eFields

Ohio State University Extension
Corn Nitrogen Timing Trial Protocol

Study Overview

The goal of this study is to determine the yield impact of corn nitrogen fertilizer timing in Ohio. Information from this trial will be used to improve management recommendations for nitrogen for growers throughout the state. A minimum of two different nitrogen timings should be compared. To maximize learning, three timings are recommended, and more application dates can be added, if adequate space is available. Consistent N sources are recommended to standardize comparisons.

Proper experimental design is important to ensure the validity of the yield results at the season end. Plot replication and randomization make it possible for statistical analysis to account for the natural field variation that occurs. For this study, a minimum of three replications should be used and four replications are recommended. Plots should be randomized within each replication to eliminate bias due to plot order.

Selecting Nitrogen Timings

- A total of 2-4 nitrogen timings are recommended replicated no less than 3 times with 4 or 5 replications ensuring a successful study.
- Increments between selected application dates should be no less than 2 weeks apart.
- Common timings to compare are pre-plant, at-planting (planter applied), V3-V5 sidedress, mid-season (V8-V10), and late-season (V10-VT).
- It is important to have the farmer articulate his/her primary question with the trial. For example, the question, *"Can late season N reduce N requirement?"* will inform a different set of treatments than the question, *"Can late season N increase grain yields?"*
- In trials with mid or late-season treatments, you should consider applying a consistent and sufficient base rate of N (100 lbs N/acre minimum) pre or at-planting across all treatments to avoid under-supplying the crop with N early in the season.
- Select application timings and make sure the farmer is comfortable with treatments. Flexibility with in-season timings will often be necessary due to weather conditions.
- It can be challenging to ensure you have true controls in place when designing N timing trials. Consider vetting your design through a seasoned educator or specialist to verify the robustness of the design.

Field Dimensions

The field size will determine the total number of plots that can be installed. Remember, at least 3 replications per application timing. Plot length is typically determined by the length of the field. All plots should be at least 500 feet long. Plot width will be determined by equipment size. It is important to take into account the size of both the N application equipment and the combine, as well as any application equipment that might impact the trial. If N is applied with the planter, this needs to be considered, as well. Lining up treatments with planters passes may make mid and late-season applications easier and help minimize crop damage caused by the applicator.

Full-width or half-width of applicator width is recommended for a plot width. It will depend on the width of the applicator plus the applicator's ability to independently control rates if a split-width setup is selected).

- If different N applicators will be used, the plot width should accommodate the size of all applicators. Example: N applied pre-plant anhydrous (8 row) and 28% UAN sidedress (12 row), plots need to be at least 60 feet (24 row).
- Estimate the field width then divide by the selected width (full- or split- width) to determine the number of passes / plots available and if you can meet the 5 treatments by 3 replications (15 plots).
- Passes / plots no less than 500-feet (not counting headland rows) are recommended.
- Plots widths should consist of two or more combine header widths.

Suggestions

- To maximize learning, at least 2 fields per county is recommended.
- Evaluate application equipment and combine width to make sure the selected plot dimensions align properly. Correct alignment of the application equipment and combine widths will ensure project success.
- Using the variety tracking option using an in-cab display can help manage the project. One can setup the 5 treatments by using the variety name then adding A, B, C, D or E (or similar nomenclature) at the end of each name.
    - Before starting each pass, select the treatment corresponding to the plot.
    - Example help guide for the Precision Planting 20/20 display illustrating how to create custom varieties for a project: https://fabe.osu.edu/sites/fabe/files/imce/images/Precision_Ag/PP20_20_AddingCustomHybrid_0.pdf

Data Collection

5 primary data needs for this project

1. Complete worksheet
2. Field boundary (lat/long of field will work at minimum)
3. As-planted data (if available)
4. As-applied data for N applications
5. Yield Monitor Data (calibrated); If a yield monitor is not available, a weigh wagon can be used to weigh the total amount harvested from each plot. Accurate plot dimensions are needed (e.g. width and length of each plot)

Example Layouts

Plot layout with 4 replications using pre-plant (PP), mid-season (MS), & late-season (LS) applications as treatments.

Planter Pass	Replication	Plot ID	Description	TRT Code
1	1	101	MS	B
2		102	PP	A
3		103	LS	C
4	2	201	LS	C
5		202	PP	A
6		203	MS	B
7	3	301	PP	A
8		302	LS	C
9		303	MS	B
10	4	401	MS	B
11		402	LS	C
12		403	PP	A