

Effects of Organic and Inorganic Manures on Physical Characteristics of Potato (*Solanum tuberosum* L.)

M.A. PERVEZ, FAQIR MUHAMMAD AND EHSAN ULLAH†

Departments of Horticulture and †Agronomy, University of Agriculture, Faisalabad-38040, Pakistan

ABSTRACT

Present studies were undertaken to observe the effect of organic manure and inorganic fertilizers particularly increased doses of potash on the yield and quality of potato. Various doses of potassium (K_2O) were 25, 50, 75, 100, 200 and 300 kg along with combined application of five tons rottened farmyard manure per hectare. Nitrogen and phosphorus were applied as a single constant dose i.e. 130 kg each per hectare at time of sowing and at the time of earthing up, respectively. Potash application alone did not show any promising results, although increased levels of potassium, increased the yield to some extent. Combined application of farmyard manure and higher doses of potassium proved best to increase the yield of potatoes.

Key Words: Potato; Fertilizer; Manure; Potassium; Yield; Tubers

INTRODUCTION

Potato plays an important role in the economy of the country as a food as well as a cash crop. Much foreign exchange can be earned by exporting potatoes to other countries especially Middle East and even Europe to some extent. But yield of potatoes per hectare is very low in our country as compared to other advanced countries. There may be so many reasons for this low yield but non-judicious and imbalance use of manures is one of the major factor due to which production is declining continuously every year. As the yield of potatoes is obtained in the form of tubers which grow under the soil surface. The present studies were, therefore, envisaged with the assumption that underground growth and development of tubers will be enhanced as a result of potash application alone or in combination with farm yard manure.

MATERIALS AND METHODS

These studies were carried out in Vegetable Experimental Area, Department of Horticulture, University of Agriculture, Faisalabad during 1997 and 1998. Physico-chemical composition of soil of experimental area for 1997-98 has been presented in Table I. Potato cv. "Desiree" was selected for sowing. There were four replications. RCB design was used for layout of the experiment. Statistical analysis was carried out according to the method described by Steel and Torrie (1980). DMR test was used to compare the treatment means at 0.05% probability. There were nine treatments: T_1 =Control; T_2 =25 kg K_2O ; T_3 =50 kg K_2O ; T_4 =75 kg K_2O ; T_5 =100 kg K_2O ; T_6 =100 kg K_2O + 5 tons FYM; T_7 =200 kg K_2O ; T_8 =200 kg K_2O + 5 tons

Table I. Physico-chemical composition of the soil for conducting experiment during 1997-98.

S. No.	Ingredient	1997	1998
1	Clay %	24.2	25.31
2	Silt %	39.3	38.82
3	Sand %	36.4	36.00
4	Class	Clay loam	Clay loam
5	pH	7.8	7.4
6	P_2O_5 ppm	28	24
7	K_2O ppm	155	170
8	Organic matter %	1.8	1.5

FYM; T_9 =300 kg K_2O

The experiment was carried out for two consecutive years. The crop was planted on the first September each year. Whole tubers of about the same size and weight were selected. Uniform cultural practices and plant protection measures were observed in both the years. Data were collected on the following parameters: 1. Germination percentage; 2. Number of main shoots per plant; 3. Number of marketable tubers; 4. Weight of marketable tubers; 5. Number of total tubers; 6. Weight of total tubers; 7. Yield; 8. Specific gravity; 9. Dry matter

RESULTS AND DISCUSSION

Table II depicts significant results for various physical characters of tubers. T_8 (200 kg K_2O + 5 tons farm yard manure) superceded all other treatments. In case of germination percentage, T_6 and T_8 were *at par* statistically. Next best treatments were T_7 and T_9 which were again statistically similar. All the other treatments were *at par* with control. For number of main shoots per plant, T_8 got the top position, however, T_6 also occupied the same position statistically. Then came T_7 and T_9 .

Table II. Effect of potash and farm yard manure application on physical characters of potato during 1997 1998 (Mean two years data)

Treatments	Germination (%)	Main shoots per plant	Marketable tubers	Wt. of marketable tubers (kg)	Total tubers	Wt. of total tubers (kg)	Yield (t/ha)	Specific gravity	Dry matter
T ₁ = Control	70.19 c	138 d	517 f	22.36 f	800 f	29.56 e	24.12 d	1.011 f	20.31 c
T ₂ = 25 kg K ₂ O	70.24 c	141 cd	549 d	27.92 ef	801 f	41.37 d	28.29 c	1.043 e	23.11 ab
T ₃ = 50 kg K ₂ O	69.37 c	139 d	542 e	28.11 e	796 f	40.52 d	28.11 c	1.042 e	22.88 b
T ₄ = 75 kg K ₂ O	70.39 c	143 c	551 d	28.76 e	825 e	42.99 cd	28.36 c	1.044 de	23.16 ab
T ₅ = 100 kg K ₂ O	71.11 c	145 c	556 d	29.19 e	997 d	44.33 cd	29.44 c	1.047 d	23.56 ab
T ₆ = 100 kg K ₂ O + 5 tons FYM	98.76 a	192 a	626 b	48.33 b	1188 b	54.99 b	31.11 a	1.081 b	24.45 a
T ₇ = 200 kg K ₂ O	87.42 b	168 b	589 c	45.67 c	1091 c	47.32 c	30.00 b	1.067 c	24.03 a
T ₈ = 200 kg K ₂ O + 5 tons FYM	99.24 a	194 a	675 a	51.66 a	1213 a	63.68 a	31.66 a	1.091 a	25.30 a
T ₉ = 300 kg K ₂ O	88.37 b	171 b	595 c	46.22 c	1176 b	55.66 b	30.55 b	1.067 c	24.37 a

The means having different letters are significantly different from each other

Control got the lowest position. Other treatments were in between.

In case of number of marketable tubers and their weight, T₈ maintained its top position which was followed by T₆. Next position was occupied by T₇ and T₉ and both of them were statistically *at par*. Lowest number and weight of tubers was observed in control. Other treatments got the middle position.

As regards number and weight of total tubers, T₈ dominated over all other treatments. Next best treatments were T₆ and T₉, both were similar statistically. Control was placed at bottom whereas, other treatments got the middle position. Maximum yield per hectare was noted in T₈ which was similar to T₆ statistically. T₇ and T₉ also gave best yields but they got the second position and no statistical difference could be located among them. All other treatments were similar statistically except control which gave the lowest yield. In case of specific gravity T₈ was found at the top followed by T₆. T₇ and T₉ occupied third position and both of them were similar statistically. Control gave the lowest specific gravity. All other treatments were found in between.

The dry matter of the tubers most of the treatments were found similar statistically as T₆, T₇, T₈ and T₉ were all alike. The next group was T₂, T₃, T₄ and T₅ which were again statistically similar. Control produced the lowest dry matter. Table I explains the chemical composition of the experimental soil.

It is evident from the results that soils having appropriate amount of potassium proved best to enhance the tuber yield of potatoes. Farm yard manure improves the soil structure and thus microbial activity is accelerated which ultimately enhances the potassium absorption, thus potato yield was increased in the form of tubers. Our results are comparable with the findings of previous workers (Verma & Grewal, 1977; Calneck, 1989; Rovas, 1992).

It has been reported that when potatoes growing in

sandy loam soils of India, were applied with 161 lbs potassium per acre, they did not respond to the addition of the potassium in the first year (Wilcox, 1961). Application of potassium sulphate resulted in more seed size and less marketable size potato tubers with higher total yields of potatoes than potassium chloride application (Henderson, 1965). It was concluded that plant and tuber growth was affected greatly by the highest potassium level. Quality of the tubers was not affected by potassium supply (Ulrich *et al.*, 1973). It has been reported that potassium application significantly increased the tuber yield of potato by increasing the size of the tubers. The increase in the size of the tubers improved the quality too (Verma & Grewal, 1977). However, it has been revealed that potash application at the rate of 90 or 180 kg ha⁻¹ did not affect potato production (Yaldes & Derencell, 1981). A good response of potatoes was observed in shape of increased yield with the application of potash fertilizers alone and even better with combined application of farm yard manure (Calneck, 1989). Response of potato was very clearly observed with increased yield of tubers as a result of increased levels of potassium supply alongwith organic manures (Rovash, 1992).

CONCLUSION

Growth and development of tubers was affected with potassium application and response was better only at higher rates of potassium. When farm yard manure was applied along with increased levels of potassium, their effect was observed two fold. So, it is recommended that potassium along with farm yard manure should be applied to get increased potato tuber production of superior quality.

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