Weed Control Investigations in Desert Irrigated Asparagus

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INTRODUCTION

Past investigations have revealed that any stress factor(s) placed on asparagus can incite Fusarium oxysporum f.s. asparagi or F. moniliforme to become pathogenic. These fungi normally live as parasites on the roots and crowns. Stand decline resulting from these epidemics cause serious economic losses.

Asparagus can be stressed by over-cutting during harvest, excess irrigation, water stress, high water table, defoliation caused by insects and plant pathogens, and perhaps, incorrectly used herbicides. To evaluate the influence of herbicides on stress, various trials were conducted. Registered herbicides in asparagus, as well as those effective in other desert flood-irrigated crops with the same or closely related weed pests, have been tested.

This report is a summary of the results of these trials. Their efficacy and phytotoxicity are presented as preliminary information for desert asparagus growers. Before attempting to use these herbicides, care should be taken to insure they are registered for intended use. Follow the label explicitly when they are recommended and apply according to directions. The margin of error is considered quite narrow with many of these chemicals. Preliminary evidence shows that herbicide stress may result under certain conditions.

Both annual and perennial weeds are persistent competitors with asparagus, requiring considerable expense to control. Many annual weeds can be satisfactorily controlled with herbicides, while perennial species are more difficult to control or prevent from becoming established. Volunteer seedlings from the plentiful supply of seed produced by asparagus are also a major problem. If not controlled, these become a serious competitor with the cultivated crop.

Of the various weeds, Johnsongrass, nutgrass, mallow species, Russian thistle, field bindweed, knotweed, and various grass species are the more serious pests.

In sandier soils, Sencor, Princep and Treflan can be phytotoxic and must be used with caution. Paraquat, Roundup and Dalapon are used as foliar-applied herbicides, but these can severely injure the fern and must be applied with caution. Karmex, Lorox, Treflan, and Princep are used extensively for lay-by control following harvest in the spring.

METHODS

Herbicide trials have been conducted in established asparagus or nurseries to determine their applicability to cultural conditions in the warmer desert areas. When practical, they have been evaluated under normal commercial cultural practices and have been applied by large, powered sprayers, aircraft or through permanent-set irrigation systems. Hand application was used for spot treatment of nutgrass and bermudagrass when infestations were erratic.

Post emergence weed control trial in winter asparagus nursery -- A nursery planted in September in superstition sand was treated with Prefar (4 lb/A ai) immediately after planting. Weed control of winter annuals was satisfactory, with the exception of annual yellow sweet clover that appeared over much of the 20 acres. By December the clover exceeded the height of the 4" asparagus seedlings. One-meter-square test plots, each

replicated 3 times, were randomly selected and treated 19 December to evaluate 2,4-D (amine), Roundup and Lorox. Roundup severely injured the young seedlings, while Lorox and 2,4-D caused only yellowing of the tips. Clover was controlled by the 2,4-D, with evidence of wilting 4 days following application. Lorox caused stunting, but the clover survived.

As a result of the preliminary test, the entire nursery was treated on 5 February with 2,4-D applied by ground spray equipment at the rate of 1 quart/A in 20 gals of water. A satisfactory control was obtained by 15 March although some additional hand-weeding was necessary. Even though total control was not obtained, results indicate nurseries infested with annual yellow sweet clover can be treated with 2,4-D in cooler weather without injury to the seedlings. Sufficient control of clover and other broad-leafed weeds is obtained without damage to the growing seedlings.

TABLE 1.

Treatment	Rate/A	Weed Control[1] Annual yellow clover control	Asparagus[2] phytotoxicity
1) 2,4-D (amine)	1 qt.	7	1
2) Roundup	1 qt.	2	8
3) Lorox	1 lb.	4	5
4) Non-treated	-	0	0

[1] Weed Control Rating: 0=No control - 10=Complete control.
[2] Phytotoxicity Rating: 0=No major reduction or damage-
10=Complete crop kill.
[3] Final observations made 16 March.

Crowns from the treated and non-treated nursery were transplanted into 3 replicated blocks of 5 acres each for observations of stand and longevity. Data from these investigations are taken annually and will be presented after three growing years.

Pre-emergence weed control in spring planted nursery -- A ten-acre nursery was divided into 3.5-acre sections to evaluate three pre-emergence herbicides for summer weed control. The soil was superstition sand, (93% sand 4% silt and less than 1/2% humus) irrigated by a permanent-set irrigation system every other day, with approximately .25 acre inches of water until emergence.

Immediately following planting in March, the herbicides Dacthal (7 lb/A), Prefar (4 .b/A) and Devrinol (8 lb/A) were applied by a ground sprayer in 20 gals water per acre. Wheat was planted in single rows every 60" for wind breaks. Four foot untreated skips were left every 30 feet for controls. Immediately following application, the entire acreage was irrigated for 2 hours with approximately 0.4 acre feet of water. Results illustrated in Table 2 indicate the degree of weed control and herbicide influence on the asparagus seedlings. Of interest was the complete kill of the wheat with Devrinol. While all three herbicides were effective in controlling the summer weeds, especially purslane, none controlled the knotweed (Polygonum argyrocoleon) and alkali mallow (Sida hederacea). Dacthal, which has been used at rates of 12 lb/A, was detrimental in this test at 7 lb/A resulting in 35-40% stand reduction.

TABLE 2.

Material	Weed Control Rating[1] Degree Weed Control	Phytotoxicity
1) Dacthal (7 lb A)	9	7
2) Devrinol (8 lb A)	9.5	5
3) Prefar (4 lb A)	9	0
4) Non treated Control	-	-

[1] Weed Control: 0=No control - 10=Complete control
Asparagus Phytotoxicity: 0=No damage - 10=Complete kill

Post-emergence weed control in crown transplanted asparagus -- Numerous summer weeds, including sandbur, annual grasses, pigweed, purslane, and tumbleweed, emerged in early May in a newly established, crown-transplanted field. Within 35 days of planting, weeds were as high as, or higher than, the asparagus. Hand-hoeing or mechanized cultivation would have been slow and cost prohibitive. While 2,4-D has been demonstrated effective when applied in cooler climates, it is considered too phytotoxic to be used in the warmer months of spring and summer in the desert. Therefore, a trial was initiated to evaluate Lorox at a 1 pound rate/A (ai) in 15 gallons of water applied by ground sprayer. Results observed 40 days after treatment are presented in Table 3.

TABLE 3.

	Weed Control Rating[1]	
1) Lorox (1 lb/A)	7	2 (slight yellowing of fern)[2]
2) Non treated control	0	0

[1] Weed Control: 0=No control - 10=Complete control

[2] No yellowing was observed after 60 days.

Post-emergence control of weeds in established asparagus -- A field of established asparagus in its second year of growth was treated in April with 2 lbs of 50% WP Karmex/A when fern was approximately 24-30". Weeds, including annual grasses, tumbleweed, sandbur, pigweed, shepherdspurse, black mustard and red spiderling had become well established. The herbicide was applied in approximately .05 acre inches of water through the permanent-set irrigation system in the last 15 minutes of a 120 minute set. Irrigation was continued for an additional 10 minutes to clean the system. Within 15 days, most weeds were dying; within 45 days, all but the largest tumbleweeds were dead. No obvious sign of phytotoxicity was noted. Only light weeding was necessary for the remainder of the growing season compared to four (actually more needed) to control the weeds in the non-treated controls. Although early application of Karmex is preferred in established asparagus, the 2 lb/A rate used in this trial was considered highly effective for post-emerged weeds without notable damage to the asparagus fern.

Stand count and total annual yield are being monitored to determine the influence of Karmex applied directly to asparagus foliage.

DISCUSSION

Chemical weed control can be used effectively and economically in desert- irrigated asparagus, if timing and rates of application are followed according to the product label.

Since asparagus is grown as a perennial, weeds can become a major cultural problem since once the plant has reached maturity in the growing period, it is difficult, or impossible, to control weed pests adequately.

Herbicides applied in asparagus nurseries can be used effectively as preplant treatments. With cooler temperatures 2,4-D can be used over the seedlings quite effectively without serious injury. Crowns from such treated areas appeared to average the same size as from non-treated areas of the nursery. After two years, no differences in plant height or total stand has been observed between treatments.

Fields planted with crowns from herbicide treatments are being monitored to establish if stress may influence or incite Fusarium caused diseases. Results of these trials will be available after 3 years observations.