

Title: Improving Herbicide Options in Beets, Carrots, and Other Root Crops

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Weed management in table beets has improved with the recent registration of Dual Magnum. Hairy nightshade control continues to be a challenge, however. Nortron (ethofumesate) herbicide is now labeled for use and will help with nightshade control, but there is very little experience in the PNW on the best use patterns for this herbicide. Another concern is carryover, particularly for fresh market producers that often plant another crop immediately after beets are harvested. Tankmixing Dual Magnum with moderate rates of Nortron may improve weed control, reduce the risk of crop injury, and reduce the potential for carryover.

Methods

Table beets were planted on beds with 3-26 inch rows on May 15, 2007. Preemergence herbicides were applied the next day with a hand-held boom sprayer with 3-8002 nozzles (20 inch spacing on the boom), at 30 PSI, and with 20 GPA of water. Herbicides were incorporated with irrigation water shortly after planting. Postemergence herbicides were applied when beets had cotyledon to 2 leaves, 2 leaves, or 4 true leaves. The predominant weed at the field site was hairy nightshade. Crop injury and hairy nightshade density were evaluated at 3 WAP, and weed control evaluated at harvest. All plots were cultivated once. Beets were harvested on August 2 from one 8.2 ft section of each row in the middle of the plot, graded, and weighed.

Results and Discussion

The overall weed control estimate at harvest accounted for approximately 88% of the yield variability. Neither Dual Magnum nor Nortron applied alone provided adequate hairy nightshade control (Table 1, Figure 1). However, Dual Magnum tankmixed with Nortron at the lowest rate of 0.47 lbs ai/A (15 oz/A) reduced hairy nightshade density by 5-fold compared to Nortron alone at the same rate. Hairy nightshade density was reduced to only 12/m² when s-metolachlor was tankmixed with the highest rate of Nortron. The two higher rates of Nortron stunted crop growth when applied with Dual Magnum, but did reduce plant stand. The best yields were with Nortron at 1.88 lbs ai/A or when any rate of Nortron was tankmixed with Dual Magnum (Figure 2). Future research should examine the synergism between these two herbicides for hairy nightshade control, particularly with reduced rates of Dual Magnum. Dual Magnum will occasionally reduce table beet stands under unfavorable environmental conditions. Lowering the Dual Magnum rate and tank mixing with Nortron may reduce the potential of crop injury yet maintain acceptable levels of hairy nightshade control.

Nortron applied POST alone or with Dual Magnum did not provide adequate weed control (Table 2). The addition of Stinger (Tr. 13) to the tankmix at 0.188 lbs ai/A (8 oz) improved weed control when applied to 4-leaf beets. Tankmixing Spin-Aid with Nortron and applying at the cotyledon to 2-leaf stage controlled 94% of the weeds at harvest (Tr. 14) and yield was very high even though there was stunting of the crop early in the season. These two treatments (13 and 14) yielded 21.3 and 28.2 t/A, respectively (data not shown in table) and did not affect the size of the beets or the number of beets harvested.

Table 1. Effect of Dual Magnum and Nortron applied PES as a tankmix on hairy nightshade control and table beet yield, Corvallis.

| | Herbicide | Rate | Stand | Phytotoxicity | Stunting | Weed control | | | Beet root harvest | |
|---|--------------|----------|----------------|---------------|----------|--------------------|---------|-----------|-------------------|-------|
| | | | | | | Hairy nightshade | | Composite | Yield | Grade |
| | | | | | | Density | Control | | | |
| | | | 13-Jun | 7-Jun | 13-Jun | 13-Jun | 21-Aug | 21-Aug | 21-Aug | |
| | | lbs ai/A | no/4 ft of row | 0-10 | 0-100 % | no./m ² | % | % | t/A | % 1-2 |
| 1 | Dual Magnum | 0.64 | 34 | 0.0 | 3 | 32 | 63 | 46 | 15.3 | 83 |
| 2 | Nortron | 0.47 | 34 | 0.0 | 0 | 69 | 23 | 23 | 9.4 | 77 |
| 3 | Nortron | 0.94 | 37 | 0.0 | 4 | 48 | 61 | 60 | 20.4 | 69 |
| 4 | Nortron | 1.88 | 36 | 0.5 | 10 | 23 | 96 | 91 | 27.5 | 49 |
| 5 | Nortron | 0.47 | 41 | 0.0 | 3 | 12 | 81 | 71 | 27.1 | 61 |
| | Dual Magnum | 0.64 | | | | | | | | |
| 6 | Nortron | 0.95 | 36 | 0.4 | 20 | 13 | 95 | 81 | 28.4 | 48 |
| | Dual Magnum | 0.64 | | | | | | | | |
| 7 | Nortron | 1.88 | 38 | 0.1 | 18 | 6 | 94 | 87 | 29.8 | 49 |
| | Dual Magnum | 0.64 | | | | | | | | |
| 8 | Check | - | 35 | 0 | 0 | 99 | 0 | 0 | 0 | - |
| | FPLSD (0.05) | | ns | 0.7 | 12 | 34 | 22 | 27 | 9.1 | 26 |

Table 2. Effect of postemergence herbicide applications on weed control in table beets, Corvallis, 2007.

| | Herbicide | Timing | Rate | Stand | Phytotoxicity | | Stunting | | Weed control | | |
|----|--------------|--------------|----------|-----------|---------------|---------|----------|--------|-------------------|------------------|------------------|
| | | | | | 7-Jun | 13-Jun | 7-Jun | 13-Jun | -----13-Jun ----- | | 21-Aug |
| | | | | | | | | | Hairy nightshade | Composite rating | Composite rating |
| | | | lbs ai/A | No/4' row | 0-10 | 0-100 % | | | ----- % ----- | --- % --- | |
| 9 | Nortron | 4 lf | 0.156 | 33 | - | 0.8 | - | 5 | - ^a | - ^a | 71 |
| | Dual Magnum | 4 lf | 0.640 | | | | | | | | |
| | Stinger | | 0.188 | | | | | | | | |
| 10 | Nortron | 4 lf | 0.313 | 37 | - | 0.3 | - | 5 | 3 | 5 | 30 |
| 11 | Nortron | 2 lf | 0.164 | 34 | 0 | 0.5 | 0 | 0 | 43 | 35 | 33 |
| | Dual Magnum | 2 lf | 0.640 | | | | | | | | |
| 12 | Nortron | 4 lf | 0.313 | 41 | - | 0.8 | - | 0 | - | - | 58 |
| | Dual Magnum | 4 lf | 0.640 | | | | | | | | |
| | Stinger | | 0.094 | | | | | | | | |
| 13 | Nortron | 4 lf | 0.313 | 39 | - | 0.5 | - | 0 | - | - | 76 |
| | Dual Magnum | 4 lf | 0.640 | | | | | | | | |
| | Stinger | | 0.188 | | | | | | | | |
| 14 | Nortron | coty to 2-lf | 0.164 | 37 | 2.0 | 0.8 | 25 | 30 | 100 | 98 | 94 |
| | Spin-Aid | coty to 2-lf | 0.244 | | | | | | | | |
| 15 | Nortron | 2 lf | 0.164 | 28 | 2.8 | 1.3 | 21 | 18 | 86 | 83 | 50 |
| | Spin-Aid | 2 lf | 0.488 | | | | | | | | |
| 16 | Nortron | 4 lf | 0.313 | 37 | - | 0.5 | - | 8 | 57 | 54 | 61 |
| | Spin-Aid | 4 lf | 0.748 | | | | | | | | |
| 17 | Spin-Aid | 2 lf | 0.488 | 37 | 1.0 | 0.8 | 9 | 9 | 56 | 60 | 36 |
| 18 | Spin-Aid | 4 lf | 0.748 | 34 | - | 1.3 | - | 13 | 71 | 66 | 40 |
| 19 | Dual Magnum | 2 lf | 0.640 | 35 | 0.1 | 0.5 | 0 | 3 | 0 | 0 | 23 |
| 20 | Dual Magnum | 4 lf | 0.640 | 33 | - | 0.0 | - | 0 | 0 | 0 | 25 |
| | FPLSD (0.05) | | | ns | 0.7 | ns | 8 | 12 | 28 | 24 | 23 |

^a (-) data missing in this column because the treatment effect was incomplete when this evaluation was made.

Table 3. Herbicide application data.

| | | | | |
|---------------------------------|----------------------------|------------------------|------------------------|---------------------|
| Date | May 16, 2007 | May 31, 2007 | June 01, 2007 | June 07, 2007 |
| Crop stage | Planted 5-15-07 | coty-2 lf | 2-lf | 4-lf |
| Weeds and growth stage | | | | |
| Hairy nightshade | | 2lf | | 2-4" tall |
| Purslane | | 2lf, 1/4 in dia. | | 2-4" tall |
| Smartweed | | 2lf | | 2-4" tall |
| Herbicide/treatment | PES | Spin-Aid coty-2 lf | 2-lf | 4-lf |
| Application timing | PES | coty-2 lf | 2-lf | 4-lf |
| Start/end time | 7-8 AM | 7-7:30 | 7:15-8 am | 6-6:45 AM |
| Air temp/soil temp (2")/surface | 60/62/66 | 65/62/64 | 72/72/76 | 53/56/54 |
| Rel humidity | 68% | 48% | 48% | 80% |
| Wind direction/velocity | 0-1 NE | NE 0-0.5 | SW 0-1 | 0 |
| Cloud cover | 0 | 0 | 0 | 100 |
| Soil moisture | very Dry | damp irrigated on 5-29 | Dry | Dry |
| Plant moisture | - | light dew | light dew | light dew |
| Sprayer/PSI | BP 30 PSI | BP 40 PSI | BP 40 PSI | BP 40 PSI |
| Mix size | 2100 mls | 2100 mls | 2100 mls | 2100 mls |
| Gallons H2O/acre | 20 | 20 | 20 | 20 |
| Nozzle type | 8002 | 8003 | 8003 | 8003 |
| Nozzle spacing and height | 3 nozzle boom 20/20 | 3 nozzle boom 20/20 | 3 nozzle boom 20/20 | 3 nozzle boom 20/20 |
| Soil inc. method/implement | 1.5 hrs irrigation at 9 AM | None | 1 hr at 2 pm | 6-8 2 hrs |
| Soil test | pH=6.2 | % OM (LOI) 2.4% | CEC 22.5 meq/100g soil | |

