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Assessment of tomato (*Solanum lycopersicum* L.) hybrids for development and yield accredits under polyhouse condition in subtropical area

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Abstract

Tomato requires optimum temperature condition for proper growth and development which is directly proportional to yield traits. Day temperature should not exceed above 38°C otherwise fruit setting is failing due to flower dropping. Development of crops under polyhouse condition offers higher production and efficiency per unit area and better-quality items produced by providing favorable environment all year which acquiring importance. The present investigation was on twelve promising indeterminate tomato genotypes including check under polyhouse condition during spring-summer season, 2020-2021 to study the relative performance for yield and growth characters at Department of Vegetable Science of Agriculture, Khalsa College, Amritsar. The experiment was conducted in Factorial Randomized Block Design with three replications. The data revealed significant variation in twelve genotypes for various traits. Based on mean performance, the result conveyed that Heemsona and NS-4266 are good performing genotypes for yield and growth-related characters taken under study. Although, minimum days to 50% flowering, average fruit weight, shorter internodal length, higher fruit yield per plant and fruit yield kg per meter square were verified in EZ-9003, while KCA-2 was sophisticated for days to first picking whereas Punjab Sartaj was superior for number of fruits per plant and hybrid Yuvraj provides maximum plant height respectively. The significant findings are taken because of the interaction of genetic makeup of genotypes with the environmental conditions.

Keywords: Hybrids, polyhouse, subtropical, tomato, yield

Introduction

Tomato (*Solanum lycopersicum* L.) is a versatile vegetable which is day neutral, monoecious in nature and belongs to dicotyledon category and grown all over the world under protected condition and open field. It is highly self pollinated crop due to homomorphism and chasmogamy however, certain level of cross pollination also happens. It is one of the most delicate yield plants and its production is frequently obliged in north Indian fields when they grow under open condition, due to different biotic and abiotic stresses. Tomato is ranked third after potato and sweet potato on the basis of its area and production but ranks first among processed vegetable crops (Kathayat *et al.* 2015) [7]. It is a high-water content containing salad crop (more than 94% water present). Tomatoes are the major source of antioxidant, β -carotene and ascorbic acid. They also have flavonoids, zinc, tartrate acid and many more other anti-radical properties.

Since, the importance of tomato as one of the potential vegetable crops for domestic consumption as well as for export market, it is important to increase the productivity along with desirable attributes by providing favorable conditions. In recent years, protected farming has become more significant for the production of vegetables because it increases yield and quality, increases productivity per unit area, creates healthy products, and protects against pests and illnesses. The indeterminate type of tomato was well suitable under polyhouse cultivation for higher yield because of its trailing nature. Considering these points, existing investigation was carried out on assessment of promising indeterminate hybrids in tomato for growth and yield traits under polyhouse cultivation.

Materials and Methods

The experiment has been carried out at Department of Vegetable Science of Agriculture, Khalsa College, Amritsar during spring summer season, 2020-2021 with twelve tomato genotypes consisting of one check Punjab Gaurav and eleven hybrids i.e. Arka Vikas, Punjab Swarna, Arka Saurabh, Punjab Sartaj, KCA-1, KCA-2, EZ-9003, Yuvraj 1003, JC-165,

Heemsona and NS-4266. The experiment was conducted in a Randomized Block Design with three replications. Suggested cultural practices by PAU, Ludhiana were followed for raising the healthy nursery in soil less media at appropriate ratio i.e. 3:1:1 (cocopeat: perlite: vermiculite). Raised healthy seedlings are transplanted in well prepared beds during evening hours after 35 days of sowing. The observations were noted on seven plants taken randomly for the characters namely, days to 50% flowering, days to first picking, number of fruits per plant, average fruit weight (gm), internodal length (cm), plant height (cm), fruit yield per plant (kg) and fruit yield (kg) per square meter. The data for various characters were examined statistically to work out an analysis of variance and mean performance as per the method (Cochran and Cox 1963) [2].

Results and Discussion

Days to 50% flowering

Days to 50% flowering is one of the vital parameters to govern the early maturity of the hybrid. Among entirely genotypes, the hybrid EZ-9003 acquired minimum number of days to 50% flowering. The line KCA-2, hybrid Heemsona and NS-4266 were statistically at par (Table-1), due to favorable conditions provide in polyhouse and genetic makeup of the genotype. Former workers specifically, Naik *et al.* (2018) [14], Singh *et al.* (2020) [17] and Kumari and Patil (2021) [11] also provide conformity results to the findings.

Days to first picking

Primary fruit maturity and picking is very important character of superior genotype. Significant differences for days to first picking were detected among the genotypes under study (Table-1). Mean values for different hybrids revealed that line KCA-2 took minimum number of days to first picking and was the earliest in maturity and hybrids Heemsona, NS-4266 and EZ-9003 were found statistically at par due to the interaction between suitable environmental conditions and genes of genotype (Table-1). Wide variability with respect to this particular trait was also observed by Jindal and Dhaliwal (2018) [6], Kathimba *et al.* (2021) [8] and Mounica *et al.* (2022) [13] respectively.

Number of fruits per plant

The number of fruits per plant is one of the most necessary parameters and directly proportional to the yield. Among all the hybrids, maximum number of fruits per plant were recorded in Heemsona which were significantly higher than the other genotypes but statistically at par with the Punjab Sartaj, check Punjab Gaurav and line KCA-2 (Table-1). The significantly rise in fruit number might be due to the reason that plant height was maximum and internodal length was shorter than others. These finding are assisted by Cheema *et al.* (2013) [1], Singh *et al.* (2015) [16], Triveni *et al.* (2017) [17] and Limbani and Makati (2020) [12].

Fruit weight (g)

Average fruit weight is the most significant yield contributing character. Fruits with maximum weight are required by the farmers in order to get more marketable yield per plant. Hybrid NS-4266 had maximum fruit weight among all the

hybrids whereas EZ-9003, Heemsona and Punjab Swarna were reported statistically at par because of the more absorption of water in locules and due to interaction between genetic factor and environmental conditions exist during fruit growth and development (Table-1). Variations for this trait were also reported by Ummiyah *et al.* (2015) [19], Zorb *et al.* (2020) [21] and Datta and Mehta (2020) [3].

Internodal Length (cm)

Plants having less inter-nodal length and a greater number of nodes have desired for getting higher yield. Mean values for different genotypes exposed that hybrid NS-4266 took minimum shorter internodal length and genotype EZ-9003, Heemsona and Punjab Sartaj were found statistically at par (Table-1). Variation was observed among the hybrids for inter-nodal length due to the hereditary makeup of cultivars. The results related to internodal length are in close with the findings of Dhillon *et al.* (2019) [4], Waiba *et al.* (2021) [20] and Mounica *et al.* (2022) [13].

Plant Height (cm)

Height of the plant is one of the imperative factors determining yield and harvest duration exclusively in plants with indeterminate type of growth habit with short internodal length. The hybrid Yuvraj-1003 was found to be significantly taller whereas, Heemsona, NS-4266 and EZ-9003 were taller but statistically at par with it (Table-1). The tallness, shortness and other differences are the varietal characteristics, which are controlled and expressed by certain genes with the interaction of growing environmental condition. These results are significant with the findings of Limbani and Makati (2020) [12], Kumar and Rana (2021) [10] and Kumari and Patil (2021) [11] correspondingly.

Fruit yield per plant (kg)

Yield is responsible for commercial viability of a variety. The recorded data on fruit yield per plant revealed significant variation among various hybrids (Table-1). In present study, maximum number of fruits per plant was observed in hybrid Heemsona which was statistically at par with NS-4266, EZ-9003 and line KCA-2 because of its genetic makeup and maximum number of fruits per plant, plant height with minimum inter-nodal length and higher fruit weight. Such kind of genetic differences for marketable fruit yield and other plant characters in different tomato hybrids had also been reported by Premalakshami *et al.* (2017) [15], Kherwa *et al.* (2018) [9] and Hassan *et al.* (2021) [5].

Fruit yield kg per square meter

This particular trait depends upon fruit yield per plant and plant population. The significantly higher yield per square meter was recorded in hybrid Heemsona as compared to other genotypes but statistically at par with the NS-4266, EZ-9003 and line KCA-2 (Table-1). This might be again due to genetic makeup of the genotype and had maximum number of fruits per plant, plant height and minimum inter-nodal length and was early in flowering and fruiting. These genetic differences for marketable fruit yield per meter square had also been reported by Kathimba *et al.* (2021) [8] and Waiba *et al.* (2021) [20].

Table 1: Mean performance of indeterminate tomato hybrids for growth and yield characters

Hybrids	Days to 50% flowering	Days taken to first fruit harvest	Number of fruits per plant	Average fruit weight	Internodal length (cm)	Plant height (cm)	Fruit yield per plant (kg)	Fruit yield kg per square meter	Days to 50% flowering
EZ-9003	38.50	83.01	47.18	84.36	14.90	288.20	3.97	18.88	38.50
Yuvraj 1003	51.16	92.38	43.83	69.53	22.91	318.41	3.05	14.51	51.16
JC-165	45.02	87.36	41.64	66.43	18.75	265.63	2.76	13.15	45.02
Heemsona	40.92	77.84	58.45	79.86	15.88	308.52	4.66	22.19	40.92
Namdhari	42.22	80.62	48.55	88.86	13.86	303.17	4.31	20.51	42.22
KCA-1	54.74	93.63	43.58	57.63	20.95	174.14	2.50	11.91	54.74
KCA-2	39.33	75.67	50.27	74.16	17.80	267.69	3.72	17.70	39.33
Arka Vikas	49.58	95.00	43.47	55.03	21.89	157.20	2.38	11.32	49.58
Punjab Swarna	47.67	92.33	43.85	77.46	19.64	256.13	3.41	16.21	47.67
Arka Saurabh	51.14	94.79	33.86	60.43	21.25	204.54	2.04	9.71	51.14
Punjab Sartaj	45.06	90.74	55.82	65.03	16.91	276.10	3.63	17.29	45.06
Punjab Gaurav (check)	43.80	92.96	54.90	59.38	20.56	209.45	3.26	15.53	43.80
C.D. ($p \leq 0.05$)	3.84	6.37	9.42	6.69	2.21	9.97	0.63	3.00	3.84

Conclusion

On the basis of results obtained it may be concluded that among the various treatments, Heemsona and NS-4266 performs well for all the traits while EZ-9003 was sophisticated for days to 50% flowering, average fruit weight, internodal length, fruit yield per plant and fruit yield kg per meter square however Punjab Sartaj was greater for number of fruits per plant and it is determined by the better growth, development and yield of tomato which were accomplished under polyhouse condition due to the optimum temperature and relative humidity during the growing period which definitely influenced the morpho-phenological and physiological measures of tomato plants.

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References

- Cheema DS, Singh N, Jindal SK. Evaluation of indeterminate tomato hybrids for fruit, yield and quality traits under net house and open field conditions. *Vegetable Science*. 2013;1:45-49.
- Cochran WG, Cox GM. *Experimental Designs*. Asia Publishing House, Bombay, 1963, 293-316.
- Datta B, Mehta DR. Generation mean analysis in tomato (*Solanum lycopersicum* L.): Estimation of gene actions for fruit yield and its component traits. *Journal of Pharmacognosy and Phytochemistry*. 2020;4:314-316.
- Dhillon NS, Sharma P, Kumar P, Sharma V. Comparative performance of tomato genotypes for yield and quality characters under protected environment. *International Journal of Chemical Studies*. 2019;7:1678-1680.
- Hassan M, Ashraf T, Asim M, Khan BA, Nadeem MA, Naseer MU, *et al.* Evaluation of different varieties of tomato for growth and seed quality in district Sargodha climate. *Plant Cell Biotechnology and Molecular Biology*. 2021;22:533-545.
- Jindal SK, Dhaliwal MS. Punjab Swarna: high yielding tomato variety for naturally ventilated polynet house cultivation. *Vegetable Science*. 2018;2:269-271.
- Kathayat K, Singh A, Rawat M. Morphological characterization of tomato (*Solanum lycopersicum* L.) germplasm in Tarai region of Uttarakhand. *Horti Flora Research Spectrum*. 2015;4:220-223.
- Kathimba FK, Kimani PM, Narla RD, Kiirika LM. Characterization of tomato germplasm accessions for breeding research. *Journal of Agricultural Biotechnology and Sustainable Development*. 2021;2:20-27.
- Kherwa RS, Solanky SS, Akhtar S, Kumar A, Kumari R. Genetic studies of wild and cultivated tomato (*Solanum lycopersicum* L.) genotypes. *International Journal of Current Microbiology and Applied Sciences*. 2018;7:2568-2574.
- Kumar MN, Rana MK. Evaluation of tomato (*Solanum lycopersicum* L.) genotypes for yield and yield attributing characters in semiarid zone of Haryana (Hisar). *The Pharma Innovation Journal*. 2021;5:1246-1249.
- Kumari S, Patil S. Assessment of genetic variability, heritability and genetic advance in tomato. *International Journal Current Microbiology Applied Sciences*. 2021;12:322-333.
- Limhani H, Makati JP. Genetic variability and D² analysis for yield and quality traits in tomato (*Solanum lycopersicum* L.). *International Journal of Current Microbiology and Applied Sciences*. 2020;9:2163-2174.
- Mounica N, Padma E, Madhavi M, Suneetha S. Evaluation of tomato (*Solanum lycopersicum* L.) hybrids for growth and yield attributes under coastal conditions of Andhra Pradesh. *The Pharma Innovation Journal*. 2022;4:1403-1408.
- Naik MR, Ruth CH, Chinnabbai CH. Growth, flowering and yield response of tomato varieties under polyhouse conditions. *International Journal Pure Applied Biosciences*. 2018;1:1303-1307.
- Premalakshmi V, Khuntia S, Kamalkumaran PR, Arumugam T. Evaluation of indeterminate tomato (*Solanum lycopersicum* L.) genotypes for growth and yield traits under polyhouse condition. *Madras Agriculture Journal*. 2017;104:405-409.
- Singh M, Ameta KD, Kaushik RA, Rajawat KS. Evaluation of tomato (*Solanum lycopersicum* L.) hybrids for quality traits, yield and fruit under polyhouse conditions. *Current Journal of Applied Science and Technology*. 2020;38:1-6.
- Singh N, Ram CN, Deo C, Yadav GC, Singh DP. Genetic variability, heritability and genetic advance in tomato (*Solanum lycopersicum* L.). *Plant Archives*. 2015;15:705-709.
- Triveni D, Saidaiah P, Reddy KR, Pandravada SR. Mean

- performance of the parents and hybrids for yield and yield contributing traits in tomato. *International Journal Current Microbiology Applied Sciences*. 2017;11:613-619.
19. Ummyiah HM, Jabeen N, Parveen K. Performance of some varieties and hybrids of tomato (*Solanum lycopersicum* Mill.) across environments under Kashmir conditions. *Environment & Ecology*. 2015;2:540-543.
 20. Waiba KM, Kasi IK. Studies of genetic variability of tomato (*Solanum lycopersicum* L.) hybrids under protected environment. *International Journal of Bio-resource and Stress Management*. 2021;12:264-270.
 21. Zorb C, Piepho HP, Zikeli S, Horneburg B. Heritability and variability of quality parameters of tomato in outdoor production. AAAS, 2020, 9pp.