

## Response of Russet Potato to Source and Rate of Phosphorus Fertilizer Application

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### Introduction:

The value of a potato crop is measured by tuber yield, size, and quality. Improving results in any or all of these categories can bring economic gains to growers.

### Challenge:

The various sources of phosphorus (P) available to growers may lead to differing yields at harvest. Determining the effects on yield and P concentration of several P sources, as well as finding optimal treatment rates, can enable growers to improve profitability.

### Research:

In 2013, agronomist Samuel Y.C. Essah of Colorado State University conducted a field study on Rio Grande Russet potato fields at the San Luis Valley Research Center in Center, Colorado. Soil P before fertilizer was applied was 199 lbs P per acre (179 lbs P<sub>2</sub>O<sub>5</sub>/ac).

### Methodology:

The treatment plots were laid out in a randomized complete block design and tested six P fertilizer sources (MAP, MAP + AVAIL®, MESZ, MESZ + AVAIL, 40 ROCK™, and 40 ROCK + AVAIL) applied at two rates each (50 and 100 lbs P<sub>2</sub>O<sub>5</sub> per acre). A control plot did not receive any P source.

### Results:

**Petiole P concentration:** 40 ROCK and 40 ROCK + AVAIL at 100 lbs/ac resulted in the highest petiole P concentration.

**Total-plant P concentration:** Plots treated with MAP or MESZ + AVAIL at 100 lbs/ac resulted in the highest total-plant P concentration, followed by MAP or 40 ROCK at 50 lbs/ac and MESZ or 40 ROCK at 100 lbs/ac.

**Tuber size:** The medium (4–10 oz) tuber group responded to P source and rate. MAP + AVAIL at 100 lbs/ac increased the medium-size tuber yield the most.

**Tuber quality:** MAP + AVAIL at 100 lbs/ac and MESZ + AVAIL or 40 ROCK at 50 lbs/ac showed the lowest percentage of tuber external defects. Tubers that received MESZ or 40 ROCK + AVAIL at 50 lbs/ac did not show any internal defects. Specific gravity was highest for tubers that received MAP, MAP + AVAIL, 40 ROCK, or 40 ROCK + AVAIL at 50 lbs/ac and MAP + AVAIL or MESZ at 100 lbs/ac.

### Practical Applications:

All treatments resulted in high P uptake, but not all treatments increased total tuber yield or size. This was possibly due to high residual P supply in the soil. Several treatments that included AVAIL improved tuber quality, size, petiole P concentration, and total-plant P concentration.

### Yield response of Rio Grande Russet potato to source and rate of phosphorus fertilizer application, 2013.

Source and Rate of P Application (lbs/ac)	4-10oz	10-16oz	Total
	Yield (cwt/ac)		
Control	267d	66a	467a <sup>1</sup>
MAP 50	284bcd	33f	464a
MAP 100	285abcd	43cdef	484a
MAP + AVAIL 50	291abcd	61ab	474a
MAP + AVAIL 100	310a	29f	482a
MESZ 50	309ab	37def	490a
MESZ 100	279d	52abcd	478a
MESZ + AVAIL 50	307ab	33f	483a
MESZ + AVAIL 100	274d	57abc	477a
40 ROCK 50	285abcd	52abcd	462a
40 ROCK 100	284abcd	35ef	464a
40 ROCK + AVAIL 50	277d	57abc	469a
40 ROCK + AVAIL 100	300abc	44bcdef	474a
LSD (0.05)	25	17	29
CV (%)	6	26	4

<sup>1</sup>Figures in the same column and bearing the same letters are not significantly different at the 0.05 level of probability.

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