Imperial County *Agricultural Briefs*

University of California
Agriculture and Natural Resources
UC Cooperative Extension

Features from your Advisors

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INFLUENCE OF ALFALFA IRRIGATION SYSTEMS ON WEED POPULATION DENSITY AND BIOMASS

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BACKGROUND

When fully established, alfalfa is very competitive with weeds. However, there are few weeds that can compete with a healthy and dense stand of alfalfa even after full establishment. Weeds more frequently invade alfalfa in bare spots and ends of fields after alfalfa stands are damaged. Some of these weeds may be undesirable, unpalatable or toxic to animals if mixed with alfalfa hay, and lower the economic and feeding value of the crop. Practices that promote vigorous and healthy growth of alfalfa may suppress weed pressure and reduce the need for additional weed control.

The irrigation system can have a large effect on stand life and thereby weed intrusion. There are several basic irrigation systems commonly practiced in the Imperial Valley; a subsurface drip (SDI), furrow and flood irrigation, as well as the use of sprinklers. Each of these have different characteristics in terms of water conservation and crop water use efficiency. The irrigation system can influence crop growth, effect distribution patterns, type of weed species, population densities and biomass of weeds within a crop. Specifically, standing water is a major risk for alfalfa stand loss and subsequent invasion of weeds. A standing water occurs frequently with check flood systems, and occasionally with sprinkler systems that are leaky. Understanding weed distribution patterns and population densities within the different irrigation systems may provide weed management decisions and preparedness. We examined the type, distribution, population densities and biomass of common weeds associated with existing alfalfa irrigation systems.

FIELD STUDIES

Studies on different irrigation systems were conducted at the UC Desert Research and Extension Center (DREC) research station in Holtville, CA. Three irrigation systems were being studied for efficiencies on alfalfa crop growth and yield with 12" deep subsurface drip, 18" subsurface drip and surface (border) irrigation. Each of the irrigation systems were replicated three times. Irrigation plots were 1,200 ft long and 50 ft wide. Since stand loss and weed intrusion frequently have a spatial component, for the purpose of this study, we sub-divided each irrigation plot into three 400 ft long along irrigation lines to represent start, midway and tail part of the irrigation systems. This approach is used to gauge potential weed intrusion patterns from the top to the bottom of each field

In each of the three irrigation systems and irrigation plot sub-divisions (distance from end of field), a quadrant (25 x 25 cm) was placed randomly into the fields and weed types and population for each quadrant were recorded. The procedure was repeated three times with each of the sub-divided irrigation plots, representing three replications per sub-plot. Each of the weed species were identified to a species level, cut at ground level and placed into paper bags. The samples were dried at 70^{0}C for 10 days and dry biomasses of each weed species recorded.

As can be shown from Figure 1, this preliminary study shows that weed population densities increased as we go down the field (tail ends are at 1200 feet). Both subsurface drip and surface irrigations had greater number of weeds towards the tail irrigation regions than at the beginning of the irrigation checks. Yet, there were no differences in weed population densities among the irrigation systems at each of the locations (sampling location (distance from the start point of irrigation).

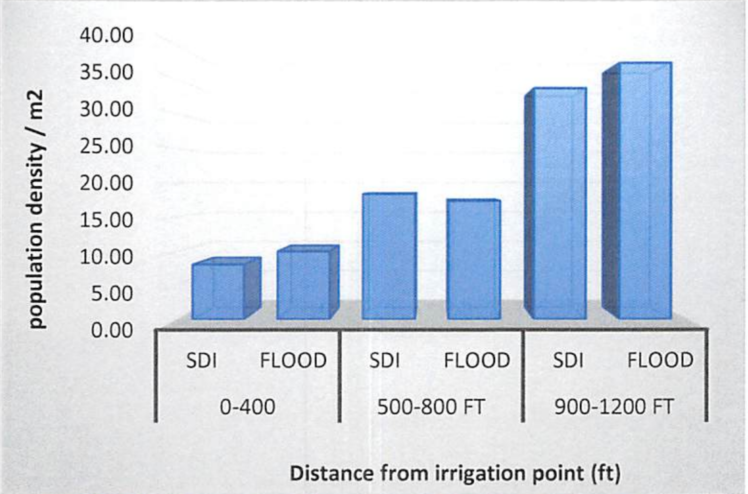

Figure 1: Weed population density per m2 of plots. Surface irrigation is shown in here as flood

Weed dry biomasses was greater in flood irrigation compared to weeds from drip irrigation. Weed biomass production within each irrigation system was influenced by the location of sampling along the irrigation field (Figure 2). Differences in weed dry biomass along irrigation lines within the subsurface drip were not as huge as within the surface irrigation plots. However, weed biomass at the beginning of both irrigation systems were fewer than at the 900-1200 ft from the start of irrigation. Increasingly vigorous weed growth and greater weed biomasses was more prominent within the flood irrigation than the subsurface drip. Weed dry biomass at the tail (900-1200 ft) of the surface irrigation was about three times higher than weed dry biomass collected from the beginning and mid-way of the subsurface irrigation.

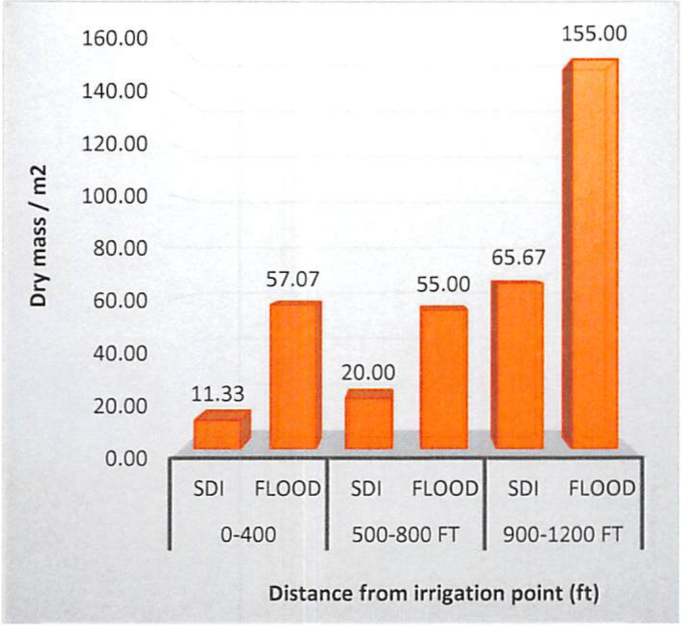

Figure 2: Weed dry biomass for subsurface drip and surface (flood) irrigation

In summary, there were differences in weed biomass production between the subsurface drip and surface (flood) irrigation systems, with the subsurface drip systems having less weed biomass than the surface irrigation field, which exhibits increased weed incidences towards the tail-ends of the checks. A greater weed intrusion at the tail-ends of fields is a common sight in flood irrigated fields. Such information may help growers to monitor their alfalfa fields for weed distributions and concentrate on spatial weed management approaches based on the distribution patterns of weeds rather than uniform weed control treatments throughout the field. While subsurface drip irrigation appears to reduce weed pressure, probably due to a better alfalfa crop survival in drip than under surface irrigation systems, it is not likely that a subsurface drip irrigation will eliminate the need for effective weed control strategies. Our observation was based on a one-year assessment. Multiple year studies are important to further generalize the recommendation. Please also note that the weed population densities and dry biomass, in this field study were combined for all weed species

A BRIEF HISTORY OF BEET CURLY TOP DISEASE AND EPIDEMIOLDOGICAL RESEARCH IN CALIFORNIA

Eric T. Natwick, Entomology Advisor, UCCE Imperial County

In the late nineteenth century, agriculture scientists began to recognize that some plant diseases are caused by viruses and beet curly top of sugar beet was among the first plant viral diseases recognized. The insect we now call the beet leafhopper, *Circulifer tenellus* (Fig. 1) was later determined to be the vector of viruses that cause curly top disease. We now know that there are actually three viruses in the genus *Curtovirus* (family Geminiviridae) causing the curly top disease symptoms in sugar beets and many other crops plants, Fig. 2. The geminiviruses are named *Beet mild curly top virus* (BMCTV), *Beet severe curly top virus* (BSCTV) and *Beet curly top virus* (BCTV). During the 1880's through 1900, there was a report of disease in garden beets in Nebraska, a report of a devastating loss of sugarbeets in Lehi, Utah and reports of a new disease negatively affecting the newly emerging California sugar beet industry. The disease problems were later attributed to curly top disease. It was not until 1915 that the relationship between the beet leafhopper and curly top disease was strongly suggested by transmission studies and it was not until 1974 that a virus was formally proven to be the cause of the disease through advances in virus purification and electron microscopy.

Fig1. Adult beet leafhopper, *Circulifer tenellus*.
Photo by Lorry Dunning.

Fig 2. Foliage symptoms of beet curly top virus.
Photo by J. Hills.

The geminiviruses that cause beet curly top disease have a host range of over 300 plant species in 44 plant families and economically important host crops include beans, beet (sugar and table), cucurbits (cucumber, melon, pumpkin, squash), flax, pepper, spinach, and Swiss chard. The beet leafhopper also has a broad host range including many wild species, crops and weeds and can produce three or more generations per year depending on the climate. The beet leafhopper can move long distances in wind currents and can transmit all three curly top viruses simultaneously. The beet leafhopper can quickly acquiring the viruses by feeding on an infected plant but the most efficient transmission occurs after a 48-hour acquisition period. The beet leafhopper remains viruliferous for more than 3 months. Curly top disease has been reported throughout western North America from Canada to Mexico. When beets are infected during early plant development they often die quickly. Plants that become infected later during plant development develop symptoms of yellowing and death of older leaves. The newer leaves remain small, are numerous compared to a healthy plant and the leaves roll upward and inward developing blister-like swelling of veins on the undersides of the leaf that resemble galls. Root symptoms include necrosis of the periderm and phloem cells adjacent to sieve tubes visible as dark concentric rings when the taproot is bisected in cross section or dark streak when bisected longitudinally, Fig 3.

Fig. 3. Darkened vascular rings in sugarbeet tap root from curly top infection.
Photo by Jack Kelly Clark.

The first curly top disease resistant sugar beet varieties were released in the 1930's. However, the primary methods for managing beet leafhopper and curly top disease for both the sugar beet industry and more importantly in California, the vegetable crop industry are programs of monitoring and controlling the weed host plants with herbicides or controlling the beet leafhopper population with insecticides. The beet leafhopper population is monitored and managed in weedy overwintering areas before the weed hosts dry down. When the weed hosts begin to dry up and die, the leafhopper adults migrate to crop hosts and when viruliferous, they can spread curly top disease. In recent years when there were lapses in the vector management in the overwintering sites of the beet leafhopper along the foothills of the Sierra Nevada Mountain Range, outbreaks of curly top disease problems have occurred in the tomatoes grown in the California Central Valley areas and also in melons. Although the viruses that cause beet curly top disease and the beet leafhopper are endemic to the Imperial Valley, the Imperial

Valley sugarbeet crop is rarely, economically affected by beet curly top. During the 2013/2014 sugarbeet production season, beet curly top broadly and negatively affected the Imperial Valley sugarbeet crop. The recent outbreaks of curly top disease problems throughout California renewed interest among vegetable crop growers, beet growers and the California Department of Food and Agriculture to support a statewide research project. The research project is funded by the California Tomato Research Institute (CTRI) and the California Department of Agriculture (CDFA) and Dr. Robert Gilbertson, a University of California Davis Plant Pathology Professor is the project leader. The team is conducting research that involves gaining a better understanding of the epidemiology of curly top disease. Part of the research involves a statewide monitoring survey of the viruses that cause curly top and the beet leafhopper on crops, weeds and wild native host plants. The survey coupled with other research from Robert Gilbertson Laboratory at UC Davis will provide a better understanding of the epidemiology of curly top disease. This in turn will aide in the development of guidelines for growers, PCAs and government agencies to better prevention and management of curly to disease problems in vegetable crop and sugarbeet production areas throughout California.

Save the Date...

UC CE

UC IPM

January 21, 2016

Alfalfa & Forage IPM and Chlorpyrifos Regulatory Update

Location:
Farm Credit Services Southwest
485 Business Park Way
Imperial, CA 92251

Time:
7:00 am - 12:00pm

No Cost to Attend!!!

To register or for more information contact...

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** Pesticide Update*
- → *Chlorpyrifos Regulatory Update*

** Insect Pest Mgmt. of:*
- → *Alfalfa &*
- → *Non-alfalfa forage*

** Weed Mgmt. of:*
- → *Alfalfa &*
- → *Non-alfalfa forage*

Pending CEU's:
AZ Dept. of Ag, CA DPR & CCA

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