WASHINGTON STATE UNIVERSITY
TRI-CITIES

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The following information is from the Western Region Integrated Pest Management Center regarding the use of cycloate (Ro-Neet) in the six-state Pacific Northwest region comprised of Alaska, Idaho, Oregon, Montana, Utah, and Washington. This information is being provided to you in response to a request sent out by USDA's Wilfred Burr.

Spinach, table beets, and sugarbeets are all grown in our region. As you may be aware, the Pacific Northwest is a major producer of seed for these crops as well. Our response provides information on cycloate use in both the seed crop and the vegetable crop. Cycloate is used extensively in both spinach and spinach seed production in our region and is considered critical to the continued successful production of these crops. It is also very important in table beet and table beet seed production. Although use has declined in the last few years, cycloate still retains a place in sugarbeet production in our area. While no longer used a great deal in sugarbeet seed production, producers would like to retain the use of cycloate on sugarbeet seed as well.

Below, with crops listed in order of importance, is information for cycloate use on spinach, table beets, and sugarbeets and their respective seed crops.

Spinach Seed
Approximately 75% of U.S. spinach seed (50% of the world's seed crop) is produced in Washington's Skagit Valley on 1500 to 2500 acres each year (2000 acres in 2004). The use of cycloate on spinach seed is viewed as critical to the continued success of this industry. Weeds are considered the most important pests in spinach seed production because spinach is not competitive against weeds during its early growth and spinach is sensitive to most herbicides. Research has shown that weed competition can reduce the yield in seed crops. In fact, competition from weeds can result in 100% yield loss if weeds are not controlled. Weeds present at harvest interfere with threshing, reduce harvest efficiency, and increase mechanical damage to the seed. Many weed species can also serve as hosts for diseases and insects that affect crop plants. Weed seeds can also contaminate harvested spinach seed. Cycloate is a very important part of weed control programs in spinach seed production.

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Cycloate use in spinach seed (as well as in spinach) is provided under Special Local Needs (SLN) registrations. On the seed crop, cycloate is applied pre-plant at 2 # ai/A. Cycloate is critical to the spinach seed industry because it is the only herbicide available for pre-plant use. In the past, growers used chlorpropham (Furloe) or diethatyl ethyl (Antor) but with the loss of these products, cycloate is now the only available and effective pre-plant herbicide. Cycloate is very important in spinach seed production because it provides good early-season weed control. Spinach is a cool-season crop that is planted early. The crop emerges at the same time that weeds are flourishing. The pre-plant use of cycloate allows the spinach plant to become established and to successfully compete with later-emerging weeds.

Growers use phenmedipham (Spin-Aid) for post-emergence weed control; however, 1) to be effective it must be used in combination with a pre-plant herbicide, and 2) some spinach varieties are particularly sensitive to phenmedipham. Further, in some years rain delays phenmedipham applications. This herbicide is only effective when used on small weeds. If the delay allows for much weed growth then phenmedipham is not effective.

As is discussed in more detail below (under spinach), the use of s-metolachlor (Dual Magnum) has been considered. While it has been used safely in some areas, it is not viewed as an alternative in all growing areas of our region because of phytotoxicity concerns.

Currently, Washington spinach seed growers have only one other broadleaf herbicide available: ethofumesate (Nortron). Nortron has caused injury to certain spinach varieties, particularly when spinach is grown on coarse soils and if rainfall is too high shortly following application. Because of the limitations of phenmedipham and phytotoxicity concerns about ethofumesate and s-metolachlor, cycloate is a critical chemical and its loss would cause extreme hardship to spinach seed producers.

Spinach

While cycloate use is important in other crops, it is critical for spinach as well as spinach seed. In Oregon and Washington, a total of approximately 1000 harvested acres of spinach are produced for fresh markets, processing, and juicing. As discussed above under spinach seed, growers had previously alternated between the pre-plant use of diethatyl ethyl (Antor) and cycloate for weed control. With the loss of diethatyl ethyl, growers are now left with cycloate as the only effective pre-emergence herbicide for weed control in spinach. This chemical is viewed as critical for the continued production of spinach in the Pacific Northwest. It is used on every acre of non-organic commercial spinach produced here.

When spinach first emerges, it is very susceptible to herbicide injury. The possibility of using s-metolachlor (Dual Magnum) for weed control in the spinach grown in our region has been researched. This chemical is effective in the drier climates of Texas and California and is used successfully in some growing areas in our region. However, in the spinach-growing areas in Oregon, because of soil type and climate, Dual Magnum has been shown to be phytotoxic to spinach and is not a weed control alternative. The other alternative for pre-emergence weed control in spinach is phenmedipham (Spin-Aid); however, as stated under spinach seed, it does

not provide adequate weed control if used alone, it only provides control if applied when weeds are small, and some spinach varieties are sensitive to this chemical.

In our region the use of cycloate is provided through a series of SLN registrations, which allow for the use of cycloate at 2 to 3 # ai/A. Roughly half of the spinach acreage is treated with cycloate at 3 # ai/A while the other half is treated at rates between 1 and 2 # ai/A.

Bob McReynolds with Oregon State Cooperative Extension notes that no new herbicides are close to registration for use on spinach, making the continued use of cycloate critical to our region's spinach industry.

Table Beet Seed

Table beet seed is grown in both Oregon and Washington with the production in Washington accounting for 95% of U.S. and 50% of world production. Weed control in this seed crop is critical because weed competition can reduce the yield and performance of table beets planted for seed production. This competition can result in 75% yield loss if weeds are not controlled. As with spinach seed, weeds can also serve as hosts for diseases and insects, and weed seeds can contaminate harvested beet seed, potentially affecting marketability.

In Washington table beet seed crops, cycloate is a critical chemical because it is the only effective pre-plant herbicide registered for use on table beet seed.

Part of the reason that cycloate is so important stems from the specific crop production practices employed for table beet seed. In our region, the vast majority of table beet seed crops begin as transplants. If cycloate were not available, growers would wait until weeds had emerged and would then apply a contact spray. When contact sprays are used, they must be applied early enough to provide effective weed control; however, if applied at this time (30 to 45 days post transplant) the beet plants are not sufficiently well established to avoid injury. Beet plants not killed outright with the use of a contact spray have impaired ability to produce seed.

Cycloate is also important because it is the only effective control for nightshade. The dried nightshade berries are about the same size as the table beet seed clusters and if the weed is not adequately controlled nightshade berries contaminate the harvested seed.

Cycloate is applied once to table beet seed crops and is typically applied pre-plant, although some growers apply it immediately after transplanting. Cycloate is applied at 3 # ai/A. Because most table beet seed is produced in sandy soil, the maximum rate of 4 # ai/A is not used.

Cycloate use is very important to table beet seed production in the Pacific Northwest.

Table Beet

Cycloate is also important in Oregon's table beet production. Currently between 600 and 700 acres are planted to table beets each year; however, personnel at Oregon State University estimate that the number of acres will approach 1000 in the near future. Due to various product cancellations, cycloate is now the only effective product for pre-emergent weed control in table

beets. Rainy conditions in western Oregon can delay cultivation in table beets making the availability of an effective pre-emergent weed control of critical importance for this crop. Cycloate is used at 3 to 4 # ai/A with the actual use rate dependent upon the soil type.

There is the possibility that s-metolachlor (Dual Magnum) may be registered for use on table beets in Oregon in the future. Studies are currently underway to assess crop safety issues involved with this use. Were Dual Magnum to be granted a registration on table beets in the Pacific Northwest, it is likely that crop safety issues will result in a limited use registration. Oregon Extension personnel believe that even with this potential registration, cycloate will remain a necessary herbicide for some growers.

Because cycloate is the only effective pre-plant herbicide for use in table beets it is essential in current table beet production.

Sugarbeet

Sugarbeets are grown throughout our region. Idaho is the major producer, with more than 200,000 acres of sugarbeet production. Effective weed control in sugarbeets is very important. Experiments with untreated fields have shown that weed competition can reduce sugarbeet yields by 12 tons per acre, or more than 50%. Cycloate use in sugarbeets has decreased as growers move to using ethofumesate (Nortron) and other chemicals, yet cycloate continues to be an important herbicide for a number of reasons. For example, ethofumesate requires water activation from overhead sprinkler irrigation and sugarbeets are grown using furrow irrigation in some portions of our region. In the Amalgamated Sugar Company LLC growing area, which includes acreage in Idaho, Oregon, and Washington, approximately 225,000 acres of sugarbeets are grown each year. Cycloate is applied to at least 35,000 of these acres (15-20%). It is applied as a broadcast application and the average application rate is 2.25 # ai/A. The labeled rate ranges from 3 to 4 # ai/A, depending on the soil type; the lower rates apply to sandier soils.

Cycloate is also used on 1,000 of Montana's 54,000 acres of sugarbeets. It is effective for the control of nightshade and is an important chemical control in the areas where nightshade is problematic. Nightshade control is particularly important in fields to be rotated to potatoes. There are limited nightshade controls available for use on potatoes, so if this weed is not adequately controlled in the sugarbeet crop it becomes a major problem in the potato crop. Where nightshade is a problem, cycloate is used at the maximum labeled rate, depending upon the soil type.

Cycloate remains an important part of weed control programs in sugarbeet. For the 15 to 20% of sugarbeet production under furrow irrigation and in areas where nightshade control is an issue, there is no good pre-emergence herbicide substitute available for cycloate.

Sugarbeet Seed

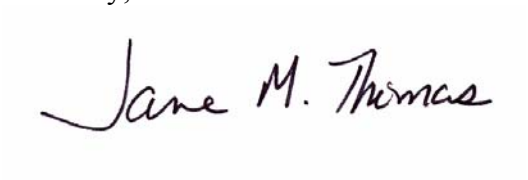
Approximately 3500 acres of sugarbeet seed are grown in Oregon's Willamette Valley. This acreage accounts for nearly 100% of U.S. sugarbeet seed production.

When cycloate availability became an issue several years ago, sugarbeet seed growers in Oregon moved away from using it. However, at one time, every acre of sugarbeet seed was treated with cycloate; producers still believe that there is a place for cycloate in sugarbeet seed production. When cycloate is applied, it is used at a rate of 4 # ai/A as a one-time, pre-emergence broadcast application. The current practice for most growers is to forgo the use of a pre-emergence herbicide and to apply herbicides (typically ethofumesate [Nortron]) only after the weeds have emerged. This approach to weed control is an option for sugarbeet seed while it is not an option for table beet seed due to differences in both production practices and the hardiness of the crops. Most sugarbeets are grown from seed and those grown from transplants use a different transplant process than that used in Washington for table beet seed crops. In either case (whether grown from seed or from transplants), by the time weed control becomes necessary, sugarbeet plants are much hardier than table beet plants and are better able to tolerate herbicide applications.

While cycloate is not critical to sugarbeet seed production, growers would like to retain the use of this chemical. Growers have concerns about resistance management and retaining cycloate means one more alternative for weed control. Also, cycloate use is important in certain crop rotation programs.

If you have any questions regarding the information contained here, please feel free to contact me or anyone on the attached contact list.

Sincerely,



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Contact List for Cycloate Information

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spinach	Klein	Paul	Seminis Vegetable Seed	Fieldman	(360) 466-3860	paul.klein@seminis.com	Washington
spinach	McReynolds	Bob	Oregon State University	Extension Horticulturist	(503) 678-1264	bob.mcreynolds@oregonstate.edu	Oregon
spinach	Miller	Tim	Washington State University	Extension Weed Scientist	(360) 848-6138	twmiller@wsu.edu	Washington
spinach	Stubbs	Gene	Seneca Food Processing Plant	Ag Manager	(509) 525-8390	gstubbs@senecafoods.com	Washington
spinach seed	Batt	Roger	North Idaho/Eastern Oregon Seed Association	Executive Director	(208) 888-0988	rbatt@spro.net	Idaho
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spinach seed	Miller	Tim	Washington State University	Extension Weed Scientist	(360) 848-6138	twmiller@wsu.edu	Washington
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table beet	Stubbs	Gene	Seneca Food Processing Plant	Ag Manager	(509) 525-8390	gstubbs@senecafoods.com	Washington
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table beet seed	Klein	Paul	Seminis Vegetable Seed	Fieldman	(360) 466-3860	paul.klein@seminis.com	Washington
table beet seed	Lyons	Milo	Alf Christiansen	Production Manager	(360) 419-3021	milo_lyons@alfseed.com	Washington
table beet seed	McReynolds	Bob	Oregon State University	Extension Horticulturist	(503) 678-1264	bob.mcreynolds@oregonstate.edu	Oregon
table beet seed	Miller	Tim	Washington State University	Extension Weed Scientist	(360) 848-6138	twmiller@wsu.edu	Washington
table beet seed	Picha	Gary	Syngenta Seeds	Fieldman	(360) 757-4184	gary.picha@syngenta.com	Washington
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