# EVALUATION OF VALENT SEED TREATMENTS FOR CONTROL OF SEEDLING DISEASES

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Sugarbeet seedling diseases are most commonly caused by *Pythium* species, *Rhizoctonia solani* and *Aphanomyces cochlioides*. *Rhizoctonia* and *Aphanomyces* also can be active throughout the growing season and cause root rot. Currently, commercially sold seed is treated with fungicides that provide good protection from Pythium seed rot and damping-off and some control of Rhizoctonia and/or Aphanomyces damping-off. Efforts continue to identify effective seed treatment products.

## OBJECTIVES

A field trial was established to compare performance of non-registered seed treatment products compared to registered products 1) for control of seedling disease and 2) on sugarbeet yield and quality.

## MATERIALS AND METHODS

A trial was established at the University of Minnesota, Northwest Research and Outreach Center, Crookston in an area naturally infested with *Pythium* species and low inoculum densities of *R. solani* and *A. cochlioide*s. Plots were fertilized to ensure optimal sugarbeet yield and quality. The trial was sown with sugarbeet seed at 4.7-inch spacing on May 12, 2010. There were 11 seed treatments: an untreated control (no insecticides, no fungicides), a Nipsit control (insecticide only), and Nipsit plus various fungicides, including numbered experimental products to control various target pathogens and/or diseases (Table 1). Of known fungicides, Thiram has activity against *Pythium* and *Rhizoctonia*, Allegiance (metalaxyl) controls *Pythium*, and Metlock (metconazole) controls *Rhizoctonia*. Seed treatments and controls were sown in the four middle rows of six-row plots (rows 22 inches apart, 30 ft long) and replicated four times. Weeds were controlled with glyphosate (4.5 lb ae per gallon product $A^{-1}$) on June 3 (24 oz $A^{-1}$) and June 24 (24 oz $A^{-1}$). Cercospora leaf spot was controlled with Super Tin 80WP + Topsin M (5 oz + 0.5 lb $A^{-1}$, respectively, on August 17) and Headline (9 oz product $A^{-1}$ on September 4) in 20 gallons of water using a tractor-mounted sprayer with TeeJet 8002 flat fan nozzles at 100 psi.

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**Table 1**. Sugarbeet seed treatments and their target pathogen(s) for experimental (numbered) and registered products.

| | Active ingredient and rate (g a.i./unit)[Y] | | | | | | Targeted pest/disease for control[Z] | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Seed treatment | Clothianidin (60) | Thiram (4.8) | Metalaxyl (0.15) | V-10208 (25.0) | Metconazole (0.20) | V-10287 (0.45) | Insects | Pythium | Aphanomyces | Rhizoctonia |
| 1. Untreated control | | | | | | | | | | |
| 2. Nipsit control | X | | | | | | X | | | |
| 3. Nipsit + Thiram + Allegiance | X | X | X | | | | X | X | | X |
| 4. Nipsit + V-10209 | X | | X | | | | X | X | | |
| 5. Nipsit + V-10208 | X | | | X | | | X | | X | |
| 6. Nipsit + V-10280 | X | | X | X | | | X | X | X | |
| 7. Nipsit + Metlock | X | | | | X | | X | | | X |
| 8. Nipsit Suite | X | | X | | X | | X | X | | X |
| 9. Nipsit + V-10250 | X | | | X | X | | X | | X | X |
| 10. Nipsit + V-10116 + V-10280 | X | | X | X | X | | X | X | X | X |
| 11. Nipsit + V-10287 | X | | | | | X | X | ? | ? | ? |

[Y] "X" denotes active ingredient(s) in product; unit = 100,000 seed.

[Z] "X" denotes target pathogen(s); ? = target pathogen unknown to authors.

Stand counts were taken in the two center rows of each treatment at regular intervals within 7 weeks after planting. A select number of dying seedlings were collected and assayed in the laboratory to determine cause of seedling death. The two centers rows were harvested on September 27 and data were collected for number of harvested roots, yield and quality. Twenty roots per plot also were arbitrarily selected and rated for severity of root rot using a 0 to 7 scale (0 = healthy root, 7 = root completely rotted and foliage dead.

**RESULTS**

Emergence was very good for all seed treatments and plant populations were optimal about 3 weeks after planting (Fig. 1). Then stands started to decline for all seed treatments and in both controls and *Rhizoctonia* and *Aphanomyces* were isolated from dying seedlings. Some treatments with high emergence lost more plants from 3 to 7 weeks after planting than treatments with lower emergence, which lost fewer plants. Treatments No. 11 (Nipset + V-10287), 10 (Nipset + V-10116 + V-10280 = metconazole), and 9 (Nipsit + V-10250, which also includes metconazole) lost 12, 10, and 7 plants per 100 ft of row, respectively, while other seed treatments lost from 20 to 39 plants per 100 ft of row (data not shown).

By 7 weeks after planting (Fig. 1) stands were significantly highest for treatment No. 11 (Nipset + V-10287), treatment No. 10 (Nipset + V-10116 + V-10280 = metconazole), treatment No. 9 (Nipsit + V-10250, which also includes metconazole) and treatment No. 8 (Nipset Suite = Nipsit + metconazole + metalaxyl) compared to treatment No. 6 (Nipsit + V-10280), treatment No. 7 (Nipset + V-10208 = metconazole), treatment No. 5 (Nipset + V-10208), treatment No. 2 (Nipsit control) and treatment No. 4 (Nipsit + V-10209=metalaxyl); the other two treatments were intermediate including No. 3 (Nipsit + Thiram + Allegiance), and No. 1 (untreated control). In general, some seed treatments with the highest stands controlled both *Aphanomyces* and *Rhizoctonia* (treatments 9 and 10); treatment 11 had the highest stand, but active ingredients are unknown by authors.

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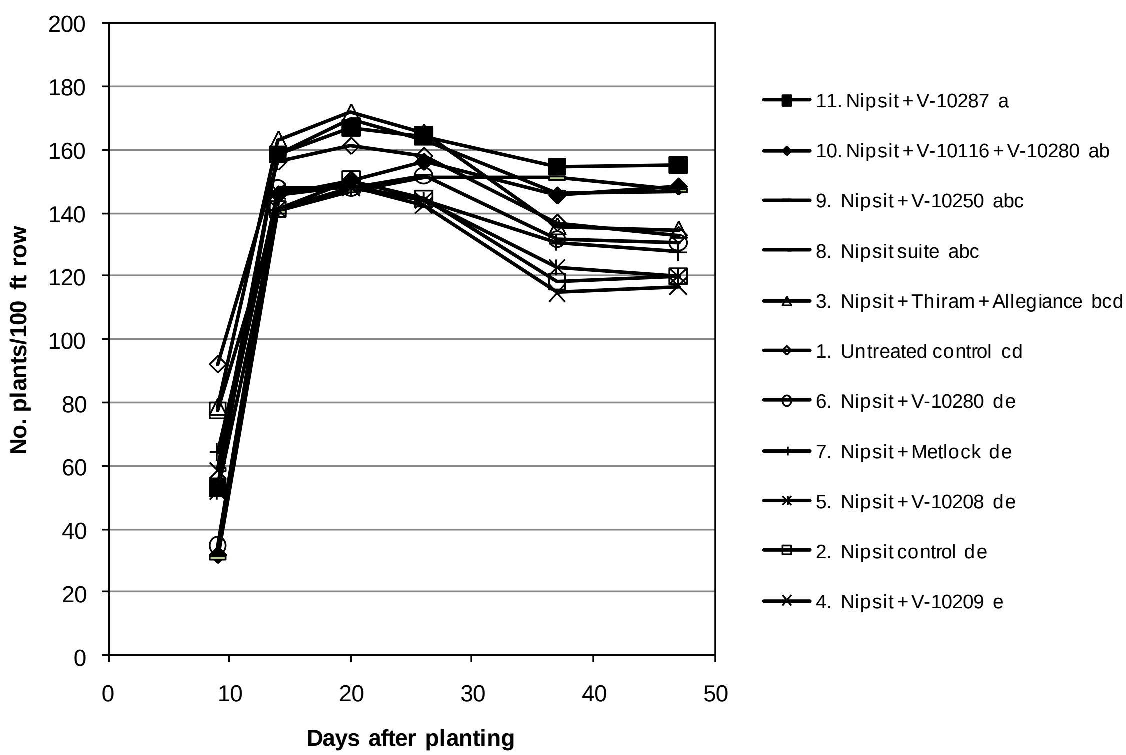


**Fig. 1.** Percent stand of sugarbeet seedlings in a field naturally infested with *Pythium* species and low inoculum densities of *Aphanomyces cochlioides* and *Rhizoctonia solani*. Legend to the right of figure, order-ranks the numbered treatments (labeled same as in tables 1 and 2) from highest to lowest stand at 47 days after planting; treatment labels followed by the same letter are not significantly different, $P = 0.05$.

**Table 2.** Effect of sugarbeet seed treatments (registered and non-registered) sown in a field naturally infested with *Pythium* species and low inoculum densities of *Aphanomyces cochlioides* and *Rhizoctonia solani* on Rhizoctonia crown and root rot (RCRR) and sugarbeet yield and quality compared to an untreated control and a Nipsit (insecticide only) control.

| | No. harvested | | | Sucrose | | |
|---|---|---|---|---|---|---|
| Seed Treatment[y] | roots/100 ft | (0-7) | T/A | % | lb/ton | lb recov./A |
| 1. Untreated control | 118 | 3.0 | 25.9 | 17.3 | 326 | 8431 |
| 2. Nipsit control | 103 | 2.9 | 23.7 | 17.3 | 327 | 7790 |
| 3. Nipsit + Thiram + Allegiance | 130 | 2.6 | 26.2 | 17.4 | 329 | 8646 |
| 4. Nipsit + V-10209 | 99 | 3.0 | 23.3 | 17.8 | 337 | 7854 |
| 5. Nipsit + V-10208 | 104 | 2.8 | 23.5 | 17.1 | 322 | 7587 |
| 6. Nipsit + V-10280 | 107 | 3.2 | 24.1 | 17.1 | 322 | 7784 |
| 7. Nipsit + Metlock | 105 | 3.0 | 24.3 | 17.2 | 324 | 7860 |
| 8. Nipsit Suite | 120 | 3.1 | 26.3 | 17.4 | 329 | 8664 |
| 9. Nipsit + V-10250 | 119 | 2.9 | 24.7 | 17.1 | 322 | 7987 |
| 10. Nipsit + V-10116 + V-10280 | 119 | 2.7 | 24.6 | 17.4 | 327 | 8055 |
| 11. Nipsit + V-10287 | 128 | 2.5 | 26.3 | 17.7 | 336 | 8833 |
| LSD (*P* = 0.05)[Z] | NS | NS | NS | NS | NS | NS |

[Y] Active ingredients for registered and non-registered products provided in Table 1.

[Z] LSD = Least significant difference; NS = not significant at *P* = 0.05.

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At harvest, there were no significant differences among treatments for number of harvested roots, however, the two best stands occurred in plots planted with treatment No. 3 (Nipsit + Thiram + Allegiance) and with No. 11 (Nipsit + V-10287) (Table 2). There were no significant differences among treatments in severity of Rhizoctonia crown and root rot (RCRR), but disease ratings indicated an indigenous population of *R. solani* (Table 2). The untreated control had a rating of 3 (6 to 25% of the root surface rotted) and ratings for treatments ranged from a low of 2.5 to a high of 3.2. There were no significant differences among seed treatments and the controls for root yield, percent sucrose, pounds of sucrose per ton, and pounds of recoverable sucrose per acre (Table 2). Root and sucrose yields tended to be highest for the untreated control, treatment No. 3 (Nipsit + Thiram + Allegiance), treatment No. 8 (Nipset Suite = Nipsit + metconazole + metalaxyl) and treatment No. 11 (active ingredients unknown by authors).

## DISCUSSION

There was insufficient disease pressure from seedling pathogens (*Pythium*, *Aphanomyces*, *Rhizoctonia*) to clearly distinguish benefits among seed treatments. *Rhizoctonia* and *Aphanomyces*, however, caused some damping-off and some of the most effective seed treatments contained active ingredients against both pathogens. Harvest results did not discern statistical benefits of seed treatments although treatment No. 11 (Nipsit + V-10287), which had the highest stand at 7 weeks after planting, also had the highest recoverable sugar $A^{-1}$. Typically, it is difficult to demonstrate benefits of seed treatments through harvest because seed treatment products are short-lived (decompose after a few weeks), plants tend to compensate in low stands because of less competition, and root pathogens (*Rhizoctonia* and *Aphanomyces*) can cause new infections through harvest.

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