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REPORTING ORBIT USE

The Section 18 permit for the fungicide Orbit (propiconazole) expired on July 31, and now is the time to report use of this product in Wisconsin. All cranberry growers in Wisconsin have received, or soon will receive, a form to record their use of Orbit. If you used Orbit, complete the form and send it no later than September 28 to: Patty McManus, Dept. of Plant Pathology, 1630 Linden Dr., Madison, WI 53706 or fax 608-263-2626.

Reporting Orbit use is required by the EPA, and future Section 18 or regular labels for Orbit will not happen if we don't provide them with use data. If you have comments, concerns, or other observations regarding cottonball, please include this on the form. If you have questions about reporting fungicide use, contact me at 608-265-2047 or psm@plantpath.wisc.edu. However, I will be away from the office August 23-30.

Patty McManus, UW-Madison, UW-Extension

Material belongings, relative wealth or poverty, physical environment—the things on which we are prone to set our hearts and anchor our aspirations, the things for which we sweat and strive, oftimes at the sacrifice of happiness and to the forfeiture of real success—these after all are but externals, the worth of which in the reckoning to come shall be counted in terms of the use we have made of them.

James E. Talmage

RESISTANCE TO PESTICIDES

Pesticide resistance is the inherited ability of a pest to tolerate the toxic effects of a particular pesticide. As resistance becomes more widespread in a population, you have to apply more pesticide more often to control the pest. Over time that pest may not be controlled with applications of that particular pesticide. Once that happens, that pesticide is no longer a useful tool. Hundreds of pest species, mostly insects, have become resistant to one or more pesticides.

Where does pesticide resistance come from? When organisms reproduce, the offspring receive copies of the parent genetic material. However, the copies are not always perfect. Mistakes appear. These are called mutations. Many times the mistakes are of no consequence or are lethal. Sometimes, however, a mutation benefits an organism. An example is a mutation that confers pesticide resistance. Because pest populations are large, it is likely that within a population there will be a small percentage that are resistant to a particular pesticide along with a small percentage that are extremely susceptible. Resistant individuals survive pesticide applications and are able to pass along this resistance to at least a portion of their offspring. Because the pesticide kills most of the non-resistant individuals, the resistant individuals begin to make up a larger percentage of the surviving population. As this continues, eventually most of the population is resistant.

In many cases, pest populations that become resistant to one pesticide in a group also become resistant to other related pesticides. This is called cross-resistance. Cross-resistance happens because closely related pesticides kill pests in the same way; (*for example, all organophospates inhibit cholinesterase*) if a pest can resist the toxic action of one pesticide, it can usually resist other pesticides that act in the same manner.

Given that pesticide resistance is an ever-present threat, you need to understand what influences its development. In this way you can manage pests to minimize the chances for resistance to develop. The most important factors that influence the development of resistance are:

- The frequency of resistance in the pest population before using the pesticide of interest. Resistance may be entirely absent from a pest population , or it may be present in relatively few individuals. Obviously, no resistance is best.
- The chemical diversity of the pesticides used. If you always use the same pesticide or the same group or family of pesticides you won't be killing pests that are resistant to that pesticide or family of pesticide. When this happens the proportion of resistant individuals will increase more rapidly in the population.
- Persistence and frequency of use of a given pesticide. Resistance is more likely to develop against pesticides that have greater persistence ad that you apply often during a treatment season. These factors are less important for herbicides than for insecticides and fungicides. Even short lived herbicides can provide season-long weed control, and normally you apply the same herbicide only once per season.
- The proportion of the population exposed to the pesticide. Insect life cycles are generally very predictable, and you usually apply a pesticide when most of the insects are at the same susceptible stage. Thus, most non-resistant individuals are killed, which increases the proportion of resistant individuals in the surviving population. On the other hand, insects that migrate in from non-treated areas dilute this population.
- The length of the pest's life cycle. As with any other inherited trait, pesticide resistance will increase more rapidly if the pest has a short life cycle and many generations in a single season. This largely explains why; insect populations become resistant faster than weed populations.

In the past we responded to resistance by switching to different chemistry. New products became available regularly. Unfortunately, this is no longer the case. Today's new pesticides are more complex, difficult to synthesize and more expensive to develop and use. Even these products are subject to development of resistance. Obviously, switching products is no longer enough.

In developing your pest management program you should assume that pests can (and will) develop resistance to any pesticide you use against them. This means placing greater emphasis on resistance management. This may be more work in the short run, but will pay dividends in the long run as effective chemistry can be maintained.

Resistance management includes reducing frequency of application of any material, utilizing non-chemical approaches (BT's, nematodes), and population monitoring. This is part of the "integration" of integrated pest management.

Adapted from: Pest management principles for the commercial applicator: Fruit Crops, 3rd edition. UWEX, Madison.

Necessity never made a good bargain.

Benjamin Franklin

Human history becomes more and more a race between education and catastrophe.

H.G. Wells

ANTHOCYANIN DEVELOPMENT

Since fruit color is so important to the cranberry industry, I thought I would take a little space and describe a little about fruit color development in cranberry. The red color of mature cranberries is caused by the development of anthocyanin pigments in the few outermost cell layers. This is also associated with a dilution of chlorophyll as the berries enlarge. Anthocyanins are fairly complex molecules that require significant amounts of energy to create. Anthocyanin production is broadly regulated at two levels: environment and genetics.

Development of fruit color is usually associated with bright sunny days and cool nights. Research has clearly shown that the greatest amount of color develops with the coolest weather and that in the immediate pre-harvest period warm temperatures lead to poor fruit color. The most intense color is also formed where sunlight strikes the fruit directly. Growers have long noted that fruit in the top of the canopy is better colored than fruit deep in the canopy and that the tops of the fruit tend to have better color than the bottoms. The effect of light on fruit color development has been studied extensively for apples (which also must have light directly striking fruit for optimal color development). In apples, light intensity of less than 30% of full sun is ineffective in developing fruit color. Apparently light is critical for two reasons. First, to induce formation of color; and second to provide carbohydrates that are subsequently formed into anthocyanins. Unfortunately, we can do little about the environment on cranberry marshes. We are at the mercy of the weather.

Different cultivars develop more anthocyanin than others do and some develop color earlier. These are genetic differences which can be exploited in breeding programs. There seems to be a negative relationship between fruit size and fruit color, with larger berries having less anthocyanin per volume than small berries. There are also qualitative differences with cultivars such as Budd's Blues producing more blue and less red pigment than other cultivars. Most of the newer hybrid cultivars produce better color than older selections from the wild.

In many fruit crops, including cranberry, there is a negative relationship between nitrogen fertilization and fruit color. The exact mechanism is not known, but the speculation is that too much nitrogen forces vegetative growth that takes resources that may otherwise have gone to color production. Alternatively, substantial vegetative growth may provide additional shade that prevents color development.

In the past several pesticides were used to enhance color development in cranberry. To my knowledge these practices have been abandoned. Good overall management accompanied by cooperative weather is what is needed for good color development today.

Teryl Roper, UW-Extension Horticulturist

The unpolite, impulsive man will sometimes rather lose his friend than his joke. He may surely be pronounced a very foolish person who secures another's hatred at the price of a moment's gratification. Spite and ill-nature are among the most expensive luxuries of life. Samuel Smiles