On-Farm Testing Protocol: Nitrogen Fertilizer Rate

Coupled with this protocol is a corresponding data file (excel document) where agronomic information and data pertaining to this trial should be recorded. It is recommended that you print off the data sheet for data collection in the field and complete the excel sheet later.

Goal - Identify optimal nitrogen (N) fertilizer application rate based on return on investment and agronomic efficiency.

Grower Considerations

- Must be able to adjust only N fertilizer rate (without adjusting any other nutrient rate).
- Soil tests in each replication should be taken.
- In-season data is collection required.

Trial Design

- Treatments can be whatever N rates you want to test. Below is a recommended starting point for N rates to test.
  - Check strip.
    - 'Normal' rate of N applied for established yield goal.
  - Additional Treatments
    - 125% of 'Normal' N rate applied in check strip.
    - 75% of 'Normal' N rate applied in check strip.
      - Adjust N rates only, do not adjust other nutrient rates.
        - This leads to confounding affects, where potential yield differences between treatments will not be able to be attributed to N specifically.
    - These treatments can be modified (alter % of normal) or additional treatments can be included.
  - Replicate check and treatments at least 4 times (Figure 1).
  - Randomize check and treatments (Figure 1).
  - Location of the trial within the field should be as uniform as possible.
    - Avoid drastic topography differences, headlands, field edges, ditches, etc.
  - In-season crop protection products must be applied perpendicular to seeding direction (Figure 1).
  - Ensure check and treatment strips are wider than swather/combine header used at harvest to ensure treatments are not mixed.

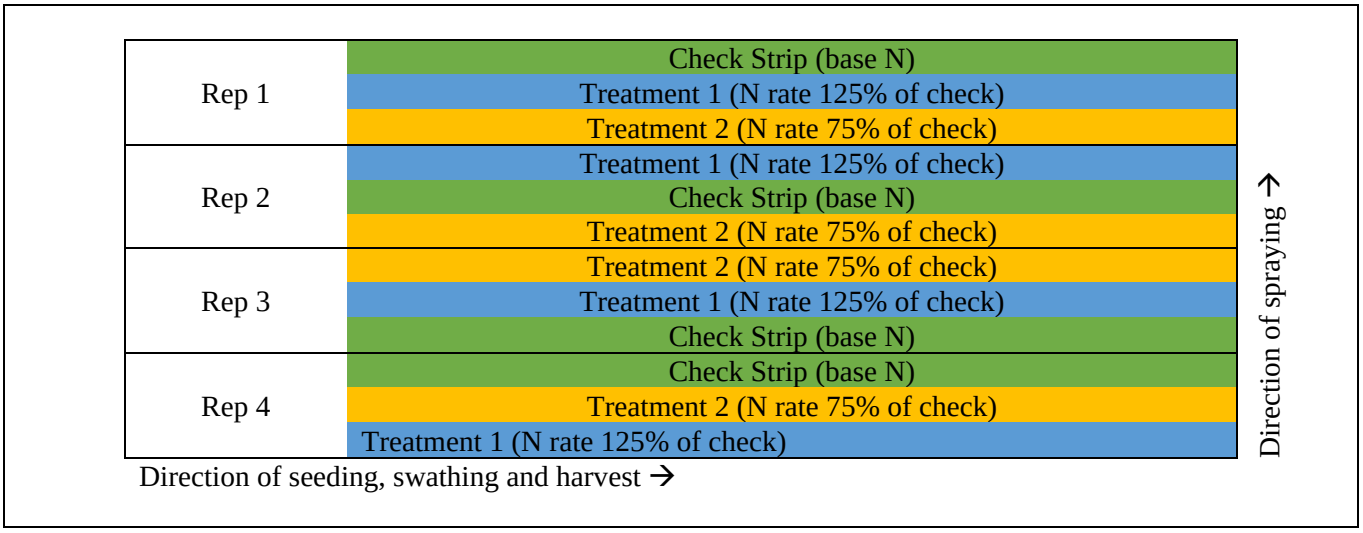

Figure 1. Plot plan example for an on-farm experiment with three treatments and four replications.

Field-Scale Trial Tips

The selected field should be as uniform as possible in topography and soil type.

- If this is not possible, choose an area of the field that is most representative of that field.

Seeding

- The same variety from the same seed lot must be used throughout the entire trial.
- Seeding rate, seed depth, and seeding speed must be the same for the entire trial.
- Seed entire trial on the same day.
- Seed each N treatment in each replication, adjust N rate, repeat.

Fertility

- For this type of experiment, it is best to soil sample each replication. However, at the bare minimum there should be at least one soil sample analysis done for the field.
    - Sample depths of 0-6" and 6-24" for N, P, K, S, micronutrients, EC, pH and organic matter.
- If required, tissue testing can be done to measure nutrient concentrations in above ground biomass.

Weed Control

- Use integrated pest management (IPM) weed control practices for the entire trial.
- Follow label recommendations for product rates and application timing.
- Spray perpendicular to the direction of seeding to ensure the same amount of wheel tracks are consistent throughout the trial (Figure 1).
    - Apply to all treatments on the same day.

Disease Control

- Use IPM disease management practices for the entire trial, if required
- Spray perpendicular to the direction of seeding to ensure the same amount of wheel tracks are consistent throughout the trial (Figure 1)
    - Apply to all treatments and replications on the same day.

Insect Control

- Use IPM insect management practices for the entire trial if insect populations exceed economic thresholds.
- Follow label recommendations for product rates, economic thresholds, and application timing.
- If chemical control of insect pests is necessary, select a product registered for the purpose and apply it at a growth stage when a benefit is ensured.
    - Applying too early or too late in the insect's life cycle you are targeting may not result in the desired outcome.
- Spray perpendicular to the direction of seeding to ensure the same amount of wheel tracks are consistent throughout the trial (Figure 1)
    - Apply to all treatments on the same day.

Swathing & Harvest Management

- If swathing, target 60% seed colour change
    - If there differences in maturity between treatments, you can:
        - Swath treatments as each treatment is ready to swath (multiple trips to the trial with swather)
        - Swath treatments when the last one has reached 60% seed colour change (one trip)
- Harvest all treatments on the same day.
- Swath/straight-cut in the middle of the plot, leaving a buffer on each side.

- When swathing, mark the swath that represents each plot with a flag that identifies which treatment it is.
- Minimum swathing/harvest length is 500 ft.
- Use a weigh wagon to collect the most accurate yield data.
  - Weigh-wagon must be calibrated prior to harvest.
  - Weigh wagons must be capable of measuring 10 lbs increments.
  - Each strip must be weighed individually (E.g. 3 treatments x 4 reps = 12 weighs)
  - Measure the exact length and width of each strip in calculate yield.
    - **Volume Harvested (bu)** = Weight harvested (lbs.) ÷ 50
    - **Area Harvested (ac)** = (Total Length ft × Total Width ft) ÷ 43,560
    - **Yield (bu / ac)** = Volume ÷ Area
  - Collect a sample of grain from each strip (used to calculate moisture concentration).

Record Keeping

- Maintaining detailed records of your trial throughout the growing season is important to the success of the trial and can help explain yield differences during analysis.
  - For example:
    - Extreme weather events: date and amount of precipitation accumulated during a severe storm.
    - Crop protection applications: product rate, growth stage timing, water volume
    - Harvest management: date of swathing, harvest date
- Scout the trial weekly and record treatment observations.
  - Weekly scouting helps when making decisions about weed, disease or insect control, plant stand establishment issues and swathing and harvest timing.
- Refer to the corresponding data collection document to keep accurate records throughout the growing season.

Data Collection

Enter this data in the corresponding data sheet document.

- Seeding Date
  - Record seeding date for each treatment (should all be the same date).
- Seeding Rate
  - Record seed size, germination %, and the variety used.
  - Record the different N treatments used.
- Plant stand counts
  - About 20 to 25 days after seeding, count the number of plants/ft^2 at four randomly selected locations in each treatment.
- Days to Flower
  - Record when 75% of canola plants have at least three open flowers.
- Plant Height
  - Record at 60% seed colour change.
  - Randomly select and measure 10 plants per treatment.
  - Record which units were used in your measurements.
- Lodging Rating
  - Record at 60% seed colour change
  - Degree of lodging rated on a 1 – 5 scale, where:
    - 1 = upright
    - 3 = moderately lodged
    - 5 = flat on ground

- Days to Maturity
    - Days from planting to maturity is based on when most of the plants have reached 60% seed colour change.
        - Assess each treatment individually.
- Yield
    - Record treatment yield (in corresponding data collection document).
- Grain Moisture
    - Measure by moisture meter in field or by grain elevator.
- Adjusted Yield
    - Yield adjusted to 10% moisture (see formula below).
        - [(100 – % moisture) x yield (in bu/ac)]/ 90 = yield corrected to 10% moisture.
- Dockage and Green Seed Count.
    - Measured at grain elevator.

Potential site rejection causes

- Major hail event that damaged the crop.
- Severe disease or insect pressure.
- Off-label herbicide applications or any herbicide application errors.
- Herbicide drift that cannot be accounted for.
- Plant stand establishment or other agronomic issues.
- Incorrect swathing timing.
- Lack of researcher personnel and/or weigh wagon present at harvest.
- Other acts of nature causing significant crop damage or failure.

Please contact your local Canola Council of Canada Agronomy Specialist with any questions.