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Performance of capsicum under protected and open field conditions under Mokokchung district of Nagaland

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ABSTRACT : Capsicum was grown under different growing conditions *viz.*, polyhouse, black plastic mulch and open field at Longkuba, Longkhum village to assess the growth and yield performance. Seedlings were raised in the low cost polyhouse and transplanted when they were 45 days old at a spacing of 45 x 60 cm. The data obtained from the experiment were analyzed statistically by using Randomized Block Design (RBD). The results revealed that capsicum grown under polyhouse significantly increased plant height (90.7cm) and number of structural branches (12.59). The yield parameters like fruit length (10.75cm), fruit diameter (8.14cm), fruit circumference (24.9cm), individual fruit weight (122.75g) and overall fruit yield (49.8 MT/ha) were also significantly higher under polyhouse.

KEY WORDS : Capsicum, Polyhouse, Plastic mulch, Open field

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Capsicum (*Capsicum annum*) is one of the important nutritious and highly remunerative vegetable crops. The fruits are harvested either at green mature stage or at colouring stage and are a very good source of vitamin A and C and other nutrients. It is a delicate crop and, therefore, low night temperature, high rainfall, waterlogging, higher relative humidity and cold wind are limiting factors for growing capsicum under open field conditions. Agronomical practices play an important role for obtaining higher yields especially under protected structures. To make its cultivation successful, polyhouses and plastic-mulching are most suitable solutions (Chandra *et al.*, 2000; Singh *et al.*, 2004 and 2010). In addition these structures facilitate the utilization of nutrients from soil for longer duration (Singh *et al.*, 2005a and b). Very limited information is available for growing capsicum through protected technology under

Mokokchung condition. Therefore, the present study was conducted with an objective to evaluate technical feasibility of protected technology for obtaining maximum yield, economic gain and to minimize biotic and abiotic stresses for capsicum under prevailing conditions of Mokokchung.

RESEARCH PROCEDURE

The experiment was conducted during 2014 at Longkuba of Longkhum village under Mokokchung district. Longkhum is located at an altitude of 1600 m above sea level with sloppy mountains. Three technology *viz.*, polyhouse, black poly-mulching and open field (unprotected) condition were applied for the experiment. The experiment was laid out in Randomized Block Design. Seedlings were raised under poly-house condition.

Seedlings of 45 days old were transplanted in a plot size of 2 x 3 m *i.e.* 6 sqm at 45 cm × 60 cm spacing during second week of March. Recommended standard agronomical package of practices were followed. The data were recorded from randomly selected five tagged plants of each plot/replication. Data on growth such as plant height (cm), number of structural branches and yield parameters *viz.*, number of fruits/plant, fruit length (cm), fruit diameter (cm), fruit circumference (cm), individual fruit weight(g) and fruit yield (kg/plot) were recorded. The statistical analysis (ANOVA) for the above parameters was carried out using Randomized Block Design (RBD). In the experiment, capsicum variety Swarna was used.

RESEARCH ANALYSIS AND REASONING

Growth, development, productivity and post-harvest quality of any crop largely depend upon the interaction between the genetic constitution of the plants and the environmental conditions under which they are grown. Capsicum is one such crop, which responds very well to the favourable environmental conditions.

Plant height :

As shown in the Table 1, plant height varied significantly due to different growing conditions. Plants grown in polyhouse showed superior performance in plant height (90.7 cm). This may be attributed to the enhanced plant metabolic activities like photosynthesis and respiration due to favourable micro-climatic conditions that prevailed in the polyhouse. The result of higher growth rate under polyhouse structure was also reported by

Maurer (1981). Subsequent plant height (61.5 cm) was recorded from plastic mulched plants while the lowest performance in plant height (46.07 cm) was observed from open field condition, indicating protected condition had positive effect on the growth and development of capsicum. The increased plant height in mulched plants may also be possibly due to better availability of soil moisture and optimum soil temperature provided by the mulch as compared to open condition. Increase in plant height in chilli by using plastic mulches was also reported by (Shinde *et al.*, 1999).

Number of structural branches :

Table 1 showed that plants grown under polyhouse had a significant effect on the number of structural branches per plant (12.59). This might be due to the taller plants and the congenial microclimate that prevailed inside the polyhouse favouring increased growth rate of plants. Mulching had also positive effect on generating and retaining higher number of branches per plant (9.64) which was observed to be higher than the open condition (7.47). Favourable weather condition and moisture of the soil are the important parameters affecting the number of branches per plant. It was reported that mulched tomato plants had more branches than that of unmulched plants, (Srivastava *et al.*, 1994) which supported the present results.

Yield parameters :

Polyhouse and mulching produced more fruits per plant compared to open field (Table 2). It means that polyhouse and mulching had positive influence on fruit setting in capsicum. Maximum number of fruits/ plant

Table 1: Effect of different protected and open condition on growth and development of capsicum

Treatments	Plant height (cm)	No. of branches/plant
Polyhouse	90.7	12.59
Poly mulch	61.5	9.64
Open field	46.07	7.47
C.D.(P=0.01)	1.42	0.18

Table 2 : Effect of different protected and open condition on yield parameters of capsicum

Treatments	No. of fruits/plant	Fruit length (cm)	Fruit dia. (cm)	Fruit cir. (cm)	Fruit wt. (g)	Yield/plot (kg)	Yield/ha (MT)
Polyhouse	12.17	10.75	8.14	24.9	122.75	29.88	49.8
Poly mulch	8.62	8.76	7.42	21.84	109.33	18.85	31.42
Open field	6.34	6.37	5.18	19.13	86.77	11.01	18.34
C.D.(P=0.01)	0.25	0.5	0.2	0.39	2.56	0.79	1.3

(12.17), fruit length (10.75 cm), fruit diameter (8.14 cm), fruit circumference (24.9 cm), highest individual fruit weight (122.75 g) and yield/ha (49.8 MT) was recorded under polyhouse. Zende (2008) also reported significant higher fruit weight (147.74 g) and fruit yield (64.91 t/ha) under polyhouse. Similarly, Yellavva (2008) also recorded higher fruit weight (160 g) and fruit yield (72.52 t/ha) under naturally ventilated poly house. The higher fruit yield under this condition may be attributed to the favourable climatic conditions that prevailed under polyhouse and also due to its protective ability against major abiotic stresses, which reduces the effect of the excess rainfall, water logging, and provide controlled environment (3–4°C higher temperature than open field condition) to the crop (Singh *et al.*, 2003 and Singh *et al.*, 2010) leading to higher vegetative growth, contributing to more number of flowers, higher per cent of fruit set resulting more number of fruits. Similar results were obtained by Nagendra Prasad (2001) and Brar *et al.* (2005) who reported highest yield under polyhouse conditions. Plastic-mulching treatment followed polyhouse in all the above observations (8.62, 8.76 cm, 7.42 cm, 21.84 cm, 109.33 g, and 31.42 MT/ha, respectively). Ravinder *et al.* (1997) reported that mulching significantly improved the number of fruits per plant and reduced the percentage of fruit abortion compared to unmulched control in tomato that supported the present experimental results. The increase in the number of fruits per plant in mulched conditions was probably associated with the conservation of moisture and improved microclimate both beneath and above the soil surface. The suitable condition enhanced the plant growth and development and produced increased fruit bearing nodes as compared to the open condition. In contrast, open field recorded the lowest in all the above observations (Table 2).

Conclusion :

Based on the experimental results, it can be concluded that polyhouse and plastic mulching had tremendous effects on the growth, and yield of capsicum, and polyhouse showed superior performance among the different growing conditions. However, black plastic mulch also recorded significantly better results over the open field condition in terms of growth and yield parameters. Therefore, based on the present results polyhouse and plastic mulching can be recommended for cultivating capsicum in Mokokchung, more specifically during rainy season for achieving high production.

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