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RESEARCH PAPER

Performance evaluation of capsicum crop in open field and under covered cultivation

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Abstract : The performance of capsicum crop in open field and under covered cultivation was evaluated at Precision Farming Development Centre experimental field at Bhopal during December, 2011 to May, 2012. Under covered cultivation, black colour shade net having 50% shade factor was used in the study. Same crop cultural practices in the open field and under covered cultivation were adopted for comparison. Drip irrigation system was adopted in both the cases and irrigation system parameters such as frequency of irrigation and wetting pattern were collected. Other parameters such as soil temperature, duration of the crop, morphological parameters of the crop and yield were monitored. The study revealed that under shade net the crop yield was increased by 80 per cent over open field cultivation along with water saving of about 40 per cent in covered cultivation. The wetting pattern from the emitting device of 2 lph indicated maximum spread of 40 cm from emitter in case of crop under covered cultivation where as in open field the spread was 25 cm. Duration of the crop was also extended by 40 more days under covered cultivation.

Key Words : Open field, Covered cultivation, Shade net, Shade factor, Micro irrigation system, Capsicum crop

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INTRODUCTION

India is the second largest vegetables producer in the world next to China; however it's per capita per day availability is well below 92 g whereas the recommended consumption is 284 g. The present production is not sufficient to meet the requirement. The target can be achieved by bringing additional area under vegetable crops, using hybrid seeds, improved agro techniques and perfection and promotion of protected cultivation of vegetables (Singh and Vashist, 1999). Protected cultivation technologies are being utilized all over the world but the level and extent of their use may be different among different countries. Of late the farmers of India are realizing the importance of protected cultivation of vegetable crops. In protected cultivation the crops are protected from excessive sunlight by providing uniform shade that results in better yield. These structures will also act as a barrier against heavy rains, hail-storms and other natural calamities, provides protection against insects, birds and helps in reducing the loss of water through evaporation. The structures are ideally suits to horticulture and floriculture crops.

The production of off-season vegetable crops under net house conditions was evaluated for total yield, earliness and other character and incidence of insect pests (Cheema *et al.*, 2004). The cultivation of vegetables in net house can play a better role in improving quality, advancing maturity as well as increasing fruiting span and productivity. Singh and Asrey (2005) studied the performance of tomato and sweet pepper under unheated green house. The production of tomato and sweet pepper under medium cost green house was found top the tune of 93.2 and 76.4 t/ ha, respectively. It was of excellent quality as compared to outside where the crop could not survive due to prevailing low temperature. Among the three cultivars of tomato, Neveen (93.2 t/ha) out yielded the other cultivars Avinash-II (71.2 t/ ha) and Akash (73.7 t/ha). Thus, the studies have indicated that cultivation of tomato and sweet

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pepper under green house would not only help in getting higher productivity but also fetch better returns (Rs.7-8 per m^2) per season. Dixit (2007) studied the performance of leafy vegetables under protected environment and open field condition. Singh and Sirohi (2008) examined that protected cultivation of vegetables offers distinct advantages of quality, productivity and favourable market price to the growers. Vegetable growers can substantially increase their income by protected cultivation of vegetables in off-season as the vegetables produced during their normal season generally do not get good returns due to large availability of these vegetables in the markets. Off-season cultivation of cucurbits under low plastic tunnels is one of the most profitable technologies under northern plains of India. Walk-in tunnels are also suitable and effective to raise off-season nursery and off-season vegetable cultivation due to their low initial cost. Insect proof net houses can be used for virus free cultivation of tomato, chilli, sweet pepper and other vegetables mainly during the rainy season. These low cost structures are also suitable for growing pesticide free green vegetables. Low cost green houses can be used for high quality vegetable cultivation for long duration (6-10 months) mainly in peri-urban areas of the country to fetch commensurate prices of produces. The potential benefits of protected cultivation technologies are well established in many studies. Many researchers are also studied the performance of drip fertigation systems for horticultural crops under open field conditions. In the present study it was aimed to evaluate the performance of drip fertigation system for capsicum crop cultivated in open field and in shade net (black colour) having 50 per cent shade factor.

MATERIAL AND METHODS

A field study was taken up to evaluate the performance of capsicum crop (*Capsicum annum* var. Swarna) in open field and under shade net house with 50% shade factor. The crop was transplanted on the same day in open field and in covered cultivation at a spacing of 45 cm between plants and 30 cm between rows with a pathway of 45 cm between the pairs on raised beds 15 cm height and 30 cm width. Lateral line with inline drippers having 2 lph discharge was installed for irrigating as well as for fertigation of crop. The lateral used in open field was extended under the shade net also by providing a lateral control valve at the entry point of lateral into shade net house. The crop growth parameters along with crop yield were monitored. The quantity of water applied was calculated from the number of hours of operation of the irrigation system and wetting pattern of drip irrigation bulb were measured by using a scale. Destructive method was adopted to find out the root zone distribution of the crop in open field as well as in shadenet house. Portable lux meter and thermometers were used to measure light intensity and ambient temperatures, respectively.

RESULTS AND DISCUSSION

The results are presented under the heads i) environmental characteristics ii) plant characteristics and iii) Irrigation system parameters.

Environmental characteristics:

The environmental parameters such as ambient temperature, light intensity, soil temperature were monitored on weekly interval from inside and outside of the shade net. The average of observations collected during the experimentation are presented in the Table 1.

It can be seen from the Table 1 that the ambient temperatures inside the shadenet were 6-9^{0}C less than the open field. The 50% shade factor shade net reduced the light intensity inside the poly house by 51000 luxes over open field conditions. Favourable soil temperatures were also observed under shadenet conditions.

Plant growth characteristics:

Plant growth characteristics such as plant height, number of branches, root zone length, date of flowering, crop yield were measured for capsicum crop under open field and in shade net house (Table 2). From Table 2 it can be seen that the plant height, number of branches per plant, number of leaves per plant were higher for the capsicum crop cultivated in shadenet over open filed. Root zone length of 8 cm more was also observed for the crop under shadenet. Timely flowering of the capsicum crop under shade net was observed where as flowering in open field was delayed by 7 days. This table reveals that under shade net the crop yield was increased by 80 per cent over open field cultivation with extended duration of about 40 more days, which fetched higher returns in the market.

Irrigation system parameters:

Drip irrigation system was used in irrigating as well as fertigating the crop in open field as well as in shade net. Same lateral line which was used in open field was extended into shade net house by providing a control valve at the inlet of shade net. Alternate day irrigation was planned initially for

Table 1 : Environmental characteristics under open field and in shade net

Treatments	Ambient temperature *(^{0}C)	Light intensity (Lux)	Soil temperature (^{0}C)
Open field	22- 30 ^{o}C	92000	29
Shadenet (50%)	16-21 ^{o}C	41000	20

Table 2 : Plant growth parameters in open field and under shade net cultivated capsicum crop

Treatments	Plant height (cm)	Number of branches	No. of leaves/ plant	Root zone length (cm)	Date of flowering	Yield (kg/ plant)
Open field	48.33	5.17	30.50	17.67	17th Dec	1.35
Shadenet (50%)	77.68	5.50	40.33	25.67	10th Dec	2.43

the crop under both treatments. About 3.5 l/day/plant was applied for capsicum in initial stage in open field and in shade net house and later stage 6.0 l/day/plant. And about from flowering stage the frequency of water application was reduced in shade net in comparison to open field. In shade net house water saving of about 40 per cent was observed over open field due to less number of frequency of irrigations (42 no.) under shade net over open field cultivation (70 no.). The comparison of water application was made till the open field crop was completely harvested in the first week of April, where as under shade net the crop was completely harvested in second week of May. Wetting bulb diameter of about 40 cm was achieved in shade nets, where as in open field the bulb diameter was found as 25 cm. The water productivity was found to be better in shade net cultivated (0.082 m^3/kg) capsicum over open field crop (0.22 m^3/kg).

Conclusion:

Cultivation of high value crops under covered cultivation is gaining momentum in India in recent past. In the present study experimental trials were taken up to study the performance of capsicum crop under shade net having 50 % shade factor in comparison to open field cultivation. The findings of the study revealed that under shade net the crop yield was increased by 80 per cent over open field cultivation along with water saving of about 40 per cent in covered cultivation. The wetting pattern from the emitting device of 2 lph indicated maximum spread of 40 cm from emitter in case of crop under covered cultivation where as in open field the spread was 25 cm. Duration of the crop was also extended by 40 more days under covered cultivation. The water productivity was found to be better in shade net cultivated (0.082 m^3/kg) capsicum over open field crop (0.22 m^3/kg).

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