

**Effects of Time of Herbicide Application and Adjuvants with Imazamox Herbicide
on Navy Bean at Crookston MN, 1997**

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The objective of this study was to evaluate weed control and navy bean response to combinations of rates, adjuvants and timings of imazamox herbicide. This study was conducted in an Overly clay loam with 4.5 percent organic matter, pH of 7.8 with P and K soil test values of 26 and 340 lb/A respectively.

“Norstar” navy bean was planted May 25 in 22-inch rows at a rate of 80 pounds of seed per acre. Preplant herbicides were applied prior to seeding and the entire trial received two passes with a Melroe cultivator/harrow to incorporate the herbicides and prepare a seedbed. Herbicides were applied with a backpack CO₂ sprayer delivering 10 gpa at 30 psi using 8015 nozzles spaced 19 inches apart. Treatments were applied to the center four rows of six row plots 20 feet in length. Application information is contained in Table 1. The experimental design was a randomized complete block with four replications.

Table 1. Plant development stages and environmental conditions at each herbicide application date

| Date | May 25, 1997 | June 11, 1997 | June 20, 1997 |
|-----------------------------------|--------------|---------------|---------------|
| | PPI | EARLY POST | POST |
| Navy bean | - | Unifoliate | 2 trifoliate |
| Foxtail (leaf no.) | - | 3 | 5 |
| height (inch) | - | 1 | 4 |
| Smartweed (leaf no.) | - | 3 | 5 |
| height (inch) | - | 1-2 | 3-6 |
| Wild buckwheat (leaf no.) | - | 1-2 | 2-3 |
| height (inch) | - | 1-2 | 4 |
| Temperature (F°) | 60 | 83 | 70 |
| Relative humidity (%) | 55 | 24 | 53 |
| Wind (mph) | E 10 | E 6 | NW 4 - 5 |
| Sky | cloudy | partly cloudy | cloudy |
| Soil moisture | dry | dry | moist |
| Rainfall after application (inch) | | | |
| 1 week | - | .81 | 2.81 |
| 2 week | .6 | 3.28 | 2.95 |

Results

Low sprayer pressure during application of pendamethalin herbicide may have affected the applied rate. Evaluation of weed control with this treatment should be viewed with caution. The preplant incorporated herbicides provided similar levels of weed control with the exception of dimethenamid which tended to have lower levels of control compared to the top performing soil applied products (Table 2).

Heavy rainfall after the herbicide applications (Table 1) injured the navy bean stand and plots were not vigorous. Consequently, weed control ratings decrease over time due to a lack of crop competition.

Single applications of imazethapyr, with and without bentazon, provided very similar weed control to imazamox with and without bentazon. The addition of 0.5 lb of bentazon improved the weed control compared to imazethapyr alone, however, the addition of 0.25 lb of bentazon did

not. Similarly, the addition of 0.25 lb of bentazon to imazamox at 0.031 lb did not improve broadleaf weed control. Split applications of imazamox at 0.016 lb with NIS compared to a single application of imazamox at 0.031 lb improved weed control but the differences were not statistically significant at the 5% level. However, substituting Scoil for the NIS, in the split applications, substantially improved both the grass and broadleaf control. Split applications with bentazon and Scoil did not improve weed control compared to treatments without bentazon. The best herbicide treatments in the experiment were split applications of imazamox with Scoil with or without bentazon. It is believed that improvements in weed control from split applications, in this study, are due both to enhanced herbicide uptake from the methylated seed oil (Scoil) and from treating smaller weeds. Imazamox quickly desiccated small grass and broadleaf weeds but often did not completely kill larger plants. Herbicide strategies that use split applications may encourage earlier treatment due to reduced risks of second flushes of weeds.

Table 2. Weed control in navy bean with PPI and POST herbicide applications

| Treatment | Rate (lbs ai) | Injury | | Foxtail | | Smartweed | | Wild Buckwheat | | | | |
|------------------------------------|---------------------|--------|------|---------|------|-----------|------|----------------|------|----|----|----|
| | | 6/10 | 7/28 | 6/10 | 7/11 | 6/10 | 7/11 | 6/10 | 7/11 | | | |
| -----% control----- | | | | | | | | | | | | |
| <u>PPI</u> | | | | | | | | | | | | |
| Pendimethalin | 1.24 | 0 | 0 | 81 | 66 | 49 | 71 | 59 | 49 | 82 | 90 | 89 |
| Ethalfuralin | 1.125 | 0 | 0 | 90 | 82 | 80 | 87 | 84 | 84 | 89 | 92 | 91 |
| Trifluralin | 1.0 | 0 | 0 | 89 | 76 | 69 | 82 | 47 | 55 | 87 | 80 | 79 |
| Dimethenamid | 1.4 | 0 | 0 | 62 | 72 | 55 | 70 | 67 | 57 | 67 | 67 | 70 |
| <u>PPI + POST</u> | | | | | | | | | | | | |
| Pendimethalin/imazethapyr + NIS*** | 1.24 /0.315 | 0 | 0 | 80 | 92 | 92 | 75 | 84 | 72 | 82 | 90 | 86 |
| <u>POST</u> | | | | | | | | | | | | |
| Imazethapyr + NIS | 0.315 | - | 0 | - | 84 | 81 | - | 76 | 60 | - | 74 | 66 |
| Bentazon + COC** | 0.5 | - | 0 | - | 39 | 27 | - | 95 | 95 | - | 87 | 94 |
| Imazethapyr + bentazon + NIS | 0.315 + 0.5 | - | 0 | - | 82 | 76 | - | 90 | 99 | - | 87 | 87 |
| Imazethapyr + bentazon + NIS | 0.315 + 0.25 | - | 0 | - | 84 | 82 | - | 69 | 45 | - | 75 | 67 |
| Imazamox + NIS | 0.031 | - | 0 | - | 82 | 81 | - | 80 | 76 | - | 76 | 77 |
| Imazamox + bentazon + NIS | 0.031 + 0.25 | - | 0 | - | 82 | 79 | - | 85 | 79 | - | 80 | 75 |
| Imazamox + NIS | 0.023 | - | 0 | - | 77 | 81 | - | 75 | 70 | - | 70 | 74 |
| Imazamox + bentazon + NIS | 0.023 + 0.25 | - | 0 | - | 82 | 76 | - | 81 | 77 | - | 72 | 72 |
| <u>EARLY POST/POST</u> | | | | | | | | | | | | |
| Imazamox + bentazon + NIS/same | 0.016 + 0.25 /same | - | 0 | - | 89 | 87 | - | 96 | 95 | - | 87 | 81 |
| Imazamox + bentazon + Scoil*/same | 0.016 + 0.167 /same | - | 0 | - | 93 | 92 | - | 98 | 98 | - | 94 | 89 |
| Imazamox + bentazon + Scoil/same | 0.01 + 0.167 /same | - | 0 | - | 94 | 89 | - | 98 | 94 | - | 92 | 95 |
| Imazamox + NIS/same | 0.016 /same | - | 0 | - | 90 | 86 | - | 91 | 81 | - | 90 | 82 |
| Imazamox + Scoil/same | 0.016 /same | - | 0 | - | 100 | 98 | - | 100 | 98 | - | 92 | 95 |
| Imazamox + Scoil/same | 0.01 /same | - | 0 | - | 95 | 90 | - | 95 | 90 | - | 91 | 86 |
| CV | | | | 12 | 12 | 16 | 11 | 11 | 12 | 15 | 11 | 11 |
| LSD (0.05) | | | | 14 | 14 | 18 | 13 | 13 | 13 | 19 | 13 | 13 |

* Scoil= methylated seed oil from Agsco applied at 1.5 pt/acre

** COC = Premium Crop Oil from West Central Chemical applied at 1.5 pt/acre

*** NIS = R-11 surfactant from Wilbur Ellis applied at 0.25% v/v