POTATO FERTILIZATION

By W. D. PEW and JAMES H. PARK

The wise use and skillful application of fertilizers play an important role in producing high yields of good quality potatoes. Because of the large fertilizer requirements for this crop, developing an adequate, yet unwasteful, fertilizer program is often difficult.

Where other factors are at an optimum, the composition of the fertilizer to be used is very important. The ratio between nitrogen, phosphorus and potassium appears important, but the water solubility of the phosphorus seems to be the key in proper fertilization.

Obviously the best and most carefully thought out program would be useless in bringing about the desired results if other factors, such as irrigation practices, fertilizer placement and other cultural practices, and the soil itself are not carefully considered and placed into proper relationship with the whole production process.

Old Methods Good No More

Studies with fertilizers and fertilizer programs have shown that very important changes have become necessary to achieve the highest degree of success. These studies have shown in general that the previously used fertilizer programs are not adequate for today's crop.

The need for fertilizer phosphorus for potato production in Arizona has been demonstrated in many experiments and under several soil conditions. Treatments listed in Table 1 were selected from a greater list to represent the fertilizers of various ratios ranging from 2-1-0 to 1-4.4-0.

A study of the data shows progressive increases in yield associated with the broadening of the N and P_2O_5 ratio up to 1 to 3. Each of the fertilizer materials used in obtaining the range of ratios was a different commercially available one. Since the same fertilizer was not used in each ratio, at least two contributing factors exist in relation to their influence on growth. These are the direct increase in amount applied and the variation in solubility. Hence, the increase in yield is associated with the total availability of phosphorus to the plants through either or both of these relationships.

Table 1. Effects of Increasing Amounts of P_2O_5 on Yield of Potatoes.

Treatment	Ratio*			Yield
	N	P_2O_5	K_2O	100 lb. Sacks/Acre
1	2	1	0	216
2	1	1	0	231
3	1	2	0	258
4	1	2.5	0	278
5	1	3	0	315
6	1	4.4	0	287

* All materials were chemically combined type. Nitrogen constant at 120 pounds per acre.

Different Ratios Today

In the past, where a 1-2-1 ratio was deemed best, today fertilizers with ratios of 1-2.5-0 or 1-3-0 produce the best yields. Yet knowing the ratio of N to P is not enough. Actually, the solubility of the phosphate is the important consideration. Sources of fertilizer with the same ratio can often produce yields that vary as much as materials of different ratios. Fertilizers with a high water soluble phosphate in the ratio range of 1-2.5-0 to 1-3-0 are therefore most desirable.

Caution should be exercised in the selection of fertilizers, and the question of water solubility should be a standard one for all potato growers to ask. Note in Table 1 the almost straight line increase in yields as the ratio changes from 2-1-0 to 1-3-0, followed by a leveling off as the ratio widens beyond this range.

It must be remembered that for most soils the total nitrogen should be at or near the 120-pounds-per-acre level for a given potato crop. This means that if a 90-pound application is made at planting time, 30 additional pounds should be applied as a side-dressing not later than when the tubers are about the size of marbles. In most cases, though, all of the nitrogen fertilizer may be applied at planting time with excellent results. This method eliminates having to incur additional expense and labor in making a second application.

Table 2. Effects of Fertilizer Potash on Yield.

Treatment	Material	Yield
		100 lb. Sacks/Acre
1	10-20-0	291
2	10-20-5	280
3	10-20-10	267

Don't Use Potash

Much has been said concerning the use of potassium in potatoes, but generally its use, even in small quantities (5 percent of the fertilizer), almost always will cause a reduction in yield and generally will reduce the chipping quality by lowering the dry matter (specific gravity). The use of fertilizer at the recommended rates, but with a 10 percent level of potash, is practically a guarantee to a reduction in yield. Data in Table 2 substantiate this finding. These tests over the past several years have consistently shown a reduction in yields where potash is present as added fertilizer.

In summary, care should be exercised in selecting a fertilizer material with a ratio within the range of 1-2.5-0 to 1-3-0 and that the phosphate contained therein be of the highest water solubility possible. The usual citric acid expression of phosphate solubility should not be used except in broad generalities, in evaluating fertilizer desirability for this crop. Keep nitrogen level at or near 120 pounds per acre.

All fertilizer may be applied at planting time. If a split application is used, the last application should be made prior to the time the early tubers reach the size of marbles.

The use of potash should be avoided except where specific reasons are apparent such as buyer requirement. Such reasons are generally not directly associated with yield or chipping quality, since both of these tend to be lowered with the use of fertilizer potash.

This is fourth in a series of articles on potato culture in Arizona by these two highly competent authors. Dr. Pew is professor of Horticulture and superintendent of the Mesa Branch Experiment Station. James H. Park is an assistant in research, for several years at Mesa but now at the Yuma Branch Experiment Station.