Fertility Guidelines for Irrigated Pumpkins and Related Crops

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Illinois is the nations leading pumpkin producer. The crop is grown on about 12,300 acres. Soil fertility requirements are distributed with the Technical Note 19. There have been revisions to the nitrogen credits based on the previous legume crop and the potassium recommendations have been modified. The revised fertility guidelines will be used when developing nutrient management plans with pumpkin producers.

N-P-K Fertilizer Requirements and Recommendations in Pumpkins and Related Crops

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1. Nitrogen fertilization recommendations

Due to the various physio-chemical transformations and mobility of N in most soils, chemical tests for plant-available soil N can be highly inaccurate and misleading. Subsequently, fertility recommendations for N in pumpkins are not based on soil N tests, but rather are based primarily on crop yield potential, with adjustments made for soil organic matter content. In Table 1, pumpkin N fertilizer recommendations are for a fruit yield potential of 20-25 tons/acre and for plant populations of 1,850 to 4,500 plants/acre. Based on the fruit yield levels and plant populations used in the calculations, the fertilizer recommendations for N (as well as P and K) discussed below should also be applicable to related winter squashes.

Table 1. Nitrogen fertilizer recommendations in pumpkins for various levels of soil organic matter.[2]

soil organic matter content (%)			
< 2	2-9.9	10-20	>20
N rate (lbs N/acre)			
100-120	80	60	30

[2]for a yield goal of 20-25 tons/acre

On soils with less than 2% organic matter (i.e., sands), it is common practice to split the N application, with one-half the N applied preplan, and one-half side dressed when vines run and fill-in between the rows.

N credits. If the previous crop was soybean, a credit of 20-25 lbs. N/acre can be taken. If the prior crop was a legume vegetable, such as green beans or peas, a credit of 15-20 lbs. N/acre can be taken. However, in both cases, no credit should be taken if pumpkins are grown on sand soils.

For each ton of solid dairy, cattle, or swine manure applied, N recommendations can be reduced 4 lbs/acre. If liquid sources of dairy, cattle, or swine manure are used, subtract 10 lbs N/acre for each 1000 gallons/acre of material applied. However, in no case should amounts of manure in excess of N fertilizer requirements be applied.

2. Phosphorus and potassium fertilization recommendations

P and K soil test levels. As regards P and K fertility requirements, pumpkins and winter squashes are classified as demand-level '5' crops, which means they have a moderate to high demand for P and K. Unlike N, however, P and K fertilizer recommendations are based on the levels of plant-available nutrient in the soil. Optimum soil test levels of exchangeable P and K for pumpkins are shown in Table 2.

Table 2. Optimum soil test levels for P and K in pumpkins and related crops.

soil type	soil P1 (lbs/acre)	soil K
loam, silt, clay	60-75	250-350
sands	60-75	200-300

Phosphorus (P205) and potassium (K20) fertilizer recommendations. When P and K soil tests are in the optimum range, P and K fertilizer recommendations are set to a rate approximately equal to the amount removed in the harvested part (pumpkin fruit) of me crop. This is known as the 'maintenance' level and is roughly equal to 105 lbs K/acre. Based on these totals, and converting P and K to their respective oxide equivalents (and increasing the P requirement 50% to account for fixation by soil particles), the fertilizer maintenance requirement (FMR*) for P and K in pumpkins for a yield goal of 20-25 tons fruit/acre calculates out to approximately 125 lbs K20/acre and 50 lbs P205/acre.

When soil test results are below the optimum range, additional P and K is added to the maintenance P and K levels. Conversely, when soil test results are above the optimum range, P and K fertilizer recommendations are reduced to approximately 1/4 to 1/2 the maintenance levels. These calculations are factored in to the P and K fertilizer recommendations in Tables 3 and 4, respectively. Similar to that for N, the recommendations in each table are based on a fruit-yield potential of 20-25 tons/acre, and for plant population densities of 1,850-4,500 plants/acre.

Additionally, it is important to note that soil test results are normally expressed in lbs/acres of elemental P or K, while fertilizer recommendations are given as P_2O_5 and K_20 equivalents. Some soil-testing laboratories report soil P_20_5 and K_20 in units of parts-per-million (ppm). To convert ppm to lbs/acre, multiply ppm by 2 (lbs/ac = ppm x 2).

Table 3. Phosphorus fertilizer requirements (P_2O_5) in pumpkins for various levels of soil P fertility

	P fertilizer requirement		
		expected yield level	
P1 soil test	maximum	95%	90%
(lbs P/ac)		(lbs P2O5/ac)	
100	0	-	-
90	30	-	-
80	60	0	-
70	90	20	-
60	120	50	0
50	150	80	30
40	180	110	60
30	210	140	90
20	240	170	120
10	270	200	150

P 'maintenance' level (~ 50 lbs P_2O_5/acre)

Table 4. Potassium fertilizer requirements (K_20) in pumpkins for various levels of soil K fertility

	K fertilizer requirement		
		expected yield level	
K soil test	maximum	95%	90%
(lbs K/ ac)		(lbs K_2O/ac)	
400	60	-	
300	150	60	-
280	160	70	10
260	180	90	30
240	200	120	40
220	210	130	60
200	230	150	80
180	250	170	90
160	260	180	110
120	300	220	140
100	310	230	160
80	330	250	180
60	350	370	190
40	360	280	210

K 'maintenance' level (~ 125 lbs K20/acre)