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Effect of Different Levels of Fertigation and Mulching on Vegetative Parameters and Cost Economics in Chilli var. Arka Lohit

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Abstract: Chilli (*Capsicum annuum* L.) is 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, one of the most valuable commercial vegetable crop grown throughout the country. The experiment was carried out at the Precision Farming Development Centre, Division of Horticulture. Plants supplied with 120 per cent of recommended dosage of water soluble fertilizers (T_5) recorded the significantly highest plant height (110.60 cm). Whereas, plants grown under control (T_1) recorded the least plant height (64.80 cm) The treatment T_5 recorded the highest number of branches (18.10). Whereas, plants of T_1 recorded the least number of branches (11.66) at final harvest. The treatment T_5 recorded the highest plant (4241.70 cm^2). Whereas, plants of T_1 recorded the least plant spread (1995.70 cm^2). Reflecting the trend of the previous growth related parameters the treatment T_5 recorded the highest average leaf area (26.31 cm^2/leaf). Whereas, plants of T_1 recorded the least average leaf area (15.28 cm^2/leaf). Among the treatment combination of mulching and levels of fertigation, the treatment T_5 (30µ mulch + 120% 0f RDF (water soluble) + drip fertigation) recorded maximum gross revenue (Rs. 3,39,600), net profit (Rs. 1,80,036) and cost benefit ratio (1: 1.13) [Table 2], while least being the combination of 100 percent recommended dosage of normal fertilizer + surface irrigation without mulching (T_1) (Rs. 1,59,800, Rs. 66,727 and 1:0.72 respectively).

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, 2011). 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. Several organic and inorganic materials can be used as mulches. Polyethylene films are good examples of inorganic mulches (Aklilu, 2003)

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 $12^0$58′ North and $77^0$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 0.16Mmhos 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, Banglore. 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

Vegetative parameters

Plant height (cm)

Plants supplied with 120 per cent of recommended dosage of water soluble fertilizers (T_5) recorded the significantly highest plant height (110.60 cm). Whereas, plants grown under control (T_1) recorded the least plant height (64.80 cm) [Table 1].

The increase in plant height at 120 per cent of recommended dosage of fertilizer at different stages might be due to maximum uptake of nutrients resulting in better availability of sufficient quantity of nutrients and continuous

wetting by drip irrigation. The applied higher dosage of N responsible for cell division and cell elongation during the vegetative growth and are quite essential for the plant growth as they directly or indirectly control the different physiological processes. Further, mulching might have helped in attaining optimum growth through controlling of weeds, conserving soil moisture and maintenance of optimum soil temperature.

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 branches

The treatment T_5 recorded the highest number of branches (18.10). Whereas, plants of T_1 recorded the least number of branches (11.66) at final harvest [Table 1].

The increased number of branches per plant may be due to continuous supply and uptake of nutrients with higher moisture content, less incidence of weeds during different growth stages which stimulate more lateral buds to branch out for flowering. These results are in agreement with that of Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al*. (2006).

Plant spread (cm^2)

The treatment T_5 recorded the highest plant (4241.70 cm^2). Whereas, plants of T_1 recorded the least plant spread (1995.70 cm^2) [Table 1].

Increased plant spread might be due to availability of more nutrients from water soluble form at higher levels of fertigation, improved soil moisture conservation, suppression of weed growth and moderation of soil temperature throughout the crop growth period which could have induced plants to produce more number of side branches and wider plant spread. These findings are in line with those of Kere, G. M (2003), Mahajan *et. al* (2006), Prajapati M. N *et al*. (2006).

Average leaf area (cm^2/Leaf) at 90 DAT

Reflecting the trend of the previous growth related parameters the treatment T_5 recorded the highest average leaf area (26.31 cm^2/ leaf). Whereas, plants of T_1 recorded the least average leaf area (15.28 cm^2/leaf) [Table 1].

Maximum average leaf area at higher fertigation may be attributed to better availability of sufficient quantity of nutrients especially the applied higher dosage of N responsible for cell division and cell elongation during the vegetative growth. It may be also due to increased nutrient availability through fertigation resulted in better nutrient uptake and increased photosynthetic activity resulted in larger leaf size. The results are in conformity with the findings of Parjapati M.N et.al (2006), Reddy et al, (2010) and Tiwari, et.al (1997)

Cost economics

Among the treatment combination of mulching and levels of fertigation, the treatment T_5 (30µ mulch + 120% 0f RDF (water soluble) + drip fertigation) recorded maximum gross revenue (Rs. 3,39,600), net profit (Rs. 1,80,036) and cost benefit ratio (1: 1.13) [Table 2], while least being the combination of 100 percent recommended dosage of normal fertilizer + surface irrigation

Table 1: Effect of different levels of fertigation and mulching on vegetative parameters in chilli var. Arka Lohit

Treatments	*Plant height (cm)*	*Number of branches*	*Plant spread (cm^2)*	***Average leaf area (cm^2/Leaf)** @ 90 DAT*
T_1	64.80	11.66	1995.70	15.28
T_2	82.03	12.48	2089.64	16.01
T_3	99.90	14.95	3033.72	22.56
T_4	99.60	14.05	2952.73	18.21
T_5	110.60	18.10	4241.70	26.31
T_6	92.80	13.11	2639.78	17.32
T_7	105.10	17.72	3918.77	23.50
T_8	102.50	16.35	3272.13	21.54
F test	*	*	*	*
S Em±	0.68	0.20	11.52	0.2
CD at 5%	2.07	0.62	34.94	0.6

Table 2: Effect of different levels of fertigation and mulching on cost economics in chilli var. Arka Lohit

Treatments	*Total yield (t ha^{-1})*	*Total cost of cultivation (Rs)*	*Gross return (Rs)*	*Net return (Rs)*	*B:C ratio*
T_1	7.99	93073	159800	66727	0.72
T_2	10.38	129394	207600	78206	0.60
T_3	12.77	144463	255400	110937	0.77
T_4	12.25	167937	245000	77063	0.46
T_5	16.98	159564	339600	180036	1.13
T_6	11.34	160221	226800	66579	0.42
T_7	14.94	152179	298800	146621	0.96
T_8	13.64	175322	272800	97478	0.56

without mulching (T_1) (Rs. 1,59,800, Rs. 66,727 and 1:0.72 respectively).

Higher levels of fertilizer through fertigation increased productivity of chilli. Further use of mulches is found highly beneficial over non mulched plots. These findings are in agreement with the findings of Parjapati M.N *et al.* (2006), Reddy *et al.*, (2010) and Tiwari, *et al.* (1997)

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