

Effect of Different Levels of Fertigation and Mulching on Yield and Quality Parameters (cm) in chilli var. Arka Lohit

¹TIPPA REDDY, ²AMBRESH, ³VIJAYMAHANTESH, ⁴PRASHANT M AND
²RENUKA MUTTAPANAVAR

¹M.Sc. Scholar, Department of Vegetable Science, University of Horticultural Sciences, Bagalkote (Karnataka), India.

²Assistant Professor, Department of Vegetable Science, University of Horticultural Sciences, Bagalkote (Karnataka), India

³Assistant Professor, Department of Natural Resource Management, University of Horticultural Sciences,
Bagalkote (Karnataka), India

⁴Assistant Professor, Agricultural Entomology, University of Horticultural Sciences,
Bagalkote (Karnataka), India

Abstract: Chilli (*Capsicum annuum* L.) is one of the most valuable commercial vegetable crop grown throughout the country. It belongs to the family Solanaceae and it is used as green and dry red chillies as an ingredient in preparation of several spicy dishes. Fertigation is a new concept that is being adopted in several horticultural crops. The treatment T₅ recorded the highest fruit length (9.62 cm) whereas the treatment T₁ recorded the least (5.66 cm). The treatment T₅ recorded the highest number of fruits per plant (185.10) among all the treatments. Whereas, the treatment T₁ recorded the least number of fruits per plant (96.46). This may be attributed to higher availability of soil moisture, optimum NPK nutrients and uptake when supplied through fertigation which renders easy accessibility as required by the crop. The treatment T₅ recorded the highest fruit yield (573.81 g plant⁻¹) whereas the treatment T₁ recorded the least (270.08 g plant⁻¹). The treatment T₅ recorded the highest ascorbic acid content (131.62 mg/100 g of fresh weight) whereas the treatment T₁ recorded the least ascorbic acid content (103.57 mg/100 g of fresh weight). The treatment T₅ recorded the highest TSS content (7.40 °Brix) whereas the treatment T₁ recorded the least TSS content (4.73 °Brix).

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most valuable commercial vegetable crop grown throughout the country. It belongs to the family Solanaceae and it is used as green and dry red chillies as an ingredient in preparation of several spicy dishes. Chilli is a tropical and subtropical crop grown in all climatic conditions in both irrigated and rainfed conditions. It is grown over an area of 7.92 lakh ha with production of 12.23 lakh MT and a productivity of 1.5 tonnes of green chilli per ha in India (Anon, 2015). Karnataka has a second place as far as area and production is concerned (2.3 lakh ha and 2.8 lakh tonnes, respectively). However, it occupies eighth position in productivity with 742 kg dry chilli/ha (Anon, 2015). The crop

is grown in all the districts of Karnataka but the major districts are Dharwad, Gadag and Haveri. In these districts chilli is mostly grown as rain fed crop.

Balanced nutrition is one of the most important factor affecting the growth and productivity of chilli. The optimum levels at which the nutrients are to be applied and sources from which they have derived are equally important.

Fertigation is a new concept that is being adopted in several horticultural crops. Fertigation has been found to increase the efficiency in the application of fertilizers and water besides reducing the amount of fertilizer applied. This in turn, reduces the cost of

production and also lessens the ground water pollution which causes ecological disturbances and health risks by fertilizer leaching and accumulation of nitrates. As such, use of fertigation could really prove as blessing for chilli cultivation. Fertigation being relatively a new concept in India, not many studies have been carried out, thus there is a need to standardize the technology. Fertigation is an effective means of controlling, timing and placement of fertilizers and improving fertilizer use efficiency by reducing losses through leaching, volatilization and fixation in the soil to less available forms (Agele, 2000).

Production of vegetables and other crops in semi-arid areas is hampered by the shortage of water, the major part of the growing season usually being characterized by low, erratic rainfall and high evapo-transpiration (ET) rates. One way to mitigate this is through mulching, which involves covering of the soil surface with crop residue(s) or other material such as paper or polyethylene film (Aklilu, 2003). Several organic and inorganic materials can be used as mulches. Polyethylene films are good examples of inorganic mulches (Dhesi *et al.*, 1992). Green pepper is highly susceptible to water stress, especially in the early growth stage (Firake *et al.*, 2007). The combination of polyethylene mulch and drip irrigation provides yield improvement in pepper production (Kashyap *et al.*, 2009).

With this background a study on "Effect of different levels of fertigation and mulching on growth, yield and quality of chilli var. Arka Lohit" was carried out.

MATERIAL AND METHODS

The experiment was carried out at the Precision Farming Development Centre, Division of Horticulture, University of Agricultural Sciences, G.K.V.K., Bengaluru. The experimental field is located at an altitude of 930 meter above Mean Sea Level and latitude and longitude of 12°58' North and 77°35' East

respectively. The soil of the experimental site was red sandy loam. Composite soil samples drawn from the experimental site were analyzed. The soil of the experimental site was neutral in reaction (pH 7.03). Before layout of the experiment the soil recorded neutral pH of 7.03 and electrical conductivity within safe limits of 0.16 Mmhos cm⁻² and the content of available nitrogen, phosphorus and potassium levels were 183.49, 11.80 and 184.60 kg ha⁻¹ respectively.

The experiment was laid out in RCBD format under 8 treatments with three fertigation levels & two mulch levels and 3 replications each. The variety is released from IIHR, Bangalore. It is a Pure line selection from IIHR-324 (local collection). Plants are tall; fruits are dark green colour, smooth, straight, turning deep red on maturity. Capsanthin content (0.205%), fruits are highly pungent, capsaicin (0.708%), Suitable for irrigated and rain fed condition. Duration of the crop is 180 days. Yield 25t/ha (green chilli) and 3t/ha (dry chilli). Fertigation was done at 15 days interval in 8 splits doses as per the crop need. Cultural operations were taken up regularly during the course of research.

EXPERIMENTAL RESULTS

Yield parameters

Fruit length (cm)

A perusal of data presented in the Table 1 indicates that there was a significant difference with respect to the parameter fruit length amongst all the treatments. The treatment T₅ recorded the highest fruit length (9.62 cm) whereas the treatment T₁ recorded the least (5.66 cm). This may be due to nutrient supplied in fertigation in the required form has helped in efficient uptake resulting in increased length of the fruits. The present findings are in accordance with those of Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al.* (2006).

Number of fruits per plant

A detailed insight into the data presented in the Table 1 indicates that there was a significant difference with respect to the parameter number of fruits amongst all the treatments. The treatment T_5 recorded the highest number of fruits per plant (185.10) among all the treatments. Whereas, the treatment T_1 recorded the least number of fruits per plant (96.46). This may be attributed to higher availability of soil moisture, optimum NPK nutrients and uptake when supplied through fertigation which renders easy accessibility as required by the crop. Further, fertigation and mulching, drip irrigation might have increased the number of fruits per plant in two ways, i) By increasing the number of primary branches and ii) Increasing shoot growth and number of secondary branches and hence, the ultimate size of the plant thereby, increasing the number of potential sites where flowers could develop. Similar results have been reported by Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al.* (2006) and Reddy *et a.* (2010)

Fruit yield (g plant⁻¹)

A perusal of data presented in the Table 1 indicates that there was a significant difference with respect to the parameter fruit yield (g plant⁻¹) amongst all the treatments. The treatment T_5 recorded the highest fruit yield (573.81 g plant⁻¹) whereas the treatment T_1 recorded the least (270.08 g plant⁻¹).

As indicated in the text, the probable reason for harvesting more fruits per plant may be due to the well establishment of plants. The drip system has maintained required soil moisture for uptake of the nutrients by the plants during the growth period. Further, fertigation had stimulating effects on initiating more fruiting points, their subsequent retention and development in the plant leading to the higher number of fruits per plant.

Similar results were observed by Singh A.K and Shashi K (2012) and Tiwari R.S.K (1997)

Quality characters

Ascorbic acid (mg/100 g of fresh weight)

A detailed insight into the data presented in the Table 8 indicates that there was a significant difference with respect to the ascorbic acid content amongst all the treatments. The treatment T_5 recorded the highest ascorbic acid content (131.62 mg/100 g of fresh weight) whereas the treatment T_1 recorded the least ascorbic acid content (103.57 mg/100 g of fresh weight). It can be said that availability of nutrients evenly with water soluble fertilizers and drip irrigation was responsible for the improvement of ascorbic acid content. Improvement in ascorbic acid content has been reported by of Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al.* (2006).

TSS (°Brix)

A detailed insight into the data presented in the Table 8 indicates that there was a significant difference with respect to the TSS content amongst all the treatments. The treatment T_5 recorded the highest TSS content (7.40 °Brix) whereas the treatment T_1 recorded the least TSS content (4.73 °Brix). The higher availability, uptake and efficient utilization of nutrients resulting in better growth and development of the fruits resulted in higher TSS. The results are in line with of Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al.* (2006).

Table 1: Effect of different levels of fertigation and mulching on yield parameters (cm) in chilli var. Arka Lohit

Treatments	Fruit length (cm)	Number of fruits plant ⁻¹	Fruit yield (g plant ⁻¹)
T_1	5.66	96.46	270.08
T_2	6.56	120.06	350.57
T_3	7.98	144.81	431.53
T_4	7.32	139.29	413.69
T_5	9.62	185.10	573.81
T_6	7.00	129.82	382.96
T_7	9.33	167.13	504.65
T_8	8.30	153.57	460.71
F test	*	*	*
S Em±	0.09	2.25	4.82
CD at 5%	0.28	6.82	14.61

Table 2: Effect of different levels of fertigation and mulching on quality parameters (cm) in chilli var. Arka Lohit

Treatments	Ascorbic acid (mg/ 100 g of fresh weight)	TSS(°Brix)
T ₁	103.57	4.73
T ₂	107.37	5.20
T ₃	118.66	6.30
T ₄	115.68	5.90
T ₅	131.62	7.40
T ₆	110.93	5.60
T ₇	127.35	7.00
T ₈	122.78	6.70
F test	*	*
S Em±	0.40	0.08
CD at 5%	1.23	0.25

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