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Evaluation of Tomato Varieties for Higher Productivity in the NEH Region of India

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ABSTRACT

On- farm trail was conducted in Longleng district of Nagaland during 2013-14 and 2014-15 to compare the phonological development and production potential of four varieties of tomato *viz*. MT-2, MT-3, Arka Meghali and Pusa Ruby (Local check) at farmers field under Krishi Vigyan Kendra Longleng. Data collected were plant height, branch per plant, number of fruits per plant, average fruit weight, fruit length, fruit breath and fruit yield. The experiment was laid out in Complete Randomized Block Design. The mean data of all the observation over two years were pooled and statistically analysed. The result revealed that maximum number of fruit/plant (43.44), fruit width were found under MT-2 whereas, plant height, average fruit weight recorded under Arka Meghali. Fruit weight of Arka Meghali and MT-2 were found statistically at par with each other. Maximum fruit yield (176.2 q/ha) and production efficiency (149.32 kg/ha/day) were recorded in MT-2 followed by Arka Meghali (173.1 q/ha, 132.14 q/ha) as compared to other tomato varieties. Gross income (Rs. 352400.00 per ha), net profit (Rs.251760.00 per ha), B:C ratio (3.49) and economic efficiency (2133.56 Rs/ha/day) were recorded highest under MT-2 as compared to other varieties.

1. Introduction

Tomato (*Solanum Lycopersicum* L) is one of the most important vegetables crops grown both in the plains and hills of north-eastern India. It is most economically important vegetables crops and is widely cultivated in India with a total area 83,000 ha and production of 7,90,000 tonnes. The general popularity and health benefits associated with this vegetable crop make it one of the most commercially viable of all agricultural commodities. Tomatoes are consumed fresh, cooked or processed into various products. The tomato is composed mainly of water (approximately 90%), soluble and insoluble solids (5-7%), citric and other organic acids and vitamins and minerals (Pedro and Ferreira, 2007). Tomato is becoming the main supplier of several plant nutrients and providing an important nutritional value to the human diet (Wilcox et al. 2003)

Ripe tomatoes have a high content of the antioxidant lycopene, which plays a possible role in the prevention of certain forms of cancer (Agarwal and Rao, 2000; Radzevičius et al. 2009). Another important antioxidant is carotene (Radzevičius et al. 2009), also noted for its cancer prevention properties. Tomatoes thrive best in moderate climates, but can adapt to a wide range of climatic conditions. The crop required warm weather and abundant sunshine for best growth and development. The plant grows best when provided with uniform moisture and well drained soil (Gould 1992). They can be grown in a variety of soil types, but do best on well-drained, fertile soils. They can be cultivated in the open under field conditions or in a greenhouse under environmentally controlled conditions. Tomatoes are usually staked and supported off the ground, in an effort to minimize losses from rots when the fruit is in contact with the soil.

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This practice has also proven to be effective in reducing the incidence of pest problems, thereby increasing yields (Saunyama and Knapp 2003). In Nagaland, Tomato is cultivated in 0.10 (000 ha) with production 0.50 (000 ha) and productivity is 5.0 t/ha. Tomato is important crop of Longleng district and its area is around 30 ha with production and productivity is 200 MT and 66.6 q/ha respectively. Tomato production is not able to meet the requirement of the people due to less production, productivity and lack of high yielding variety. Therefore, Krishi Vigyan Kendra, Longleng initiated to conduct On Farm testing for evaluation of high yielding tomato varieties for higher production and productivity of the Longleng District to fulfill the demand of the people and also go for production in commercial scale.

2. Materials and Methods

Krishi Vigyan Kendra, Longleng is situated at 26° 26' 0" N Latitude, 94° 52' 0" E Longitude with altitude of 1366 m MSL). The soil is generally high in soil organic carbon, medium to high in available nitrogen and potassium and low to medium in available phosphorus. On Farm testing was conducted in Longleng district during 2013-14 and 2014-15 to compare the phonological development and production potential of four varieties *viz.* MT-2, MT-3, Arka Meghali and Pusa Ruby (Local check) under Longleng district of Nagaland with 5 replication, farmers as replication. Seeds of four varieties were sown in a raised nursery beds and after 25-30 days old seedlings were transplanted. Seedlings were transplanted with a spacing of 45 cm plant to plant and 45 cm row to row. Recommended package and practice were adopted to raise the crops successfully. Five tomato plant were selected at random in each plot to record the observation on Plant height, No. of fruit/plant, average fruit weight, fruit length, and fruit breath. The yield was noted on plot basis. The experiment was laid out in Complete Randomized Block Design. The mean data of all the observation over two years were pooled and statistically analysed using the F-test (Gomez and Gomez 1984). The test of significance of the treatment was done on the basis of the t-test. The differences between treatments means which were higher than the respective CD values were considered as significant difference (LSD) at the 5% level of probability (P=0.05). The difference between two treatments means which were considered as significant.

3. Results and Discussion

3.1 Growth and yield

The two year pooled data on screening of tomato varieties was presented in the table1. The result revealed that maximum plant height was found in MT-3 (63.75 cm) followed by MT-2 (61.26 cm) and minimum in Pusa Ruby (49.0 cm). Number of fruit/plant was found significantly higher in MT-2 (43.44 cm) and lowest in Pusa Ruby (24.8 cm). Maximum fruit breadth was recorded in Arka Meghali (5.25 cm) followed by MT-2 (4.58 cm) whereas maximum fruit length was found in MT-2 (4.67 cm) and minimum in Arka Meghali (4.06 cm) compared to other varieties. Maximum fruit weight was recorded 50.1 g in Arka Meghali followed by MT-2 (47.3 g) compared to other varieties, but these two varieties at par with each other. Rangnamei et al. (2014) also reported that growth and yield attributes were recorded maximum in MT-2 compared to other tomato variety. Tomato fruit yield were significantly recorded 176.2, 173.1, 156.0 and 129.10 q/ha of the variety MT-2, Arka Meghali MT- 3 and Pusa Ruby respectively. The yield of and MT-2, Arka Meghali, MT-3 were 36.5, 21.0 and 34.0 percent higher respectively than Pusa Ruby. The trend observed in the results indicates that the higher yield depends on the number of fruits and weight of fruits per plant. It was apparent, that fruit number and weight per plant showed a positive association with fruit yield of tomato.This might be due to MT-2 variety was best suited to climatic condition of Longleng and also this variety was developed and recommended by ICAR Research Complex for NEH region, Umiam, Meghalaya for NEH region. Maximum production efficiency (kg/ha/day) was recorded 149.32 in the MT-2 followed by Arka Meghali (132.14 kg/ha/day) compared to other variety. The variation in yield may also be due to genetic differences among the varieties since they were grown under the same environmental conditions (Olaniyi and Fagbayide 1999). Zahedi and Ansari (2012) found significant variation in yield of tomato genotypes,

Table 1. Growth and yield of tomato varieties (Pooled two year)

Varieties	Plant height (cm)	No. of branch	Fruits /plant	Fruit breath (cm)	Fruit length (cm)	Avg. Fruit weight (g)	Fruit yield (q/ha)
MT-2	61.26	6.8	43.77	4.58	4.67	47.3	176.2
MT-3	63.75	6.4	37.4	4.51	4.15	39.1	156.0
Arka Meghali	60.65	6.1	40.8	5.25	4.06	50.1	173.1
Pusa Ruby	49.00	5.7	24.8	4.15	4.1	38.4	129.1
SEm(±)	2.33	0.17	2.17	0.18	0.35	3.0	2.21
CD(P=0.05)	7.2	NS	6.7	NS	NS	9.2	6.8

whose impact on plant growth and yield was different for different genotypes. The varietals differences in growth and yield might be attributed to the differences in ecological distribution of the tomato varieties (Olaniyi, 2007).

4. Economics

Maximum gross income net profit and B: C ratio were recorded (Table: 2) with MT-2 (Rs.352400/ha, Rs.251760/ha and 3.45:1) compared to Arka Meghali (Rs. 346200 / ha, Rs. 245660 / ha and 3.43:1), MT- 3(Rs. 312000/ha, Rs.212060/ha and 3.12:1) and Pusa Ruby (Rs.258200/ha, Rs. 157660/ha and 2.56:1). This might be due to MT-2 tomato variety recorded higher yield compared to other variety. Economic efficiency was also recorded highest in MT-2(Rs. 2133.56 Rs./ha/day) followed by Arka Meghali (Rs 1875.27/ha/day), MT-3 (Rs 1767.56 /ha/day) and minimum in Pusa Ruby (Rs. 1382.98 /ha/day).

Conclusion

From the On-farm trial result, it was concluded that tomato cv. MT-2 was found most suitable for Agro - climatic condition of Longleng District, Nagaland. Therefore, tomato cv. MT-2 can go for large scale cultivation practices for livelihood improvement of the farmers under Longleng district of Nagaland.

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Table 2. Production efficiency and economics of tomato varieties (Pooled two year)

Varieties	Production efficiency (Kg/ha/day)	Economic efficiency (Rs./ha/day	Gross income(Rs./ha)	Net profit(Rs./ha)	B:C ratio
MT-2	149.32	2133.56	352400	251760	3.49
MT-3	130.00	1767.56	312000	212060	3.12
Arka Meghali	132.14	1875.27	346200	245660	3.43
Pusa Ruby	113.25	1382.98	258200	157660	2.56
SEm (±)	1.59	19.44	-	-	-
CD(P=0.05)	4.90	59.90	-	-	-