

SUGAR BEET TOLERANCE AND WEED CONTROL WITH POSTEMERGENCE COMBINATIONS OF OUTLOOK®

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Introduction

As weed problems and management systems change, it is important to evaluate new herbicides with potential use in sugar beets. Continual review of pesticides by the U.S. Environmental Protection Agency (EPA) also may reduce the herbicides available for use in sugar beets in the future. In these trials, Outlook (dimethenamid-p), was evaluated for crop tolerance and weed control from postemergence applications to sugar beets. Outlook is a soil-active herbicide that provides control of annual grasses as well as control or suppression of several small-seeded annual broadleaf weeds.

Methods

General

Trials were established at the Malheur Experiment Station under furrow irrigation on April 12, 2001. Sugar beets (Hilleshog 'WS PM-21') were planted in 22-inch rows at a 2-inch seed spacing. Sugar beets were thinned to 8-inch spacings on May 16. Plots were sidedressed on May 23 with 200 lbs N/acre as urea. Herbicide treatments were applied with a CO₂-pressurized backpack sprayer calibrated to deliver 20 gal/acre at 30 psi. Plots four rows wide and 27 ft long were arranged in a randomized complete block design. Roundup (0.75 lb ai/acre) was applied preemergence to all trials. Sugar beet injury and weed control were evaluated throughout the season. Sugar beet yields were determined by harvesting the center two rows of each plot on October 2.

Sugar Beet Tolerance to Outlook

Outlook was applied at either 0.64 or 0.96 lb ai/acre to two-leaf sugar beets in various tank-mix combinations including standard rates of Progress (0.33 lb ai/acre), UpBeet (0.016 lb ai/acre), and Stinger (0.094 lb ai/acre). All plots were treated with Progress plus UpBeet when sugar beets were in the cotyledon stage of growth on April 25. On May 4, Progress, UpBeet, and Stinger; Progress plus UpBeet; Outlook (0.64 lb ai/acre) with Progress and UpBeet; and Outlook (0.64 and 0.96 lb ai/acre) in combination with Progress, UpBeet, and Stinger were applied to two-leaf sugar beets. Tank-mix combinations of Progress and UpBeet with and without Stinger were applied to eight-leaf sugar beets on May 17. Weed escapes following herbicide treatments were removed by hand to eliminate any weed competition. Experimental plots were evaluated for sugar beet injury throughout the season. Sugar beet injury from treatment combinations with Outlook were compared to the hand-weeded and standard rate treatments without Outlook. In addition to sugar beet root yield, 16 sugar beets from each plot were sent to the Hilleshog Mono-Hy Research Station in Nyssa, Oregon, to determine beet pulp sucrose content and purity.

Weed Control with Outlook in Sugar Beets

Outlook (0.32 or 0.64 lb ai/acre) was applied at various application timings combined with standard rates of Progress (0.33 lb ai/acre), UpBeet (0.016 lb ai/acre), and Stinger (0.094 lb ai/acre). Treatments applied on April 25 to cotyledon sugar beets consisted of Progress (0.33 lb ai/acre) plus UpBeet (0.016

lb ai/acre) or Progress plus UpBeet plus Outlook (0.32 or 0.64 lb ai/acre). On May 4, Progress, UpBeet, and Stinger were applied to two-leaf sugar beets with or without Outlook (0.32 or 0.64 lb ai/acre). Treatments applied to eight-leaf sugar beets on May 17 consisted of Progress, UpBeet, and Stinger with and without Outlook (0.32 or 0.64 lb ai/acre). Weed control evaluations were made over the course of the growing season. Weed control with combinations containing Outlook were compared to standard rate treatments applied either two or three times.

Results and Discussion

Sugar Beet Tolerance to Outlook

Eight days following two-leaf application, sugar beet injury was greatest from treatment combinations of Outlook (0.64 or 0.96 lb ai/acre) with Progress (0.33 lb ai/acre), UpBeet (0.016 lb ai/acre), and Stinger (0.094 lb ai/acre) (Table 1). Treatments with tank-mix combinations containing Stinger displayed the greatest sugar beet injury on May 24. On June 2, all treatments caused greater sugar beet injury than Progress plus UpBeet applied to cotyledon, two-leaf, and eight-leaf sugar beets. By June 24, significant injury was not apparent for any treatment. Sugar beet root yield and estimated recoverable sucrose (ERS) were significantly lower for plots treated with Outlook (0.96 lb ai/acre) in combination with Progress, UpBeet, and Stinger than with the hand-weeded control (Table 1). Notwithstanding the observed injury, there were no differences in percent sucrose or sucrose percent extraction among treatments.

Weed Control with Outlook in Sugar Beets.

In general, redroot pigweed control was greatest among treatments having three applications compared with the two application treatments (Table 2). All treatments provided greater than 89 percent control of lambsquarters on June 25. Hairy nightshade control was greatest when Outlook was applied in the second and/or third applications as opposed to the first application. Barnyardgrass control, evaluated on June 4, was improved when Outlook was included in a two-application treatment. However, barnyardgrass control was similar among treatments with tank-mix combinations of Outlook and treatments having three applications without Outlook. Despite differences in weed control and sugar beet injury, all herbicide treatments provided similar root yields ranging from 39 to 43.5 tons/acre (Table 3).

Table 1. Sugar beet tolerance to Outlook combinations, Malheur Experiment Station, Oregon State University, Ontario, OR, 2001.

| Treatment | Rate lb ai/acre | Timing* | Injury | | | | Sugar beet yield | | | |
|--|--------------------------------|---------|----------|----------|-----------|-----------|---------------------------|------------------|----------------|-----------------------------|
| | | | 5-12 | 5-24 | 6-2 | 6-24 | Root yield ton/acre | Sucros e % | Extract ion | ERS [^] lb/acre |
| Hand weeded | -- | -- | 0 | 0 | 0 | 3 | 46.3 | 16.8 | 92.9 | 14,445 |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 36 | 49 | 25 | 5 | 42.6 | 16.7 | 92.9 | 13,202 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 2 | 35 | 37 | 15 | 4 | 44.8 | 17.0 | 92.9 | 14,093 |
| Progress + UpBeet | 0.33 + 0.016 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 38 | 37 | 25 | 7 | 44.9 | 16.8 | 93.0 | 14,050 |
| Progress + UpBeet + Outlook | 0.33 + 0.016 + 0.64 | 2 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 40 | 46 | 27 | 5 | 43.1 | 16.9 | 92.9 | 13,566 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.64 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 48 | 51 | 34 | 5 | 40.2 | 17.1 | 93.3 | 12,826 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.96 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | | | | | | |
| LSD (0.05) | | | 8 | 6 | 10 | NS | 5.1 | NS | NS | 1,612 |

*Application timings were (1) April 25 to cotyledon sugar beets, (2) May 4 to two-leaf sugar beets, and (3) May 17 to eight-leaf sugar beets.

[^]Estimated recoverable sucrose.

Table 2. Weed control with postemergence Outlook combinations, Malheur Experiment Station, Oregon State University, Ontario, OR, 2001.

| Treatment | Rate lb ai/acre | Timin g* g | Weed control | | | | | | | |
|--|--------------------------------|------------------|--------------|------|---------------|------|---------------|------|---------------|-----|
| | | | Pigweed | | Lambsquarters | | H. nightshade | | Barnyardgrass | |
| | | | 6-25 | 8-22 | 6-25 | 8-22 | 6-25 | 8-22 | 5-24 | 6-4 |
| Untreated | -- | -- | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 92 | 85 | 98 | 88 | 92 | 89 | 88 | 80 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | | | | | | |
| Progress + UpBeet + Outlook | 0.33 + 0.016 + 0.64 | 1 | 81 | 78 | 94 | 86 | 79 | 78 | 92 | 82 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 80 | 77 | 100 | 98 | 92 | 89 | 87 | 80 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.64 | 2 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 95 | 84 | 97 | 93 | 98 | 91 | 92 | 85 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.64 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 98 | 93 | 100 | 98 | 100 | 98 | 91 | 88 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.32 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.32 | 3 | | | | | | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 83 | 79 | 100 | 95 | 95 | 87 | 50 | 63 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | | | | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | | | | | | |
| Progress + UpBeet + Outlook | 0.33 + 0.016 + 0.32 | 2 | 88 | 74 | 89 | 90 | 90 | 79 | 74 | 81 |

Table 3. Sugar beet injury and root yield with postemergence Outlook combinations, Malheur Experiment Station, Oregon State University, Ontario, OR, 2001.

| Treatment | Rate lb ai/acre | Timing* | Injury | | Sugar beet Yield ton/acre |
|--|--------------------------------|---------|---------------|------|---------------------------------|
| | | | 5-12 | 5-24 | |
| | | | ----- % ----- | | |
| Untreated | -- | -- | 0 | 0 | 10 |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 37 | 44 | 39 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 3 | | | |
| Progress + UpBeet + Outlook | 0.33 + 0.016 + 0.64 | 1 | 38 | 22 | 42 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 53 | 32 | 41 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.64 | 2 | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 43 | 47 | 42 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.64 | 3 | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 41 | 47 | 44 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.32 | 2 | | | |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.32 | 3 | | | |
| Progress + UpBeet | 0.33 + 0.016 | 1 | 44 | 23 | 42 |
| Progress + UpBeet + Stinger | 0.33 + 0.016 + 0.094 | 2 | | | |
| Progress + UpBeet + Outlook | 0.33 + 0.016 + 0.32 | 1 | 47 | 23 | 44 |
| Progress + UpBeet + Stinger + Outlook | 0.33 + 0.016 + 0.094 + 0.32 | 2 | | | |
| LSD (0.05) | | | 8 | 7 | NS |

*Application timings were (1) April 25 to cotyledon sugar beets, (2) May 4 to two-leaf sugar beets, and (3) May 17 to eight-leaf sugar beets.

