

# Potato quality lowered in field tests with High Nitrogen Fertilization

Deterioration in quality of potatoes may be caused by applications of large quantities of nitrogen fertilizer.

In field trials, larger total yield of white potatoes resulted from increasing amounts of nitrogen. However, the yield of U.S. No. 1 grade tubers was not increased and the specific gravity—dry matter—of the tubers was lowered.

Lack of an adequate soil supply of nitrogen will cause yellowing of plant foliage and early maturity and low yields. An excess of nitrogen tends to stimulate production of succulent foliage and delays maturity. Phosphorus fertilizer may induce earlier maturity even with high levels of nitrogen.

In past investigations, in all principal potato growing areas of California, applications of nitrogen at rates above 160 pounds per acre gave little or no increase in yield. However, it is not economical to raise potatoes in mineral soils under semi-arid conditions without some form of nitrogen fertilizer.

## Field Trials

Three field trials were established in Kern and Tulare counties to study the effect of various rates of nitrogen application upon total yield, grade distribution and the dry matter content of potatoes. In two of the trials White Rose potatoes were used; one with differential irrigation treatments and the other with spacing pieces. In the third trial Kennebec potatoes were used to study the effects of varying nitrogen and phosphorus. All trials were conducted to coincide with

normal growing period of planting and harvest for the area.

Four rates of nitrogen—60, 120, 180, and 240 pounds per acre—were applied as ammonium sulfate. In addition, supplemental phosphorus as treble superphosphate was included with the nitrogen. The fertilizer treatments were banded at time of planting.

Growing conditions were ideal for potatoes during the year of the trials, and yields in most of the state were reported to be higher than in previous years. Thus, the potential demands upon soil nutrients by growing plants should have been at maximum. Consequently the fertilizer should exert considerable influence upon potato tuber responses.

## Yield and Grade

At harvest—104–110 days after planting—potatoes from the field trials were graded and specific gravity of tubers was determined. Increases in total yield obtained with application of nitrogen at rates up to 180 pounds per acre ranged from 0.1% to 14.1%. The application of 240 pounds of nitrogen per acre increased the yield of White Rose potatoes by only 0.3% above the 180 pound rate, but the yield of the Kennebec showed an increase of from 2.8% to 8.6% above the 120 pound rate.

Although total yield increased, with the larger amounts of nitrogen, the desired medium-to-large grade—U.S. No. 1—declined in sacks per acre and in percent of total yield. In contrast, the culls—potatoes with growth cracks or

knobs—showed a marked increase in yield per acre and percentage of total crop produced. This trend was consistent, for both White Rose and Kennebec varieties, in all three trials.

Inclusion of different levels of phosphorus in the Kennebec trial did not materially alter the effects of high rates of nitrogen. A higher total yield was obtained with the 60 pounds per acre rate of superphosphate; however, the yield of U.S. No. 1 potatoes failed to show a corresponding increase.

The amount of rotted White Rose potatoes was not influenced by increased rates of nitrogen. However, with Kennebec, increased nitrogen produced a tendency toward an increase of rotted tubers. A high percentage of rot was noted at the stolon attachment.

## Specific Gravity

Increasing the rates of nitrogen caused a marked and highly significant reduction in the dry matter content of the tubers. In all cases the lowest specific gravity was found with the 240 pounds per acre of nitrogen. This appears to be a reflection of the delay in maturity due to high nitrogen treatment. Phosphorus fertilizer did not increase tuber dry matter content.

Whether yield or specific gravity of tubers from the higher rate of nitrogen would have reached the same level as the other treatments if harvest had been delayed to allow full maturity of tubers was not investigated.

Studies are being continued with varying rates of fertilizers to determine the proper methods and amounts of application to obtain the best yields of high quality potatoes.

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Yield and Grade of Kennebec Potatoes for Various Rates of Nitrogen

Fertilizer treatment Pounds per acre		Average yield—Hundredweight sacks per acre							
Nitrogen	Superphosphate	Small	Med. to large U.S. #1	Large	Green	Rot	Deformed		Total
							Growth cracks	Knobs	
60	0	17	297	..	10	10	2	27	364
120	0	21	300	..	16	12	11	60	420
240	0	23	267	..	30	20	23	69	432
120	60	21	306	..	17	12	14	64	437
240	60	19	286	..	17	22	41	95	478
120	120	19	307	..	20	15	16	71	448
240	120	21	281	..	19	13	46	89	469
LSD* 5%		N.S.	32		N.S.	N.S.	19	29	100
1%		N.S.	44		N.S.	N.S.	26	39	135

\* Least significant difference.