

EFFECTS OF TRANSPLANTING AGE ON GROWTH AND YIELD OF TOMATO VARIETIES COMMONLY GROWN IN SOUTH-WESTERN NIGERIA

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ABSTRACT

Seedling stability after transplanting is a widely recognized problem for tomato growers and is caused by planting sensitive seedlings into the field environment where they often encounter stress conditions from heat, wind, cold and high solar radiation, which causes a reduction in seedling survival and slows crop establishment. There is need to determine the optimum age at which tomato seedling can be transplanted in order to achieve optimum yield. Field trial was carried out in early raining season of 2017 and 2018 at the research field of the National Horticultural Research Institute (NIHORT), Ibadan (Latitude 7° 22' N and Longitude 3° 50' E at 234 m above sea level), in the forest agro-ecological zone of Nigeria. The trial was laid in a randomized complete block design (RCBD) with a split plot arrangement and replicated three times. Tomato varieties were the main plots (Roma VF and Ibadan local) transplanting age (3, 4 and 5 weeks) was the sub plots. Data collected included; % number of survived plant, plant height, number of leaves, fruit diameter, number of fruit/plant, fruit yield (ton/ha) and average fruit weight. All data were analyzed using the analysis of variance and significant means were separated by the least significant difference at 5% probability level. The highest percentage of survived plants was recorded in 5 weeks old Roma VF seedling transplanted during early cropping season of both years. The tallest tomato plant was obtained in 4 weeks old Roma VF. The highest number of leaf was produced in 3 weeks old Roma VF. Ibadan local transplanted at 3 weeks gave significantly higher stem girth. Among Roma VF variety, the highest yield obtained at both years was gotten in 3 weeks old seedling while the highest yield obtained in Ibadan local was gotten from 5 weeks old seedling. In conclusion, Ibadan local transplanted at 5 weeks old gave the optimum yield during the cropping season in forest agro-ecological zone of Nigeria.

Keywords: Transplanting age, Roma VF and Ibadan local, yield component.

INTRODUCTION

Tomato (*Solanum lycopersicon* L Mill) belongs to the family Solanaceae and the genus *Lycopersicon* (Vander et al., 2004). Tomato is a very important vegetable cultivated 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 (Agyeman et al., 2014). It is widely grown a vegetable crop in the world, giving its growers income, expanding export potential and improving the supply of vitamins and minerals in human nutrition (Olaniyi et al., 2010). The world production of tomato was estimated at 70 million tonnes from 2.7 million hectares

(National Bureau of Statistics, 2010). It is mostly produced from temperate countries with 11% from tropical countries (Rafi, 1996). Seedling age is an important factor for a uniform stand of crop production (Sanjeewanie and Ranamukhaarachchi, 2011) and to regulate the growth and yield (Reza *et al.*, 2011). Tomato may either be seeded directly into the field or grown from transplants raised from seed in the nursery. Transplanting tomato seedlings rather than direct seeding saves seed and also allow better weed control at the nursery stage before transplanting. The effect of seedling age on yield is an issue often faced by growers of horticultural crops (Schrader, 2000). However, there are conflicting reports on the appropriate age at which tomato seedlings could be transplanted after sowing. For instance, Salik *et al.* (2000) concluded that tomato seedling transplanted at 5 weeks gave a better growth after transplanting and their yield was higher than seedling transplanted at 4 and 6 weeks. Ademiluyi (2011) recommended a nursery period of 4 weeks for tomato transplanting. The potential of the genotype used and timely availability of resources (Isah *et al.*, 2014) is considered for choosing the two varieties. There is need to determine which seedling age will be most suitable for tomato varieties commonly grown in southwestern Nigeria.

MATERIALS AND METHODS

The field trial was carried out in early raining season of 2017 and 2018 at the vegetable research field of the National Horticultural Research Institute (NIHORT), Ibadan (Latitude 7° 22' N and Longitude 3° 50' E at an altitude of 234 m above sea level), Oyo state in the forest agro-ecological zone of Nigeria. The experimental site had been under continuous cultivation for many years. The land was ploughed and left for two weeks to allow buried weeds to decay and reploughed followed by harrowing. The plot size was 3 x 3 m, the alley of 0.5 m within plots and 1.0 m between replicates. The plots were laid out in a randomized complete block design (RCBD) in a split-plot arrangement and replicated three times. Tomato varieties were the main plot (Roma VF and Ibadan local) while transplanting age was the subplot (3 weeks, 4 weeks, and 5 weeks). Topsoil for the nursery was sterilized by heating to 100°C in a metal drum and allowed to cool. The sterilized soil

was filled into nursery trays after which seeds of tomato were sown. Regular watering and monitoring were carried out in the nursery. Tomato seedlings were transplanted at 3, 4 and 5 weeks after sowing at 75 x 25 cm giving 53,333 plants/ha. Uniform fertilizer rate of 90 kg N ha⁻¹, 45 kg P₂O₅ ha⁻¹ and 45 kg K₂O ha⁻¹ was applied in two split doses at 5 and 7 weeks after sowing (WAS) as recommended by Oyinlola and Jinadu, (2012). Weeds were controlled manually, using traditional hoe at 3, 5 and 7 weeks after transplanting. Cypermethrin was applied at 0.4 L/ha to control insect pests at 7WAS and also 1 liter of NIHORT Iyptol was mixed with 5 litre of water and applied at 6 and 9 WAS to control diseases. The following data were collected from ten randomly tagged plants per plot; percentage of survived plants was carried out according to Modupeola *et al.* 2014, plant height using meter rule, number of leaves, fruit diameter, number of fruit/plant, fruit yield (ton/ha), average fruit weight using kitchen scale. All data collected were subjected to the analysis of variance (ANOVA) using Gen-Stat Discovery Edition 4 (2013). Significant means were separated using the least significant difference (LSD) at five percent (5%) level of probability ($p \leq 0.05$).

RESULTS

The results of laboratory analyses of the pre-cropping soil samples of the experimental site are presented in Table 1. The soil pH was 5.90 and 5.30 in the early raining season of 2017 and 2018 respectively. Organic carbon was 4.51 and 3.45 in the early raining season of 2017 and 2018. Total nitrogen and available phosphorus were higher in the early raining season of both years. The soil obtained at the experimental site was sandy loam soil (Table 1).

Effect of transplanting age on plant establishment count of tomato varieties as presented in Table 2 showed that significant varietal difference existed in the percentage of survived plants at all counting period in both years except at 3WAT in 2017 when the varieties were similar. At 6WAT in 2017 and 2018 Roma VF had higher percentage of survived plants (89.71% and 77.75% respectively) (Table 2). Similarly, transplanting age had significant effect on percentage survived tomato plant throughout the period of observation in 2017 and 2018. Meanwhile, at 3WAT in 2017, transplanting age had no

significant effect on tomato stand count. Tomato transplanted at 5 weeks old had the highest percentage of survived plants in both years (Table 2). Interaction of tomato variety x transplanting age had no significant effect on the percentage number of survived plants in both years except at 5 and 6 WAT in 2017 and 2018 respectively. 5 weeks old seedling of Roma VF recorded the highest percentage of the survived plant at 4, 5 and 6 WAT in both years (Table 3).

The result showed significant varietal differences in term of plant height at 10WAS in 2017, 8 and 10 WAS in 2018. In 2017, Roma VF had higher plant height of 35.90 cm and 33.83 cm in 2018 which was significantly higher than Ibadan local that recorded 32.27cm and 31.16cm in 2017 and 2018 respectively while Roma VF was significantly taller by 3.63cm and 2.67cm than Ibadan local at 10WAS in 2017 and 2018 respectively (Table 4).

Transplanting age had significant effect on plant height of tomato across the sampling periods except at 6 and 8 WAS in 2017 and 10 WAS in 2018. Plot with 4 weeks old seedling had the tallest plant (35.99cm) which was significantly taller than plot with 3 and 5 weeks old seedling at 10WAS in 2017. However in 2018, 3 weeks old seedling was significantly higher than 4 and 5 weeks old seedling at 6 and 8 WAS while at 10WAS, 4 weeks old seedling gave the highest plant height but statistically the same with 3 and 5 weeks old seedling (Table 4). Interaction of tomato varieties x transplanting age had no significant effect on plant height at all the sampling period in 2017 while significant interaction was observed at the sampling period in 2018. The plant height increases as the plant ages. In 2017, 4 weeks Roma VF gave the highest plant although not significantly differ from other height. In 2018, 5 weeks old Roma VF gave significantly higher plant height while 3 weeks Ibadan local had the shortest plant (Table 5).

The number of leaves produced by tomato varieties significantly differs at 8 and 10 WAS in 2018. On the contrary, the number of leaves produced by tomato varieties had no significant effect throughout the growing period in 2017 (Table 6). In 2017 at 10WAS, Ibadan local produced a higher number of leaves (16.28) than Roma VF that produced the average leaf of 15.73 although no significant difference was

observed among the varieties. At 10WAS of 2018, Ibadan local produced a significantly higher number of leaves (25.09) than Roma VF that produced the average leaves of 24.10 (Table 6). Similarly, in 2018 at 10WAS, 3 weeks old seedlings produced tomato the highest number of leaves (28.98) while tomato transplanted at 5WAS produced the least number of leaves in the early raining season of both years.

Interaction of variety x transplanting age had no significant effect on the number of leaves at 6 and 8 WAS in 2017 but at 10 WAS in 2017 there was a significant effect of variety x transplanting age on the number of a leaf. Moreover, there was highly significant ($p < 0.01$) difference at 8 and 10 WAS in 2018 (Table 7). Roma VF transplanted at 3 WAS had a significantly higher number of leaves at 10 WAS in both years (Table 7).

Yield components of tomato varieties as influenced by transplanting age and plant density is presented in Table 8. In both years, fruit diameter of tomato varieties used significantly ($p < 0.01$) differ from one another. Ibadan local had the highest fruit diameter (5.36cm and 5.29cm) which was significantly different from Roma VF which had the least (4.45cm and 4.38cm) in 2017 and 2018 respectively (Table 8).

Transplanting age significantly ($p < 0.01$) affected fruit diameter of tomato in both years. 5 weeks old seedling had the highest fruit diameter (5.07cm and 5cm) which was significantly different from 3 weeks old seedling and also 4 weeks old seedling which had the least in 2017 and 2018 respectively (Table 8).

The number of fruit per plant produced by the varieties used in this study was significantly different from one another in both years. Ibadan local had the highest number of fruit /plant (3.93 and 2.93) which was significantly different from Roma VF that produced the least number of fruit/plant (2.41 and 2.56) in 2017 and 2018 respectively (Table 8).

Transplanting age had no significant effect on the number of fruit/plant in both years. 5 weeks old seedling recorded the highest number of fruit/plant (3.5) while the least number of fruit/plant (3) were obtained from 3 and 4 weeks old seedling in 2017. In 2018, 4 weeks transplanting age produced the highest number of fruit/plant (2.89) than 3 and 5 weeks old

seedling that gave the least number of fruit/plant of 2.78 and 2.56 respectively (Table 8).

There was no significant difference existed among the fruit weight of tomato varieties used in this study at both years of the study. In both years, Ibadan local gave the highest fruit weight (66.7g and 129.5g) although not significantly different from Roma VF that produced the lowest fruit weight of 55.2g and 125.2g in 2017 and 2018 respectively (Table 8). Transplanting age had highly significant ($p < 0.01$) effect on fruit weight of tomato. In 2017, 3 weeks old seedling gave the highest fruit weight (69.8g) which was significantly higher than fruit weight obtained from 4 and 5 weeks old seedling. In 2018, 5 weeks old seedling produced the highest fruit weight (173.1g) which was significantly higher than fruit weight obtained from 3 and 4 weeks old seedling. Although fruit weight got from 3 and 4 weeks old seedling was not significantly differed (Table 8).

Significant ($p < 0.01$) varietal difference existed among the varieties of tomato used in terms of fruit yield in both years. Ibadan local produced significantly higher fruit yield of 9.78 and 11.59 tons/ha in 2017 and 2018 than Roma VF that produced the lowest fruit yield of 4.7 and 8.76 ton/ha in 2017 and 2018 respectively (Table 8). Transplanting age had highly significant ($p < 0.01$) effect on fruit yield of tomato. In 2017, seedlings transplanted at 3 weeks old produced the highest fruit yield of 8.42 tons/ha while 4 weeks old seedling produced the least fruit yield of 6.22 tons/ha. In 2018, seedlings transplanted at 5 weeks old produced the highest yield of 11.22 tons/ha while seedlings transplanted at 4 weeks old recorded the lowest yield of 9.6 tons/ha (Table 8).

Interaction of tomato varieties x transplanting age had highly significant ($p < 0.01$) effect on all the yield components of tomato in both years (Figure 1). The highest fruit diameter, number of fruit/plant, average fruit weight and fruit yield was obtained from Ibadan local transplanted at 5 weeks in both years except average fruit weight that was obtained from Roma VF transplanted at 5 weeks in the year 2018 (Figure 1).

DISCUSSION

The results of soil analysis showed that the textural class of the soil of the experimental site

is sandy loamy. The pH of the experimental soil ranged between 5.90 to 5.10 in 2017 and 2018. Tomato plants require nutrients for growth and development, including nitrogen, phosphorus, and potassium, but plant growth and production will vary depending on soil pH (Daneshvar, 2006). It was suggested by tomato grower that tomato will grow in a wide variety of soil types while the pH between 5.5 – 6.8 is preferable for tomato production (Best Juicy Tomatoes, 2019).

The results of the main effects obtained in the early raining season of 2017 and 2018 showed that Roma VF tomato variety resulted from more significant percentage number of the established plant than Ibadan local this might be due to high vigor and adaptability of Roma VF seedling after transplanting. This is in agreement with the findings of Ibrar *et al.*, 2015 and Joyet *et al.*, 2015 who reported high vigor in Roma VF among other tomato varieties evaluated and also confirmed the adaptability to the tropical environment.

The highest percentage of survived plant observed from 5 weeks old seedling at 6 WAS in 2017 and 2018 may be due to adequate development of taproot before transplanting as reported by Daniel and Leskovar (1995) that seedling establishment in any field environment depends on the adequate development of a taproot. The highest number of leaf recorded in Ibadan local across the two seasons at both years agreed with the findings of Olaniyi *et al.*, (2010) trial on a tomato that Ibadan local recorded a good performance on growth attributes than other varieties used in the trial. The results obtained from this study revealed that tomato transplanted at 3 weeks gave the best performance on the number of leaves of tomato in 2017 and 2018. The observed similarity clearly shows as reported by Ademiluyi, (2011) that transplanting tomato seedlings at 2 or 3 weeks after sowing (WAS) substantially increased field establishment, growth and yield of tomato than the 4 and 5 weeks old seedling in the study area. Ibadan local variety had the highest yield component (fruit diameter, average fruit weight, and fruit yield) across the two seasons at both years. Ibadan local being a desirable trait commonly grown in southwestern Nigeria. This could be due to the desirable trait in Ibadan local variety with good performance.

This agreed with the report of Adebooye *et al.* (2006) that recorded the highest fruit diameter and fruit yield on Ibadan local. Shobo *et al.* (2016) also gave a similar report on a significant increase in yield component of tomato. Significant variation among the transplanting age on the yield and yield component may be due to stress-related to transplant establishment and the climatic factor which may determine the stability of the transplanted seedling for optimum yield. The significant higher increase in yield component (fruit diameter, fruit weight and fruit yield) obtained from Ibadan local transplanted at 5 weeks old at both years may be due to adaptability of Ibadan local variety to some common disease that affect tomato during the growing period in forest agro-ecology zone of Nigeria and yield potential of the variety with older transplanting age may have exhibited faster growth and establishment as a result of being restricted longer in the nursery before transplanting. Isah *et al.* (2014) gave a similar report that tomato productivity at a given location depends on the potential of the genotype used and timely availability of resources. Also, the management practice which greatly influences tomato fruit yield are transplanting age as reported by Nguyen *et al.* (2015) and Abdel-Mawgoud *et al.* (2007). Salik *et al.* (2000) reported that tomato transplanted at 5 weeks grew better after transplanting and their yield was higher than that of 4 and 6 weeks transplants.

CONCLUSION

In conclusion, Ibadan local transplanted at 5 weeks gave the optimum yield in early raining season of 2017 and 2018

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Table 1: Physical and chemical properties of pre- cropping soil of experimental sites

Soil properties	2017	2018
Ph	5.90	5.30
Organic carbon(g/kg)	4.51	3.45
Total Nitrogen(g/kg)	0.65	0.50
Available phosphorus(mg/kg)	8.85	4.60
Exchangeable cation(cmol/kg)		
Na ²⁺	0.22	0.37
Ca ²⁺	0.25	0.24
Mg ²⁺	2.78	3.32
K ²⁺	0.56	0.63
Exchangeable acid	0.26	0.25
Effective cation	4.70	4.80
exchangeable capacity		
Particle size distribution (g/kg)		
Sand	878	865
Silt	12	11
Clay	110	124
Textural class	Sandy loamy	Sandy loamy

Table 2: Main effects of transplanting age on percentage stand count of tomato varieties

Treatment	2017				2018			
	3WAT (%)	4WAT (%)	5WAT (%)	6WAT (%)	3WAT (%)	4WAT (%)	5WAT (%)	6WAT (%)
Variety (V)								
Roma VF	99.42	94.72	91.37	89.71	88.7	83.51	79.7	77.75
Ibadan local	99.13	90.63	84.44	82.33	80.22	74.6	70.23	68.71
SED	0.41	0.24**	0.44**	1.13*	0.22**	0.14**	1.11**	0.52**
L.S.D. _{0.05}	1.77	1.05	1.89	4.84	0.92	0.61	0.46	2.25
Transplanting age (T)								
3 weeks	99.24	92.04	85.57	84.23	82.98	77.04	73.3	71.38
4 weeks	99.23	92.05	87.01	84	81.91	76.53	72.2	70.35
5 weeks	99.37	93.95	91.13	89.82	88.49	83.61	79.4	77.97
SED	0.46	0.74*	0.64**	0.77**	0.88**	1.11**	1.51**	1.21**
L.S.D. _{0.05}	1.06	1.70	1.49	1.77	2.03	2.55	3.49	2.78
V X T	ns	ns	*	*	ns	ns	ns	ns

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means
WAT: Weeks After Transplanting, NS: Not Significant, Significant: *, Highly Significant: **

Table 3: Effects of transplanting age and tomato varieties on plant establishment (%) on early raining season

Variety	Transplanting Age	2017				2018			
		3WAT	4WAT	5WAT	6WAT	3WAT	4WAT	5WAT	6WAT
Roma VF	3Weeks	99.56	93.63	88.94	88.45	87.69	81.77	78.75	76.53
Roma VF	4Weeks	99.34	94.94	91.66	88.46	86.53	81.06	76.71	74.95
Roma VF	5Weeks	99.37	95.6	93.5	92.21	91.89	87.71	83.65	81.79
Ibadan local	3Weeks	98.92	90.45	82.2	80.02	78.28	72.31	67.85	66.23
Ibadan local	4Weeks	99.11	89.16	82.36	79.54	77.29	72	67.69	65.75
Ibadan local	5Weeks	99.37	92.29	88.76	87.42	85.09	79.51 ^{ns}	75.15	74.15
SED		0.67	0.88	0.86*	1.43*	1.04	1.29	1.75	1.49
L.S.D. _{0.05}		1.53	1.99	1.93	3.73	2.36	2.96	4.03	3.33

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means
WAT:WeeksAfter Transplanting, NS: Not Significant, Significant: *, Highly Significant: **

Table 4: Main effects of transplanting age and plant density on plant height of tomato varieties

Treatment	2017			2018		
	6WAS (cm)	8WAS (cm)	10WAS (cm)	6WAS (cm)	8WAS (cm)	10WAS (cm)
Variety (V)						
Roma VF	12.26	20.09	35.9	11.65	14.65	33.83
Ibadan local	12.44	20.27	32.27	11.48	14.02	31.16
SED	1.94	0.99	0.55	0.09	0.11	0.12
L.S.D. _{0.05}	ns	ns	2.35	ns	0.49	0.53
Transplanting age (T)						
3 weeks	13.78	20.67	33.77	12.10	15.45	32.49
4 weeks	11.25	19.56	35.99	10.75	13.69	32.51
5 weeks	12.01	20.31	32.49	11.84	13.86	32.48
SED	1.10	0.59	0.65	0.15	0.18	0.25
L.S.D. _{0.05}	ns	ns	1.51	0.34	0.41	ns
V X T	ns	ns	ns	*	*	*

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means

WAS: Weeks After Sowing, NS: Not Significant, Significant: *, Highly Significant: **

Table 5: Effects of transplanting age and tomato varieties on plant height

Variety	Transplanting age	2017			2018		
		6WAS (cm)	8WAS (cm)	10WAS (cm)	6WAS (cm)	8WAS (cm)	10WAS (cm)
Roma VF	3Weeks	14.65	20.65	35.40	12.23	15.98	34.09
Roma VF	4Weeks	11.00	19.09	37.02	10.53	13.27	33.22
Roma VF	5Weeks	11.11	20.51	35.29	12.18	14.70	34.19
Ibadan local	3Weeks	12.90	20.68	32.14	11.98	14.93	30.90
Ibadan local	4Weeks	11.51	20.03	34.96	10.96	14.11	31.79
Ibadan local	5Weeks	12.91	20.11	29.70	11.50	13.02	30.78
SED		2.32	1.20	0.93	0.19*	0.23**	0.31**
L.S.D. _{0.05}		6.48	3.31	2.11	0.43	0.52	0.69

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means

WAS: Weeks After Sowing, NS: Not Significant, Significant: *, Highly Significant: **

Table 6: Main effects of transplanting age and plant density on number of leaf of tomato varieties

Treatment	2017			2018		
	6WAS	8WAS	10WAS	6WAS	8WAS	10WAS
Variety (V)						
Roma VF	3	7	16	5	9	24
Ibadan local	5	11	16	5	10	25
L.S.D. _{0.05}	ns	2.71	ns	ns	0.23	0.79
Transplanting age (T)						
3 weeks	6	12	21	6	13	29
4 weeks	4	9	15	5	9	25
5 weeks	3	7	12	4	8	19
L.S.D. _{0.05}	2.14	2.01	2.26	0.40	0.45	0.31
V X T	ns	ns	*	ns	*	*

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means
WAS: Weeks After Sowing, NS: Not Significant, Significant: *, Highly Significant: **

Table 7: Effects of transplanting age and tomato varieties on number of leaf

Variety	Transplanting Age	2017			2018		
		6WAS	8WAS	10WAS	6WAS	8WAS	10WAS
Roma VF	3weeks	4.68	8.87	23.47	6.03	13.59	33.67
Roma VF	4weeks	3.51	7.59	15.95	4.38	7.99	22.00
Roma VF	5weeks	2.08	5.73	7.76	4.22	6.22	16.63
Ibadan Local	3weeks	8.05	14.67	17.72	5.91	11.54	24.30
Ibadan local	4weeks	4.72	10.56	14.55	4.74	10.88	28.83
Ibadan local	5weeks	3.46	9.17	16.56	4.13	8.82	22.13
SED		1.38	1.19	1.41**	0.33	0.23**	0.24**
L.S.D. _{0.05}		3.17	2.67	3.20	0.88	0.53	0.61

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means
WAS: Weeks After Sowing, Significant: *, Highly Significant: **

Table 8: Main effects of transplanting age and population density on yield component of tomato varieties

Treatment	2017				2018			
	Fruit diameter (cm)	Number of fruit/plant	Fruit weight (g)	Fruit yield (ton/ha)	Fruit diameter (cm)	Number of fruit/plant	Fruit weight (g)	Fruit yield (ton/ha)
Variety (V)								
Roma VF	4.45	2.41	55.2	4.7	4.38	2.56	125.2	8.76
Ibadan local	5.36	3.93	66.7	9.78	5.29	2.93	129.5	11.59
SED	0.01**	0.30*	9.50	0.44**	0.01**	0.04**	5.69	0.18**
L.S.D. _{0.05}	0.04	1.28	40.87	1.91	0.04	0.16	24.24	0.79
Transplanting age (T)								
3 weeks	4.76	3	69.8	8.42	4.69	2.78	106.1	9.7
4 weeks	4.89	3	59.8	6.22	4.82	2.89	102.8	9.6
5 weeks	5.07	3.5	53.3	7.08	5.00	2.56	173.1	11.22
SED	0.02**	0.20	4.11**	0.54**	0.02**	0.20	11.83**	0.60*
L.S.D. _{0.05}	0.05	0.47	9.49	1.24	0.05	0.46	27.27	1.39
V X T	**	**	**	**	**	**	ns	**

LSD_{0.05}: Least Significant Difference at 5% probability, SED: Standard Errors of Differences of Means NS: Not Significant, Significant: *, Highly Significant: **

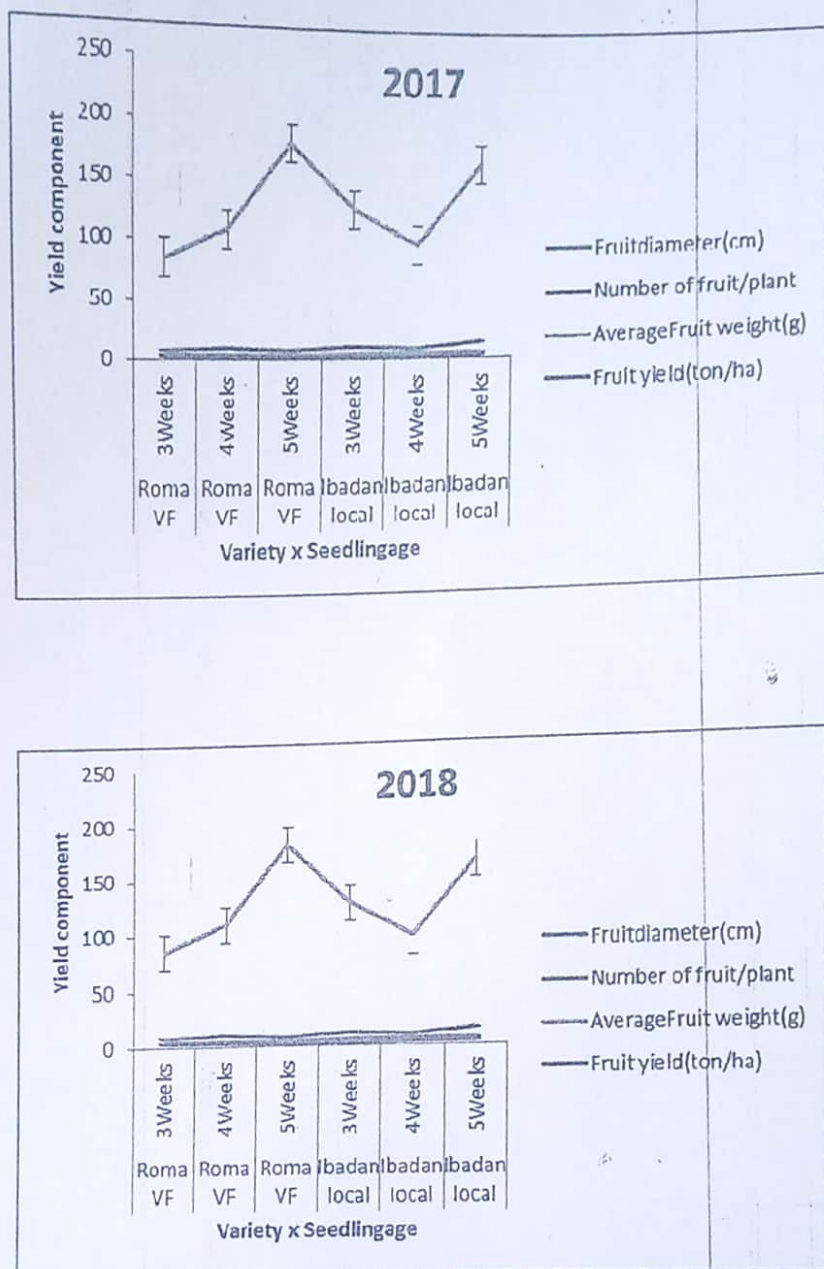


Figure 1: Effects of transplanting age and tomato varieties on yield component on early raining season of 2017 and 2018