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Effect of various organic sources along with inorganic fertilizers on seed quality attributes at different fruit pickings of tomato (*Lycopersicon esculentum* Mill)

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Abstract

Effect of various Organic Sources along with Inorganic Fertilizers of various organic sources viz., FYM, Poultry manure, neem cake, Azotobacter, VAM, PSB and pea crop residue along with the inorganic fertilizers was tested on seed quality attributes of tomato at different fruit pickings. The fruits harvested in the first picking resulted in greatest 1000 seed weight, germination percentage, seedling length and seedling vigour index having considerable differences over the late pickings. Among different treatments the application of VAM + 50% P and full dose N and K through fertilizers proved best almost in all the fruit picking with respect with respect to all the above seed quality attributes closely followed by the application of PSB+75% P and full dose of N and K through fertilizers.

Keywords: Tomato, residual effect, INM, picking and seed quality

Introduction

Good quality seed is a pre-requisite for higher productivity of any crop. The losses in the seed viability and vigour depend on various factors like genetic makeup of seed material harvesting stage of the seed fruit position on the mother plant, fruit size, fruit pickings and prevailing environmental condition at harvesting time. The crop like tomato in which multiple fruit pickings are done over a long period variation in seed quality may occur from one picking to the other. Nutrient application also plays a major role for harnessing yield and quality. At present chemical fertilizers contribute a lot in fulfilling the nutrient requirement of tomato but their regular excessive and imbalanced use may lead of health and ecological hazards besides causing deterioration in physio - chemical properties of soil which may ultimately lead to poor yield and quality of fruit as well as seed. With this view now it is widely being felt that organic sources should form an integral component of the crop nutrition. The traditional organic manures release the nutrients slowly, hence the effect is exhibited not only on the instant crop but also it is reflected on the performance of other succeeding crops. Similarly the bio-fertilizers enrich the soil with beneficial microorganisms with may show a prolonged effect on the sequential crops. Therefore a modest attempt in this investigation was made for evaluating different seed quality parameters in different pickings of tomato as influenced by the residual effect of different integrated nutritional treatment

Materials and Methods

The study was carried out with tomato cultivar Pant T-3 at Horticultural Research Center of G.B. Pant Univ. of Agriculture, & Technology, Pant Nagar during summer season of two years. The soil of the experimental plot was sandy loam, with neutral pH (6.85) medium in organic carbon (0.72%) high in available nitrogen (282.4 kg/ha), low in available phosphorus (22.8 kg/ha) and medium in available potassium (200.00 kg/ha). The treatments comprised of : T1 – recommended dose of NPK through fertilizer, T2-FYM (15t/ha) + rest amount of NPK through fertilizer, T3 – neem cake (3q/ha) + rest amount of NPK through fertilizer, T4 – poultry manure (3t/ha) + rest amount of NPK through fertilizer, T5- Azotobacter + 75% of N and full dose of P and K through fertilizers, T6 – VAM + 50% P and full dose of N and K through fertilizers, T7 – PSB + 75% P and full dose of N and K through fertilizers, T8- Azotobacter + VAM + PSB + rest amount of NPK through fertilizers, T9- micro nutrients through multiples (2.5ml/litre) + recommended dose of NPK through fertilizers, T10 – FYM + Azotobacter + VAM + PSB + REST NPK through fertilizers and T11 - recommended dose

of NPK through fertilizers + pea straw incorporation. All the cultural operations were followed which are recommended to raise a good crop of tomato fermentation method from well ripened fruits. Thirty days of old seeds were used for recording various attributes of seed quality. The germination and seedling length were recorded on the final count day of germination i.e. 14 days after sowing. The seedling vigour index was calculated by multiplying germination percentage with seedling length. The data presented in tables represent the pooled mean of two years.

Results and Discussion

Seed Test Weight

The seed test weight an important physical parameter of good quality of seed differed significantly owing to the residual effect of INM treatments at all the fruit pickings except second and third pickings. The highest seed test weight was obtained at first picking. After which it gradually decreased till the last picking, the reduction being more conspicuous in the sixth and seventh pickings. The reduction in seed test weight occurred in the range of 25.08 of 31.58% in the last picking over the first picking under different treatments. The highest seed test weight among all the treatments was observed under the T6, which contained VAM + 50% P and full dose of N and K through fertilizers T6 closely followed by T7 in most of the pickings. The higher seed test weight under T6 and T7 might be due to the VAM and phosphobacteria which physiologically influence the activity of enzymes that lead to increased cell metabolism and change in the biochemical composition of the seed. Another reason might be due to the increased absorption of nitrogen in the presence of phosphatic Biofertilizers and its direct participation in the protein synthesis which increased protein content as reported by Subbiah and Ramanathan.

Germination Capacity

The germination percentage was significantly influenced by the various integrated nutritional treatment in all the pickings except the first one. Generally the highest germination percentage was observed in T6, closely followed by T7 in different pickings. Similarly like seed test weight the germination percentage was in general highest in the first

picking after which it gradually declined till the last picking (Table-1). Comparatively better seed germination percentage observed in earlier pickings may be because of prevalence of comparatively better environmental conditions and sound physiological state of plants and seed. These results corroborate the earlier findings of Dharmatti *et al.* [2].

Seedling Length

The seedling length exhibited by seeds of different picking was significantly influenced by different treatments in all the seven pickings (Table-2). The length was found to be maximum in T6 with non-significant difference from T7 at all the stages of pickings. The minimum length was observed with T1. Among different pickings comparatively higher seedling length was noticed in the first and second pickings than the other ones and a gradual decline occurred in each successive picking, the last one showing a decline in the range of 7.80 to 14.02 per cent over the first picking.

Seedling Vigour Index

As evident from the Table-2 the treatments had significant variation in seedling vigour index (SVI) in all the seven pickings. In general the seedling vigour index was higher in first two pickings which declined in successive later pickings. The reduction in the seedling vigour index was to the tune of 13.47 to 19.20 per cent in the last picking over the first picking. The probable reason for such findings may be a healthy and vigorous growth state maintained by the plants during the stage of first picking. Internal hormonal level and metabolic activities are higher during initial stages harvest. The leaf area index as well as net photosynthetic area during this period was also maximum because of the absence of yellowing and senescent leaves during early phases. This would have led to proper formation and accumulation of photosynthates in the seeds. Among the treatments and T6 always resulted in the higher seedling vigour index in all the pickings closely followed by T7. The T6 and T7 supplied with VAM and PSB respectively would have allowed balanced uptake to phosphorus and other minerals which may have resulted in higher seed and seedling vigour in these treatment. Dev and Sharma [3] and Demir and Ellis [4] Mehar *et al.* [5] also observed similar findings in tomato.

Table 1: Seed test weight and germination per centage at different picking of tomato as observed under IPNM treatment

Treatment	Seed test weight							germination per centage						
	I picking	II picking	III picking	IV picking	V picking	VI picking	VII picking	I picking	II picking	III picking	IV picking	V picking	VI picking	VII picking
T1	3.52	3.51	3.34	3.13	2.93	2.74	2.53	90.00	89.00	88.50	87.17	85.83	85.50	84.33
T2	3.32	3.31	3.34	3.09	2.92	2.70	2.48	90.67	90.67	89.50	86.83	86.17	85.83	85.67
T3	3.56	3.47	3.38	3.20	3.06	2.74	2.51	91.50	91.00	90.17	87.83	87.50	87.17	86.33
T4	3.46	3.40	3.40	3.05	2.96	2.65	2.44	90.00	88.00	87.67	84.00	85.50	85.33	84.50
T5	3.53	3.49	3.34	3.19	3.04	2.75	2.49	92.17	91.14	90.00	89.00	88.00	87.33	86.33
T6	3.61	3.57	3.53	3.35	3.19	2.79	2.52	92.33	91.83	91.00	89.83	88.67	88.67	87.50
T7	3.59	3.54	3.44	3.24	3.09	2.78	2.59	91.17	91.33	90.64	89.83	88.67	87.17	86.50
T8	3.37	3.34	3.29	3.18	3.08	2.75	2.50	90.33	89.50	88.50	87.33	87.00	86.33	85.83
T9	3.35	3.34	3.25	3.11	2.90	2.68	2.46	90.50	89.17	87.50	87.50	86.83	86.17	85.00
T10	3.37	3.35	3.28	3.18	2.91	2.67	2.44	90.33	91.00	88.67	87.50	86.67	85.33	85.00
T11	3.53	3.53	3.42	3.26	3.11	2.78	2.47	92.00	91.17	89.50	89.00	87.67	87.67	87.50
Sem+	0.05	0.06	0.08	0.06	0.06	0.03	0.04	0.69	0.80	0.70	0.90	0.74	0.71	0.70
Cd at 5%	0.14	NS	NS	0.16	0.16	0.09	0.12	NS	2.23	2.07	2.65	2.18	2.08	2.06

Table 2: Seedling vigour exhibited by the seeds of different pickings under the influence of IPNM treatment

Treatment	Seedling length (cm)							Seedling Vigour Index						
	I	II	III	IV	V	VI	VII	I	II	III	IV	V	VI	VII
	picking	picking	picking	picking	picking	picking	picking	picking	picking	picking	picking	picking	picking	picking
T1	13.70	13.34	13.37	12.51	11.95	12.14	11.91	1446	1188	1185	1090	1025	1038	1006
T2	13.94	13.58	13.40	12.98	12.54	12.42	11.92	1267	1232	1200	1127	1081	1066	1021
T3	14.29	14.24	13.82	13.28	13.05	13.02	12.70	1307	1296	1245	1167	1142	1135	1096
T4	13.46	13.36	13.25	13.25	12.89	12.62	12.41	1212	1175	1162	1112	1103	1091	1046
T5	15.25	14.68	14.00	13.81	13.55	13.51	13.20	1405	1343	1269	1229	1193	1179	1139
T6	16.42	16.32	15.65	14.91	14.56	14.56	11.28	1515	1499	1423	1338	1289	1290	1249
T7	16.14	16.09	15.32	14.78	14.30	13.84	13.91	1488	1470	1395	1328	1267	1206	1203
T8	14.19	14.61	13.64	13.00	12.94	12.63	12.45	1281	1306	1207	1135	1126	1091	1069
T9	15.19	15.17	14.11	13.81	13.53	13.35	13.06	1375	1352	1233	1208	1174	1150	1117
T10	13.58	13.70	13.32	13.94	12.92	12.88	12.33	1226	1246	1182	1132	1120	1099	1038
T11	15.33	15.39	14.62	14.20	13.89	13.95	13.60	1410	1403	1307	1265	1216	1222	1190
Sem+	0.24	0.26	0.28	0.31	0.28	0.26	0.30	63	28	25	24	24	24	26
Cd at 5%	0.70	0.81	0.83	0.90	0.83	0.78	0.88	187	81	74	70	71	71	77

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