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Yield Comparison Between two Varieties of Tomato (*Lycopersicon esculentum* Mill) under the Influence of NPK

Muhammad Arshad and Audil Rashid
Department of Botany, University of Arid Agriculture, Rawalpindi, Pakistan

Abstract

Two varieties of tomato were sown to determine the effect of NPK on tomato plants by using them independently under normal field conditions. Application of urea delayed flowering and fruit setting in both the varieties, but increased the number of fruit set, weight of fruits harvested per plant, weight of individual fruits and fruit yield/ha. Muriate of potash and controlled treatments did not have significant influence on yield components. Super phosphate treatment, however, gave better results then potash and controlled treatments for number of fruits set, and harvested fruit weight/plant and average weight/fruit and yield/ha. The average yield of Roma was significantly higher than that of Moneymaker in urea and super phosphate plots.

Introduction

Several researches (Singh, 1978; Liu *et al*., 1997; Motis *et al*., 1998; Kim *et al*., 1997) have discussed various factors influencing tomato yield. Low yield of tomato may be attributed to several factors such as nutritional deficiencies, pest and disease attack, inadequate irrigation, incorrect time of planting etc. Improvement in tomato yield with the application of N, P, K fertilizers has been reported by Besford and Maw (1975), Adams *et al*. (1978), Asi and Amjad (1985) and Maynard (1994).

The present study was under taken to determine the effect of NPK on tomato plants by using them independently under normal field conditions.

Materials and Methods

Using split design, the experimental field was divided into four blocks representing replications. Each of these blocks was then divided into two main plots to be allocated to varieties, namely, Roma and Moneymaker. Each of the main plots was again divided into four equal subplots each 3 m x 2.4 m in size. The alleys between blocks, main plots and subplots were 1.5 m, 1 m, and 6 cm respectively, Fertilizers treatments used were Nitrogen (90 kg ha^{-1}), Phosphorus (40 kg ha^{-1}), Potassium (40 kg ha^{-1}) and control (without fertilizer).

Three weeks old tomato seedlings were transplanted in such a way that four rows having 5 tomato seedlings in each, were in each subplots allocated for both the varieties. 60 cm distance was maintained between plants and rows. Fertilizer application was split into two equal doses. The first dose was applied two weeks after transplanting and second was given after three weeks after the first dose. Ring method was followed for fertilizer application. Using watering cane, the plants were uniformly irrigated once daily. Comparative effects on yield components were determined on the basis of:

Number of days required for flowering and fruit ripening
Number of fruit set/plant
Number of fruits harvested/plant
Weight of the harvested fruits/plant (g)
Weight of the individual fruit (g)
Yield ha^{-1} (tones)

The data was subjected to the analysis of variance (Steel and Torrie, 1980).

Results

Average time for flowering after transplanting required by plants of both varieties in N was 38 days which was significantly more than those required by P, K and control. In phosphorus (40 kg ha^{-1}) and potassium (40 kg ha^{-1}) comparatively less flowering time was observed (Table 1). The maximum number (36) of fruit set was recorded for the variety Roma with N, and the lowest for the variety Moneymaker with control. P in Roma resulted 33 fruits per plant and showed non-significant differences with N for both the varieties, P however, resulted significantly higher number of fruit set then in K and control for both varieties. Similarly, the maximum number of harvested fruits (32) was noted in Roma receiving N showing non significant differences with P for the same variety. The minimum number of harvested fruits was recorded with control in Moneymaker while in K, similar number (22) of harvested fruits per plant was observed for both the varieties (Table 1).

The highest average weight of fruits per plant (1191.3 g) was obtained with N in Roma and showed significant differences with lower fruit weights in P and K. Similar results were observed for Moneymaker as well. The minimum weight of fruits per plant was recorded with control for both the varieties (Table 1).

N in Moneymaker and P in Roma gave similar weights of individual fruits. The minimum fruit size (19.6 g) was obtained with control and showed non-significant differences with K in both varieties and P in Moneymaker (Table 1).

Discussion

Higher fruit yield components in the Roma variety than Moneymaker can be explained on the basis of better

Table 1: Average values ± SD of some yield components of Roma and Moneymaker cultivars of tomato (*Lycopersicon esculentum* Mill) as influenced by Nitrogen, Phosphorus and Potassium Nitrogen

	Nitrogen		Phosphorus		Potassium		Control	
Yield components	Roma	M. M	Roma	M.M	Roma	M.M	Roma	M.M
Days required for flowering	$38^{a} \pm 1$	$38^{a} \pm 3$	$27^{b} \pm 2$	$27^{b} \pm 1$	$27^{b} \pm 1$	$27^{b} \pm 1$	$29^{b} \pm 0$	$29^{b} \pm 2$
Days required for fruit ripening	$58^{a} \pm 4$	$58^{a} \pm -5$	45b ± 2	$45^{b} \pm 3$	$45^{b} \pm 3$	$45^{b} \pm 5$	$42^{b} \pm 4$	$42^{b} \pm 2$
Number of fruits set/plants	$36^{a} \pm 7$	$30^{b} \pm 9$	33^{a}b ± 6	$30^{b} \pm 7$	$26^{b} \pm 6$	$27^{c} \pm 11$	$22^{cd} \pm 5$	$20^{c} \pm 4$
Number of harvested fruits/plants	32^{a}- ± 3	$26^{b} \pm 5$	$29^{ab} \pm 4$	$26^{b} \pm 4$	$22^{c} \pm 3$	$22^{c} \pm 2$	$19^{b} \pm 5$	$18^{a} \pm 7$
Weight of fruits per Plant (g)	1191.3^{b} ± 73	769.1^{b} ± 52	812.2^{b} ± 44	518.5^{c} ± 51	492.9^{c} ± 47	508.5^{c} ± 58	360.1^{c} ± 39	353.2^{c} ± 51
Weight of individual Fruit (g)	$37^{a} \pm 9$	$29^{b} \pm 7$	$28^{b} \pm 8$	$20^{c} \pm 5$	$22^{c} \pm 4$	$23^{c} \pm 7$	$20^{c} \pm 6$	$19^{c} \pm 3$
Yield per hectare (Tones)	$33^{a} \pm 5$	$21^{b} \pm 4$	$22^{b} \pm 4$	$1.4^{c} \pm 1$	$13^{c} \pm 2$	$14^{c} \pm 2$	$10^{c} \pm 3$	$9^{c} \pm 2$

Note: values in a row sharing a similar letter do not differ significantly, $p < 0.5$ (M.M = Moneymaker)

response of Roma for nitrogen absorption, translocation and its distribution within plant organs including leaves and fruits (Weaver, 1972; Steward, 1975). Moreover, it seems that fruit growth in both the varieties is due to cell enlargement because in *Lycopersicon esculentum* Mill, cell division ceases at anthesis stage (Houghtaling, 1935) which means that subsequent fruit growth as well as increased in size of morphological plant parts is totally dependent on cell enlargement.

Although in control no marked deficiency symptoms of nitrogen and phosphorus were observed but increased yield upon addition of fertilizers manifested a sort of hidden hunger by tomato plants. This behavior of hidden hunger is reported for many other crops as well (Ahmad and Chaudhary, 1990; Liu *et al*., 1997). In addition to that tomato is a heavy feeder for nitrogen and phosphorus (Singh, 1978).

Our study further suggests that increased yield of tomato is indirectly related to availability to an adequate amount of NPK in soil. Though control plots were not fertilizer deficient but availability of macro-nutrient elements in soil solution was more frequent in all treatment plots. The importance of nutrients availability for tomato particularly in soil solution is evident (Mehta and Saini, 1986; Perez-Alfocea *et al*., 1996; Mauromicale and Cavallaro, 1997). This further supports our findings regarding yield per hectare especially for Roma variety, which concludes that T1 treatment is probably the most suitable dose for fertilizer application. Another important aspect highlighted by this work is that plants differ in response to different amount of applied fertilizers. In order to have maximum yield, proper dose is obviously essential especially when plants not showing any deficiency symptoms.

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