

On-Farm Research
Corn Yield Response to Potassium Fertilization
Grains and Nutrient Management Teams

Contact Information:

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Trial No. 1

Objective: Determine corn (or soybean) yield response to potassium (K) fertilization at existing soil test levels.

Rationale: Results will indicate whether response to K fertilization occurs across a range of soil test levels that hopefully will be represented by a number of similar trials conducted around the state. These results will indicate if current soil test K recommendations need to be revised. Current recommendations indicate the following approximate response categories:

- Soil test K = 80-110 ppm, response expected
- Soil test K = 110-140 ppm, occasional response possible
- Soil test K = >140 ppm, response unlikely

Experiments in all of these soil test K categories will provide valuable information for the data base.

Treatments:

1. No added K
2. Broadcast K application (suggested rate, 120 lb K₂O/acre. Lower or higher rates are also acceptable)

Methods:

1. Experimental design will be a randomized complete block design with three replications (four replications is preferred). Treatments will be installed as strips in farmer's fields. Minimum no. of plots = 2 treatments x 3 reps = 6 strips (plots). Trials should be located in a representative area of the field with the strips running across obvious natural variation within the field. Treatments should be randomly assigned to strips (plots) within each replication. Map and record the location of all treatments and replications in the experiment.
2. Since all field operations will probably be done with farmer equipment, the width of the strips should accommodate the width of the broadcast K fertilizer application and planting and harvesting equipment.

3. Soil samples for routine soil tests including K, should be taken from each strip. Each sample should be a composite of at least 10 cores taken from the strip. Sampling depth should be 0-6 inches with optional additional samples taken to the 6-12 inch depth. My program will cover the cost of routine tests (pH, P, K, and organic matter) on these samples if they are sent to the UW labs at Marshfield or Madison. Number of samples per trial = 2 treatments x 4 reps x 2 depths = 16
4. Trials will be done at the existing K soil test level at the experimental location (see Rationale above).
5. If standard grower practice includes use of starter fertilizer, the same starter application should be used across the entire experiment. (See procedures for Trial Nos. 2 and 3 for starter fertilizer evaluation options).
6. Data collection - Record and return the following information from each trial: Hybrid or variety, hybrid relative maturity planting date, starter fertilizer rate, placement, and analysis, tillage (specifically indicate if and how broadcast K treatments were incorporated), previous crops (document tillage and crop rotation history for the three previous years if possible), soil test data for current year samples and existing soil test data with test date. Measure residue cover in three plots or strips using the line-transect method. In no-till systems, indicate if planters were equipped with row clearing devices.
7. Yield measurements: Yield measurements require accurate information on the length and width of the area harvested in each strip, the weight of the harvested grain, and the moisture and test weight of grain from each strip. This information should be recorded and forwarded to me for data analysis.

Trial No. 2

Objective: Determine corn yield response to potassium in a starter fertilizer application where broadcast potassium fertilizer has been applied.

Rationale: Results will indicate whether response to K in starter fertilizer occurs across a range of soil test levels represented by a number of similar trials conducted around the state. Specifically, the question of additional response to K in starters in the presence of a broadcast K application for the current crop will be addressed. This trial would be conducted where fall or spring broadcast K (suggested rate, 120 lb K₂O/acre. Lower or higher rates are also acceptable) was applied to the entire experimental area.

Treatments:

1. No starter fertilizer
2. Complete starter fertilizer (N-P-K) applied at 100-200 lb of material/acre in a 2 x 2 or similar side-placed method. Seed-placed or pop-up starter treatments could be substituted for the side-placed material, but rates must be reduced so that N+K₂O in the application does not exceed about 10 lb/acre. Typical starter fertilizer grades could be 9-23-30 for dry fertilizers and 7-21-7 for liquids.

Methods: Use same methods as described for Trial No. 1.

Trial No. 3

Objective: Determine the effect of starter fertilizer composition on corn yield response where broadcast potassium fertilizer has been applied.

Rationale: Results will indicate whether a complete N-P-K starter or a N-P starter will optimize yields where broadcast K fertilizer (suggested rate, 120 lb K₂O/acre. Lower or higher rates are also acceptable) has been applied. Specifically, the question of whether additional response to starter will occur with a N-P-K fertilizer compared to a N-P fertilizer will be addressed. These trials will be conducted across a range of K soil tests represented by a number of similar trials conducted around the state.

Treatments:

1. No starter fertilizer
2. Complete starter fertilizer (N-P-K) applied at 100-200 lb of material/acre in a 2 x 2 or similar side-placed method. Example materials would be 9-23-30 for dry fertilizers and 7-21-7 for liquids.
3. N-P starter fertilizer applied at 100-200 lb of material/acre in a 2 x 2 or similar side-placed method. Example materials would be 18-46-0 for dry fertilizers and 10-34-0 for liquids.

Seed-placed or pop-up starter treatments could be substituted for the side-placed materials, but rates must be reduced so that N+K₂O in the application does not exceed about 10 lb/acre. If only one starter fertilizer material is available, use the N-P-K starter material and conduct the trial using the procedure under “Trial No. 2” above.

Methods: Use same methods as described for Trial No. 1. Note that Trial No. 3 includes three treatments per replication. Therefore, the minimum number of plots = 3 treatments x 3 replications = 9 strips (plots).

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