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Herbicide Evaluations for Hazelnuts in Ontario

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Canada 

Research Team

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- Todd Leuty – OMAFRA, Tree Nuts & Maple Syrup
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- Jim Chaput – OMAFRA, Minor Use Coordinator
- Adam Dale – Univ. of Guelph, Hazelnut Breeding

Pest management – weeds, insect pests, diseases
Scouting – constant awareness of pests



Orchard herbicide sprayers



Background

- There are few herbicides, insecticides, fungicides registered for use on nut trees in Ontario.
- The Pest Management Centre (PMC) of AAFC obtains data in support of pesticide registrations for minor acreage growers in Canada.
- There are 6 Pesticide Minor Use (PMU) sites across Canada, ranging from BC to PEI.

Background

- Harrow, ON. is the southern most minor use location in Canada.
- Prior to this project, the PMC did not have a nut tree orchard available to test pesticides for registration purposes.
- Harrow is GLP (Good Laboratory Practices) certified.
- Pesticides that are prioritized by growers may be tested by the PMC for maximum residue limits and efficacy.

Glyphosate Use

- Glyphosate is registered for use on nut trees in Ontario.
- Glyphosate is a great product, however;
 - Does a poor job controlling perennial weeds.
 - Additionally, there are now 3 confirmed weed species in Ontario that are known to be resistant to glyphosate.
 - Giant ragweed, common ragweed and Canada fleabane.
 - The long-term effects of glyphosate use on orchards is still unknown.
 - Apple growers are now reporting that repeated glyphosate use is causing adverse affects on their orchards.

Canada Fleabane



Giant Ragweed



Common Ragweed



Try them today!



Announcements

US: Glyphosate exposure contributes to internal browning of apples during long-term storage

Glyphosate (Round-Up and generics) is a herbicide that kills weeds by blocking a critical enzyme pathway known as the shikimic acid pathway. In other crops, it has been studied that the glyphosate exposure can reduce root growth and seed production and can affect seed quality and plant nutrient balances.



In soil, the affinity of glyphosate for cations can reduce the availability of calcium, magnesium, manganese, copper, iron, nickel, and zinc either by direct chemical interaction or by negative effects on soil microbes involved in making these minerals available for plants. Glyphosate taken up by roots can interfere with movement and availability of minerals inside the fruit. It tends to accumulate in meristematic tissue and storage organs.

Currently, no one knows how much of the glyphosate taken up by apple tree is moved to the apple fruit, but it seems possible that glyphosate may influence fruit physiology either by partially blocking the shikimic acid pathway or by affecting nutrient balance within the fruit.

The internal browning is a physiological disorder that can occur during controlled atmosphere (CA) storage and makes fruits unacceptable for fresh-cut processing. The incidence and the severity of internal browning vary from orchard to orchard, and the causes responsible of this problem must be yet determined.

In 2009, Rosenberg et al. started a study to determine if the exposure of 'Empire' apple trees to glyphosate might influence the incidence and severity of internal browning that develops in apples that are stored in CA for a long period. The study has been conducted in three farms on

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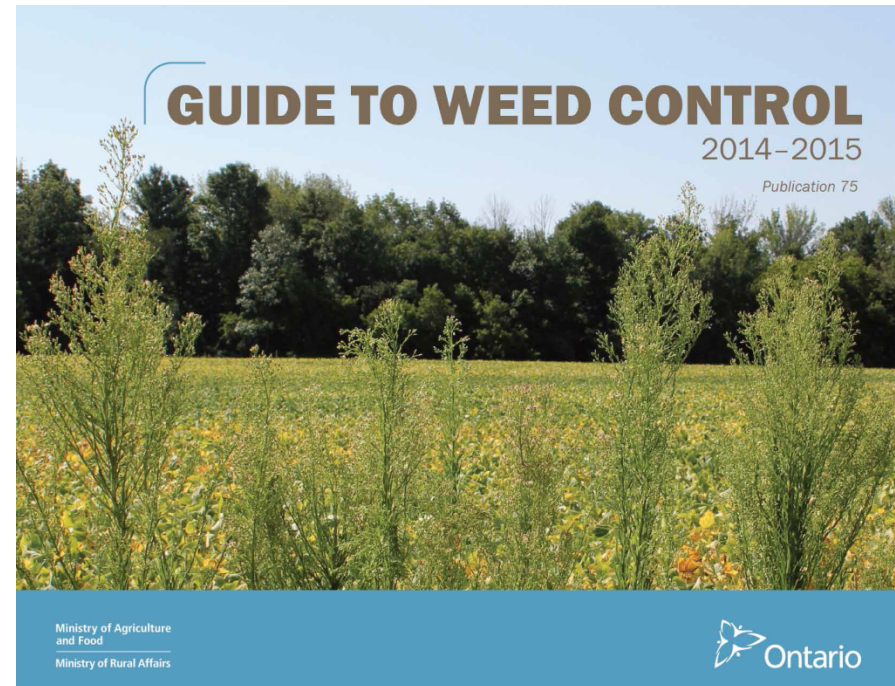


Paraquat use

- Paraquat is also widely used in Orchards.
- Similar to glyphosate, paraquat controls a wide spectrum of weeds; however there are:
 - Environmental impact concerns and
 - Worker exposure concerns
- The long-term use of paraquat in blueberries has resulted in the first paraquat resistant Eastern Black Nightshade found in the world (located in Ontario).
- Canada fleabane was found to be resistant to paraquat in orchards in the early '90s.

Access to information

- OMAFRA publication 75: The Guide to Weed Control 2014-2015 **Chapter 15** now includes Tree Nuts.
 - This chapter lists all of the currently registered herbicides on Tree Nuts in Ontario.
 - The 2015 supplement will **ONLY** be available on-line in April. All new registrations (Sandeia) will be highlighted in yellow.
 - The supplement is available as a PDF. Each chapter can be downloaded and printed separately.



Pub. 75 Chapter 15 – tree nut herbicides

TRADE NAME (Concentration) active ingredient	PRODUCT RATE PER HECTARE active rate per ha	PRODUCT RATE PER ACRE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario, page 33 and Chapter 5, Notes on Adjuvants, page 85.
TREE NUTS (CHESTNUT, FILBERT, HAZELNUT, JAPANESE HEARTNUT, PECAN AND WALNUT)			
Soil Applied Grass and Broadleaf Herbicides			
ALION 200 SC (200 g/L) indaziflam	0.375 L/ha 0.075 kg/ha	0.152 L/ac	<ul style="list-style-type: none"> - Apply ONLY once per growing season. - Apply ONLY to crops that have been established for at least three full growing seasons. - Apply to soil before weeds germinate. If weeds have emerged, this product may be tank-mixed with a burn down herbicide (consult label for further instructions). - May be applied at any time throughout the growing season when the ground is not frozen or snow covered. - Excessive crop or weed debris present on the soil surface at time of application may prevent uniform product distribution in the soil and result in reduced weed control.
CHATEAU WDG (51.1%) flumioxazin	0.280–0.420 kg/ha 0.143–0.215 kg/ha	0.113–0.170 kg/ac	<ul style="list-style-type: none"> - Established plantings ONLY. - Maximum 2 applications per growing season at least 30 days apart. - Apply the lower rate to coarse textured soil with less than 5% organic matter and apply the higher rate to medium textured soil with less than 5% organic matter. - Do NOT apply within 100 m of non-dormant pears. - Apply using ground application only. - Do NOT apply to trees established less than 1 year, unless protected from spray contact by non-porous wraps, grow tubes or waxed containers. - Do NOT apply after bud break unless using hooded or shielded equipment. - After use, tanks and nozzles must be cleaned with a 3% ammonia solution. Please review label for more detailed instructions. - Do NOT harvest within 60 days of application.
PRINCEP NINE-T (90 WG) or SIMADEX (500 g/L) or SIMAZINE 480 (480 g/L) simazine	2.5–5 kg/ha 4.5–9 L/ha 4.7–9.4 L/ha 2.25–4.5 kg/ha	1–2 kg/ac 1.8–3.6 L/ac 1.88–3.76 L/ac	<ul style="list-style-type: none"> - Use on filberts, hazelnuts and walnuts ONLY. - Use on Established plantings ONLY, planted for 1 year or more. - PRE – Apply in 300–1,000 L/ha water (120–400 L/ac). - Apply the spray to the orchard floor, avoiding contact with fruit, foliage or stems. - DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. DO NOT apply with spray droplets smaller than the American Society of Agricultural Engineers (ASAE) medium classification. Boom height must be 60 cm or less above the ground. - DO NOT apply by air. - Restricted-entry interval is 12 hours.
* See Table 4-1. Herbicides Used in Ontario, page 35, for formulations available. Not all formulations are registered on all crops. See label for specific uses and rates.			

Benefits to the Growers

As a result of this research:

- Nut tree growers will have access to a more diverse portfolio of registered products available to them.
- Growers will be more competitive regionally, and internationally, especially with the U.S.
- Growers will be better able to rotate herbicide modes of action and delay development of resistance.
- The long-term impacts of herbicides will be better understood.
- A long-term research orchard will be established.

Specific Objectives

1. To determine the tolerance of nut trees (hazelnuts) to low risk soil applied and post-emergence herbicides. Especially, during orchard establishment.
2. Determine the long-term impacts of herbicide application on tree growth and production.
3. Summarize data and submit potentials for registration through the pesticide minor use program.

Methods

- A hazelnut orchard was established in Harrow, ON during the spring of 2013.
- Three (3) unique varieties were selected to ensure that proper cross pollination occurs and that there was a range of genetic characteristics.
 - The cultivars chosen: Geneva, Tonda di Giffoni, and Jefferson.

Methods

- A 1.3 ha field at the Harrow Research Farm was selected. (140m x 96m).
- Soil type: Loam – 48% sand, 36% silt, 16% clay
 - pH of 6.9 and 2.8% organic matter.
- Crops for the previous 3 years have been soybean, rye and red clover.
- All other nutrient statuses were appropriate for a nut tree orchard.

Methods

- At transplanting, trees were spaced at least 5m apart to prevent shading.
- Rows were oriented North/South.
- A total of 504 trees fit into the area.
- Irrigation drip tape was placed into the field to ensure that the trees had adequate moisture during establishment and growth.

Methods

- Trees were suckered at least twice to ensure that they did not grow as a bush.
- A mixture of 40% turf type (TT) ryegrass, 40% TT creeping red fescue, and 20% TT tall fescue was seeded in the row middles. This mixture was chosen based on its ability to minimize insect pests and nematodes.

Herbicide Treatments

1. Untreated Control
2. Roundup
3. Treevix
4. Sandea
5. Princep Nine-T
6. Prowl H2O
7. Gallery
8. Goal 2XL
9. Munger Hort Vinegar Plus



Herbicide Treatments

- All herbicides were applied at doses and timings recommended by the registrants.
- Short-term assessments:
 - Herbicide injury on foliage: 7, 14, 28 days after application
- Long-term assessments:
 - Trunk Cross Sectional Area each autumn
 - Leaf disc samples for herbicide residue
 - Yields after year 3

Trunk Cross Sectional Area

Treatment	Jefferson	Tonda di Giffoni	Geneva
Weedy Control	96	89	110
Roundup	100	86	139
Treevix	88	111	116
Prowl H20	97	96	124
Sandea	105	90	115
Princep Nine-T	98	81	104
Gallery	106	90	101
Goal 2XL	98	93	123
Munger Vinegar	89	90	123
LSD _{0.05}	n.s.	n.s.	n.s.

Herbicide Residue Analysis

- Leaf disk samples for all fall applied treatments have been collected. Data for spring applied treatments will be collected in 2015.

Results

Goal – not detected

Prowl H20 – not detected

Gallery – not detected

Other Results of Note

- No injury was observed as a result of the herbicide treatments for any hazelnut variety.
- There was a “winter kill” loss of ~50% in year 1 for Tonda di Giffoni.
 - Winter kill was minor for Jefferson and Geneva.

- Hazelnut bacterial blight
- Black rot canker (apples)



- Not herbicide injury
- Infections due to winter injury?

Intercropping precautions

Tree nut herbicides: non-bearing trees

Intercrop herbicides



Next Steps

- Data in support of URMULE's (user requested label expansions) are currently being prepared for the following treatments:
 1. Treevix
 2. Prowl H2O
 3. Gallery
 4. Goal 2XL
 5. Munger Vinegar

Recent Registrations

- Bayer CropScience has registered a product called Alion for use in orchards, including nut trees.

GROUP	29	HERBICIDE
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Alion™ Herbicide

For Preemergent Weed Control in Citrus Fruit, Stone Fruit, Pome Fruit, Tree Nuts and Pistachios

ACTIVE INGREDIENT: Indaziflam*	19.05%
OTHER INGREDIENTS:	80.95%
TOTAL:	100.00%

Contains 1.67 pounds of indaziflam per gallon.

*(CAS No: 730979-19-8)

EPA Reg. No.: 264-1106

EPA Est. No

http://pr-rp.hc-sc.gc.ca/1_1/view_label?p_ukid=53869380

Recent Registrations

- Canyon Group LLC(Gowan Canada) has registered a product called Sandea for use in orchards, including nut trees.

GROUP 2 HERBICIDE

SANDEA HERBICIDE

SANDEA® Herbicide is a selective herbicide for control of nutsedge and listed broadleaf weeds.

AGRICULTURAL Wetable Granules

GUARANTEE:

HALOSULFURON, present as methyl ester.....72.6%



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