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Research Article

VEGETATIVE GROWTH AND YIELD PERFORMANCE OF FOUR CHILLI (*CAPSICUM ANNUUM* L.) CULTIVARS UNDER MOKOKCHUNG DISTRICT OF NAGALAND

RENBOMO NGULLIE AND PIJUSH KANTI BISWAS*
Krishi Vigyan Kendra, Yisemyong, Mokokchung, 798601, Nagaland, India
*Corresponding Author: Email - drpijushpckvk@gmail.com

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Abstract: Four varieties of Chilli, Guntur hope, Bullet, Demon and Pusa Jwala showed wide differences in their genotypic constituents reflected by morphological status. Major characters of growth and yield such as plant height, number of branches/plant, number of fruits/plant, individual fruit weight, fruit length, fruit width, yield/ha were influenced by cultivars. Out of the four cultivars, Guntur Hope resulted the best performance in almost all the parameters like plant height (74.8 cm), number of fruits/plant (134.33) and total yield (72.47 q/ha). Cultivar Bullet produced the highest fruit width (1.97 cm) and fruit weight (3.2 gm) but failed to have any impact on total yield due to production of minimum fruit number/plant (79) and lesser fruit length (5.4 cm).

Keywords: Chilli, Cultivars, Growth, Yield

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Introduction

Chilli (*Capsicum annuum* L.) is a spice, a fruit vegetable widely cultivated in the world and which importance in human food is capital [1,2]. It is a dicotyledonous flowering plant which belongs to the family Solanaceae [3]. Chilli is emerging as one of the commercial vegetable crops at the global level, and is probably most important vegetable after Tomato [4]. Throughout the world, chilli is consumed fresh, dried or in powder [5]. The improvement can be brought out after confirming the association of most important character yield with other yield attributing characters. Hence, an experiment was conducted to identify the best chilli variety suited to Mokokchung district to study the different traits and to assess the association of different yield attributing traits with the yield of chilli.

Materials and Methods

Experimental Location

The experiment was conducted during kharif season of 2018 at Krishi Vigyan Kendra, Mokokchung. The experimental site was located at 26.2302'N Latitude and 92.7734'E Longitude and at an altitude of 1050 m. from the mean sea level. The climate of the experimental site was warm and humid. During investigation period average temperature ranged from 12°C to 24.5°C with average annual rainfall of 2000 – 2500mm. Relative humidity ranged from 60% to 90%. Soil sampling was done before planting for analyzing physio-chemical properties of the soil. The results of the soil analysis are presented in [Table-1].

Genetic Materials and Experimental Design

The experiment consisted of five chilli cultivars namely Guntur hope, Bullet, Demon and Pusa Jwala. The plots were laid out in a Randomized Block Design with 3 replications.

Raising seedlings

The seed of the cultivars was sown in raised nursery beds in March. After sowing, carbendazim was applied to the beds and with covered with dry grass mulch until emergence and watering the seedlings was done using watering can.

Plot size and planting

Unit plot size measuring 4.5 x 3.5 m were prepared for planting the seedlings. Transplanting was done on well prepared beds at a spacing of 70 x 30 cm as recommended by Matta and Cotter (1994) [6]. Seedlings were transplanted after 4 to 5 weeks of sowing or when they were about 15 cm high [7].

Data Collection and Measuring Procedures

Data were collected on plant height, number of branches/plant, number of fruits/plant, fruit length (cm), fruit diameter (cm), fruit weight (gm), yield/plant (kg), yield/plot (kg) and yield/ha. Five randomly selected plants from each replication were taken to record the data on vegetative growth characters, yield and yield attributing parameters.

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Statistical Analysis

All the data collected were subjected to statistical analysis by adopting complete randomized block design [8].

Result and Discussion

Soil analysis

Data on soil analysis reveals that the experimental area soil pH is highly acidic and available N, P and K are in medium range [Table-1]

Table-1 Physio-chemical properties of experimental soil

Soil properties	Description/value
Soil texture	Clay loam
Soil pH	4.56
OC (%)	1.8
Available N (kg/ha)	420
Available P (kg/ha)	48
Available K (kg/ha)	280

Plant height

Plant height was significantly influenced due to varieties. According to [Table-2], *cv.* Guntur Hope attained the highest plant height (74.8cm) which was closely

followed by Pusa Jwala (72.3 cm) and while the lowest plant height was observed in *cv.* Bullet (59.1 cm). This could be due to its efficient utilization of environmental growth resources so as to stimulate and enhance the photosynthetic and metabolic activities of the plant which reflected on the increase in the vegetative growth. Similarly, El-Tohamy *et al.*(2006) noted that the increase in plant height could mainly be due to better availability of soil nutrients in the growing areas, especially Nitrogen and Phosphorus which have enhancing effect on the vegetative growth of plants by increasing cell division and elongation and the varietal variability to absorb the nutrients from the soil [9]. Moreover, this result was consistent with the report of Lahbib *et al*. (2013)., Abdullah *et al*. (2003), Bhagyalakshami *et al*. (1990). Sreelathakumary and Rajamony (2004) also recorded the variation of plant height among different cultivars in their experiment [9-13]. Sarkar *et al*. (2009) also found significant variations among 49 genotypes of Chilli regarding 12 growth and fruit characters in West Bengal condition [14].

Number of Branches/Plant

On an average, the maximum number of primary branches per plant (5.71) was found in *cv.* Guntur Hope whereas, the minimum value (3.48) was recorded in Bullet [Table-2]. An increase in the number of primary branches in response to varietal differences is due to the accumulation of assimilates in the growing seedlings that initiates the rise of new primary branches. Variety is also the major factor that is responsible to determine the number of primary branches. The number of secondary branches per plant varied markedly in the experiment and the trend was almost similar to the number of primary branches per plant. Similar to number of primary branches, Gunture Hope produced the highest number of secondary braches (8.76) followed by Pusa Jwala (7.47) while the lowest was observed from Bullet (4.47). Hence, Guntur hope showed an overall encouraging performance on vegetative growth of the plant.

Table-2 Response of chilli cultivars to different growth attributes

Varieties	Plant height (cm)	No. of primary branches	No. of secondary branches
Guntur Hope	74.8	5.71	8.76
Bullet	59.1	3.48	4.47
Demon	71.0	4.50	6.57
Pusa Jwala	72.3	5.46	7.47
CD(P=0.01)	1.23	1.17	0.41

Number of fruits/plant

Number of fruits/plant is the most important yield contributing character in chilli [15]. According to Table 3, there was a significant difference in number of fruits per plant of the cultivars. The maximum number of fruits/plant was found from Guntur Hope (134.33) followed by Pusa Jwala (123.67) whereas the minimum from cultivar Bullet (79.0). The highest fruit number in Guntur Hope cultivar was most likely due to the fruit bearing capacity of the variety and more branch formation nature which leads to contain high number of fruits/plant. In line with this result, Amare *et al*. (2013) found different fruit number/plant due to variety differences [16]. Furthermore, Seleshi *et al*. (2014) reported that number of fruits/plant was highly significantly affected by the interaction of variety by location [17]. Obidiebube *et al*. (2012) also reported that number of fruit/plant in chilli differ significantly from one cultivar to another [18].

Fruit Length and width

Fruit length and diameter showed distinct variation among the cultivars. The maximum fruit length was observed from Guntur Hope (10.27 cm) followed by Pusa Jwala (9.33 cm) while the lowest was recorded from Bullet (5.4 cm). The significant difference in fruit length among the hot pepper varieties is attributed to their inherited traits and adaptability to the environmental condition of the study area. This current result was supported by the findings of Haileslassie *et al*. (2015) and Seleshi *et al*. (2014) [19]. Moreover, this finding was supported by the work of Tibebu and Bizuayehu (2014) [20]. Rani (2001) also observed variation in fruit length among different cultivars in his experiment [21]. However, with regard to fruit width, the cultivar Bullet registered significantly highest fruit width (1.97 cm) while the minimum fruit width was obtained from cultivar Demon (1.14 cm) [Table-3]. Karak *et al* (2014) also reported maximum fruit width in cultivar Bullet [22]. Haileslassie *et al*. (2015) found that fruit width was significantly affected due to varietal effect. In case of chilli fruits, length is having market value because normally medium to long fruits are preferred by customers [23] while extra large fruit is undesirable because it is usually associated with lower productivity, irregular fruit shape and poor quality [24].

Fruit weight

It is known that fruit weight in chilli is generally governed by fruit width and fruit length. Distinct variation was found among the cultivars for single fruit weight. The maximum single fruit weight was found from Bullet (3.2 g) followed by Guntur Hope (2.63 g) whereas the minimum was observed from Demon (1.67 g) [Table-3]. Variation in the fresh weight of single fruit among the cultivars also reported by Obidiebube *et al*.2012

Yield

Yield of the chilli cultivars showed a significant variation. Among the genotypes tested, cultivar Guntur Hope recorded the highest yield (72.47 q/ha) followed by Pusa Jwala (67.37 q/ha). The lowest yield was recorded from cultivar Bullet (43.63 q/ha) [Table-3]. Although Bullet produced the maximum fruit width and fruit weight, number of branches and number of fruits/plant was very less which eventually lowers the total yield. The increased yield in these cultivars was due to increased number of primary branches, number of fruits/plant and fruit length. Krishnakumar *et al*. (2003) also observed positive association of yield with number of primary and secondary branches, number of fruits per plant and other characters [25]. The trend of this result illustrated that the higher yield was associated with higher number of fruits/plant as well as earliness but least related with fruit weight. Evidently, number of fruits/plant was the main character for increasing the fruit yield. Similarly, such large variations in dry chilli yield in different genotypes were previously reported by Hundal *et al*. (1995), Warade *et al*. (1996), Khurana *et al*. (2003) and Shanthanu *et al*. (2005) [26-29]. Mehraj *et al*. (2014) studied the performance of four chilli lines and found variation on yield among the lines [30]. Padda *et al*. (1970) observed 113.7 to 399.8 g fresh weight of fruits per plant of chilli varieties in Punjab [31]. Mathai *et al*. (1977) recorded 271 to 369 g fresh weight of fruits per plant of chilli selection during summer, 1975 [32]. Large varietal variations in yields were also reported by Rajput *et al*. (1991) [33]. The differential response by different varieties may be due to differences in genetic constituents of the varieties and variable environmental condition [34]. Saha *et al*. (2010) observed that high temperature reduced the fruit set percentage as well as fruit size of bell pepper varieties and found that heat tolerance line produced higher amount of proline in expressing the heat tolerant capability [35].

Table-3 Response of chilli cultivars to different yield characters

Varieties	No. of fruits/plant	Fruit length (cm)	Fruit width (cm)	Fruit weight (gm)	Yield (Q/ha)
Guntur Hope	134.33	10.27	1.47	2.63	72.47
Bullet	79.00	5.40	1.97	3.20	43.63
Demon	104.33	8.57	1.14	1.67	54.30
Pusa Jwala	123.67	9.33	1.37	2.17	67.37
CD(P=0.01)	3.83	0.54	0.08	0.18	0.77

Conclusion

Availability of improved varieties is among the best technologies to improve chilli productivity. Results of this experiment showed that Guntur Hope cultivar exhibited best performance in most of the parameters like plant height, branches, fruit number, fruit length, etc. followed by cultivar Pusa Jwala. This investigation led to infer that Guntur Hope and Pusa Jwala were the high performing varieties and suggested their recommendation for commercial cultivation. Similar type of studies was conducted by Elangovan *et al*. (1982), Natarajan *et al*. (1994), Abusaleha (1998) and Kumar *et al*. (1999) to identify suitable cultivars for different agroclimatic conditions [36-41].

Application of research: Study of Guntur Hope cultivar

Research Category: Vegetable Science

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Study area / Sample Collection: Krishi Vigyan Kendra, Yisemyong, Mokokchung, 798601

Cultivar / Variety name: Chilli, Guntur hope, Bullet, Demon and Pusa Jwala

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