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Influence of Organic Manure and Seedling Age on Growth and Yield of Tomato (*Lycopersicon esculentum Mill.)* cv. Ayaan

Amita Choudhary*, Anshul Asre, Dilip Pathak, Aayushi Singh, Gulshan Pandey and Pooja Joddar

Department of Horticulture, Faculty of Agricultural Sciences and Technology AKS University Sherganj, Satna - 485001 (M.P.), India

**Corresponding author*

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A B S T R A C T

An experiment was conducted on seedling age of tomato (*Lycopersicon esculentum*) at the student instructional field, department of Horticulture, AKS University sherganj, satna (M.P.) during *rabi* 2023-24. There were 12 treatments of seedlings age viz. 25, 30, 35 days old which were tested in RBD with factorial concept. The results revealed that poultry manure@2ton/ha and 25 days old seedlings recorded highest values of plant height (53.46cm), maximum number of branches per plant (18.40), maximum number of leaves per plant (102.83), maximum number of days taken to 1st flowering (46.13), number of days taken to 50% flowering (43.93), number of fruits/plant (27.60), fruit weight/plant (54.61 g), fruit yield/plot (21.56kg), fruit yield/ha (507.81q/ha), and fruit diameter (4.00 cm) were found are most suitable for transplanting of tomato during *rabi* season to get higher crop yield in vindhya region of Madhya Pradesh.

Introduction

Tomato (*Solanum lycopersicum* L.) is a very important vegetable crop belong to the family solanaceae and consumed in most parts of the world, from home gardens and greenhouses to large commercial farms due to its wider adaptability to various agro-climatic conditions. It is one of the most fashionable salad vegetables and is taken with great relish. Tomatoes contribute to a healthy, well-balanced diet and are rich in minerals, essential amino acids, sugars, and dietary fibers. In India tomato is grown over an area of 0.81 M hectares with an annual production of 21003 Mt and in Madhya Pradesh, area 37 thousand hectare fallowed by Haryana 14 hectare, Uttar Pradesh 12.8 thousand hectare, Himachal Pradesh area under tomato is 1.3 thousand hectares and production is 577 Mt. (Anonymous, 2021)

The term "Organic fertilizer "comprises material from animal or plant origin. It covers all soil amendments that add to the pool of soil organic matter, namely organic compounds and carbon. Soil organic matter improves the physical properties of the soil by improving its structure and water holding capacity and by preventing nutrient leaching. Organic farming leads to reduction in total crop yield by 9.2 %, but it provides higher net profits to the farmers by 22.0 % as compared to conventional farming due the availability of premium prices (20-40%) for the

certified organic produce and reduction in cost of cultivation by 11.7 % (Ramesh *et al.,* 2010). Organic fertilizers usually also provide some measure of N, P and K, as well as varying amounts of micronutrients. Better soil fertility with higher organic matter content is a prerequisite for sustainable crop production, and organic manure can play a role in increasing soil fertility and crop production.

Time of sowing and transplanting of seedlings are important factor especially in Vindhya Region influencing vegetable production to pinpoint the exact time of sowing of seed in nursery and transplanted in field is essential for obtaining maximum yield along with quality of vegetable. Optimum age of transplant is one of the important factors which affect growth and yield of the crop; but generally, this factor is ignored by the farmers.

The optimum seedling age depends on the soil, environmental factors such as temperature, moisture, location and cultural practices. Several investigations have been conducted to see the effect of transplant age on crop performance.

Exact age of seedling transplant would therefore be helpful in understanding the relationship between the physiological state of the transplant, its survival in the field, its growth and yield responses under various cultural systems and environment.

Materials and Methods

An experiment was conducted on seedling age of tomato (*Lycopersicon esculentum*) at the student instructional field, department of Horticulture, AKS University sherganj, satna (M.P.) during *rabi* 2023-24. The experimental field was randomly selected where the pH of the soil is 7.3.The experimental plots were fertilized as per treatments. FYM, vermicompost, and poultry manure were used for this investigation. Well decomposed al the organic manures was applied as per treatment.

As treatments, 25, 30, 35 days old seedlings were used for transplanting. All 12 treatments were tested in randomized block design with factorial concept. Transplanting of seedlings in all treatment plots was done on same day *i.e. 1st* November, 2024. To get different age seedlings, nursery sowing was started from 27th September, 2023 at 5 days interval upto 6th October, 2023 in different nursery beds. Main experimental field was uniformly manured with vermicompost, FYM, poultry manure @2ton/ha respectively.

The healthy and uniform size seedlings were planted at the distance of 60x45 cm with hand khurpi. Crop was raised with recommended package of practices under irrigated condition.

The observations on crop were recorded for growth characters, yield attributes and fruit yield under different treatments. All data collected were processed, tabulated and analyzed statistically as per procedure suggested by Panse and Sukhatme (1985).

Therefore, from proper growth point of view 25 days old seedlings seem to be suitable for transplanting .These result corroborate with the findings of Sharma and Tiwari (1992).

Results and Discussion

Growth characters

We found that all growth characters of tomato under study were influenced significantly by age of seedlings was depicted in Table 1to 5. The results revealed that 25 days old seedlings recorded highest values of plant height (53.46cm) with poultry manure @2ton/ha and minimum (16.06cm), maximum number of branches per plant (18.40) with poultry manure @2ton/ha and minimum (6.80), maximum number of leaves per plant (102.83) with poultry manure @2ton/ha and minimum (94.81), maximum number of days taken to 1st flowering (46.13) with poultry manure @2ton/ha and minimum (35.33), number of days taken to 50% flowering (43.93) with poultry manure @2ton/ha and minimum (41.45).

These results show that too old seedlings reduced the plant growth significantly as compared to normal middle age seedlings. Plants kept for longer time in nursery bed either get too leggy or become too woody due to check of growth and such old age seedlings do not make a quick start when transplanted in the main field.

Therefore, from proper growth point of view, 25 days old seedlings with poultry manure@2ton/ha seem to be suitable for transplanting.

Table.1 Effect of different levels of organic manure and age of seedling on plant height of tomato at 60 DAT (cm)

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	22.34	43.76	35.45	53.46	38.75
D_2 (30 days old)	19.48	40.39	34.59	45.93	35.10
D_3 (35 days old)	16.06	38.76	33.89	41.88	32.65
Mean	19.29	40.97	34.65	47.09	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	1.34	3.94
Age of seedlings (D)	1.55	4.55
Interaction (G x D)	0.78	1.61

Table.2 Effect of different levels of organic manure and age of seedling on number of branches per plant of tomato at 60 DAT

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	11.60	16.47	15.80	18.40	15.57
D_2 (30 days old)	10.40	16.13	15.40	16.73	14.67
D_3 (35 days old)	6.80	16.00	15.07	16.27	13.53
Mean	9.60	16.20	15.42	17.13	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	0.81	2.37
Age of seedlings (D)	0.93	2.74
Interaction (G x D)	0.47	0.97

Table.3 Effect of different levels of organic manure and age of seedling on number of leaves per plant of tomato at 60 DAT

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	41.33	121.73	117.67	130.60	102.83
D_2 (30 days old)	34.27	119.40	116.40	124.73	98.70
D_3 (35 days old)	30.10	118.33	111.20	119.60	94.81
Mean	35.23	119.82	115.09	124.98	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	5.91	17.33
Age of seedlings (D)	6.82	20.01
Interaction (G x D)	3.41	7.07

Table.4 Effect of different levels of organic manure and age of seedling on number of days taken to first flowering of tomato

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	36.00	42.40	37.87	46.13	40.60
D_2 (30 days old)	35.87	41.80	37.53	43.40	39.65
D_3 (35 days old)	35.33	40.60	36.20	42.00	38.53
Mean	35.73	41.60	37.20	43.84	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	0.79	2.32
Age of seedlings (D)	0.91	2.68
Interaction (G x D)	0.46	0.95

Table.5 Effect of different levels of organic manure and age of seedling on number of days taken to 50% flowering of tomato

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	39.20	46.80	41.33	48.40	43.93
D_2 (30 days old)	38.13	44.13	40.07	47.47	42.45
D_3 (35 days old)	38.20	43.07	39.27	45.27	41.45
Mean	38.51	44.67	40.22	47.04	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	1.45	4.24
Age of seedlings (D)	1.67	4.90
Interaction (G x D)	0.84	1.73

Table.6 Effect of different levels of organic manure and age of seedling on number of fruits per plant of tomato

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	9.40	22.17	17.73	27.60	19.23
D_2 (30 days old)	7.87	20.20	17.20	25.40	17.67
D_3 (35 days old)	3.73	18.80	16.53	21.80	15.22
Mean	7.00	20.39	17.16	24.93	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	1.25	3.68
Age of seedlings (D)	1.45	4.25
Interaction (G x D)	0.72	1.50

Table.7 Effect of different levels of organic manure and age of seedling on diameter of fruits of tomato (cm)

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	3.28	4.50	3.90	4.98	4.16
D_2 (30 days old)	3.21	4.34	3.71	4.72	4.00
D_3 (35 days old)	2.50	4.08	3.49	4.47	3.64
Mean	2.99	4.31	3.70	4.72	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	0.43	1.26
Age of seedlings (D)	0.50	1.46
Interaction (G x D)	0.25	0.51

Table.8 Effect of different levels of organic manure and age of seedling on fresh weight of fruits of tomato (g)

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	35.61	51.74	43.72	54.61	46.42
D_2 (30 days old)	28.49	48.72	40.13	53.02	42.59
D_3 (35 days old)	25.28	47.13	38.44	50.48	40.33
Mean	29.79	49.20	40.76	52.70	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	1.07	3.14
Age of seedlings (D)	1.24	3.63
Interaction (G x D)	0.62	1.28

Table.9 Effect of different levels of organic manure and age of seedling on fruit yield per plot of tomato (kg)

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	5.66	20.69	19.83	21.56	16.93
D_2 (30 days old)	4.97	20.18	19.58	20.92	16.41
D_3 (35 days old)	4.38	20.07	17.82	20.44	15.68
Mean	5.00	20.31	19.08	20.97	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	0.11	0.32
Age of seedlings (D)	0.13	0.37
Interaction (G x D)	0.06	0.13

Table.10 Effect of different levels of organic manure and age of seedling on fruit yield per hectare of tomato (q/ha)

Age of seedlings	Organic manure @ 2 t/ha				
	G_0 (control)	G_1 (Vermicompost)	G_2 (FYM)	G_3 (Poultry manure)	Mean
D_1 (25 days old)	141.42	517.17	495.75	539.08	423.35
D_2 (30 days old)	124.25	504.42	489.58	523.00	410.31
D_3 (35 days old)	109.50	501.83	445.42	510.92	391.92
Mean	125.06	507.81	476.92	524.33	

	S. Em±	C.D. (P= 0.05)
Organic manure (G)	2.71	7.96
Age of seedlings (D)	3.13	9.19
Interaction (G x D)	1.57	3.25

Yield attributes and yield

We found that table no. (6-10) the age of seedlings was also significantly influenced the number of fruits per plant, diameter of fruits, fresh weight of fruit, fruit yield per plant and fruit yield per hectare. Maximum number of fruits per plant (19.23) was found under 25 days old seedling (D_1)in the organic manure of poultry manure @ 2 ton/ha followed by 30 days old seedling, D_2 (17.67) and minimum number of fruits per plant (15.22) was recorded with oldest seedling (D_3). Highest diameter of fruits (4.16 cm) was found under 25 days old seedling (D_1)highest diameter of fruits (4.72 cm) was observed in the organic manure of poultry manure @ 2 t/ha (followed by 30 days old seedling, D_2 (4.00 cm) and lowest diameter of fruits (3.64 cm) was recorded with oldest seedling (D_3). Highest fresh weight of fruits (46.42 g) was found under 25 days old seedling (D_1) in the organic manure of poultry manure@2ton/ha followed by 30 days old seedling, D_2 (42.59 and lowest fresh weight of fruits (40.33 g) was recorded with oldest seedling (D_3). Highest fruit yield per plant (0.76 kg) was found under 25 days old seedling (D_1) in the organic manure of poultry manure @2ton/ha followed by 30 days old seedling, D_2 (0.70 kg) lowest fruit yield per plant (0.65 kg) was recorded with oldest seedling (D_3). Highest fruit yield per hectare (423.35 q/ha) was found under 25 days old seedling (D_1) in the organic manure of poultry manure @2ton/ha followed by 30 days old seedling, D_2 (410.31 q/ha) and lowest fruit yield per hectare (391.92 q/ha) was recorded with oldest seedling (D_3).

Based upon this experiment it is concluded that the application of poultry manure@ 2ton/ha and planting of 25 days old seedlings recorded significantly enhance growth and yield parameters *viz.* plant height, number of branches per plant, number of leaves per plant, number of days taken to 1st flowering, number of days taken to 50% flowering, number of fruits/plant, fruit weight/plant, fruit yield/plot, fruit yield/ha, and fruit diameter and yield of tomato.

Author Contributions

N'guessan Francis: Conceived the original idea and designed the model the computational framework and wrote the manuscript; Keita Gaoussou: Formal analysis, writing review and editing; Kouassi Affoue Edwige: Validation, methodology, writing—reviewing

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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