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*$_2$SO$_4$) 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*$_2$SO$_4$ 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 14.84 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 (*K*$_7$SO$_4$), potassium chloride (*KCl*) and potato (*Solanum tuberosum* L.)

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### 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, timely irrigation, use of balanced fertilizer and other influence cultural practices are judiciously explored.

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$_2$SO$_4$**)** 100 kg size hectare (ha)$^{-1}$,
- **Potassium Sulphate (**K$_2$SO$_4$**)** 150 kg ha$^{-1}$,
- **Potassium Sulphate (**K$_2$SO$_4$**)** 200 kg ha$^{-1}$,
- **Potassium Chloride (**KCl**)** 100 kg ha$^{-1}$,
- **Potassium Chloride (**KCl**)** 150 kg ha$^{-1}$,
- **Potassium Chloride (**KCI**)** 200 kg ha$^{-1}$ and control Small tubers (approximately 3040 gm tuber$^{-1}$) were sown in 3$^{rd}$ 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 (Punghakhay) to make the ridges. After sprouting of tubers the crop field was properly irrigated.

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;

\[ \text{Weight of tubers (ha}^{-1}) = \text{Weight of (Large or Small) tubers treated plot}^{-1} \times 10,000 \ (\text{metre}^2) \]

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$_2$SO$_4$ 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), Getting (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$_2$SO$_4$ 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$_2$SO$_4$. The encouraging effect with KCl was also reported by Lin (1966) and Hahlin and Johansson (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$_2$SO$_4$ 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$_2$SO$_4$ at 200 kg ha$^{-1}$ as compared to KCl at 200 kg ha$^{-1}$ and
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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 (Solanum tuberosum L.)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of small tubers (in thousand)</th>
<th>No. of large tubers (in thousand)</th>
<th>Small tuber (in Tones)</th>
<th>Large tuber (in Tones)</th>
<th>Yield (in Tones)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>166.6713</td>
<td>195.000</td>
<td>6.45 D</td>
<td>11.50 C</td>
<td>18.25E</td>
</tr>
<tr>
<td>K$_2$SO$_4$ at 100 kg ha$^{-1}$</td>
<td>167.56</td>
<td>200.67C</td>
<td>6.83 B</td>
<td>12.13 BC</td>
<td>18.970</td>
</tr>
<tr>
<td>K$_2$SO$_4$ at 150 kg ha$^{-1}$</td>
<td>170.33B</td>
<td>224.678</td>
<td>6.52D</td>
<td>12.92ABCD</td>
<td>20.03C</td>
</tr>
<tr>
<td>K$_2$SO$_4$ at 200 kg ha$^{-1}$</td>
<td>189.67A</td>
<td>224.99B</td>
<td>7.59A</td>
<td>13.61AB</td>
<td>21.26</td>
</tr>
<tr>
<td>KCI at 100 kg ha$^{-1}$</td>
<td>168.008</td>
<td>201.33C</td>
<td>6.74BC</td>
<td>13.63AB</td>
<td>18.87CD</td>
</tr>
<tr>
<td>KCI at 150 kg ha$^{-1}$</td>
<td>167.338</td>
<td>225.678</td>
<td>6.63CD</td>
<td>13.42ABCD</td>
<td>20.06C</td>
</tr>
<tr>
<td>KCI at 200 kg ha$^{-1}$</td>
<td>168.006</td>
<td>243.33A</td>
<td>6.61CD</td>
<td>14.84A</td>
<td>21.52A</td>
</tr>
</tbody>
</table>

Figures Followed by the same letters are not significantly different from each other

* denotes significant

** denotes highly significant

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 KCI at 200 kg ha$^{-1}$. It can be concluded from the results that the application of K$_2$SO$_4$ 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 KCI at 200 kg ha$^{-1}$, whereas K$_2$SO$_4$ 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 KCI by Lin (1966) and Hahlin and Johannsson (1973). KCI at 150 kg ha$^{-1}$ produced 20.06 tones, while at the same rate K$_2$SO$_4$ gave 20.03 tones ha$^{-1}$. The yield in K$_2$SO$_4$ and KCI 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 KCI was very pronounce. While, K$_2$SO$_4$ encourage the formation of small and medium size tubers. Thus KCI promotes the formation of large tuber more suitable for table use.

References