



Research Article

PERFORMANCE EVALUATION OF GROWTH, YIELD AND QUALITY OF TOMATO INDETERMINATE ENTRIES (*Lycopersicon esculentum* Mill.) ALL INDIA CO-ORDINATED VEGETABLE IMPROVEMENT PROJECT (AICVIP) VARIETAL TRIALS (AVT-II)

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Abstract: The field experiment was carried out to study the performance evaluation of All India Co-Ordinated Vegetable Improvement Project (AICVIP) varietal trial (AVT-II) on growth, yield and quality of Tomato Indeterminate entries from 2014 to 2015 at the Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. The seeds of the tomato Indeterminate (AVT-II) Six entries were chosen for this study. Among the Six entries tested (AVT-II), the highest fruit yield (345.0 q/ha) was recorded in 2012/ TOINDVAR-4 followed by ARKA VIKAS (C) (335.0 q/ha), whereas, the lowest fruit yield (291.0 q/ha) was recorded in 2012/ TOINDVAR-1.

Keywords: ICAR-ICRP-VC -Tomato Indeterminate varietal entries (AVT-II), growth, Yield

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Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most popular and widely consumed vegetable crops worldwide and has recently gained considerable attention in relation to its health benefits. Tomato fruit contains lycopene an antioxidant that contributes to the prevention of certain cancers [1] such as cancers of prostate, lung and stomach [2]. The fruit also contains vitamin A which is important for growth, improvement of eyesight and the regulation of immune system [3]. Moreover, the fruit contains vitamin C which is important in formation of collagen, a protein that gives structure to bones, cartilage, muscles and blood vessels [3]. Tomatoes can be consumed fresh or in a Multiple of processed forms. There has been a marked increase in the consumption of fresh cut vegetables around the globe due to health concerns [4]. Tomatoes require different climatic range for seed germination, seedling growth, and flower set and fruit maturity. The optimum average monthly temperature range is 21°C-30°C [5]. Tomato cultivation can be conducted in open field conditions or in the greenhouse under environmentally regulated conditions. There has been a rapid increase in vegetable production in Zimbabwe in the recent years with tomato ranking high amongst the list [6]. This rapid production calls for high yielding and efficient methods for tomato production. Over the years, a lot of emphasis has been made on developing improved varieties with better processing qualities as well as horticultural characteristics which include field vine storage, disease and nematode resistance, transportability and early maturing among others. This led to tomato breeding companies producing F1-Hybrids. Tomato (*Lycopersicon esculentum* Mill.) is one of the most important edible and nutritious vegetable crops in the world. It ranks next to potato and sweet potato with respect to world vegetable production. It is widely cultivated in tropical, subtropical and temperate climates and thus ranks third in terms of world vegetable production [7]. The leading tomato producing countries are China, the United State of America, India, Egypt, Turkey, Iran, Mexico, Brazil and Indonesia [7]. A total of 7,255.93 hectares of land was under tomato in the country and yielding about 81,738.05 tones of

tomato production in Ethiopia [8]. Tomato is an essential ingredient in the diet of the people and often used in almost every household. It is used in preparing soups, sauces, stews, salads and other dishes, and used in large quantities as compared to other vegetables [9]. The fruit is fairly nutritious and contains high amount of vitamins A and C [10]. Such diverse uses make the tomato an important vegetable in irrigated agriculture in Ethiopia and the production is rapidly increasing in many parts of the country. However, local production of tomato in eastern Harerghe is not able to meet the domestic demand. This has led to high supply of tomato from other parts of the country. The landholding of Ethiopian farmers is so much fragmented with most farmers owning a piece of land less than a hectare. The rainfall pattern is so Erratic and intensive throughout when it rains. Currently, it is being tried to harvest rain water using different water harvesting structures and using it in combination with gravity drip system. This is useful especially for vegetable production which can augment farmers' income and nutritional intake. Tomato generally requires warm weather and abundant sunshine for best growth and development. The climatic soil conditions of Ethiopia allow cultivation of a wide range of Fruit and vegetable crops including tomato, which is largely grown in the eastern and central parts of the mid- to low-land areas of the country. Large scale production of tomato takes place in the upper Awash valley, under irrigated and rain-fed conditions whereas small scale production for fresh market is a common practice around Koka, Ziway, Wondo-Genet, Guder, Bako and many other areas [5]. In 2008, tomato production in Ethiopia reached about 41, 815 tons from a total harvested area of 3542 ha [6]. The shortage of varieties and recommended information packages, poor irrigation systems, lack of information on soil fertility, diseases and insect pests, high postharvest loss, lack of awareness of existing improved technology and poor marketing system are the major constraints in Ethiopian tomato production [11]. This study therefore aims at investigating the performance evaluation of growth, yield and quality of tomato Indeterminate entries- All India Co-ordinated Vegetable Improvement Project (AICVIP) varietal trials (AVT-II) have been received from

Tables-1 Performance of (AVT-II) entries on growth and yield quality of Tomato Indeterminate

Name of the entry	Days to 50% flowering	Days to first fruit harvest for earliness etc	Marketable yield/plot (kg)	Un Marketable yield/plot (kg) (Average of 10 plants)	Yield q / ha	TSS (%)
2012 / TOINDVAR-1	62.0	86.0	52.8	7.5	291.1	4.46
2012 / TOINDVAR-2	60.0	83.0	54.6	8.3	300.5	4.60
2012 / TOINDVAR-3	58.0	80.0	54.5	8.0	301.7	4.23
2012 / TOINDVAR-4	54.0	76.0	62.8	9.6	345.0	4.46
2012 / TOINDVAR-5	56.0	78.0	58.7	8.9	324.0	3.83
ARKA VIKAS (C)	59.0	84.0	60.5	9.1	335.0	4.16
CD%	5.96	86.0	12.23	1.44	15.11	0.75
CV%	5.64	83.0	11.73	9.24	2.63	9.65

Tables-2 Performance of (AVT-II) entries on growth and yield quality of Tomato Indeterminate

Name of the entry	Plant height (cm) (Average of 10 plants)	Fruit length (cm) (Average of 10 fruits)	Fruit circumference/girth (cm) (Average of 10 fruits)	Average fruit weight (Average of 10 fruits)	No. of locules/fruit (Average of 10 fruits)	No. of fruit/plant (Average of 5 plants)	Duration of crops (days)
2012 / TOINDVAR-1	90.0	6.2	11.3	36.0	5.0	24.8	170.66
2012 / TOINDVAR-2	92.0	7.1	15.0	50.1	5.0	17.5	168.00
2012 / TOINDVAR-3	97.0	8.5	16.3	60.0	5.0	16.3	165.00
2012 / TOINDVAR-4	110.0	8.13	16.2	59.3	5.0	18.5	157.00
2012 / TOINDVAR-5	100.0	4.2	8.1	7.6	4.0	128.2	160.00
ARKA VIKAS (C)	94.0	8.8	17.5	63.0	6.0	18.0	161.66
CD%	10.05	0.81	1.01	8.69	NS	8.24	3.72
CV%	5.69	6.27	3.95	10.39	NS	12.12	1.25

IIVR, Varanasi and these varietal trials were conducted from 2014 to 2015 at the Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore. Application of fertilizers- Tomato Indeterminate Recommended dose: Apply FYM 25 t/ha, N 75 kg, P 100 kg, K 50 kg, Borax 10 kg and Zinc sulphate 50 kg/ha as basal dose and 75 kg N/ha on 30th day of planting during earthing up. Spray 1.25 ppm (1.25 mg in one lit) Triacanol, 30 days after transplanting and at full bloom stage to increase the yield. As per the TNAU recommendation has been followed this Trials.

Materials and Methods

The present investigation was carried out at All India Co-Ordinated Vegetable Improvement Project (AICVIP) at the Department of Vegetable Crops, Horticultural College and Research Institute, Coimbatore from 2014 to 2015. Field trials were laid out in randomized block design with replicated thrice. Tomato Indeterminate varietal trials (AVT-II) Six entries were taken for this study. The seeds of the Tomato Indeterminate AVT-II entries viz. 2012/ TOINDVAR-1, 2012/ TOINDVAR-2, 2012/ TOINDVAR-3, 2012/ TOINDVAR-4, 2012/ TOINDVAR-5 and ARKA VIKAS (C). The seeds of the Tomato Indeterminate entries were sown at a spacing of 75 x 40 cm with the plot size of 4.5 x 4.0 m. The results of the Tomato Indeterminate entries (AVT-II) were presented in the [Table-1] and [Table-2].

Results and Discussion

The results revealed that (AVT-II), the highest fruit yield (345.0 q/ha) was recorded in 2012/ TOINDVAR-4 followed by ARKA VIKAS (C) (335.0 q/ha), whereas, the lowest fruit yield (291.0 q/ha) was recorded in 2012/ TOINDVAR-1. These findings are similar to those reported [12] who observed significant differences in fruit yield per plant and total fruit yield among different varieties. It is also obtained significant differences amongst different tomato varieties [13]. The yield variation could be related to genetic differences among the varieties since they were grown under the same environmental conditions [12]. Days to 50% of flowering for tomato Indeterminate AVT-II entries showed significant variations. Early 50% of flowering was found from 2012/ TOINDVAR-4, (54.0 days). Which was followed by 2012/ TOINDVAR-5 (56.0days). Days to first fruit harvest for earliness was found from 2012/ TOINDVAR-4 (76.0days). Which was followed by 2012/ TOINDVAR-5 (78.0days). Marketable fruit yield showed significant variations. The maximum marketable fruit yield per plot was recorded in 2012/ TOINDVAR-4 (62.8 kg/plot) followed by ARKA VIKAS (C) (60.5 kg/plot), while the minimum marketable fruit yield per plot was recorded in 2012/ TOINDVAR-1 (52.8 kg/plot). The maximum TSS was recorded in 2012/ TOINDVAR-2(4.60%) followed by 2012/ TOINDVAR-1&4 (4.46%), while the minimum TSS was observed in 2012/ TOINDVAR-5

(3.83%). The plant height showed significant variations among the different varietal entries. The maximum plant height was recorded in 2012/ TOINDVAR-4 (110.0 cm) which was followed by 2012/ TOINDVAR-5 (100.0 cm) while the minimum plant height was noticed in 2012/ TOINDVAR-1 (90.0 cm). Fruit length and width showed significant variations among the different varietal entries. The maximum fruit length and girth was found from ARKA VIKAS (C) (8.8 cm), ARKA VIKAS (C) (17.5cm) respectively, while the minimum was observed from 2012/ TOINDVAR-5 (4.2cm), 2012/ TOINDVAR-5(8.1cm) respectively. Average fruit weight varies among the different entries. However, maximum average fruit weight was found from ARKA VIKAS (C) (63.0 g), followed by 2012/ TOINDVAR-3 (60.0g), while the minimum average fruit weight was noticed in 2012/ TOINDVAR-5 (7.6 g). The number of fruits per plant showed significant variations among the Entries. The maximum number of fruits per plant was recorded in 2012/ TOINDVAR-5 (128.2 nos) followed by 2012/ TOINDVAR-1 (24.8 nos), while the minimum number of fruits per plant was recorded in 2012/ TOINDVAR-3 (16.3 nos) duration of crops showed significant variations among the cultivars. The maximum duration of crops was found from 2012/ TOINDVAR-1 (170.66days) followed by (168.0 days), while the minimum duration of crops was found from 2012/ TOINDVAR-4 (157.0 days). The varietal differences in growth and yield might be attributed to the differences in ecological distribution of the tomato varieties [14]. Besides the differences of varietal genetic makeup, the low marketable yield obtained for some tomato varieties used might be due to non-development of flowers into fruits as about 50% of the flowers developed into fruits. These results get support from the previous work [15, 16&17] who observed time variation in fruit setting in different tomato cultivars. They highlighted that the genetic factors of the hybrids and the environmental conditions prevailing at the experimental site might have caused the earliness in fruit set of some of the varieties.

Conclusion

From the above study, it could be concluded, among the Six entries tested (AVT-II), the highest fruit yield (345.0 q/ha) was recorded in 2012/ TOINDVAR-4 followed by ARKA VIKAS (C) (335.0 q/ha), whereas, the lowest fruit yield (291.0 q/ha) was recorded in 2012/ TOINDVAR-1.

Application of research: The seeds of the Tomato Indeterminate AVT-II entries viz. 2012/ TOINDVAR-1, 2012/ TOINDVAR-2, 2012/ TOINDVAR-3, 2012/ TOINDVAR-4, 2012/ TOINDVAR-5 and ARKA VIKAS (C). Among the Six entries tested (AVT-II), the highest fruit yield (345.0 q/ha) was recorded in 2012/ TOINDVAR-4 followed by ARKA VIKAS (C) (335.0 q/ha), whereas, the lowest fruit yield (291.0 q/ha) was recorded in 2012/ TOINDVAR-1.

Abbreviations:

AVT-Advanced Varietal Trial
 TOIDVAR-Tomato Indeterminate variety
 NPK-Nitrogen, Phosphorus and Potash
 G-Grams
 C-Check (Variety)
 LC-Local check
 Q/HA-Quintal per Hectare

- [15] Khokhar K.M., Hussain S.I., Mahmood T., Hidayatullah and Laghari M.H. (2002) *Asian J. Plant Sci.*, 6, 659-660.
- [16] Chaudhry M.F., Khokhar K.M., Hussain S.I., Mahmood T. and Iqbal S.M. (1999) *Pak. J. Arid. Agri.*, 1(1), 33-35.
- [17] Hussain S.I., Khokhar K.M., Mahmood T., Laghari M.H. and Mahmud M.M. (2001) *Pakistan J. of Bio. Sci.*, 10(4), 1215-1216.

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Study area / Sample Collection: Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, 641003, Tamil Nadu

Cultivar / Variety name: Tomato (*Lycopersicon esculentum* Mill.)

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References

- [1] Giovannucci E. (1999) *J. of the Nat. Cancer Inst.*, 91(4), 317-331.
- [2] Canene Adams K., Campbell J.K., Zaripheh S., Jeffery E.H. and Erdman J.W. (2005) *The J. of Nutrition*, 135(5), 1226-1230.
- [3] Fontem D.A. (1991) *In Bio.sci. Proc.*, 2, 82-86.
- [4] Farai Isabel Chibi, Tsvakai Mushayabasa and Elphigio Magejo (2015) *Annals of Biological Research*, 6(6), 65-68
- [5] Brentlinger D. (1997) *An Int. Symposium on Growing Media and Hydroponics*, 481, 731-734.
- [6] Jackson J.E., Turner A. and Matanda M. (1997) *Smallholder hort.in Zimbabwe. University of Zimbabwe*
- [7] FAO (2006) *FAO Production Year Book. Basic Data Unit, Statistics Division, FAO, Rome, Italy*, No. 55, 125-127.
- [8] Central Statistic Authority. (2012) *Report of Federal Democratic Republic of Ethiopia, Statistical Report on Socio- Economic Characteristics of the Population in Agricultural Households, Land Use, Area and Production of Crops. Addis Ababa, Ethiopia.*
- [9] Ellis (1998) *J. of the Ghana Sci.*, 1(1), 55-59.
- [10] AVRDC (2004) *Medium-term plan, 2004-2006. High lights. AVRDC-The World Veg. Center, Shanhu, Taiwan.*
- [11] Lemma D. (2002) *Ethiopian Agrl. Res. Org., (EARO), Addis Ababa, Ethiopia*, 20-28.
- [12] Hussain S.I., Khokhar K.M., Mahmood T., Laghari M.H. and Mahmud M. M. (2001) *Asian J. Plant Sciences*, 1(6), 661-662
- [13] Olaniyi J.O. and Fagbayide J.A. (1999) *J. of Agrl. Biotech. and Environment*, 1, 4-10.
- [14] Olaniyi J.O. (2007) *Res. J. Agron.*, 1 (2), 42-45.