Germination Characteristics and Chemical Control of Horehound

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Highlight: *Less than 35% of the seed collected in October from mature plants of horehound (*Marrubium vulgare *L.) would germinate. Seventy-eight percent of the seeds germinated after 1 month of wet storage at 0°C. From 20 to 25% of the seeds were still dormant after 4 months of storage at the three conditions tested. Better than 90% control of the existing horehound plants was possible with both 2,4-D and silvex at a rate of 2 lb/acre.*

Horehound (*Marrubium vulgare* L.) is an introduced perennial forb from Britain that reproduces by rhizomes and seeds. It belongs to the mint family and is recognized easily with its square stem, opposite roundish serrate leaves, and white fuzzy stem (Fig. 1). The seeds of the plant are formed in tubular spiny-hooked calyxes (Fig. 2) and these frequently catch in the wool of sheep; thus, lowering the value of the wool, as well as helping in the scattering of the plant. It is thought to have escaped from cultivation in California in 1833 (Ridley, 1930). Since that time, it has become widely distributed throughout the regions where sheep are raised. It is found growing primarily in fence lines surrounding corral areas, but is becoming naturalized and spreading into adjacent open range areas. The leaves and flower stalks are used in the preparation of certain cough medicines and for flavoring candy. The pharmaceutical value of the plant is due to marrubiin (a bitter substance from the flowering stem), and it has been used in the treatment of fever, asthma, and snake bites. Sterol and sesquiterpenes have also been isolated from plant extracts (Nicholas, 1964). The plants flower early in the spring and are used readily by bees as a source of nectar (Wells, 1956).

There have been attempts to use the plant as a forage plant (Dean, 1957), but the characteristic bitter taste of the plant makes it undesirable to animals.

The objective of this study was to find ways to control horehound and to determine the dormancy condition of the seeds.

Materials and Methods

A horehound infestation on Ted Webb's ranch of Custer, Okla., was utilized for these studies. Sheep had been kept on the ranch in previous years, and a solid infestation of horehound was present in the fence rows and areas surrounding the old pens. Various herbicides were evaluated in 1972 and 1973 (see Table 1 and 2 for herbicides and rates). In both years, plot size was 10 X 20 feet. Each treatment was replicated four times. Herbicide treatments were applied with a small portable CO_2 sprayer at 25 gpa of water. The percent of plants killed was determined in the fall after spraying. The control of the established plants in the 1972 study was also evaluted one year after application.

In the fall of 1973 (October 25), seeds were collected from mature plants in the fence rows and placed at various temperatures (10, 14, 18, 22, 26, 30°C) to determine viability and dormancy of the seeds. The dormancy of the seeds was evaluated further by dividing the seed into 3 groups and placing in different environmental conditions (22°C-dry, 0°C-dry, 0°C-moist). The germination was checked monthly for 4 months by placing a group of seeds in germination containers at 26°C.

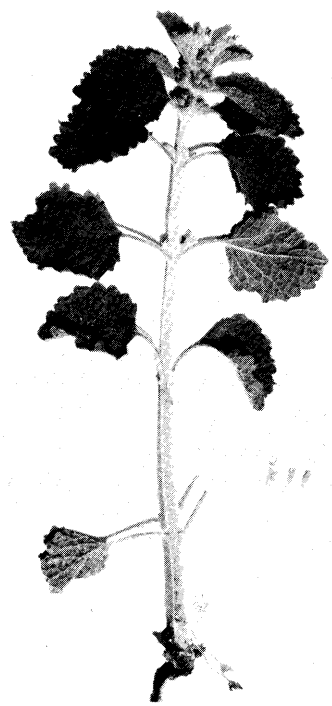

Fig. 1. *Horehound stem as seen in May during flowering. Also, three detached flowers are shown to the right of the plant stem.*

Fig. 2. *Four flowers as seen in May. The white petals are still evident on one of the flowers and the spiny-hooked teeth of the calyx are evident on all of the flowers. Four seeds are formed within each calyx. These spiny-hooked calyxes which are about ¼-inch long catch in the wool of sheep.*

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Journal Article 2889 of the Agricultural Experiment Station, Stillwater, Okla.

Manuscript received July 8, 1974.

Table 1. The control (%) of established horehound plants by various herbicides.

Treatment[1]			
Herbicide	Rate (lb/acre)	Initial control[2]	1 year Control
2,4-D	2	96 a	98 a
2,4-D	4	97 a	98 a
Silvex	2	95 a	84 ab
Silvex	4	99 a	98 a
Dicamba	1	20 c	55 b
Dicamba	2	52 b	70 b
Picloram	½	30 bc	62 b
Picloram	1	52 b	86 ab
Amitrole	2	29 bc	76 ab
Amitrole	4	52 b	66 b

[1] Plots were sprayed May 8, 1972. The formulations used were the butoxyethanol ester of 2,4-D and silvex, dimethylamine salt of dicamba and the potassium salt of picloram. Soil moisture at spraying was only fair and soil temperature was 24°C and relative humidity was 45%. Horehound plants were 8 to 12 inches tall and blooming at time of spraying.

[2] Initial control readings were taken July 24, 1972, and 1 year control readings were taken May 14, 1973. Control means followed by the same letter are not significantly different at the 5% level.

Analysis of variances were calculated on weed control ratings and seed germination. Differences were separated according to Duncan's Multiple Range Test.

Results

Herbicide Effectiveness

Both 2,4-D [(2,4-dichlorophenoxy) acetic acid] and silvex [2-(2,4,5-trichlorophenoxy) propionic acid] gave excellent initial control of the horehound plants. There was no significant difference between 2,4-D and silvex,

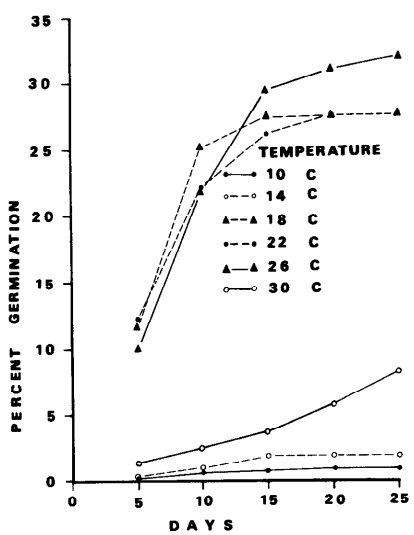

Fig. 3. *The germination of horehound seed collected in the fall after maturity and placed at five constant germination temperatures. The germination at these temperatures was recorded every 5 days for 25 days.*

Table 2. The control (%) of horehound by various rates (lb/acre) of 2,4-D and silvex.

Treatment[1]		
Herbicide	Rate	Control[2]
2,4-D ester	½	55 bc
2,4-D ester	1	69 bc
2,4-D ester	2	95 a
2,4-D amine	1	82 ab
2,4-D oil soluble amine	1	45 c
Silvex ester	1	68 bc
Silvex ester	2	95 a

[1] Plots were sprayed May 14, 1973. Butoxyethanol ester, diethanol amine, and oil soluble amine (dodecyl and tetradecyl amine mixture) formulations were used. The top 4 inches of soil was dry but there was good moisture deeper. Air temperature was 21°C and relative humidity was 85%. Horehound plants were 12 inches tall and blooming at time of spraying.

[2] Control means followed by the same letter are not significantly different at the 5% level.

nor between 2 and 4 lb/acre rates (Table 1). Initial control with picloram (4-amino-3,5,6-trichloropichloropicolinic acid) at 1 lb/acre and dicamba (3,6-dichloro-*o*-anisic acid) at 2 lb/acre was fair; whereas, control with dicamba at 1 lb/acre and amitrole (3-amino-*s*-triazole) at both 2 and 4 lb/acre rates was poor. Control of established plants one year after spraying was better generally with all treatments. Control with 2,4-D at both the 2 and 4 lb/acre rates and with the 4 lb/acre rate of silvex was 95% one year after treatment.

Further evaluation of 2,4-D and silvex in 1972 indicated the 2 lb/acre was needed for maximum control (Table 2). Reducing the rate of the ester formulations to 1 lb/acre resulted in a significant decrease in control. Formulations of 2,4-D also had an effect on control (Table 2). Three formulations were compared at the 1 lb/acre rate. The diethanol amine was significantly better than the oil soluble amine. The ester was intermediate in acitivity.

Seed Germination

The majority of the seeds were dormant at sampling with less than 35% of the seed germinating at any of the temperatures (Fig. 3). Essentially no germination occurred at the 20 and 14°C temperatures, and less than 10% germinated at the 30°C. Germination at 18, 22, and 26°C were comparable with a leveling off of 25 to 30% germination at 15 days.

The germination was increased significantly by 1 month of storage

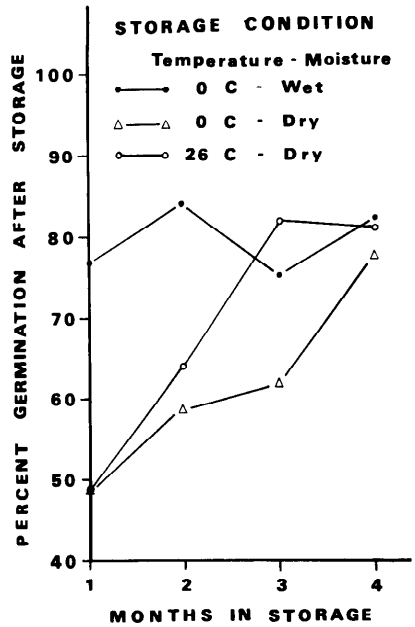

Fig. 4. *The effect of storage time and condition on germination of horehound seed.*

(Fig. 4). The best storage condition for breaking dormancy was the cold wet storage where 78% germination resulted after a 1-month storage. It took 3 months of dry storage at 26°C before germination increased to 80% and 4 months to reach this level of germination when seeds were stored dry at 0°C.

Discussion and Conclusions

The calyx seed cluster of horehound readily sticks to the wool of sheep and other animals and has resulted in horehound being distributed in many of the sheep-raising areas of the world. Both established plants and new seedlings can be controlled readily with 2 lb/acre of 2,4-D or silvex (applied in May when established plants were blooming). Respraying will be required to keep horehound controlled since seedling plants were noted in most plots one year after the control of established plants.

Literature Cited

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