

# Advances in Agronomic Weed Control

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Agronomic crops in California are grown over four million acres and generate in excess of three billion dollars annually. The major crops and acreage include:

Alfalfa hay -	1,000,000
Dry beans -	130,000
Corn, grain & silage -	500,000
Cotton -	900,000
Rice -	500,000
Sugar beets -	100,000
Wheat -	550,000
Other hay & grain -	700,000

*Source: California Field Crop Review, October 1998, Vol. 19 No. 10*

This paper will discuss these crops except for cotton, which will be covered in another presentation. My specific focus will be to address recent advances made during the past year to solve weed problems by utilizing new herbicides, herbicide resistant crops and cultural practices.

## **Alfalfa**

Managing weeds in alfalfa is always of major importance, beginning with establishing a new stand or trying to maintain top hay quality that is desirable to the dairy industry. Two herbicides were registered for use in alfalfa hay in 1998, which will help in both of these areas:

Prism® - is a new selective herbicide from Valent Corp that can be used on all ages and growth stages of alfalfa without danger of crop injury. It controls annual and perennial grass weeds. This herbicide will be an important tool for control of yellow foxtail and other grasses occurring in summer months or in seedling stands. It can also be tank mixed with Buctril or Pursuit to expand the spectrum of control to broadleaf weeds.

Zoriel® - is a preemergence herbicide effective on grasses and broadleaf weeds in established alfalfa. It also will suppress nutsedge growth when applied in advance of emergence. Zoriel will need the addition of another herbicide in the spray mixture such as Gramoxone or Velpar to control emerged weeds and to control common groundsel.

Dodder – a parasitic weed that has plagued alfalfa growers for decades. Only preemergence control using trifluralin granular herbicide has been effective and recommended. In 1998, field research trials evaluating Pursuit herbicide applied during the early germination and attachment of dodder (March – May) to seedling alfalfa showed a significant reduction in

growth and control. Depending on size and degree of dodder attachment control reached as high as 100% with two applications (Figure 1).

## **Dry Beans**

Dry beans – the most important weed problem common to all bean types (Lima, blackeye, kidney) grown in California is nightshade. Black and hairy nightshade cause problems to beans when allowed to develop seed berries at harvest. The juice released from the berries permanently stain white colored beans such as blackeye and Limas, reducing their value in the market place. The canning industry has also established a zero tolerance to nightshade contamination in beans. The presence of any seed berries will reject the entire lot and loss of payment. Research trials were conducted in several locations by E. Roncoroni, et. al.. to evaluate methods to extend nightshade control season long in blackeye beans. Three strategies were outlined:

1. The application of a preplant incorporated herbicide followed with a mid-season layby application of another herbicide to prevent late season germination.
2. Pursuit herbicide applied in a 12” directed spray pattern on either side of the bean row minimized crop injury and controlled nightshade post and preemergence.
3. The Bezzerides™ cultivator designed with spring type hoe weeder controlled young nightshade plants around and between the bean plants. Several cultivations were needed up until row closure allowing the bean canopy to shade out further nightshade development.

## **Corn**

Corn – weeds are competitive with corn during the first 3-5 weeks following emergence of the crop. Control is important before weeds exceed 6-8” in height and begin to impact yields. Perennial weeds such as Johnsongrass and nutsedge can be major problems and very expensive to control when a preplant herbicide followed by postemergence treatments are needed. The development of herbicide resistant corn varieties for California using broad-spectrum herbicides and combined with existing products offers an additional potential for controlling tough perennials.

Roundup Ready® - glyphosate resistant corn varieties being developed by Monsanto and DeKalb Companies will offer the potential to control annual and perennial weeds more effectively. Results from 1998 field trials showed favorable results in controlling Johnsongrass and other annual weeds (Figure 2). In 1999, 30,000 acres are expected to be planted.

Liberty Link® - glufosinate resistant corn varieties being developed by AgrEvo and Pioneer Seed Company will provide a broad spectrum control of emerged weeds. In 1999, 1,000 acres of experimental testing is expected to begin.

## **Rice**

Rice – weeds reduce yields by competing with rice plants for light, nutrients and space. This competition is most critical at the seedling and tillering stages of rice. The most competitive aquatic weeds include watergrass, sedges and broadleaf types such as arrowhead, duck salad and red stem. There have been two significant occurrences that have recently taken place in affecting the rice industry. Weed resistance to Londax® herbicide developed in 1993 on four broadleaf weed species. In 1997, poor control of watergrass of several rice herbicides was reported. It now has been confirmed that both multiple and cross resistance exist on a number of northern California rice fields.

Progress for registration is being made with two herbicides that will aid in controlling some of the resistant weeds:

Regimen® - postemergence herbicide developed by Valent Corporation for control of watergrass, sedge and certain broadleaf weeds. Used in a tank mix combination with Abolish and applied in a pinpoint flood application provided 95% control of many broadleaf and grasses. Shown control of some watergrass SP that has developed herbicide resistance to other herbicides.

Shark® - postemergence control on a wide range broadleaf weeds. Received a Section 18 in 1998 to control Londax-resistant weeds and use on approximately 20,000 acres. Section 18 is expected again in 1999. Performed well when tank mixed with Grandstand at reduced use rates.

Transgenic rice – Liberty Link, Roundup Ready and Imi- rice are moving forward for California. AgrEvo, Monsanto and American Cyanamid are working in conjunction with public breeders to establish necessary traits in medium grain varieties. The earliest expectation for commercialization is in 2001.

## **Sugar Beet**

Sugar beet – is not a very competitive crop, thus weed control is mandatory. Research has shown weeds to reduce yields by 90% and can result in stand failure. In California, sugar beets are planted from September through June. Weed population and type differ by season and location in the state. Fall planted beets grow slowly and are easily overshadowed by mustards, shepherdspurse, minerslettuce, chickweed and a host of winter grasses. Spring planted beets are more likely to compete with pigweed, lambsquarters, nightshade and barnyardgrass. Therefore, chemical control is needed with mechanical cultivation and often a hand hoeing crew to establish a stand of sugar beets. Weed control operations can reach \$100.00/acre.

The development of transgenic sugar beets used with broad-spectrum herbicides offer a great potential to California growers to manage a wide range of weed types under different climate conditions more efficiently. Liberty Link® and Roundup Ready® sugar beets are two leading companies now testing in California and are expected to be commercially available for limited plantings in 2000.

Stinger® - is a selective postemergence herbicide for control of broadleaf weeds. Effective on thistles and legumes, it is expected to complement a tank mix combination with Beta mix® or Progress® to increase the broadleaf weed spectrum. California registration is currently pending for 1999.

## Wheat

Wheat – weed control in wheat is important for yield and provides the grower an opportunity to reduce the overall weed population. Broadleaf species are most commonly treated on an annual basis while grass weeds problems are less likely to be addressed that frequently.

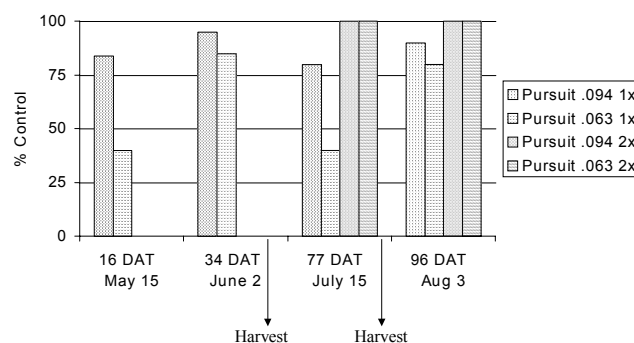
The occurrence of grass weeds however, is spreading statewide. A recent survey conducted by UCCE advisors ranked the important grasses populating wheat and the estimated acreage affected by each of the grasses (Figure 3). The most widespread grass problem was wild oat followed by canarygrass, Italian ryegrass and several brome species. The limited availability of grass herbicides one can use in California wheat might account for the increase in grass problems.

Puma® - a postemergence herbicide developed by AgrEvo is expected to gain California registration in 1999. In test conditions Puma has provided good control of canarygrass (Figure 4). and wild oat.

Assert® controls wild oats and mustards in wheat and barley. Developed by American Cyanamid Company, Assert shows a high degree of safety to both red and white Durham wheat varieties. Will be useful in areas were Avenge resistant wild oats have developed. California registration is expected in 1999.

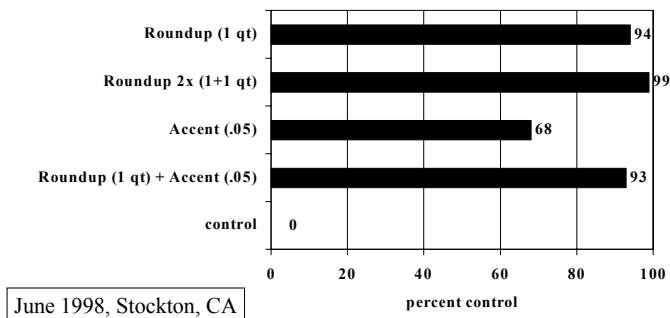
Imi wheat – Imidazolinone resistant varieties are being developed by American Cyanamid in conjunction with public universities. The Imi-herbicide imazamox is anticipated for use in California. The herbicide controls many broadleaves and grasses and will be important in areas where jointed goatgrass occurs. California registration is expected after 2000.

**Figure 1.** Postemergence Control of Dodder with Pursuit in Alfalfa



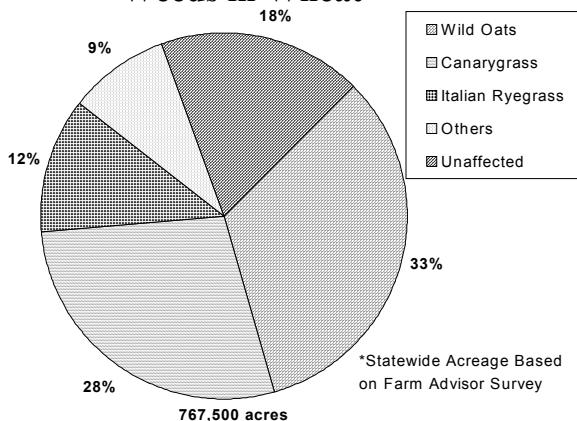
**Figure 2.**

**Johnsongrass Control in Roundup Ready® Corn**



**Figure 3.**

**Estimated Acreage\* Affected by Grass Weeds in Wheat**



**Figure 4.**

**Hood Canarygrass Control & Yields in Wheat with Puma®**

