Oxalis corniculata and Oxalis pes-caprae Biology and Control in Container and Field Grown Ornamentals

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Oxalis corniculata and Oxalis pes-caprae are two weeds that while in the same genus have completely different biology and therefore different methods of control. In this presentation I will cover only those methods of control that are pertinent or registered for use in container or field grown ornamentals.

Oxalis corniculata: Known as creeping woodsorrel, creeping oxalis, yellow oxalis, yellow woodsorrel and simply as oxalis, is a perennial weed that is a problem in greenhouses, lawns, landscape and nursery ornamentals. While it appears to be associated with human activity it is not a large problem in cultivated fields. Established plants are not easily controlled with herbicides in container ornamentals. Hand pulling of established plants, followed by herbicide application has been effective. The whole plant must be pulled or any stem material left can develop into a new plant.

Leaves are composed of three heart-shaped leaves attached to the petiole and the flowers have five small yellow petals that occur in clusters of one to five at the end of flower stalks. Plants must be controlled before seeds are produced. Seedlings flower in as little as four weeks nearly year around. Seedpods are 1/3rd to 1 inch in length and contain 10 to 50 seeds. These red, rough seeds can be expelled up to eight feet from the parent plant when the okra-shaped capsule ruptures. Sunlight is required for the seeds to germinate. A single plant can produce a total of 5000 seeds!

Oxalis pes-caprae: Known as Bermuda buttercup, buttercup oxalis, soursob, sourgrass, and yellow sorrel is a perennial that grows in full sun in cool coastal areas and in shaded areas inland. It is a problem in lawns, landscape, field-grown ornamentals, and increasingly in wild land and natural preserve areas. It is generally a problem in cultivated areas, but repeated cultivation before bulbs develop may reduce infestation. There are several reports of sheep loss in Australia when soursob, as the locals there call it, is eaten.

Plants form a single, short vertical stem which is mostly underground. Small, whitish bulblets develop on the stems at the base of the rosette of leaves. New bulbs form underground. These bulbs will germinate in the fall after the first rain. Leaves are larger and more fleshy than in Oxalis corniculata. Bright yellow flower clusters form at the end of a leafless stock from November through April. Plants in California rarely, if ever produce seeds. Foliage dies and the bulbs become dormant as the temperatures rise in the late spring and summer.

There are several methods to control these two weeds, some more successful than others. Cultural practices such as cultivation, hand hoeing or pulling, sanitation, irrigation control and crop timing have been used in ornament production. In container ornamentals where Oxalis corniculata is big problem hand pulling of this weed is widely used. This method of weed control is labor intensive and therefore can be expensive and the plants can be damaged by this operation. It is important to keep the area around the containers free from weeds that can contaminate the containers with weed seeds. All soil media used should be weed-free. Irrigation should be applied so that the soil on top of the container dries out between irrigations. In field

grown ornamentals where O. pes-caprae is much more prevalent cultivation can be done with tractor implements before bulbs are initiated. Hand weeding is also widely used. It is important that all implements that are moved from a field infested with O. pes-caprae be cleaned before being used in a field that does not have this weed. If O. pes-caprae is a major weed in the field then planting a crop that grows in a different cycle than this weed may reduce the competition effect.

Herbicides are used in field-grown ornamental production, but are not very effective in the control of O. pes-caprae because of the perennial biology of the weed. There are several herbicides that are effective for the control of O. corniculata in container ornamentals. Isoxaben, prodiamine, pendimenthalin, napropamide, oxadiazon, oryzalin, trifluralin, diclobenil, and oxyflurofen alone and in combinations are registered for use in ornamental production. These herbicides have an approximate residual persistence of from one month to one year. This is an important consideration in a container nursery where water is recycled onto crops that may incur phytotoxicity.

Several types of mulches are used for weed control and moisture conservation in container ornamentals. Sand, nut shells and man made material disks are just a few of the materials effective for weed control. Mulches are of limited use in annual field grown ornamentals.

When weather conditions in coastal flower growing areas are conducive to solarization this method of weed control is effective against O. pes-caprae. Because of the cool, cloudy conditions that are often prevalent during the summer in the flower growing region solarization is often ineffective. Solarization for container ornamentals is limited to pre-potting treatment of planting media.

Fumigation is used in container ornamentals for pre-potting soil media sterilization. Chemical and steam sterilization use is widespread.

The use of fumigation in field grown ornamentals is undergoing review and experimental with the impending loss of the use of Methyl Bromide in 2005. Several fumigants are being tested as replacements for Methyl Bromide. Iodomethane, chloropicrin, 1, 3- D, and metam are among the most promising compounds.

Because of the nature of both Oxalis corniculata and Oxalis pes-caprae these two weeds will continue to be a major pest of ornamental production in the future. By understanding and utilizing the biology of these pests in combination with cultural and chemical controls future control efforts can be made more effective.

References:

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WEED CONTROL IN CONTAINER AND FIELD PRODUCTION WITH FLUMIOXAZIN

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Introduction

It has been over seven years since a new active ingredient for an herbicide has been registered for the ornamental market. There are many herbicides currently on the market, which do a fairly good job of weed control. Unfortunately, no single herbicide, tank mix, or premix will control all the weeds. Research on new candidate herbicides is an ongoing process. The objective in this research is to eventually provide the grower a new herbicide that will control a broader spectrum of weed species, including the hard-to-control weeds. Hand weeding problem species can cost the grower thousands of dollars per acre if there are no effective herbicides available.

During October/November 2003, the EPA granted Valent U.S.A. Corporation Section 3 registrations for two formulations of flumioxazin, BroadStar™ Herbicide and SureGuard™ Herbicide. The California registration for these two herbicides, unfortunately, is probably several months away.

Mode Of Action

Flumioxazin (2-[7-fluoro-3,4-dihydro-3-oxo-4-(2-propynl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1*H*-isoindole-1,3(2*H*)-dione) works primarily as a preemergence herbicide, but with considerable postemergence activity, depending on formulation, which is influenced by extent of coverage on the weed seedling. Flumioxazin is an N-phenylphthalimide herbicide. The mode of action in this family of chemistry is the inhibition of protoporphyrinogen oxidase (PPO), an enzyme important in the synthesis of chlorophyll. This PPO inhibition causes porphyrins to accumulate in susceptible plants, and when seedling weeds are exposed to sunlight, membrane lipids undergo peroxidation. The peroxidation of membrane lipids leads to irreversible damage of membrane function and structure in susceptible plants. Treatment of soil with flumioxazin will cause susceptible emerging weed seedlings to turn necrotic and die shortly after exposure to sunlight.

Toxicology

Flumioxazin has considerable safety and therefore has only the "Caution" signal word on the BroadStar and SureGuard labels. The hazards are minimal with an oral LD_{50} of >5000mg/kg, dermal LD_{50} of >2000mg/kg, and inhalation toxicity of only 3.93mg/L. It is non-carcinogenic and does not present a genetic hazard. The risk to mixers, loaders, and applicators is minimal, assuming protective clothing is worn, consisting of long pants, long-sleeved shirt, waterproof gloves, and shoes plus socks.