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RESEARCH PAPER

Productivity enhancement in drip irrigated chilli (*Capsicum annuum* L.) through inorganic fertilizers

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Abstract: A field experiment was conducted during *kharif* 2020 at the Irrigation Water Management Research Centre, Belavatagi to investigate the productivity enhancement in drip irrigated chilli (*Capsicum annuum* L.) through integrated nutrient management. The experiment was laid out in split plot design with 14 treatments. The treatment comprised of two levels of irrigations 0.8 PE and 0.6 PE and seven different sources of nutrients (N_1: 100 % RDF through inorganic fertilizers, N_2: 100 % RDN through FYM, N_3: 100 % RDN through vermicompost, N_4: 100 % RDN through green leaf manuring, N_5: 50 % RDN through inorganic fertilizers + 50 % RDN through FYM, N_6: 50 % RDN through inorganic fertilizers + 50 % RDN through vermicopost and N_7: 50 % RDN through inorganic fertilizers + 50 % RDN through green leaf manure) with three replications. Growth parameters like, plant height, number of leaves, leaf area and dry matter production and yield attributes like, number of fruits per plant, fruit yield were significantly influenced by drip irrigation levels and different sources of nutrients. Application of water through drip irrigation at 0.8 PE with 100% RDF through inorganic fertilizers recorded significantly higher plant height (82.52 cm), number of leaves (157.9), leaf area (1592 cm^2 $plant^{-1}$), total dry matter (81.92 g $plant^{-1}$), number of fruits per plant (48.72), fruit yield per plant (50.76 g), dry fruit yield (2200 kg ha^{-1}), ascorbic acidcontent (124.52 mg 100 g^{-1}), oleoresin (15.80 %) with higher net returns (₹ 2,26,920 ha^{-1}) and benefit cost ratio (4.24) over other treatments.

Key words: Ascorbic acid, Chilli, Drip irrigation, Economics, Oleoresin, Yield

Introduction

Chilli (*Capsicum annuum* L.) is one of the important commercial crops in India. It is originated in South America and was introduced to India by Portuguese in the seventeenth century. Chilli belongs to the family Solanaceae, genus Capsicum and two main species are *Capsicum annuum* and *Capsicum frutescence*are cultivating in India. It is a crop of tropical and sub-tropical regions and require warm humid climate. Chilli is the most widely used universal spice and named as wonder spice. It is an indispensible condiment of every home in India. It is used in the daily diet in one form or the other. It is a rich source of vitamin A, C and E with good medicinal properties. The pungency in chilli is due to the alkaloid 'capsaicinoid'. Apart from this capsaicin and many alkaloids are extracted from chilli and used for medicinal purpose.

Chilli can be grown in many types of soil; well-drained loamy soils rich in organic matter are best suited for its cultivation. Water and nutrient management are the key factors for successful cultivation of vegetable crops, which responds well to nutrient and irrigation regime.Chilli requires high demand of water and fertilizer and is very sensitive to water stress condition particularly during the establishment period and fruit setting. As chilli is energy rich crop, the nutrient requirement is very high throughout its growing period. Drip irrigation, which aims to supply only the required amount of water, is used to apply irrigation at a regulated interval (Mahajan *et al.,* 2007). Now a day's water is a scares resource in agriculture, it has to be used in a precised manner with high utilization efficiency like pressurized irrigation (drip) methods. In Northern dry zone rainfall is very less and erratic so that a balanced application of both organic and inorganic fertilizers appear to be an ideal proposition to meet nutrient requirements of the crop under drip irrigation. The present investigation is planned to assess the effect of organic and inorganic nutrients on growth, yield and quality of chilli through integrated nutrient management under drip system. So the present investigation aims to help the farmers in finding the role of drip irrigation and nutrient management for obtaining better growth and maximum yield of chilli. In this context, a field experiment was conducted at Irrigation Water Management Research Centre, Belavatagi, during *Kharif* 2020 on productivity enhancement in drip irrigated chilli (*Capsicum annuum* L.) through integrated nutrient management.

Material and methods

A field experiment was conducted at the Irrigation Water Management Research Centre, Belavatagi during *kharif* 2020 to investigate the productivity enhancement in drip irrigated chilli (*Capsicum annuum* L.) through integrated nutrient management in black soil (*vertisols*). The experiment was laid out in a split plot design with 14 treatments. The treatment comprised of two levels of irrigations 0.8 PE and 0.6 PE and seven different sources of nutrients (N_1: 100 % RDF through inorganic fertilizers, N_2: 100 % RDN through FYM, N_3: 100 % RDN through vermicompost, N_4: 100 % RDN through green leaf manuring, N_5: 50 % RDN through inorganic fertilizers + 50 % RDN through FYM, N_6: 50 % RDN through inorganic fertilizers + 50 % RDN through vermicopost and N_7: 50 % RDN through inorganic fertilizers + 50 % RDN through green leaf manure) with three replications.

The land was ploughed with tractor and harrowed twice to bring the soil to fine tilth. Plots were laid out as per the plan before transplanting. A well decomposed FYM, vermicompost and green leaf manure as per treatment details were incorporated

15 days prior to the transplanting and were mixed well in to the soil. Two healthy chilli (byadagi dabbi) seedlings of 45 days old were transplanted per spot at 60 cm × 40 cm spacing in main field on 4th August 2020. Nitrogen, phosphorus and potassium were applied in the form of urea, single superphosphate and muriate of potash, respectively. Recommended dose of fertilizers (150:75:75 N, P_2O_5 and K_2O kg ha^{-1}) were applied in ring method. Circular rings were opened around the plants with the help of sickle and fertilizers were applied, then rings were closed with soil manually.Scheduling of irrigation was done according to treatments, commencing from 20 days after transplanting. Evaporation was recorded from USWB class 'A' open pan evaporimeter (mm day^{-1}), installed at the Irrigation Water Management Research Centre (WMRC), Belavatagi. These pan evaporation readingswere used to determine the amount of water to be given in the ratio of 0.6 and 0.8 cumulative pan evaporation (CPE).The discharge rate of the emitter was 2 liters per hour. Later observations on plant height, number of leaves, leaf area and dry matter production were recorded at 30, 60, 90, 120 DAT and at harvest and yield of fruits per hectare was calculated by multiplying the average yield of fruits per square meter and expressed in kilogram per hectare. Calculation of cost of cultivation, gross returns, net returns and B:C ratio was done treatment wise.The data was analyzed statistically for test of significance following the procedure described by Gomez and Gomez (1984).

Results and discussion

Effect of drip irrigation levels and different sources of nutrients on growth parameters of chilli

The data (Table 1) revealed that application of water through drip irrigation at 0.8 PE was significantly superior to drip irrigation at 0.6 PE with respect to plant height, number of leaves per plant, leaf area per plant and total dry matter production at all stages of plant growth. Application of water through drip irrigation at 0.8 PE recorded significantly higher plant height (74.88 cm) at harvest, number of leaves per plant (123.5), leaf area (1319 cm^2 plant^{-1}) and total dry matter (71.85 g plant^{-1}) at 120 DAT over drip irrigation at 0.6 PE. These results could be related to the fact that plants received their water and fertilizer requirements by employing a drip irrigation system with a 0.8 PE. It is possible that frequent supply of water (quantity) provided, resulted in optimum soil moisture content, which favoured plant growth metabolism, resulting in increased plant growth characteristics and higher dry matter production (Badawi *et al.,* 2020). Water stress also affects carbohydrates metabolism, protein synthesis, and the activity of several enzymes, which may reflect a shift in the balance between synthesis and breakdown, resulting in reduced plant growth and dry matter accumulation, according to Hamlyn (1986).

Among nutrient management practices, higher plant height (82.43 cm), number of leaves per plant (153.24), leaf area (1579.76 cm^2 plant^{-1}) and total dry matter (79.33 g plant^{-1}) were recorded in the treatment 100 % RDF through inorganic fertilizers. And lower plant height (65.34 cm), number of leaves per plant (86.96), leaf area (1033 cm^2 plant^{-1}) and total dry matter (59.16 g plant^{-1}) were found in the treatment 100 % RDN through green leaf manure. This may be because release of nutrients from the inorganic form of NPK was faster which aided in increased uptake of nutrients and better translocation to different parts of plants which aided in accumulation of balanced phytohormones favoring more photosynthetic surface area *i.e.* leaf area (1580 cm^2) for the plants supplied nutrients with 100 % recommended dose in the inorganic form. This resulted in more plant growth thus contributing to higher dry matter accumulation. Application of fertilizers in an inorganic form brought out a very large increase in plant height, due to rate of enhancement of chlorophyll synthesis, which causes an increase in carbohydrate synthesis responsible for higher vegetative growth. The results are endorsed the findings of Rekha *et al.* (2017) and Mishra *et al.* (2019) who indicated that recommended dose of NPK as 100% inorganic fertilizer form significantly recorded superior growth attributes in chilli.

Among interactions, treatment combination of 0.8PE + 100 % RDF through inorganic fertilizers recorded higher plant height (82.52 cm), number of leaves per plant (157.9) and leaf area (1592 cm^2 plant^{-1}) and it was on par with the combination of 0.6 PE + 100 % RDF through inorganic fertilizers (82.34 cm, 148.6, 1568 cm^2 plant^{-1}, respectively). Lower plant height (64.48 cm), number of leaves per plant (86.93) and leaf area (1015 cm^2 plant^{-1}) were recorded in 0.6 PE + 100 % RDN through green leaf manuring. Higher total dry matter (81.92 g plant^{-1}) was recorded in of 0.8 PE + 100 % RDF through inorganic fertilizers and lower total dry matter production (57.61 g plant^{-1}) was observed in 0.6 PE + 100 % RDN through green leaf manuring. Increased performance in chilli with respect to growth parameters with 100% recommended N, P and K might be owing to continuous supply of required quantity of nutrients in the root zone of the crop, which creates favourable conditions for growth and development of the crop by way of increasing metabolic activities in the plant system Brahma *et al.* (2010). Since, the drip irrigation level (0.8 PE) contained the higher quantity of water and that helped in enhancing nutrient uptake, water and nutrient use efficiency. On the other hand, the increased leaf area plant^{-1} by the irrigation scheduling approach enhanced the more photosynthetic surface and thereby more photosynthesis, enhanced the more accumulation of photosynthates from source to sink. These results are in line with the findings of Brahma *et al.* (2010) concluded that drip fulfillment at 100% evaporation replenishment along with supplementation of 100% recommended N and K through drip irrigation influenced the chilli crop to produce superior growth attributes.

Effect of drip irrigation levels and different sources of nutrients on yield and yield attributes of chilli

In the present study (Table 1), application of water through drip irrigation at 0.8 PE recorded higher number of fruits per plant (40.66), fruit yield per plant (42.36 g) and dry chilli yield (1850 kg ha^{-1}) as compared to drip irrigation at 0.6 PE (38.03, 39.63 g and 1736 kg ha^{-1}, respectively). The higher yield could be attributable to a higher proportion of air-to-soil water in drip irrigation, which was maintained throughout the crop's life cycle as reported by Kadam *et al.* (2006). It's possible that the

Table 1. Effect of drip irrigation levels and different sources of nutrients on growth, yield, quality parameters and economics of chilli

Sl. No.	Treatments	Plant height (cm) (at harvest)	leaves plant^{-1} (at 120 DAT)	Leaf area (cm^{2} plant^{-1}) (at 120 DAT)	Dry matter (g plant^{-1}) (at 120 DAT)	Number of fruits per plant	Fruit yield per plant (g)	Yield (kg ha^{-1})	Ascorbic acid (mg 100 g^{-1})	Oleoresin (%)	Gross returns (₹ ha^{-1})	Net returns (₹ ha^{-1})	B:C ratio
Main plots (Drip irrigation levels)													
1	I_1- 0.8 PE	74.88^{a}	123.52^{a}	1319.39^{a}	71.85^{a}	40.66^{a}*	42.36^{a}	1849.51^{a}	115.06^{a}*	14.61^{a}	249683^{a}*	154741^{a}	2.92^{a}
2	I_2- 0.6 PE	73.44^{b}	114.67^{b}	1259.61^{b}	68.43^{b}	38.03^{b}	39.63^{b}	1735.47^{b}	112.28^{b}	14.35^{a}	234288^{b}	139346^{b}	2.74^{b}
	S.Em± **	0.22	1.08	9.33	0.56	0.43	0.45	18.74	0.43	0.26	2530.08	2530.08	0.02
Sub plots (Nutrient management)													
1	N_1	82.43^{a}	153.24^{a}	1579.76^{a}	79.33^{a}	47.06^{a}	49.04^{a}	2127.54^{a}	123.87^{a}	15.79^{a}	287218^{a}	217197^{a}	4.10^{a}
2	N_2	69.14^{e}	105.05^{d}	1147.33^{d}	65.62^{e}	35.53^{de}	37.03^{de}	1627.19^{de}	109.01^{e}	13.93^{cd}	219671de	113581^{c}	2.07^{c}
3	N_3	70.36^{e}	107.94^{d}	1171.33^{d}	67.38^{e}	36.83^{c-e}	38.38^{c-e}	1683.59^{c-e}	110.27^{de}	14.14^{c}	227285^{c-e}	65753^{d}	1.41^{d}
4	N_4	65.34^{f}	86.96^{e}	1032.53^{e}	59.16^{f}	31.57^{e}	32.89^{e}	1454.98^{e}	104.23^{f}	13.09^{d}	196422^{e}	133061^{bc}	3.10^{b}
5	N_5	74.43^{d}	122.34^{c}	1291.99^{c}	70.99^{d}	38.96^{b-d}	40.6^{b-d}	1776.01^{b-d}	113.43^{cd}	14.47^{c}	239761^{b-d}	154075^{b}	2.80^{b}
6	N_6	80.23^{b}	133.57^{b}	1469.76^{b}	75.50^{b}	43.94^{ab}	45.78^{ab}	1992.07^{ab}	119.20^{b}	15.31^{ab}	268930^{ab}	155682^{b}	2.37^{c}
7	N_7	77.19^{c}	124.54^{bc}	1333.82^{c}	73.00^{c}	41.50^{a-c}	43.24^{a-c}	1886.02^{a-c}	115.69^{c}	14.67^{bc}	254613^{a-c}	189956^{a}	3.94^{a}
	S.Em±	0.39	2.49	18.58	0.46	1.32	1.38	57.37	0.78	0.19	7745.40	7745.40	0.10
Interactions (Drip irrigation levels × Nutrient management)													
1	I_1N_1	82.52^{a}	157.85^{a}	1591.79^{a}	81.92^{a}	48.72^{a}	50.76^{a}	2199.56^{a}	124.52^{a}	15.80^{a}	296941^{a}	226920^{a}	4.24^{a}
2	I_1N_2	70.00^{g}	115.82^{d}	1231.41^{e}	68.37^{g}	37.10^{d-f}	38.66^{d-f}	1695.15^{d-f}	111.45^{de}	14.26^{de}	228845^{d-f}	122755^{ef}	2.16^{ef}
3	I_1N_3	72.28^{f}	118.12^{d}	1247.88^{de}	69.89^{fg}	38.55^{d-f}	40.17^{d-f}	1758.01^{d-f}	111.71^{de}	14.33^{c-e}	237331^{d-f}	75799^{gh}	1.47^{g}
4	I_1N_4	66.19^{i}	87.00^{e}	1050.33^{f}	60.71^{j}	33.42^{fg}	34.82^{fg}	1535.20^{fg}	106.27^{f}	13.19^{fg}	207251^{fg}	143890de	3.27^{b}
5	I_1N_5	74.50^{e}	124.24^{b-d}	1293.16^{c-e}	71.68^{ef}	39.09^{c-f}	40.73^{c-f}	1781.55^{c-f}	114.29^{cd}	14.53^{cd}	240509^{c-f}	154823^{c-e}	2.81^{cd}
6	I_1N_6	80.51^{b}	135.21^{b}	1480.99^{b}	76.42^{bc}	44.95^{a-c}	46.84^{a-c}	2035.87^{a-c}	120.83^{b}	15.45^{ab}	274842^{a-c}	161594^{cd}	2.43^{de}
7	I_1N_7	78.17^{c}	126.39^{b-d}	1340.20^{c}	73.98^{d}	42.77^{a-d}	44.56^{a-d}	1941.22^{a-d}	116.39^{c}	14.74^{b-d}	262065^{a-d}	197408^{ab}	4.05^{a}
8	I_2N_1	82.34^{a}	148.62^{a}	1567.73^{a}	76.74^{b}	45.40^{ab}	47.31^{ab}	2055.52^{ab}	123.22^{ab}	15.77^{a}	277495^{ab}	207474^{ab}	3.96^{a}
9	I_2N_2	68.28^{h}	94.28^{e}	1063.25^{f}	62.86^{i}	33.97^{fg}	35.40^{fg}	1559.24^{fg}	106.58^{f}	13.60^{e-g}	210498^{fg}	104408^{fg}	1.98^{f}
10	I_2N_3	68.44^{gh}	97.77^{e}	1094.78^{f}	64.87^{h}	35.12^{e-g}	36.60^{e-g}	1609.18^{e-g}	108.83^{ef}	13.95^{d-f}	217239^{e-g}	55707^{h}	1.34^{g}
11	I_2N_4	64.48^{i}	86.93^{e}	1014.72^{f}	57.61^{k}	29.72^{g}	30.97^{g}	1374.76^{g}	102.19^{g}	12.98^{g}	185593^{g}	122232^{ef}	2.93^{bc}
12	I_2N_5	74.37^{e}	120.44^{d}	1290.81^{c-e}	70.30^{e-g}	38.83^{c-f}	40.47^{c-f}	1770.47^{c-f}	112.58^{d}	14.40^{c-e}	239013^{c-f}	153327^{c-e}	2.79^{cd}
13	I_2N_6	79.96^{b}	131.93^{bc}	1458.53^{b}	74.58^{cd}	42.93^{a-d}	44.73^{a-d}	1948.27^{a-d}	117.57^{c}	15.17^{a-c}	263017^{a-d}	149769^{c-e}	2.32^{ef}
14	I_2N_7	76.21^{d}	122.70^{cd}	1327.45^{cd}	72.02^{e}	40.23^{b-e}	41.91^{b-e}	1830.83^{b-e}	114.99^{cd}	14.59^{cd}	247162^{b-e}	182505^{bc}	3.82^{a}
	S.Em±	0.55	3.52	26.28	0.65	1.87	1.95	81.14	1.10	0.27	10953.65	10953.65	0.14

N_1-100 % RDF through inorganic fertilizers, N_2-100 % RDN through FYM, N_3-100 % RDN through vermicompost, N_4-100 % RDN through green leaf manuring, N_5-50 % RDN through inorganic ferilizers + 50 % RDN through FYM, N_6-50 % RDN through inorganic fertilizers + 50 % RDN through vermicompost, N_7-50 % RDN through inorganic fertilizers + 50 % RDN through green leaf manuring, PE- Pan evaporation, * Mean followed by same letters did not differed significantly, ** S.Em. applicable to Duncan's multiple range test increased dry chilli yield under drip irrigation is due to the constant availability of water surrounding the root zone at very low moisture tension. Singh and Kumar (2007) also reported the maximum fruit weight and tomato yield with 80 % ET.Similar findings are also reported by Gupta and Chattoo (2014) in knolkhol and Singh *et al.* (2017) in chilli. Data further revealed that higher number of fruits per plant (47.06), fruit yield per plant (49.04 g) and dry chilli yield (2128 kg ha^{-1}) were recorded in the treatment 100 % RDF through inorganic fertilizers and it was on par with 50 % RDN through inorganic fertilizers + 50 % RDN through vermicompost and 50 % RDN through inorganic fertilizers + 50 % RDN through green leaf manuring. The improvement in yield and yield attributing parameters might be the result of inorganic fertilizers as they are fast acting, these nutrient-rich salts dissolve quickly and are immediately available to the plants to provide essential nourishment in the form of nitrogen, phosphorus and potassium.Application of inorganic fertilizer at recommended level produced excellent quality of fruits and resulted in higher yield (Imamsaheb *et al.,* 2014). These results are confined with findings of Shashidhara (2006) and Rekha *et al.* (2017). However, minimum fruits per plant (31.57), fruit yield per plant (32.89 g) and dry chilli yield (1455 kg ha^{-1}) were noticed in application of 100 % RDN through green leaf manure. Among interactions, treatment combination of 0.8 PE + 100 % RDF through inorganic fertilizers recorded higher number of fruits per plant (48.72), fruit yield per plant (50.76 g) and dry chilli yield (2200 kg ha^{-1}) over 0.6 PE + 100 % RDN through green leaf manuring (29.72, 30.97 g and 1374.76 kg ha^{-1}, respectively). However, it was on par with combination of 0.6 PE + 100 % RDF through inorganic fertilizers, 0.8 PE + 50 % RDN through inorganic fertilizers + 50 % RDN through vermicompost, 0.6 PE + 50 % RDN through inorganic fertilizers + 50 % RDN throughvermicompost and 0.8 PE + 50 % RDN through inorganic fertilizers + 50 % RDN through green leaf manuring. The important reasons responsible for better production of yield and yield attributes might be due to 100 % RDF through inorganic fertilizers better performance under drip irrigation which can be attributed to maintenance of favourable nutrient-water interaction in the root zone, which in turn might have helped the plant to utilize nutrients more efficiently. These results were in agreement with the findings of Singh *et al.* (2017) concluded that higher yield of chilli was achieved by drip irrigation at 80 % PE along with 75% RDF through fertigation + 2 foliar spray of 1% urea phosphate.

Effect of drip irrigation levels and different sources of nutrients on quality aspects of chilli

In the present study (Table 1), application of water through drip irrigation at 0.8 PE recorded higher ascorbic acid (115.06 mg 100 g^{-1}) over drip irrigation at 0.6 PE (112.3mg 100 g^{-1}). The availability of soil moisture has a positive effect on the ascorbic acid content of chilli fruit. Ascorbic acid content increased as soil moisture increased. The increasing water content in the plants may have enhanced protoplast content as well as acid metabolism. These results were in agreement with findings of Shashidhara (2006) who reported that the highest ascorbic acid content of chilli was recorded in treatment receiving water with 80 per cent PE level over 60 per cent PE level. Oleoresin content did not differed by drip irrigation.Ascorbic acid and oleoresin content of chilli fruits were influenced by different sources of nutrients, significantly higher ascorbic acid content(123.9 mg 100 g^{-1}) and oleoresin (15.79 %) in chilli fruits were registered with the application of 100 % RDF through inorganic fertilizers in comparison with rest of the treatments. However, significantly lower ascorbic acid and oleoresin content were noticed in 100 % RDN through green leaf manure (104.2 mg 100 g^{-1} and 13.09 %, respectively).The increase in ascorbic acid content might be ascribed to better availability and uptake of required plant nutrients and also favourable conditions resulted by the applied fertilizer, which helped in the synthesis of chlorophyll and increased ascorbic acid content. These results are in agreement with the findings of Mary and Balakrishnan (1990) who have reported that, high N uptake enhanced the enzyme activities for amino acids synthesis and increased ascorbic acid content in fruits. The increase in oleoresin value might be attributed to higher uptake of macronutrients of fruits. Similar results were also reported by Shashidhara (2006) and Altaf *et al.* (2019). Among interactions, combination of 0.8 PE + 100 % RDF through inorganic fertilizers recorded significantly higher ascorbic acid content (124.5 mg 100 g^{-1}) and oleoresin (15.80 %) over rest of the treatments. However, it was on par with 0.6 PE + 100 % RDF through inorganic fertilizers (123.2 mg 100 g^{-1}).Increase in ascorbic acid content at higher levels of nitrogen might be due to enhancement of enzyme activity for amino acids synthesis leading to higher ascorbic acid content. Similar findings are also reported by Gupta *et al.* (2015) and found that fertigation with 80 % recommended NPK through drip produced significantly maximum values for ascorbic acid in hybrid tomato. Results regarding ascorbic acid are in agreement with the findings of Prabhavathi *et al.* (2008) and Ramachandrappa *et al.* (2010) who reported positive correlation between N and K content and ascorbic acid. Combination of 0.8 PE + 100 % RDF through inorganic fertilizers recorded significantly higher oleoresin (15.80 %) over rest of the treatments. However, it was on par with 0.6 PE + 100 % RDF through inorganic fertilizers (15.77 %), 0.8 PE + 50 % RDN through inorganic fertilizers + 50 % RDN through vermicompost (15.45 %) and 0.6 PE + 50 % RDN through inorganic fertilizers + 50 % RDN through vermicompost (15.17 %). Fertigation of 100 % N + 100% K produced superior quality fruits with respect to ascorbic acid as reported byMounika *et al.* (2018) and Supekar (2020).

Effect of drip irrigation levels and different sources of nutrients on economics of chilli

The data on economics (Table1) revealed that, crop receiveddrip irrigation at 0.8 PE was recorded significantly higher gross returns (₹ 2,49,683 ha^{-1}), net returns (₹ 1,54,741 ha^{-1}) and B:C ratio (2.92) compared to 0.6 PE with gross returns (₹ 2,34,288 ha^{-1}), net returns (₹ 1,39,346 ha^{-1}) and B: C ratio (2.74). This is due to application of water through drip irrigation at 0.8 PE recorded significantly higher fruit yield, leads to higher net returns. Similar results were reported by Singh *et al.* (2017).

Among different sources of fertilizers, significantly higher gross returns (₹ 2,87,218 ha^{-1}), net returns (₹ 2,17,197 ha^{-1}) and B:C ratio (4.10) were obtained with the application of 100 % RDF through inorganic fertilizers over the rest of other treatments. These results were in conformity with Shashidhara (2006) and Altaf *et al*. (2019). The interaction effect of drip irrigation and different sources of fertilizer on economics differed significantly. Chilli crop received irrigation supply at 0.8 PE with 100 % RDF through inorganic fertilizersrecorded significantly higher gross returns (₹ 2,96,941ha^{-1}), net returns (₹ 2,26,920 ha^{-1}) and B:C ratio (4.24) compared to 0.6 PE + 100 % RDN through vermicompostwith net returns (₹ 55,707 ha^{-1}) and B:C ratio (1.34). This is due to application of water through drip irrigation at 0.8 PE with 100 % RDF through inorganic fertilizers recorded significantly higher fruit yield so higher net returns were recorded. Theser results were in conformity with Singh *et al.* (2017) and Supekar (2020) found drip irrigation at 1.0 ETc with 80 per cent of RDF was optimum for gross returns, net returns and B:C ratio.

Conclusion

From the results it was concluded that, drip irrigation at 0.8 PE with 100 % RDF (150:75:75 kg ha^{-1} NPK, respectively) through inorganic fertilizers recorded significantly higher values with respect to growth, yield, quality parameters, gross returns, net returns and B:C ratio.

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