to supply only required amount of water of fruit yield of Capsicum Mahajanet.al(2007).Hence a study was carried out to increase the yield potential of Capsicum was under taken in order to assess the effect of drip irrigation and fertilizer management on growth and yield of Capsicum cultivar California wonder

II. Materials And Methods

The field experiment was conducted at experimental farm of the department of Horticulture, Assam Agriculture University, Jorhat during the rabi season of 2008-09 on Capsicum variety California wonder. The research farm is located at a latitude of 26^0 47'N, longitude of $94^0$12'E and elevation of 86.56 from mean sea level. Geologically, the farm area forms within the upper Brahmaputra valley zone of Assam. Climatic parameters were recorded at a meteorological observatory. The total rainfall during the Capsicum growing season (November-December) was quite lower by 124.27 mm than those of the average rainfall .The monthly maximum temperature ranged from 30.50^0C in March to 21.70^0C during February and the maximum temperature ranged from 8.64^0C in January to 17.40^0C in March and minimum relative humidity 85.40% to 98.0% during the cropping season varied widely. The soil of the experimental field was sandy loam in texture acidic in reaction with Ph 5.2.The organic carbon content of the soil was 6.6 g/Kg, with available Nitrogen (285

Kg/ha),Phosphorus (48.6 Kg/ha) and high in Potassium (210.0 Kg/ha) respectively. The experiment was conducted in randomized block design (RBD) replicated thrice. The treatments included two levels of drip irrigation regimes viz. drip irrigation at 100% EpR and drip at 75 % EpR, two methods of application of fertilizer viz N and K applied through drip and all dose applied in soil and two levels of fertilizer application viz 100 % recommended dose of fertilizer and 75 % RDF along with an additional treatment surface irrigation combined with 100% RDF applied in soil. The combination of two drip irrigation regimes, two methods of fertilizer applications and two doses of fertilizer resulting in eight treatments combinations which were compared with the surface irrigation combined with 100% RDF applied in soil. Thus, all together nine treatments were included in experiment. Each plant was provided with 1 emitter 5 cm away from seedling,drip irrigation scheduling was done at 100 % of open pan evaporation. In drip irrigation scheduling was done based on irrigation depth/cumulative pan evaporation (IW/CPE) = 1 to 4 cm depth. The gross size and the net plot size were 4 x 3 m and 2.5 x 2.5 m respectively. Water soluble solid fertilizer Urea and MOP were applied through drip irrigation in six equal splits.

Water requirement (litter/2 days/plant) = Ep xKpX A
Where, Ep = cumulative pan evaporation for 2 days (cm),Kp = Pan coefficient factor = 0.7,
A =Area/Plant (cm^2)

$$\text{Time required to run the system} = \frac{\text{Quantity of water required/per plant/2 days}}{\text{Drip discharge}}$$

All agronomic practices and pest control measures were adopted as per recommendation.

III. Result And Disscussion

It is seen from the data presented in table -1 that the total water use under different quantity of water applied through drip .It was observed that irrigation requirement in case of drip irrigation at 100% EpR was 14.40 cm, while it was 10.80 cm in case of drip drip irrigation at 75 % EpR and the total water used varied from 21.15 cm to 25.15 cm. The highest irrigation requirement of 24.00 cm requiring 6 irrigation each of 4 cm depth as well as total water used (34.75 cm) were recorded under the conventional method of surface irrigation. However depth of irrigation water was considerably varied due to intensity of irrigation and there by showed higher total water used under drip irrigation at 100 % EpR (25.11 cm) over that of drip irrigation at 75 % EpR (21.57 cm).The highest total water used was recorded under the treatment T_2 (362.55 Kg/Ha cm), which was closely followed by the treatment T_3 (347.68 Kg/ha-cm).Irrigation water use efficiency value was the lowest of 183.40 Kg cm was observed in treatment T_9.Similar findings have been reported of earlier worker on water use efficiency by (Tumbre and Bhoite,2002, Muralikrishhasamyet al 2006 and Mahajanet al,2007) irrespective of crop

Effect on Percent Nutrient Content in Plant and Fruits:

The effect of drip irrigation and fertilizer management treatments were significantly in respect of percent nitrogen content both in plant and fruits. The percent content of nitrogen due to the treatment T_3 were significantly highest in both plants (2.18%)and in fruits (1.19%),(Table 1).Similarly higher per cent of P_2O_5 in fruit was recorded with the treatment T_3 (0.190%)which was closely followed by T_1 (0.188%)and T_3 (0.187%) respectively. The percent of potassium varied from 2.00-2.17% in plants. The percent content of potassium in fruits significantly higher values were observed under the treatment T_1 (1.34%)(Table 1).

The percent content of N,P_2O_5 and K_2O in plants and fruits except percent content of P_2O_5 and K_2O in plants were significantly influenced by different drip irrigation and fertilizer management treatments, the treatment T_3 produced significantly higher values of N,P_2O_5 and K_2O in both plants and fruits over other treatments. The higher nutrients content under the drip irrigated treatments over the surface irrigation might be done to frequent application of irrigation and fertilizer in drip with low concentration, for which the nutrients were effectively utilized as these were direct contact with root system with negligible loss through leaching beyond the deeper depth of the soil profile. The treatment T_3i.e drip irrigation at 100% EpR alone with application of 75% RD of N and K through drip produced significantly higher uptake of N both by plants (46.33Kg/ha) and fruit (22.83kg/ha).In regards to uptake of phosphrous by both plants and fruit to different treatments were significant. Highest uptake of (P_2O_5) by plants (7.37kg/ha) and by fruits (3.64 kg/ha) was recorded under the treatment T_3.

The treatment T_3i.e drip irrigation at 100% EpR along with application of 75% R D of N and K through drip produced significantly higher uptake of K_2O both by plants (47.05 jg/ha) and fruits (26.07 kg/ha) over the treatment T_9.The total uptake of N (69.16 kg/ha),P_2O_5 (11.00 kg/ha) and K_2O (73.12 Kg/ha)were also significantly under this treatment over the treatment T_9 (N-48.27,P_2O_5-7.41 and K_2O-48.85 Kg/ha) respectively. The higher uptake of all the nutrients due to drip irigation and N and K applied through drip might be continued

by increased nutrient content in both plants and fruits coupled with increased yields observed under th above treatments over the surface irrigation combined with fertilizer applied in soil. these observations are in consonance with the findings and Badaret al (2007)and Sharma et al (2009) on tomato,Bhanu and Mahavishan (2008) on lady's finger and Tumbare (2004) on capsicum.Significantly higher uptake of nutrients duetofertigation over conventional surface irrigation.

Nutrient Status of Soil after Harvest:

The nutrieentstatous determined in terms of available N,P_2O_5 and K_2O in kg/ha was significantly influenced by different drip irrigation and fertilizer management treatments (Table-2).Significantly higher values in all these aspect were observer under drip irrigation and fertilizer applied through drip over the treatments where applied in soil.as the drip fertigation restricts the leaching losses of fertilizer beyond 30-40 cm soil depth ,this might be led to better nutrient statous of soil compared to the conventional irrigation combined with fertilizer applied in soil.

Table 1: Percent Content of N, P2O5 and K2O in Plants and Fruits As Influenced By Drip Irrigation and Fertilizer Management.

Treatments	Per cent N content		Per cent P_2O_5 content		Per cent K_2O content	
	Plant	Fruit	Plant	Fruit	Plant	Fruit
T1 - 100 % EpR + 100 % RD of N & K through drip	2.14	1.17	0.32	0.188	2.06	1.34
T2 - 75 % EpR + 100 % RD of N & K through drip	2.15	1.15	0.31	0.185	2.12	1.29
T3 - 100 % EpR + 75% RD of N & K through drip	2.18	1.19	0.34	0.190	2.17	1.36
T4 - 75 % EpR + 75% RD of N & K through drip	2.13	1.13	0.32	0.182	2.07	1.29
T5 - 100 % EpR + 100 % RD of N & K soil application	2.11	1.16	0.32	0.187	2.06	1.31
T6 - 75% EpR + 100 % RD of N & K soil application	2.08	1.13	0.30	0.179	2.08	1.28
T7 - 100 % EpR + 75 % RD of N & K soil application	2.10	1.12	0.32	0.176	2.00	1.26
T8 - 75 % EpR + 75 % RD of N & K soil application	2.05	1.00	0.31	0.170	2.06	1.18
T9 - Surface + 100 % RDF soil application	2.07	0.98	0.30	0.173	2.02	1.09
S. Ed.±	0.01	0.01	0.01	0.01	0.01	0.014
C.D. (5 %)	0.03	0.02	NS	0.003	NS	0.029

Table 2: Uptake Of Nutrients N, P_2O_5 And K_2O By Plants And Fruits, Total Uptake Of Nutrients And Fruit Yield By Drip Irrigation And Fertilizer Management.

Treatments	Uptake of N (Kg/ha)		Uptake of P_2O_5 (Kg/ha)		Uptake of K_2O (Kg/ha)		Total uptake of nutrients (Kg/ha)			Total uptake of nutrients (Kg/ha)			Fruit yield (Q/ha)
	Plant	Fruit	Plant	Fruit	Plant	Fruit	N	P_2O_5	K_2O_5	N	P_2O_5	K_2O_5	
T_1- 100 % EpR + 100 % RD of N and K through drip	40.54	20.72	6.05	3.18	38.57	23.74	61.26	9.36	62.30	207.60	39.90	165.87	80.53
T_2-75 % EpR + 100 % RD of N and K through drip	35.88	19.75	5.97	3.18	37.76	22.15	55.63	9.15	59.97	209.90	40.16	163.16	78.13
T_3-100% EpR + 75% RD of N and K through drip	46.33	22.83	7.37	3.64	47.05	26.07	69.16	11.00	73.12	212.62	42.16	186.96	87.20
T_4-75 % EpR + 75% RD of Nand K through drip	37.28	19.47	5.57	3.06	36.03	21.63	56.75	8.62	57.56	204.09	38.49	160.86	76.26
T_5-100 % EpR + 100 % RD of N and K soil application	37.93	19.94	5.75	3.21	37.06	22.50	57.87	8.96	59.56	209.20	38.16	162.98	78.13
T_6-75 % EpR + 100 % RD of Nand K soil application	34.88	18.15	5.00	2.84	34.69	20.31	53.03	7.93	55.00	204.85	36.74	160.38	72.16
T_7-100 % EpR + 75 % RD of N and K soil application	35.91	17.60	5.25	2.76	35.23	19.81	53.51	8.00	55.04	199.92	34.76	158.01	71.46
T_8-75 % EpR + 75 % RD of N and K	33.49	15.13	5.06	2.57	33.65	17.85	48.62	7.63	51.50	197.83	34.39	155.87	68.80

soil application													
T_9-Surface + 100 % RDF soil application	34.42	13.85	4.99	2.42	33.61	15.24	48.27	7.41	48.85	194.14	32.44	152.98	63.73
SEd ±	1.55	0.83	0.34	0.11	0.74	0.79	1.78	0.41	1.19	0.05	0.3	0.02	2.15
CD 5 %	3.29	1.77	0.72	0.23	1.58	1.68	3.78	0.87	2.52	0.12	0.7	0.04	6.45

RFD –Recommended dose of fertilizer

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