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EFFECT OF SEEDLING AGE ON GROWTH AND FLOWERING ATTRIBUTES OF TOMATO (*Lycopersicon esculentum* Mill.)

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ABSTRACT : The experiment was conducted at the Department of Horticulture, C.S.A.University of Agriculture and Technology, Kanpur during the year 2014-15 to find out effect of seedling age on growth and flowering attributes of tomato (*Lycopersicon esculentum* Mill.).Randomized block design (RBD) was used with eight treatments of seedling age *i.e.,* T_1 (16 days), T_2 (20 days), T_3 (24 days), T_4 (28 days), T_5 (32 days), T_6 (36 days), T_7 (40 days) and T_8 (44 days) and three replications. Observations were recorded on growth and flowering attributes *i.e.,* height of plant, spread of plant, number of primary branches/plant, number of secondary branches/plant, day to first flower initiation and number of flower per plant. The results showed that T_3 (24 days old seedling) increased significantly to plant height, spread of plant (N-S,E-W), and number of flowers/plant revealing 63.19 cm maximum plant height, maximum plant spread 116.18 cm (N-S) and 171.13 cm (E-S), and maximum number of flower/plant (69.64) respectively. Treatment T_4 (28 days old seedling) enhanced number of primary branches (7.35) which was greater variation among treatments while number of secondary branches were significantly influenced (9.65) with T_4 treatment also. Days to first flower initiation was significantly enhanced with T_1 treatment (62.15 days).

Keywords : *Tomato, seedling age, growth, flowering.*

Tomato (*Lycopersion esculentum* Mill.) belonging to the family Solanaceae, is one of the most popular and widely grown vegetable crop in the world. Tomato is warm season crop and highly susceptible to frost and high humidity and perishable in nature. The perishability of tomato is high and ranges up to 60 per cent. It is most important protective food both because of its nutritive value and also due to wide spread production. It is world's largest vegetable crop after potato and sweet potato but it is to in the list of canned vegetables also. The peoples who eat tomato regularly reduced risk of cancer disease and it has detoxification effect in the body.

There are scanty literatures and researches about seedlings right age either there is great mortality or the seedling become susceptible to draught hampering, so, growth and yield are depressed ultimately. Therefore, transplanting seedlings of proper age is essential. So, optimal age of seedling for transplanting is therefore, needed to work out the right stage of transplanting for raising good crop of tomato under the agro climatic condition of Central Uttar Pradesh which is utmost importance. Important view as above, the present investigation entitled effect of age on growth and flowering attributes of tomato was conducted.

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MATERIALS AND METHODS

The experiment was conducted at Horticulture garden of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur during Rabi Season 2014-15. Geographically, Kanpur is situated in the belt of Gangatic plain of central U.P. It falls in latitude and longitude range of 79.30° to 84.34° East and 25.28° North, respectively. The mean elevation is 125.90 meters. Agro-climatically Kanpur is characterized by semi-arid and sub-tropical climate with hot dry summer and cold winter. The annual rain fall is about 800-850 mm.The maximum temperature ranges from 24° to 42° C , minimum 8.3 to 27.8°C and the relative humidity is 40 to 97 per cent in different months of the year. The soil of experimental field was sandy loam. Mechanical analysis of soil was done by "International pipette method" as suggested by Piper (9).The chemical analysis of soil *i.e.,* pH organic carbon, available nitrogen, available phosphorus and potash were estimated with Piper (9), A.O.A.C. (2), Olsen *et al.* (7) and Walkley and Black (16), respectively.

Genetically pure seed of tomato var. Azad T-5 were obtained from Department of Vegetable Science Chandra Shekhar Azad University of Agriculture and Technology, Kanpur.The experiment comprises 8 treatments of seedling age T_1 (16 days), T_1 (20 days), T_3 (24 days), T_4 (28 days), T_5 (32 days), T_6 (36 days),

T_7 (40 days) and T_8 (44 days).For obtaining of these different age of seedlings, sowing of seed of tomato as nursery raising was proceed from 18.09.2014 to 20.10.2014 in 4 days intervals. Transplating of seedlings were performed on 04.11.2014 in 3 replication in randomized block design.

Prior to nursery raising as well as transplanting all soil preparation procedures was followed to prepare ideal soil for seedling and tomato transplanting. Recommended dose of fertilizers were also applied as norms. All the weeding, sanitation and controlling of disease pest recommendations were followed. Healthy seeding of tomato variety Azad T-5 were planted at each spotted place (45×45 cm) in each treatment and each replication and thereafter, soil was pressed which was followed by the light irrigation. Further requirement of irrigation was also provided as norms and needs. Hoeing and weeding was done as manually. Earthing up of crop was done with the help of *Khurpi*.

Data for recording of vegetative and flowering attributes, 5 plants under each treatment were tagged randomly. The height of plant was measured with the help of meter scale at prematurity stage under each treatment and mean value was derived statistically. Number of primary branches was counted manually and average of 5 plants per plot was taken. Secondary branches were also counted manually and observations were recorded. Days to first flower initiation was determined from the date of showing of seed to date when first flower initiated. Number of flowers per plants was also counted. The observations were analyzed statistically.

RESULTS AND DISCUSSION

The results obtained in the present investigation revealed that different treatments of seedling age of tomato influenced various parameters of growth and flowering (Table 1). Effect of age of transplant on height of plant at 90 days after transplanting revealed that the data including different treatments enhanced the height of plant Treatment T_3 (24 days old transplant) showed maximum plant height (63.19 cm) which is significantly highest overall treatments barring T_2 and T_4 treatments. Treatments of T_2 and T_4 revealed 61.23 and 60.34 cm values respectively which were statistically at par with T_3 treatment (63.19 cm),where as significantly minimum plant height was registered under T_1 (52.10 cm). Such type of experimental findings had also been reported by Sharma and Tiwari (11) and Adelana (1) in tomato.

Age plays significant role in spread of plant. Results clearly indicated that the spread of plant (N-S) at ripening showed greater variation and maximum (116.18 cm) plant spread (N-S) was recorded with T_3 treatment which is significantly greatest over all the treatments. The treatment T_3 proved superior being statistically at par with T_4, T_2 and T_5 showing 113.44, 114.23 and 112.39 cm plant spread respectively.

The minimum plant spread (N-S 105.10 cm) showed with T_1 (16 days old transplant) treatment which was 10.54% less than maximum spread of T_3 treatment spread of plant (East-West). Treatment T_3 *i.e.,* 24 days old transplant caused 171.13 cm greater spread and the minimum spread (161.12 cm) was observed with T8 (44days old seedling).These findings regarding spread of plant from North to South and East to West are also in line with the reports of Chowdhury *et al.* (3) in brinjal and Leskovar *et al.* (6) in tomato.

The number of primary branches per plant at 95 days after transplanting was recorded treatment wise (Table 1).The mean value showed that the effect of different treatment on number of primary branches indicated greater variation in treatments, T_4 (28 days old transplant) resulted in maximum number of primary branches (7.35) which proved significantly higher over all other treatments. T_4 being most effective maximized primary branches followed by T_3 and T_5 (6.21 and 6.01 cm) plant spread significantly. The minimum primary branches 5.37 was noted with T_8 (44 days old transplant) which was 36.87% lesser than treatment T_4 .These finding are in consonant with the reports of Tsekleev and Bakhchevanova (14), Sharma and Tiwari (11) and Supe and Kale (13) in tomato.

Effect of age of transplant on number of secondary branches was also recorded at 95 days after transplanting and the mean values showed that the number of secondary branches influenced by age of transplant varied significantly. Treatment T_4 (28 days old transplant) maximized number of secondary branches (9.65) which was significantly higher over all the other treatments. Statistical analysis exhibited that treatment T_4 has proved superior followed by treatment T_3 and T_5 producing 8.15 and 7.89 number of secondary branches per plant, respectively. The poorest (7.05) number secondary branches were observed with T_8 (44 days old transplant), Tsekleev and Bakhchevanova (14) and Supe and Kale (13) in tomato gave similar results on number of secondary branches.

The mean value showed that effect of different treatments on days to first flower initiation was significantly varied. T_1 (16 days old transplant) required maximum days taken to express flower initiation (62.15 days) which was significantly higher as compared to all

Table 1 : Effect of different seedling age on growth and flowering attributes of tomato.

Treatments	Height of plant(cm)	Spread of plant(cm) N-S	Spread of plant(cm) E-W	Number of primary branches/ plant	Number of secondary branches/ plant	Days to first flower initiation	Number of flowers/plant
16 days old transplant (T_1)	52.10	105.10	161.78	5.60	7.35	62.15	50.72
20 days old transplant (T_2)	61.23	114.23	164.26	5.73	7.52	52.48	60.16
24 days old transplant (T_3)	63.19	116.18	171.13	6.21	8.15	48.46	69.64
28 days old transplant (T_4)	60.34	113.44	168.35	7.35	9.65	47.33	67.12
32 days old transplant (T_5)	56.09	112.39	169.23	6.01	7.89	50.85	63.92
36 days old transplant (T_6)	59.36	109.19	167.36	5.82	7.64	49.22	65.88
40 days old transplant (T_7)	57.27	110.28	165.41	5.52	7.25	46.71	64.51
44 days old transplant (T_8)	54.16	107.32	161.12	5.37	7.05	45.45	61.97

other treatments followed by T_2 (52.48 days) and T_5 (50.85 days). However, treatments T_2 and T_3 (48.46 days) showed significantly lesser period than T_1 treatment. 44 days old transplant (T_8) expressed earliest flower initiation 45.45 days which is closely followed by 40 days old transplant (46.71 days). Both treatments T_8 and T_7 did not show significant variation in this regard. These findings are in agreement with reports of Chowdhury *et al.* (3) in brinjal, Rahman *et.al.* (10), Zhao and Chen (18), Vavrina and Orzole (15) and Weston and Zandastra (17) in tomato.

Effect of age of transplant on number of flowers per plant,till harvesting was observed and data showed that treatment T_3 (24 days transplant) produces maximum number of flower (69.64) being significantly higer than T_1 (50.72), T_2 (60.16) and T_8 (61.97) treatments. Statistically data proved that treatment T3 is superior followed by treatments T_4, T_6, T_7 and T_5 revealing 67.12, 65.88, 64.51 and 63.92 flowers per plant respectively showing variation but did not differ significant when compared among each other. Thus, treatment T_3 (24 days old transplant produce maximum 69.64 flowers per plant while the minimum 50.72 flowers per plant was observed with T_1 (16 days old transplant). The difference between maximum and minimum number of flower production is 48.50% which was mostly affected age of transplant. These findings are similar with the reports of Sharma and Tiwari (11) Goto *et al.* (4), Shukla *et al.* (12) and Oviedo and Minami (8) in tomato.

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