

CONTROL OF DODDER IN ALFALFA HAY PRODUCTION

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Dodder is an annual plant that contains no chlorophyll and shortly after germination from seed it has to attach itself to a host plant in order to survive. Alfalfa is an excellent host, but the dodder is not a cooperative or sympathetic recipient of its hosts bounty; it entwines the alfalfa and unless controlled, it can destroy it.

There are numerous species of dodder. In their vegetative stage they look very similar. In California's alfalfa fields the most troublesome are field dodder (*Cuscuta campestris*) and largeseed dodder (*Cuscuta indicora*). In some areas a third species called smallseed dodder (*Cuscuta planiflora*) may be troublesome. Any or all three species can become very damaging in alfalfa fields.

Dodder seeds germinate and emerge from the surface 1 to 1½ inches of soil but it is not unusual to find emerging seedlings from greater depth. It emerges as a slender threadlike, not readily visible stem, one to four inches in length. Soon after emergence it waves or rotates around and unless it finds a suitable host plant it dies.

In the presence of alfalfa or other host plant, the dodder seedling attaches itself by means of very small cuplike suckers and its connection with the soil is severed. From then on it lives entirely off the host. No wonder dodder is a true "hanger on" or parasite.

Once a dodder is attached to the alfalfa it grows very rapidly by means of yellow or orange colored threadlike stems. If not controlled, it forms a large, spreading, tangled network smothering its host. It thrives best in open sunlight. In late summer it flowers profusely and produces a large number of seeds.

Although we are discussing dodder control in alfalfa, it is important to know that many other crops widely grown in California, and many species of weeds, are also excellent hosts to dodder.

Dodder seed does not germinate very readily. It contains a large percentage of hard seed that can survive in the soil for many years. Subsequent cultivations or other processes in the soil can cause scarification of the seed that will make it germinate more readily. Therefore, a field once infested with dodder that is allowed to produce seed, may become reinfested for many years if planted with crops that can serve as hosts.

Dodder can be spread by planting it with crop seed. But most often it is spread by one or more of the following means: manure, infested hay, grazing animals, farm equipment, irrigation water, and mud adhering to vehicle tires or man's footwear.

Controlling Dodder

"Prevention is the most effective and least expensive control measure" sounds like an often repeated trite statement. But it is a valid statement; therefore, planting dodder-free certified seed, thorough cleaning of combines and haying equipment, practicing good sanitation and weed control are sound methods of prevention that are worth repeating.

Once dodder is attached it can be killed only by destroying the vegetative, above ground, growth of the host plant. Dodder generally appears as scattered small infestations in the field. Early location of the infested areas and destroying it before it produces seed is very important and it is the least expensive method of control or eradication.

Flame - Oil - Dinitro

Dodder infestations are most visible in an alfalfa field before it is mowed. Therefore, if small scattered infestations are present, the alfalfa growth as well as the dodder should be destroyed prior to cutting. The alfalfa, being a perennial, will regrow from the crown and only hay from that cutting will be lost.

Propane or butane fueled burners, weed oil, dinoseb-DNBP (Dow general® or Sinox general®) or combinations of these nonselective herbicides have been used very effectively to destroy the dodder without permanently injuring the alfalfa. To insure complete control and avoid injuring the alfalfa crown, two treatments at 2-to-4 day intervals should be made. The first treatment will wilt and partially destroy the alfalfa stem, and the second treatment will insure complete kill.

The application of sufficient heat, oil or dinitro to destroy the alfalfa stems in a single treatment could severely injure the crown and reduce the stand. This has been often observed especially in weak and in first year stands.

Control of Large Infestations

Extensive infestations where spot sprayings would be impractical or time consuming, treatments should be carefully planned to obtain effective control and to minimize loss of production.

Widespread infestation in alfalfa should be treated as soon as possible after cutting and removal of the hay from the field. When mowing, extra effort should be made to leave as short a stubble as possible. Two treatments at 3 to 4 day intervals provided the best control whether flame, oil or dinitro were used. An emulsion of 2.0 lb ai/A of dinoseb plus 10 gallons of weed oil in 75 to 90 gallons of water per acre has provided very effective control as a single treatment during the hot summer months but only on short stubble. To obtain good control importance of thorough coverage to kill back the alfalfa stems cannot be over-emphasized.

The Use of Selective Herbicides

In laboratory and greenhouse studies several investigators were able to demonstrate that a large number of herbicides inhibited dodder seedling development and/or prevented attachment to the host plant. Unfortunately, under field conditions the greenhouse experiments could not be reproduced with reliable frequency.

With the exception of chloroprotham, Furloe®, no herbicide is registered by the Environmental Protection Agency for use in alfalfa hay for the selective control of dodder.

In newly planted alfalfa fields dodder infestations first appear in scattered, limited areas infrequently covering more than 1 to 5% of the total acreage. Unless selective herbicides or combination of herbicides are found that will effectively control other annual weeds as well as dodder, it is questionable whether a grower could bear the expense of treating the entire field in anticipation of dodder infestation.

In the Central San Joaquin Valley dodder seeds germinate from late February through the summer months. Therefore, in established alfalfa hay fields herbicides are needed that would provide long residual control of dodder as well as other summer annual grasses and broadleaf weeds.

Trials were conducted in Fresno County in newly planted as well as in established stands to evaluate the effectiveness of numerous herbicides and combinations of herbicides for the selective control of dodder and other annual weeds. Herbicides were applied preplant incorporated and preemergence under sprinkler irrigation in newly planted fields. In an established field herbicides were also evaluated following attachment of the dodder.

Newly Planted Fields

In the preplant incorporated and preemergence studies chlorthal, Dacthal®, provided the most effective dodder control with excellent selectivity on the alfalfa. It also provided effective summer annual grass control as well as certain broadleaf weed control.

Sulfallate-Vegadex®, in combination with benefin-Balan®, exhibited good dodder as well as summer annual weed control with sufficiently good selectivity to justify further evaluation.

H-26905, a new experimental herbicide, effectively controlled dodder but in a pre-emergence trial, under sprinkler irrigation, it significantly reduced the alfalfa stand.

Other herbicides, listed in Table 1, evaluated in a preplant incorporated trial, failed to provide adequate dodder control.

If the registration of Dacthal® could be obtained, it would provide an effective tool for the control of dodder in newly planted fields.

Established Stands

Herbicides were applied prior to any visible dodder attachment in established alfalfa fields. The herbicides used are given in Tables 2 and 3 along with the date of treatments and rates of application.

The most effective dodder control was obtained with H-26905. The summer annual weeds were too sparse in the field to obtain reliable evaluation. But in studies conducted in other crops H-26905 provided effective grass and broadleaf weed control with the exception of sowthistle.

Dacthal® also provided good dodder control through June but by early July scattered reinfestation occurred in the treated areas.

Furloe®, as in previous years trials, provided short-lived dodder control. From 8.0 lb ai/A, applied February 28, less than 50% control was observed in May.

Pronamide-Kerb®, a recently registered herbicide for use in alfalfa, has been reported to effectively control dodder. At 2.0 lb ai/A it provided approximately 30% control for three months following application. At 4.0 lb ai/A 45 to 60% control was observed 4½ to 5 months following treatment.

Vegadex® 20% granular formulation applied at 4.0 and 8.0 lb ai/A failed to control dodder in established alfalfa.

Perfluidone-Destun®, H-22234-Antor® and metribuzin-Sencor® were ineffective for the control of dodder. Sencor® caused severe injury to the alfalfa at 2.0 and 4.0 lb ai/A.

Control of Attached Dodder

Several herbicides were evaluated to study their effectiveness in controlling dodder after it was attached to the host plant. H-26905 (O-ethyl-O-(3-methyl-6-nitrophenyl)-N-sec-butyl phosphorothioamidate) was the only one that inhibited the elongation of dodder stems and prevented attachment. The control was most effective when the dodder stems were short at the time of treatment. Long vigorously growing attached dodder was retarded in growth but they recovered, especially following cutting of the alfalfa. The further evaluation of H-26905 for the control of dodder should be vigorously pursued.

In Conclusion

There are several herbicides that selectively controlled seedling dodder in alfalfa prior to attachment, but not one of them provided effective control through the growing season.

Repeated timely applications of some of these compounds could provide seasonal dodder control but conditions for their effective use may be too exacting and costly to enable

Table 2 Evaluation of Herbicides for Dodder Control in Alfalfa
Established Seed Field
CW-10, A-36, F-11, 10, 75-3

Trial Location: Belmont Ave. $\frac{1}{2}$ mile west of San Diego, Mendota
Soil Type: Panoche Loam Irrigation Method: Furrow
Plot Size: Trial 10'x50'

		Dodder Control Evaluation Average of 3 Reps			
Applied: 24 March 1975		May 1	Aug 9	Range Per	% Control
Herbicides	lb ai/A	Average No. Infested Area	Average No. Infested Area	Treatment	Compared to Untreated
A	Antor Gr	2.0	3.0	1-6	25
B	Antor Gr	4.0	2.3	1-4	42
C	Destun Gr	3.0	3.0	1-4	25
D	Destun Gr	6.0	2.3	1-4	42
E	H-26905 EC	3.0	0	0	100
F	Sencor WP	2.0	4.3	0-8	0
G	Sencor WP	4.0	4.0	1-7	0
H	Vegadex Gr	4.0	2.0	1-3	50
J	Vegadex Gr	8.0	1.3	0-4	67
K	Furloe Gr	4.0	2.0	1-5	50
L	Furloe Gr	8.0	1.3	1-2	67
M	Dacthal WP	10.0	0	0	100
N	Dacthal WP	15.0	1.2	0-2	70
P	Kerb Gr	2.0	4.6	1-7	0
Q	Kerb Gr	4.0	0	0	100
R	Untreated	---	4.0	3-5	0
Applied: 14 April 1975					
S	H-26905 EC	2.0	1.6	0-3	60
T	H-26905 EC	4.0	0.6	0-1	85
U	Kerb WP	2.0	2.0	1-3	50
V	Kerb Gr	2.0	2.0	1-3	50
W	Dacthal WP	8.0	0	0	100
X	Furloe Gr	4.0	3.0	1-4	25
Y	Vegadex Gr	4.0	3.6	3-5	10
Z	Destun Gr	3.0	3.0	1-6	25

Remarks: Following the application of herbicides on 24 March 1975, the trial area was cultivated with sectioned rolling cultivators; hence the herbicides were incorporated into the soil and germinated dodder seedlings were destroyed. The April 14 treatments were not incorporated.

Table 3 Evaluation of Herbicides for Dodder Control in Alfalfa
 Established Hay Field
 CW-10, A-36, F-11, 10, 75-1

Trial Location: Section 2, Field 3&4, Murietta Farms, Mendota
 Soil Type: Panoche Loam Plot Size: Trial A 10'x20' - 3 reps
 Herbicides Applied: 27 & 28 February 1975 Trial B 20'x40' - 4 reps
 Irrigation Method: Flood (Border check) Evaluated: 3 July 1975

Trial A:		Dodder Control Evaluation			
Herbicides	lb ai/A	Average Number Areas Infested	Range Per Plot	% Control Compared to Untreated	
A	Vegadex 20G	4.0	15.6	1-30	0
B	Vegadex 20G	8.0	11.3	2-18	0
C	Furloe 20G	4.0	8.6	4-18	10
D	Furloe 20G	8.0	5.3	2-7	45
E	Dacthal 75 WP	10.0	6.3	1-14	34
F	Kerb 50 WP	2.0	7.6	2-12	21
G	Kerb 50 WP	4.0	5.3	2-8	45
H	Untreated		9.6	0-17	0

Trial B:

Herbicides	lb ai/A	Alfalfa Injury	% Dodder Control ^{1/}
J	Antor 5G	3.0	0
K	Antor 5G	6.0	0
L	H-26905 4EC	3.0	0
M	H-26905 4EC	6.0	0
N	Destun 4EC	3.0	0
P	Destun 4EC	6.0	0
Q	Semcor 50WP	2.0	3.0
R	Semcor 50WP	4.0	9.0

^{1/} Dodder infestation was sparse in the area where Trial B was established, therefore, the dodder control evaluation may not be reliable.

^{2/} May be due to the severe injury and lack of alfalfa top growth.