Information on the Control of Scentless Chamomile.

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Scentless chamomile is a weed of cropland, roadsides and abandoned agricultural areas. A survey of habitats in a severely infested area found the weed most often in sloughs and low spots in fields. These areas and abandoned agricultural areas are source areas for infesting nearby fields. Field experiments established on a scentless chamomile infested, abandoned area, which was being invaded with grasses, indicated that herbicides (picloram, picloram + 2,4-D, chlorsulfuron and metsulfuron methyl) applied at industrial rates, aided succession in favour of grasses but with time and no mowing the grasses dominated the weed. In field experiments on spring wheat, bromoxynil, clopyralid, metsulfuron methyl and chlorsulfuron controlled scentless chamomile following an effective spring tillage program. In other field experiments, metsulfuron methyl and chlorsulfuron effectively controlled scentless chamomile but a few seed heads remained, containing a sufficient number of seeds for a future infestation.

INTRODUCTION

Scentless chamomile is a weed of cropland and nearby non-cropland in several isolated areas in Saskatchewan. Local residents indicate that the weed was introduced into the Stockholm area by European settlers from Scandinavian countries and into the Balgonie-Zehner area with feed for horse teams used for construction work. The weed has since spread in these and other localized areas in Saskatchewan. The objectives of this project were: to identify and quantify the various habitats where scentless chamomile can be found and to develop methods to control scentless chamomile in these habitats.

MATERIALS AND METHODS

Survey for Scentless Chamomile. Low level aerial photographic maps of quarter sections, known to have scentless chamomile, were purchased from the Supply and Service, Government of

Saskatchewan. The map of a quarter section was enlarged to approximately 20 x 20 cm using a photocopy machine and all of the major habitats and landmarks were traced onto plain white paper. These sheets of paper were used to record the results of the survey. A surveyor walked the perimeter of each quarter section and then zigzaged across the field locating all of the major habitats and landmarks. At regular 50 paces, the surveyor recorded the cover-abundance of scentless chamomile and the habitat in which the weed was found (Table 1). The results were tabulated as per cent cover-abundance for each habitat which occurred in the area (Table 2).

Table 1. Scentless Chamomile Habitat Rating.

Score	Cover	Plants
5	>75%	Unlimited
4	50-75%	Unlimited
3	25-50%	Unlimited
2	5-25%	Unlimited
1	<1%	Unlimited
+	Small	Numerous
r	-	Solitary
0	-	Non-existant

Scentless Chamomile Seed Rain. The amount of seed on scentless chamomile plants growing in four different habitats was estimated by counting the number of seed heads per square meter and multiplying by a count of the number of seeds in five randomly selected seed heads (Table 3).

Germination of Scentless Chamomile. Petri dishes, 100 x 80 mm, were filled to a depth of 1 cm with greenhouse soil. Fifty seeds of scentless chamomile were placed on top of the soil and water was added at 6 levels (Table 4). At the 50 % moisture level, water was at the soil surface and at the 100 % moisture level, there was approximately 1 cm of water on the soil. The experiment was replicated 4 times and duplicated.

Scentless Chamomile Control on Non-cropland. An ecotone between cropland and a non-cultivated slough was selected for the experiment. The area had been once cultivated and was abandoned. The experiment site contained scentless chamomile and invading grasses. Plot size was 2.1 x 2.1 m and the sampling area consisted of two 25 x 25 cm permanent subplots. In these plots, scentless chamomile seedlings were counted on 28 and 30 May 1984 and 28 May 1985. Herbicides were applied with a hand held sprayer on 11 June 1984 when some scentless chamomile plants were in the 2 leaf stage and other plants were 25 cm tall. The herbicides which were used are listed in Table 5 and 6. The numbers of plants in the permanent subplots which set seed were recorded on 20 August 1984 and 9 August 1985. Seed rain was estimated by selecting 2 plants from the permanent subplots and multplying the number of seed heads per plant by the average number of seeds in 5 seed heads. On 20 August 1984 and 9 August 1985, forage samples from two other 50 x 50 cm areas were clipped, sorted into forbs, grasses and scentless chamomile, weighed and oven dried at 100 C for 48 hr (Table 6). The experiment was replicated 3 times in 1984 and duplicated with 4 replicates in 1985. Only the 1984 experiment is reported (Table 5 and 6).

Scentless Chamomile Control in Spring Wheat. The experimental site was located in a producers field near Balgonie, Saskatchewan. The area was seeded with an airseeder to HY320 spring wheat. The airseeder effectively controlled the winter and spring annual scentless chamomile plants. Herbicides listed in Table 7 were applied on 11 June 1984 with a hand held sprayer, the wheat was in the 4 leaf, 2 - 3 tiller stage and scentless chamomile was in the 4 - 6 leaf, 4 - 6 cm stage. Control of scentless chamomile was determined by counting the number of scentless chamomile seedlings in four 25 x 25 cm permanent quadrats established in each plot. Seedlings were counted before herbicide application on 5 June 1984 and each seedling was marked with a colored toothpick. Similarly, any new seedlings which appeared after spraying on 25 June 1984 were counted and marked with toothpicks. Plant mortality was recorded on 25 July 1984. Results reported in Table 7 are the per cent of scentless chamomile seedlings, counted before and after spraying which are alive on 25 July 1984. Seed rain was estimated by the method described for the non-cropland. The number of scentless chamomile plants which set seed was recorded on 15 August 1984. Wheat yield was estimated from two 1 square meter subsamples per plot.

Scentless Chamomile Control in Winter Wheat. Test 1. The experimental site was located in a producers field near Stockholm, Saskatchewan. Norstar winter wheat was seeded into canola stubble at the rate of 36 kg/ac with a hoe press drill on 13 September 1986. Fertilizer (11-51-00) was applied at 24 kg/ac with the seed. On 30 April 1987, 81 kg/ac of 34-00-00 was broadcast over the plots. Herbicides listed in Table 8 were applied with a hand held sprayer on 16 October 1986 when winter wheat was in the 2 - 4 leaf stage and scentless chamomile seedlings were in the 2 - 4 leaf stage. Other scentless chamomile plants were present in the small to large rosette stage. Rosette control was assessed in four 25 x 25 cm permanent quadrats which were established in each plot. On 15 October 1986, seedlings and rosettes of scentless chamomile were counted in the permanent quadrats and were marked with colored toothpicks. The number of living scentless chamomile plants which were marked with toothpicks on 27 July 1987 were counted. The results were expressed as per cent rosette reduction (Table 8). The number of plants and seed heads in the permanent quadrats was counted on 27 July 1987. Seed heads were pooled for each plot and the number of seeds was counted in one randomly selected head. Crop yield was estimated from two 1 meter square samples, harvested from each plot.

Test 2 was the same as test 1 except the area was cultivated prior to seeding winter wheat in order to control scentless chamomile. Shallow cultivation failed to control scentless chamomile rosettes.

RESULTS AND DISCUSSION

Survey for Scentless Chamomile. Scentless chamomile was found more often in lowspots in fields which usually are cultivated and in sloughs which usually are not cultivated (Table 2). Some scentless chamomile plants were found in transition areas between the cultivated fields and roadsides. It is thought that non-cultivated areas, sloughs and transition areas, are source areas for future scentless chamomile infestations in fields.

Table 2. Scentless Chamomile Habitats.

Habitats	>75% Cover	1-75% Cover	<5% Cover	Solitary Plants	Non-Existant
Cereal Crops	4	16	9	9	62
Sloughs	23	43	15	7	12
Lowspots	35	33	13	4	15
Transition Areas	8	12	9	7	64

Scentless Chamomile Seed Rain. Scentless chamomile, especially in pure stands, has the ability to produce large quantities of seed (Table 3). This is important in any area of a field which can not be tilled. One example is the area around electric power poles which can not be cultivated. If this area is approximately one square meter, then a pure stand of scentless chamomile could produce over one million seeds.

Table 3. Scentless Chamomile Seed Rain.

Habitat	Seeds/m2 x1000
Pure Stand	1 200
Non-cropland	252
Spring Wheat	79
Winter Wheat	735

Germination of Scentless Chamomile. Seeds of scentless chamomile were able to germinate when the soil water table was at the soil surface and the soil was flooded with water (Table 4). Many of the scentless chamomile seeds germinated on the surface of the water. This suggests that scentless chamomile seed could be moved by the force of water and then could germinate. Drainage ditches made of concrete, have been observed to have seed producing scentless chamomile plants growing in cracks of the concrete.

Table 4. Effect of moisture on the germination of scentless chamomile.

% Soil Moisture	% Germination
0	0
10	64
20	94
30	94
50	87
100	70

Scentless Chamomile Control on Non-cropland. There was a large number of scentless chamomile seedlings on all plots in the early spring (Table 5).

Table 5. Scentless Chamomile control on non-cropland.

Treatment	Rate kg/ha (ai)	Seedlings/m2 ---Spring--- 1984	1985	Seed Rain/m2 ---x1000---- 1984	1985
Check		2410a*	1442	252	0
Picloram	0.3	8131a	0	0	0
Picloram + 2,4-D	0.3 + 1.2	4477a	38	0	0
Chlorsulfuron	0.06	4914a	164	51	0
Metsulfuron Methyl	0.03	4248a	204	0	0
Dicamba	0.6	5952a	812	13	0
Clopyralid	0.17	2203a	1025	11	0

* DMR 5%.

Applications of Picloram (Tordon 22K), picloram + 2,4-D (Tordon 101), chlorsulfuron (Glean) and metsulfuron methyl (Ally) controlled scentless chamomile, preventing seed set in all plots except one plot which was treated with chlorsulfuron. Persistent herbicide residues controlled the seedlings which emerged early in the spring of 1985. In the check plots, there was ample seed set in 1984 but not in 1985. Scentless chamomile disappeared from the check plots in 1985 because of a combination of rapidly invading grass species, grasshoppers which preferred scentless chamomile over the other vegetation and drought. The plots were not mowed during 1985. Grass yields did not increase during the year of herbicide application but increased the year after treatment (Table 6).

Table 6. Scentless Chamomile control on non-cropland.

Treatment	Rate kg/ha (ai)	Grass kg/ha 1984	1985	S. Cham. kg/ha 1984	1985
Check		1010a*	990b	1660a	0
Picloram	0.3	590a	2640ab	40b	0
Picloram + 2,4-D	0.3 + 1.2	900a	2690ab	0b	0
Chlorsulfuron	0.06	940a	1350ab	740b	0
Metsulfuron Methyl	0.03	660a	2270ab	0b	0
Dicamba	0.6	710a	2440ab	657b	0
Clopyralid	0.17	860a	3290a	341b	0

* DMR 5%.

Scentless chamomile was not found on any of the plots in 1985. This suggests that invading undisturbed grasses, which are not mowed, can greatly reduce scentless chamomile. This experiment was repeated in another abandoned area, which had rapidly invading grass species, with similar results. However, scentless

chamomile has been observed growing and setting seed in undisturged grass stands when moisture is abundant throughout most of the growing season.

Scentless Chamomile Control in Spring Wheat. Tillage effectively controlled winter annual and early spring scentless chamomile plants when spring wheat (variety HY320) was airseeded. Bromoxynil (Torch DS), clopyralid (Lontrel), chlorsulfuron (Glean) and metsulfuron methyl (Ally) effectively controlled seedlings, marked with colored toothpicks before herbicide application (Table 7).

Table 7. Scentless Chamomile Control in Wheat (HY320).

Treatment	Rate g/ha ai	% S. C. Alive ---25 July--- Before Spray	After Spray	Seed Rain /m2 x1000	Yield kg/ha
Check		90a**	50a	79	2960a
Bromoxynil	350	16b	60a	0	4930b
Clopyralid	170	16b	16b	<1	5250b
Chlorsulfuron*	6	0b	7b	0	4700b
Metsulfuron Methyl*	22.5	1b	3b	0	4940b
Dicamba + 2,4-D	420 + 140	79a	61a	9	4510b
Metribuzin	150 + 150	74a	26b	16	4530b

* plus Agsurf 0.1%
** DMR 5%

Many of the seedlings marked with colored toothpicks after the application of the contact herbicide, bromoxynil, survived but did not set seed. Fewer seedlings, which emerged after the application of the other herbicides, survived because residues remained in the soil. There was no seed returned to the plots following the application of bromoxynil, chlorsulfuron and metsulfuron methyl. Grain yields were greater on the herbicide treated than on the check plots. Results from the repeat test were similar.

Scentless Chamomile Control in Winter Wheat. The two tests to control scentless chamomile were similar, except the experimental location for test 2 received shallow fall tillage before seeding and test 1 was direct seeded to winter wheat (Table 8). Tillage failed to control scentless chamomile rosettes growing in the stubble but promoted the emergence of new seedlings. In test 1 clopyralid (Lontrel) and metsulfuron methyl (Ally) and in test 2 metsulfuron methyl (Ally) and chlorsulfuron (Glean) effectively controlled rosettes of scentless chamomile. No reason is available for the lack of control with chlorsulfuron in test 1 and with clopyralid in test 2. In the remainder of the plots there were a few scentless chamomile plants which set seed. When the seed rain was calculated for the entire plot there was sufficient seed set for a future infestation.

Table 8. Scentless Chamomile Control in Winter Wheat (Fall applied herbicides).

Treatment	Rate g/ha ai	Rosette Reduction %	Seed Heads /m2	Seed /m2 x1000	Yield kg/ha
TEST 1					
Check		7c**	2612a	986a	1580
Check (weed free)		100a	0b	0b	2270
Clopyralid	150	96a	0b	0b	2510
Metsulfuron Methyl*	4.5	97a	12b	3b	2610
Chlorsulfuron*	22.5	57b	247b	90b	2540
Cyanazine + MCPA	563 + 281	4c	2200a	799a	2050
TEST 2					
Check		24b	1562a	633a	
Check (weed free)		100a	0c	0c	
Clopyralid	150	80a	728b	260b	
Metsulfuron Methyl*	4.5	100a	3c	1c	
Chlorsulfuron*	22.5	100a	6c	2c	
Cyanazine + MCPA	563 + 281	16b	1298a	570a	

* plus Agsurf 0.1%
** DMR 5%.

CONCLUSION

1. Scentless chamomile was most often found in non-cultivated sloughs and lowspots in fields.

2. Scentless chamomile was found to be a very prolific seed producer and can produce over 1 million seeds per square meter per year.

3. Seeds of scentless chamomile germinated in soil when water was at the soil surface and when the soil was flooded with water.

4. Picloram, picloram + 2,4-D, chlorsulfuron and metsulfuron methyl, applied at non-cropland rates effectively controlled scentless chamomile in a vegetation type which had rapidly invading grasses. In the non-herbicide treated areas, which were not excessively moist, grasses were more competitive than scentless chamomile, eliminating the latter.

5. In spring wheat, bromoxynil, clopyralid, chlorsulfuron and metsulfuron methyl effectively controlled scentless chamomile seedlings, provided spring tillage controlled winter annual and early spring emerging plants.

6. In winter wheat, fall applied metsulfuron methyl effectively controlled scentless chamomile rosettes in two tests whereas clopyralid was effective in one test and chlorsulfuron was

effective in the other test. Regardless of the treatment, a few seed heads (3 - 12/m2) can produce a seed rain of 1,000 - 3,000 seeds/m2.

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