

Effect of Different Herbicides on Various Legume Crops in Interior Alaska

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Introduction

One of the major problems in the production of successful forage/green manure legume crops in Alaska is weed control. Many species of legumes are slow to establish from seeds as their seedlings are relatively noncompetitive with weeds such as chickweed, common lambsquarters, and mustards. These weeds, if not controlled, can cause total failure of new legume crop stands. Many of the herbicides that are very effective in controlling the common Alaskan weeds in barley cannot be used in legume crops since they will also kill or severely damage legumes. Only a few herbicides are available for controlling broadleaf weeds in legumes. Of these, several are labeled for "established" plants only. Very little work has been done in Alaska on the effect of herbicides on legumes. The spectrum of weeds to be controlled is different from those in most temperate agricultural areas where these herbicides were developed and tested. Also, root systems of established plants in cold subarctic soils are closer to the surface than is normally true in temperate regions, thus they may be more susceptible to herbicide injury. Therefore, we

decided to do a preliminary study to determine the effects of several different herbicides on selected legumes, some non-legume crops, and weeds at two sites in interior Alaska.

Nine herbicides were evaluated on nine legume species and three non-legume crops at Fairbanks and/or Delta in 1991 and 1992. Four of the herbicides are normally applied prior to planting the crops (preplant), two are applied during the growing season to actively growing crops (post-emerge), and three are applied in fall after the crop has become dormant or prior to crop green-up in spring (dormant applied). The crops and herbicides used and the major weeds at the particular sites where the tests were done are shown in Table 1. The herbicides were applied at the highest recommended rate with a CO₂-powered backpack sprayer. Legumes were planted in single-row plots; they were sown within a few hours after application and incorporation of the preplant herbicides. Herbicides were incorporated with a Roterra rotovator. Planting was done on May 31, 1991, at Delta and on July 25, 1991, at Fairbanks. The post-emerge herbicides were applied at the recommended growth stage for best weed control. The dormant applied herbicides were

applied in May of 1992; however, at Fairbanks the perennial legumes had begun growth and were therefore not truly dormant at the time of application. At each site an untreated control (i.e., received no herbicide treatment) was included for each crop species. All results were based on visual observations made at several times during the growing season.

Results

Results are shown in Tables 2 and 3. Winter survival of most of the legumes at Fairbanks was poor, probably because they were planted late and did not become well established in 1991. Also, in spring of 1992 the plot area at Fairbanks was too wet to enter until the plants had already begun to break dormancy. This, coupled with the poor establishment of the plants, was the likely reason for the severe damage done to the crop plants by herbicides normally applied when the crop is dormant (Karmex[®], Sencor[®], Sinbar[®]). Although some damage occurred to some of the legumes at Delta from the application of the dormant applied herbicides, the effects were temporary and by late June, the plants looked identical to the non-treated plants. No residual effect of the herbicides applied in 1991 were noted on either crops or weeds in 1992.

Conclusions

This preliminary study indicates that several herbicides have potential for use in controlling various weeds in legume crops in Alaska. More research is needed before specific recommendations can be made.

Labels should be carefully checked before using any of these herbicides to make sure they are registered for the crops that they are to be applied to and for application rates and appropriate time of application.

Table 1. Crops and herbicides used and major weeds in the test plots at Fairbanks and Delta.

Legumes Used		
Fababeans		(<i>Vicia faba</i>)
Austrian peas		(<i>Pisum sativum</i>)
Vetch		(<i>Vicia spp.</i>)
White Dutch clover		(<i>Trifolium repens</i>)
Red clover		(<i>Trifolium pratense</i>)
Alsike clover		(<i>Trifolium hybridum</i>)
Birdsfoot trefoil		(<i>Lotus coniculatus</i>)
Yellow sweetclover		(<i>Melilotus officinalis</i>)
Alfalfa		(<i>Medicago sativa</i>)
Other Crops Used		
Barley	(<i>Hordeum vulgare</i>)	(Delta only)
Oats	(<i>Avena sativa</i>)	(Fairbanks only)
Ky. bluegrass	(<i>Poa pratensis</i>)	
Red fescue	(<i>Festuca rubra</i>)	(Fairbanks only)
Herbicides Used		
Ambiben [®]		(preplant)
Balan 1.5 EC [®]		(preplant)
Eptam 7E [®]		(preplant)
Treflan [®]		(preplant)
Basagran		(post-emerge)
Butyrac 200 [®] (2,4-DB)		(post-emerge)
Karmax DF [®]		(dormant applied)
Sencor [®]		(dormant applied)
Sinbar [®]		(dormant applied)
Major Weeds		
Delta		
Common lambsquarters	(<i>Chenopodium album</i>)	
Flixweed ¹	(<i>Descurania sophia</i>)	
Tansy mustard ¹	(<i>Descurania pinnata</i>)	
Shepardspurse ¹	(<i>Capsella bursa-pastoris</i>)	
Fairbanks		
Chickweed	(<i>Stellaria spp.</i>)	
Wild mustard ¹	(<i>Brassica spp.</i>)	
¹ All members of the mustard family		

Table 2. Herbicide effects at Delta (all herbicides applied at highest recommended rate).

Preplant	
Ambiben [®] . ¹ —	No visual effect on any of the crops, good early control of common lambsquarters although common lambsquarters began to come in late in the season; fair control of mustard family weeds.
Balan 1.5 EC [®] —	Completely inhibited germination of Kentucky bluegrass, caused stunting of barley, may have caused slight delay in germination of red clover, alsike clover, and fababeans. Excellent control of common lambsquarters, no control of mustard family weeds.
Eptam 7E [®] —	Caused stunting of barley; appeared to cause slight, short term stunting of vetch. Good control of common lambsquarters, fair control of mustard family weeds.
Treflan [®] —	Completely inhibited germination of Kentucky bluegrass, some stunting of barley. Good control of common lambsquarters, no control of mustard family weeds.
Post-emerge	
Basagran [®] —	Killed birdsfoot trefoil, caused slight bleaching of tips of leaves of fababeans. Excellent control of common lambsquarters, good control of mustard family weeds.
2, 4-DB —	Significant damage to fababeans, vetch, and sweetclover; some temporary damage to peas, alfalfa, red clover, alsike clover, and white clover. Excellent weed control.
Dormant (applied in May 1992)	
Karmex [®] —	Some visual damage on Kentucky bluegrass and alfalfa. Excellent control of broadleaf weeds. There was some foxtail barley (<i>Hordeum jubatum</i>) in this plot which was not controlled.
Sencor [®] —	Caused severe damage to Kentucky bluegrass, some damage to alsike clover, birdsfoot trefoil, sweetclover, and alfalfa; excellent weed control.
Sinba [®] —	Caused some visible damage to Kentucky bluegrass, red clover, alsike clover, and birdsfoot trefoil, excellent weed control.
¹ No longer registered for use	

Table 3. *Herbicide effects at Fairbanks (applied at highest recommended rate).*

Preplant	
Ambiben® ¹ —	Caused stunting of alfalfa, birdsfoot trefoil, alsike clover, and oats. Appeared to cause slight stunting of fababeans, peas and vetch. Good control of mustard family weeds.
Balan 1.5 EC® —	Partially inhibited germination of Kentucky bluegrass and oats. Good control mustards and chickweed.
Eptam 7E® —	Partially inhibited germination of Kentucky bluegrass, red fescue and oats, maybe birdsfoot trefoil. Good control of mustards and chickweed.
Treflan® —	Completely inhibited germination of Kentucky bluegrass, partially inhibited germination of red fescue and oats. Poor weed control.
Post-emerge	
Applied too late in the fall to see any effects; however, 2,4-DB applied in 1992 to seedling and one-year-old legumes caused various degrees of damage to legumes (it killed one-year-old sweetclover) and resulted in varying degrees of weed control depending on weed type.	
Dormant (applied in May 1992)	
Karmex DF® —	Killed almost all of the legume plants and crop grasses, killed all weeds.
Sencor® —	Killed almost all of the legume plants, completely killed Kentucky bluegrass and red rescue, killed all weeds.
Sinbar® —	Killed most of the legume plants, all of the Kentucky bluegrass and red fescue plants, killed all weeds.
¹ No longer registered for use	