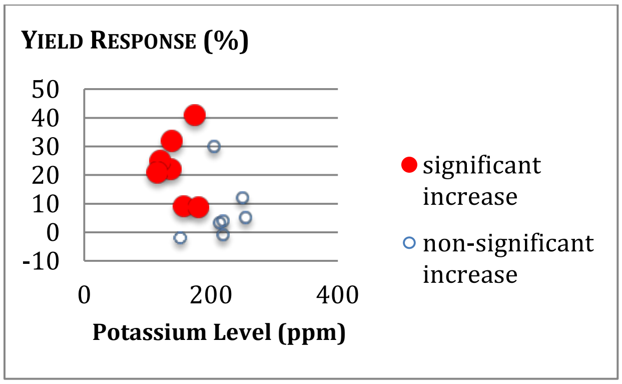
Got Potassium?

(Partial reprint from newsletter Tomato Info Dec 2014)

Tomatoes may benefit from potassium applications. UC Plant Pathologist Mike Davis and I measured yield responses up to 40% when soil levels were below 200 ppm K.

Our recent tests explored improving tomato plant health, initially as a soilborne disease control project. In our first season, a supplemental application of composted poultry manure increased yield by 30%. While not demonstrably reducing disease level, we repeatedly observed yield responses to composted manure. Of the 14 tests conducted over a 4-year period, 7 of the tests had statistically significant yield responses to the supplemental compost application. The control was the 'norm' for the grower nutrient management practice in their commercial field where each test was conducted. All tests, except for one, were conducted in buried-drip irrigated fields. Compost increased yields when soil K levels were below 200 ppm (Table A). There were exceptions.

Table A. Influence of soil K level (in ppm) on processing tomato yield response to composted poultry manure, Yolo-Solano, 2011-2014.



Our treatment list was adjusted as we gathered and processed data. Our focus shifted from disease control to nutrient management. We compared the compost input to conventional NPK fertilizer. An estimated compost-equivalent rate to the seasonally available NPK level served as our 'compost mimic' treatment. We also compared a potassium-only input as potassium muriate (KCl). Seven of the 14 tests included the comparative treatments: non-supplemented control, composted poultry manure, NPK compost mimic and KCl.

Composted poultry manure provided the highest yield, while potassium alone also boosted yields, similar to the compost NPK mimic (Table B). The yield response to compost appears to be related to potassium, but there is an added contribution beyond NPK. Compost rates were commonly10 tons per acre applied in a 12" band centered on the bed top ahead of springtime, seedbed tillage that included a PTO-driven, rotary mulcher. While deeper placement would seem more effective, we were not able to assess the benefit in our few attempts. We plan to continue to evaluate surface vs. deeper placement.

Table B. Yield response in processing tomatoes from 7 field tests, Yolo-Solano county, 2011-2014.

	Treatment	Yield (tons/A)	
1	Compost	**56.9**	a
2	NPK mimic	54.1	b
3	Potassium KCl	53.8	b
4	Control	50.2	c
	LSD 1%	2.0	
	CV	5	
	interaction prob	0.00	

Note: There was a significant influence by individual field sites on the treatment response, as indicated by highly significant statistical interaction.

Self-Assessment of Potential Benefit of K: Collect soil samples from top foot. For drip irrigated fields, sample within 6 inches of drip line to measure nutrients from the active root zone. Our limited tests indicate that soils with less than 200 ppm K (from an ammonium acetate extraction lab procedure) are candidates for a potential yield response to K applications. Soil K levels below 150 ppm are more likely to respond. A secondary indicator to the ppm K measurement is percent K on the cation exchange capacity. Fields with K levels below 2% are better candidates for a response. The combination of less than 200 ppm K coupled with less than 2% K help refine the prediction.

As there may well be high variation within a field, the few samples may not accurately reflect the K status. Thus, fertilizing with K across a dozen rows as a test strip may be a practical pilot method of assessing whether a field is K responsive. Harvest those rows separately into empty trailers and record weights relative to harvested row distance and compare to neighboring non-K fertilized rows. Net fruit weight receipts along with trailer identification from the processor and grade station can be tracked.

We've had success with sidedressing K as a preplant application in drip irrigated fields. What rate? One of our test fields had a linear response with rates from 50 to 800 lbs. of K_20 per acre. A rate between 50 to 200 lbs/A seems reasonable given the uncertainty.

Note: If applying K through the drip line, applications should begin as early as 6 weeks after planting and repeated for 4 to 5 weeks. Applications should be before 'full-bloom' to be well ahead of fruit-sizing period when K demand is high. Preseason soil sampling appears to be a timelier and better indicator compared to in-season, plant tissue sampling. In my limited experience, by full bloom, tissue sampling may be an indicator of a problem, but is too late for a corrective action.

Further depletion of potassium will continue unless replenished. As yields increase, the crop removal rate of potassium increases. With drip irrigation, the root exploration area is reduced and thus the depletion rate of soil K is higher. It seems logical that in the future, K applications are needed to sustain the system.

The current local information suggests less than 200-ppm soil K may be a threshold for K applications. At full bloom growth stage, tissue samples to guide potassium management decisions are questionable; and by 1st ripe fruit stage, the samples are ineffective in guiding further K input for the current season.

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