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The Effect of Sulphate of Potash (SOP) Versus Muriate of Potash (MOP) on the Yield of Potato (*Solanum tuberosum* L.) Crop

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Abstract: Two potash fertilizers viz. Potassium Sulphate (K_2SO_4) and Potassium Chloride (KCl) at the rate of 100, 150 and 200 kg ha^{-1} each were applied to Cardinal potato to study their influence on the potato productivity. The application of K_2SO_4 at the rate of 200 kg ha^{-1} produced 7.59 tones of small (189.67 thousand) tubers ha^{-1}, while at the same doze KCl produced 1 4.84 tones of large (243.33 thousand table size) tubers ha^{-1}. The total average 21.52 tones tubers ha^{-1} were obtained with application of KCl at the rate of 200 kg ha^{-1}, followed by 21.2 tones tuber ha^{-1} with the application of $K_2 SO_4$ at the rate of 200 kg ha^{-1}. The poor yield 18.25 tones ha^{-1} was gained in control.

Key word: Potassium sulphate (K7 SO_4, potassium chloride (KCl) and potato (*Solanum tuberosum* L.)

Introduction

Potash is one to the important commodity of farm product because it is world's leading vegetable crop ranking only behind Wheat, Rice and Corn (Hartmann et *al.,* 1981). This crop has been successfully cultivated throughout in Pakistan, especially in Peshawar, Swat, Okara, Multan, Pashin, Kalat and Nawab Shah. The versatile soil climatic nature of the area makes it possible to plant three crops almost all over the country. The varying climatic conditions of the country enable the planting of three crops a year i.e Autumn, Spring and summer crops in other works one crop in hilly area while two crops in plains. The total occupied area in NWFP, during 198990 was 8700 Hectares, with the production of 86500 tones (Anonymous, 1989).

Besides, the extensive nature of the statistics regarding the area have still the capability to increase over the dimension of per hectare yield, if the following variable i.e improved variety, proper time of sowing, timidly irrigation, use of balanced fertilizer and other influence cultural practices are judiciously exploded.

Potato is an agricultural commodity which has high potash demand (Bussler, 1965). Actually potassium is essential for a variety of process, i.e. photosynthesis rates, fruit quality, formation of carbohydrates and their accumulation in the plant (Saleem *et al.,* 1986). Now the question, which farm of potassium carrier should be used under the different soil and climatic condition of NWFP, the main aim of this experiment was to find out an optimum dose of the two popular sources of Sulphate of Potash (SOP) and Muriate of Potash (MOP).

Materials and Method

The Research project was carried out on potato cultivars Cardinal at Agricultural Research Institute Tarnab, Peshawar. The experiment was designed as Randomized Complete Blocks (RCB) with total seven treatments, which *were* replicated four times. The detail of treatment is followed;

Potassium Sulphate (K_2SO_4) 100 kg size hectare $(ha)^{-1}$, Potassium Sulphate (K_2SO_4) 150 kg ha^{-1}, Potassium Sulphate (K_2SO_4) 200 kg ha^{-1}, Potassium Chloride (KCl) 100 kg ha^{-1} Potassium Chloride (KCl) 150 kg ha^{-1}, Potassium Chloride (KCl) 200 kg ha^{-1} and control Small tubers (approximately 3040 gm $tuber^{-1}$) were sown in 3rd week of September in the thoroughly prepared land (Fig. 1). The calculated amount of fertilizers was mixed before the construction of ridges. Urea was applied in two split doses i.e. one dose at the time of sowing while the second at the time of first irrigation. Nitrogenous (Urea) and Phosphoric Triple Super Phosphate (TSS) fertilizers were applied in a constant dose. In each plot 50 tubers were equally distributed in 2 rows and the soil was turned over by mean of ridger (Punjghakhay) to make the ridges. After sprouting of tubers the crop field was properly irrigation.

The following parameters were studied;

Number and Weight of Small and Large (above 40 gm $tuber^{-1}$) size ha^{-1}.

In each plot the entire small and large tubers were separated, counted and weighed. The number and weight of tubers ha^{-1} was calculated by the following formula;

Weight of tubers (ha^{-1}) = Weight of (Large or Small) tubers treated $plot^{-1} \times 10{,}000$ ($metre^2$)
Total area of the treated plot ($metre^2$)

No. of tubers (ha^{-1}) = No. of (Large or Small) tubers treated $plot^{-1} \times 10{,}000$ ($metre^2$)
Total area of the treated plot ($metre^2$).

Results and Discussion

The mean value of weight of small tubers ha^{-1} in different treatments varied significant among different treatments and control. The maximum small potatoes were found in treatment K_2SO_4 at 200 kg ha^{-1} followed by 6.83 tones in same source of fertilizer at 100 kg ha^{-1} while 6.74 tones in KCl at 100 kg ha^{-1} (Table 1, Fig. 2). Similar results were reported by Henderson (1955), Dickens *et al*. (1962), Gething (1968) and Love (1978).

The mean value of large size tubers in different treatment showed significant difference among all treatments. The highest yield of large size tubers 14.84 tones ha^{-1} were recorded in the treatment of KCl at 200 kg ha^{-1} as compared of control, which were 11.50 tones. The treatment of K_2SO_4 at 200 kg ha^{-1} produced 13.61 tones tubers ha^{-1}. Similarly KCl at 100 kg and 150 kg ha^{-1} were 13.63 and 13.42 tones ha^{-1}, respectively (Table 1, Fig. 2). The increasing yield of large tuber response was better with KCl than K_2SO_4. The encouraging effect with KCl was also reported by Lin (1966) and Hahlin and Johannsson (1973).

The mean values of number of tubers ha^{-1} were significantly different among different treatment of various source of potash (Table 1). Generally K_2SO_4 produced smaller tubers than KCl (which is not a desirable characteristics to the producer (farmers) point of view. Small tubers ha^{-1} were gained with K_2SO_4 at 200 kg ha^{-1} as compared to KCl at 200 kg ha^{-1} and

Table 1: The effect of sulphate of potash (SOP) versus muriate of potash (MOP) on the No. of small tubers, No. of large tuber, small tuber, large tuber and yield of potato (*Solarium tuberosum* L.) Crop

Treatment	No. of small tubers (in thousand)	No.of large tubers (in thousand)	Small tuber (in Tones)	Large tuber (in Tones)	Yield (tin Tones)
Control	166.6713	195.000	6.45 D	11.50 C	18.25E
K_2SO_4 at 100 ha^{-1}	167.56	200.67C	6.83 B	12.13 BC	18.970
K_2SO_4 at 150 kg ha^{-1}	170.33B	224.678	6.52D	12.92A8C	20.03C
K_2SO_4 at 200 kg ha^{-1}	189.67A	224.99B	7.59A	13.61AB	21.26
KCl at 100 kg ha^{-1}	168.008	201.33C	6.748C	13.63AB	18.87CD
KC1 at 150 kg ha'	167.338	225.67B	6.63CD	13.42ABC	20.06C
KCl at 200 kg $ha^{-/}$	168.006	243.33A	6.61 CD	14.84A	21.52A
Significance	**	**		*	*

Figures Followed by the same letters are not significantly different from each other
* denotes significant
** denotes highly significant

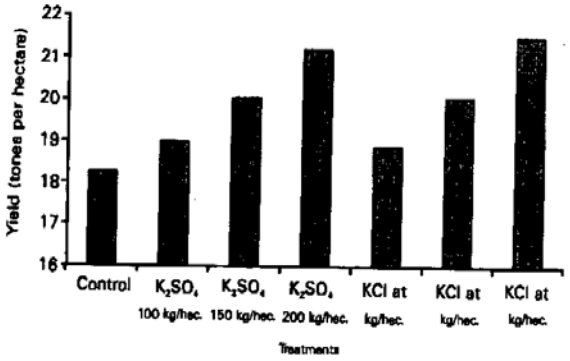

Fig. 1: The effect of different rates and sources of potash fertilizers on the yield of potato cultivars Cardinal

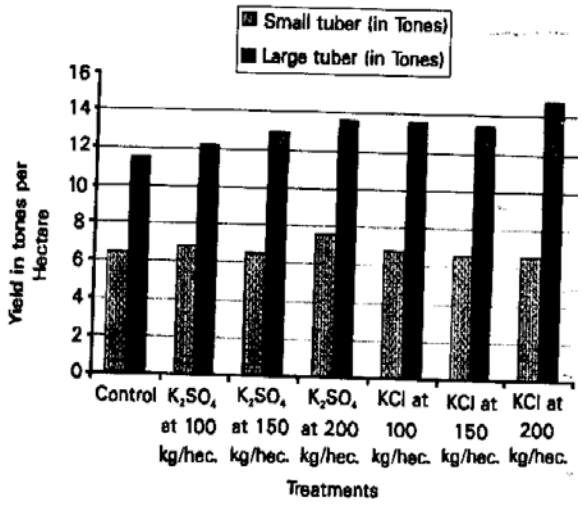

Fig. 2: Yield of small and large potatoes in different potash fertilizers

Control which were 188 and 166.7 thousand ha^{-1} (Table 1, Fig. 2). The result is vice versa in case of the production of large number of tubers. The highest production of large (243.33 thousand) tubers ha^{-1} were recorded with the application of KCl at 200 kg ha^{-1}. It can be concluded from the results that the application of K_2SO_4 is useful of production of small tubers, which called Gola (seed). Similarly results were reported by Henderson (1955), Dickens *et al*. (1962), Gething (1968) and Love (1978). Mean value of yield of tubers showed significant difference ($p<0.05$) among all treatments. The maximum yield produced with the treatment of KCl at 200 kg ha^{-1}, whereas K_2SO_4 at 200 kg ha^{-1} produced 21.200 tones ha^{-1} while, control plant produced 18.25 tones ha^{-1} (Table 1, Fig. 1).

Same results was reported for KCl by Lin (1966) and Hahlin and Johannsson (1973). KCl at 150 kg ha^{-1} produced 20.06 tones, while at the same rate K_2SO_4 gave 20.03 tones ha^{-1}. The yield in K_2SO_4 and KCl at 100 kg ha^{-1} was 18.97 and 18.87 tones ha^{-1}, respectively. It is evident that potash at 150 kg and above has increased the yield and there was no effect of potash in either form at 100 kg ha^{-1}. The response of KCl was very pronounce. While, K_2SO_4 encourage the formation of small and medium size tubers. Thus KCl promotes the formation of large tuber more suitable for table use.

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