## Title: Weed Control in Table Beets and Carrots

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### Summary

Projects evaluated the potential of controlling hairy nightshade with tankmixes of ethofumesate and s-metolachlor and determined table beet tolerance to s-metolachlor in a commercial production system. Hairy nightshade control with Dual Magnum improved nearly linearly as the rate of Dual Magnum increased. Hairy nightshade control improved significantly when Dual Magnum was tankmixed with Ethotron, and the increase in efficacy was most apparent with Ethotron tankmixed at 15 and 30 oz/A. In a commercial field, Dual Magnum significantly improved weed control, but may have reduced yield where irrigation was excessive.

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### I. *Hairy Nightshade Control with Ethotron and Dual Magnum in Root Crops, Research Farm, Corvallis*

### Methods

Fertilizer with 12-29-10 analysis was broadcast before planting at 300 lbs/A and shallow incorporated with a vertical tine tiller. Table beets and carrots were planted on May 19, 2008 in 25 ft long plots. Two rows of beets and one row of carrots were planted on 26 inch centers. An additional 200 lbs/A of fertilizer was banded at planting. Herbicides were applied with a $CO_2$ pressured back sprayer at 20 GPA and incorporated with ½ inch irrigation. Soil pH was 5.6, OM (LOI) 2.23% and CEC 18.9 meq/100g soil at planting. Plots were cultivated twice after hairy nightshade seedlings were counted and weed control was rated. The check plot was hand-weeded once in addition to cultivation. Beets were pulled from 8 ft of row on August 25 and carrots from 10 ft of row on September 8.

### Results

Hairy nightshade was by far the most abundant weed in this experiment. The composite weed control rating at harvest accounted for nearly 80% of the variability in table beet yield and 61% of the carrot yield (Table 1 and 2).

Hairy nightshade control with Dual Magnum improved nearly linearly as the rate of Dual Magnum increased (Table 1). Hairy nightshade control improved significantly when Dual Magnum was tankmixed with Ethotron, and the increase in efficacy was most apparent with Ethotron tankmixed at 15 and 30 oz/A. Dual Magnum at 5.3 oz/A plus Ethotron at 30 oz/A reduced hairy nightshade emergence by 80% compared to Dual Magnum applied alone, but only 50% when Dual Magnum at 5.3 oz/A was applied with Ethotron at 15 oz/A. Dual Magnum at 5.3 oz/A and Ethotron at 30 oz/A maximized hairy nightshade control with acceptable crop injury. None of the treatments completely controlled hairy nightshade.

**Table 1.** Effect of Ethotron and Dual Magnum on weed control in root crops, Corvallis, 2008.
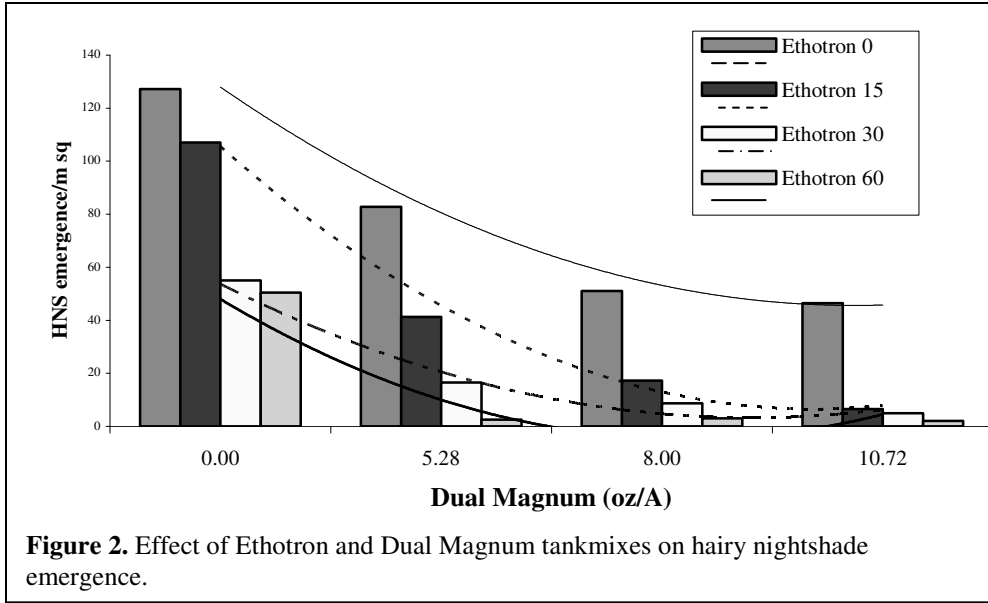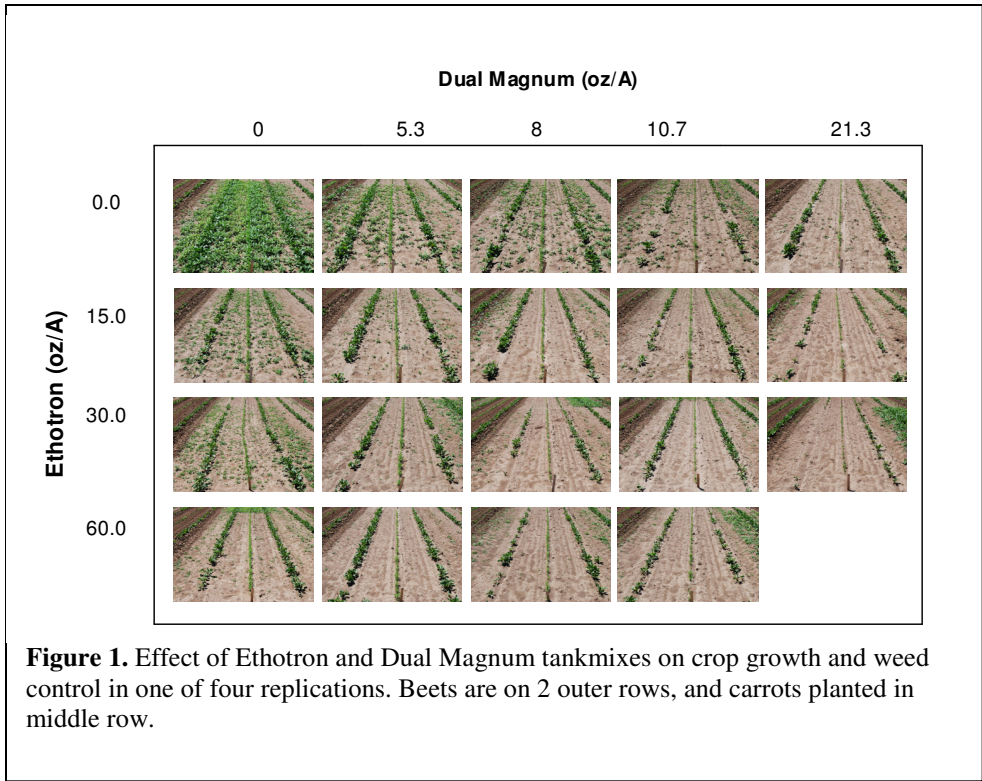
| Tr. No. | Ethotron | Dual Magnum | Hairy nightshade emergence 4 WAP (18-Jun) | Weed control 5 WAP (25-Jun) | | | | | Weed control at harvest | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Hairy nightshade | Shepherds-purse | Pineapple weed | Common purslane | Composite rating | Hairy nightshade | Composite rating |
| | *oz/A* | *oz/A* | *no/m sq* | ------------------------------------------------%------------------------------------------------------------ | | | | | | |
| 1 | 0 | 0.0 | 127 | 0 | 0 | 0 | 0 | 0 | 85 | 84 |
| 2 | 0 | 5.3 | 83 | 65 | 83 | 78 | 95 | 73 | 55 | 55 |
| 3 | 0 | 8.0 | 51 | 83 | 94 | 91 | 96 | 81 | 69 | 69 |
| 4 | 0 | 10.7 | 47 | 88 | 97 | 71 | 100 | 87 | 71 | 70 |
| 5 | 15 | 0.0 | 107 | 78 | 5 | 61 | 100 | 75 | 65 | 63 |
| 6 | 15 | 5.3 | 41 | 91 | 95 | 95 | 100 | 91 | 80 | 80 |
| 7 | 15 | 8.0 | 17 | 95 | 98 | 87 | 100 | 97 | 88 | 88 |
| 8 | 15 | 10.7 | 7 | 98 | 99 | 97 | 100 | 98 | 94 | 90 |
| 9 | 30 | 0.0 | 55 | 95 | 61 | 53 | 100 | 84 | 88 | 85 |
| 10 | 30 | 5.3 | 17 | 98 | 98 | 97 | 100 | 97 | 98 | 95 |
| 11 | 30 | 8.0 | 9 | 99 | 100 | 96 | 100 | 99 | 100 | 99 |
| 12 | 30 | 10.7 | 5 | 99 | 100 | 100 | 100 | 99 | 100 | 100 |
| 13 | 60 | 0.0 | 51 | 97 | 95 | 71 | 100 | 95 | 95 | 93 |
| 14 | 60 | 5.3 | 3 | 99 | 100 | 99 | 100 | 99 | 97 | 97 |
| 15 | 60 | 8.0 | 3 | 99 | 100 | 99 | 100 | 98 | 98 | 98 |
| 16 | 60 | 10.7 | 2 | 100 | 100 | 99 | 100 | 99 | 100 | 100 |
| 17 | 0 | 21.3 | 11 | 95 | 100 | 98 | 100 | 95 | 91 | 91 |
| 18 | 15 | 21.3 | 3 | 99 | 100 | 100 | 100 | 98 | 98 | 96 |
| 19 | 30 | 21.3 | 1 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| *ANOVA* | | | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 |
| *FPLSD* | | | 22 | 6.3 | 15 | 28.6 | 3.5 | 5.9 | 10.8 | 10 |

**Table 2.** Effect of Ethotron and Dual Magnum herbicides on beet and carrot growth and yield.

| Crop | Tr. no | Ethotron | Dual Magnum | Emergence (18-Jun) | Stunting (25-Jun) | Phyto. (25-Jun) | Root no. | Yield | Avg. root wt | Grade |
|------|--------|----------|-------------|--------------------|-------------------|-----------------|----------|-------|--------------|-------|
| | | *oz/A* | *oz/A* | *no/4 ft* | *%* | *0-10* | *no./ft* | *t/A* | *lbs* | *% 1-3* |
| Beets | 1 | 0 | 0.0 | 41 | 0 | 0 | 5.0 | 31.9 | 0.66 | 50 |
| Beets | 2 | 0 | 5.3 | 36 | 0 | 0 | 5.6 | 26.0 | 0.52 | 63 |
| Beets | 3 | 0 | 8.0 | 36 | 8 | 0 | 4.6 | 30.7 | 0.70 | 52 |
| Beets | 4 | 0 | 10.7 | 36 | 8 | 0 | 4.2 | 33.1 | 0.77 | 53 |
| Beets | 5 | 15 | 0.0 | 38 | 5 | 0 | 5.2 | 29.1 | 0.63 | 65 |
| Beets | 6 | 15 | 5.3 | 38 | 4 | 0 | 6.0 | 36.8 | 0.67 | 61 |
| Beets | 7 | 15 | 8.0 | 41 | 13 | 0 | 5.5 | 41.3 | 0.78 | 45 |
| Beets | 8 | 15 | 10.7 | 34 | 20 | 1 | 4.1 | 43.5 | 1.07 | 35 |
| Beets | 9 | 30 | 0.0 | 32 | 6 | 0 | 4.8 | 39.3 | 0.86 | 51 |
| Beets | 10 | 30 | 5.3 | 36 | 18 | 1 | 4.4 | 42.0 | 1.01 | 41 |
| Beets | 11 | 30 | 8.0 | 35 | 24 | 2 | 3.9 | 40.8 | 1.20 | 30 |
| Beets | 12 | 30 | 10.7 | 36 | 20 | 1 | 5.6 | 43.5 | 0.84 | 46 |
| Beets | 13 | 60 | 0.0 | 34 | 9 | 0 | 5.2 | 41.6 | 0.83 | 45 |
| Beets | 14 | 60 | 5.3 | 29 | 25 | 1 | 5.3 | 38.4 | 0.80 | 52 |
| Beets | 15 | 60 | 8.0 | 38 | 26 | 2 | 4.1 | 41.8 | 1.07 | 30 |
| Beets | 16 | 60 | 10.7 | 34 | 31 | 2 | 5.1 | 40.2 | 0.85 | 42 |
| Beets | 17 | 0 | 21.3 | 37 | 21 | 1 | 6.5 | 39.0 | 0.64 | 55 |
| Beets | 18 | 15 | 21.3 | 27 | 35 | 1 | 4.5 | 38.7 | 1.00 | 34 |
| Beets | 19 | 30 | 21.3 | 30 | 45 | 3 | 4.7 | 41.2 | 0.92 | 38 |
| *ANOVA* | | | | *ns* | *<0.0001* | *<0.0001* | *ns* | *<0.0001* | *<0.001* | *<0.001* |
| *LSD* | | | | *13* | *12.8* | *0.97* | *1.6* | *6.97* | *0.13* | *18* |
| Carrots | 1 | 0 | 0.0 | 49 | 0 | 0 | 12.7 | 18.1 | 0.14 | - |
| Carrots | 2 | 0 | 5.3 | 46 | 3 | 0 | 13.7 | 15.2 | 0.11 | - |
| Carrots | 3 | 0 | 8.0 | 48 | 8 | 0 | 15.5 | 20.1 | 0.13 | - |
| Carrots | 4 | 0 | 10.7 | 44 | 20 | 0 | 13.8 | 20.3 | 0.15 | - |
| Carrots | 5 | 15 | 0.0 | 50 | 0 | 0 | 15.4 | 17.6 | 0.12 | - |
| Carrots | 6 | 15 | 5.3 | 46 | 10 | 0 | 14.2 | 21.7 | 0.15 | - |
| Carrots | 7 | 15 | 8.0 | 52 | 13 | 0 | 15.8 | 22.6 | 0.14 | - |
| Carrots | 8 | 15 | 10.7 | 46 | 16 | 0 | 14.2 | 23.1 | 0.16 | - |
| Carrots | 9 | 30 | 0.0 | 43 | 5 | 0 | 15.1 | 21.2 | 0.14 | - |
| Carrots | 10 | 30 | 5.3 | 49 | 9 | 0 | 15.0 | 23.8 | 0.16 | - |
| Carrots | 11 | 30 | 8.0 | 45 | 18 | 0 | 13.7 | 22.9 | 0.17 | - |
| Carrots | 12 | 30 | 10.7 | 43 | 28 | 0 | 14.4 | 22.1 | 0.15 | - |
| Carrots | 13 | 60 | 0.0 | 45 | 9 | 0 | 16.0 | 25.0 | 0.16 | - |
| Carrots | 14 | 60 | 5.3 | 45 | 23 | 0 | 13.8 | 23.6 | 0.17 | - |
| Carrots | 15 | 60 | 8.0 | 43 | 23 | 0 | 12.9 | 23.5 | 0.18 | - |
| Carrots | 16 | 60 | 10.7 | 44 | 25 | 0 | 13.1 | 21.4 | 0.17 | - |
| Carrots | 17 | 0 | 21.3 | 47 | 33 | 0 | 13.8 | 21.0 | 0.16 | - |
| Carrots | 18 | 15 | 21.3 | 41 | 28 | 0 | 13.4 | 21.8 | 0.16 | - |
| Carrots | 19 | 30 | 21.3 | 42 | 35 | 0 | 11.9 | 20.9 | 0.18 | - |
| *ANOVA* | | | | *ns* | *<0.0001* | *<0.0001* | *0.04* | *<0.0001* | *<0.0001* | |
| *LSD* | | | | *8* | *12* | *0* | *2.3* | *3.6* | *0.02* | |

**Table 3.** Herbicide application data.

| | |
|---|---|
| Date | Tuesday, May 20, 2008 |
| Application timing | Preemergence Surface |
| Start/end time | 8-10 A |
| Air temp/soil temp (2")/surface | 69/66/64 |
| Rel humidity | 85% |
| Wind direction/velocity | 0-3 SE |
| Cloud cover | 100% |
| Soil moisture | Rained 0.13 during the night prior to treatment |
| Plant moisture | - |
| Sprayer/PSI | BP 25 PSI |
| Mix size | 2100 mls |
| Gallons H20/acre | 20 |
| Nozzle type | 4-XR-8003 |
| Nozzle spacing and height | 4 nozzle boom 20/24 |
| Soil inc. method/implement | Total of 0.5 inches of rain fell/irrigation was applied with 48 hrs after planting |

**Figure 1.** Effect of Ethotron and Dual Magnum tankmixes on crop growth and weed control in one of four replications. Beets are on 2 outer rows, and carrots planted in middle row.



**Figure 2.** Effect of Ethotron and Dual Magnum tankmixes on hairy nightshade emergence.

## II. Table beet tolerance to Dual Magnum in a commercial production field.

### Methods
Table beets were planted in a field near Dayton, Oregon on May 22, 2008. Roneet was preplant incorporated and Pyramin was banded over the row at planting. Dual Magnum treatments (see Table 4) were applied broadcast immediately after planting at 10.7 oz/A (0.64 lbs ai/A) to 16 foot strips the length of the field (2120 ft). Crop emergence was measured in 18-3 foot row lengths in each plot on June 10. Beets were machine harvested on Sept 3, and the area that was harvested was measured with GPS.

### Results
Yield was greater in Test 3 (Roneet+Pyramin+Dual Magnum) than Test 5 (Roneet+Pyramin). The yield in Test 4 was probably low because of a reduced stand that occurred where the irrigation sprinklers drained on the first irrigation set. Test 4 was also a mix of beets harvested from Test areas 3 and 4 (see footnote). Revenue per acre was higher in the Test 5 because of smaller beets. These results suggest that Dual Magnum had a slight effect on beet emergence early in the season, which caused larger beets and less value per acre even though yield was greatest where Dual Magnum was applied. Weed control definitely improved with Dual Magnum, however, even when applied over Roneet + Pyramin (Test 3).

**Table 4.** Effect of Dual Magnum on table beet emergence, grade, and yield in a commercial field near Dayton, OR

| Test | Treatment | Beet emergence (June 10) | Harvest (truck load) data | | | | | | | | | Estimated yield | Est. value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Time in | #1 | #2 | # 3 | NV | LVS | LRG | SMAL | OTH | | |
| | | *no/3 ft* | --------------------------------------%--------------------------- | | | | | | | | | *t/A* | *$/A* |
| 3 | Roneet + Pyramin+ Dual Mag | 74 | 9/3/2009 14:07 | 14 | 41 | 21 | 24 | 2 | 5 | 2 | 2 | 38.8 | 2157 |
| 4* | Roneet+ Dual Mag | 71 | 9/3/2009 14:07 | 21 | 44 | 6 | 29 | 6 | 0 | 1 | 2 | 26.2 | 1593 |
| 5 | Roneet+ Pyramin | 76 | 9/3/2009 14:07 | 25 | 55 | 7 | 13 | 8 | 0 | 2 | 2 | 32.3 | 2410 |

*70% of the beets harvested in this test were from Test Area 4 (Roneet + Dual Magnum) and 30% were from Test Area 3.*