The Evaluation of Two Agricultural By-products as a Control of Dandelion in Turf

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Introduction

Recent studies were completed in western Canada that tested various agricultural by-products for their effect on weeds in turf (Anderson and Ross, 2005). Corn gluten meal, soybean meal, mustard meal and sugar beet extract were tested in four western Canadian cities. The three year study examined the effects of the products for their ability to control weeds in turf, particularly dandelion.

Dandelion is the most common turfgrass weed in western Canada and is well adapted to the climatic conditions. Although considerable research has been conducted on control of this weed, the biology of the plant is not well understood. In order for pre-emergent controls to be effective the timing of germination of this plant must be known.

Watson et al (2001) noted that germination could occur between 4-30^{o}C and that the optimum temperature for germination was 23^{o}C, and this was under conditions of adequate moisture. In a recent study conducted in Manitoba, Van Acker and Hacault (2006) found that 96% of plants that germinated in late spring, early summer were from spring seed dispersal. Only 4% of new plants were attributed to the seed bank.

Seed dispersal of dandelion is thought to be greatest in spring in western Canada. However, seed dispersal has been observed throughout the growing season but are thought to be considerably less. Observations of seed dispersal show that it occurs in early April in White Rock, British Columbia, around the end of April in Kelowna and Penticton, and around the middle of May in Olds, Alberta (Clark et al, 2006).

Results of the recent tests showed that high rates of both corn gluten and soybean meal were effective in controlling dandelion populations. Mustard meal was generally less effective, due in part to turf damage which left large voids in the turf that were then colonized by weeds. Sugar beet extract did not effectively control dandelions. However, these high rates of application would make the product cost prohibitive to use and it would not receive wide acceptance at these high rates.

It was also noted in the previous studies that complete eradication of the weeds prior to the initiation of applications of the products was critical in pre-emergent weed control. Products that were applied at sites that did not first of all remove dandelions with a herbicide application did not show effective control.

The objective of this study was to examine corn gluten and soybean meal at rates of application that would more closely approximate normal fertility rates. In addition, the timing of application will be examined in this study.

Methodology

Four sites were chosen across Western Canada within the various city parks system. In Kelowna plots were established at City Park, in Penticton at Kings Park, in Regina at Dover Park and in Calgary at Shouldice Park. Sites were chosen that had high infestations of weeds, particularly dandelion. This was done to ensure that there was sufficient seed from dispersal in order for dandelions to germinate.

The trials located at Kelowna and Penticton were initiated May 10th and 12th respectively. Two weeks later the Regina trial was initiated on May 24th. The start date at the Calgary site was delayed until August 11th due to weather factors that did not allow for the initial spraying of the test area. All of the sites received a single application of a selective herbicide, Killex 500 at the rate of 32ml/100m^2, prior to the application of the treatments in order to eliminate existing dandelion.

From the previous study two agricultural by-products, corn gluten meal and dehulled soybean meal, were selected for further testing on the control of dandelion in turf. Both products were compared with a single fall herbicide application and an untreated control (Table1). The test plots were 1x 2 metres in size and were replicated four times within a randomized complete block design (Table1).

Table 1- Treatment schedule and application rates for dandelion control study.

Treatments	Product		Applied	Rate(s)
Corn gluten meal	Turf Maize Pro	Low rate	Spring	125g/m^2
			Fall	125g/m^2
			Spring & Fall	125g/m^2
		High rate	Spring	250g/m^2
			Fall	250g/m^2
			Spring & Fall	250g/m^2
Dehulled soybean meal	Unifeed Soybean meal	Low rate	Spring	133g/m^2
			Fall	133g/m^2
			Spring & Fall	133g/m^2
		High rate	Spring	266g/m^2
			Fall	266g/m^2
			Spring & Fall	266g/m^2
Control Treatments:				
Selective herbicide	Killex 500	Single rate	Fall	32.5mls/100m^2
Untreated control				

The sites in British Columbia and Saskatchewan were rated once during the summer and again in the fall. The Calgary, due to the late start, was rated only once in the fall. During the visits, the number of dandelion present within each plot as well as the overall quality of the turf was recorded.

Three turf quality factors: colour, density and area coverage was assessed using protocols established by the National Turfgrass Evaluation Program (NTEP).

The colour factor subjectively evaluated the uniformity and intensity of the colour displayed by the turf. A 1 to 9 visual assessment scale was used to rate each plot. Treatments which stimulated a uniform dark green colour received scores ranging from 6 for an acceptable colour to 9 for turf with outstanding colour. While treatments that negatively impacted the turf appearance were scored lower.

Density, the second quality factor, subjectively evaluated the impact of the treatments on the turf to produce more shoots and tillers. The 1 to 9 scale was again used to rate each plot. Treatments which stimulated a tight knit surface received scores ranging from 6 for an acceptable density to 9 for superior turf. Treatments associated with a weak or thin turf stand were scored lower.

The final quality factor, area cover, subjectively evaluated the vigor of turf. Once again a 1 to 9 scale was used to rate each plot. Treatments which stimulated a thick competitive turf cover received scores ranging from 6 for an acceptable area cover to 9 for a superior area cover. Treatments producing a weak turf, affected by weed encroachment and/or the presence of bare patches, were scored lower.

To compare the effect of the treatments on the overall turf quality, the average of the combined colour, density and area cover scores for each plot was calculated and statistically analyzed.

Results and Discussion

This data is preliminary in nature, as fall applications of the two agricultural by-products and the fall herbicide treatment had not yet been made prior to the fall dandelion count and turf quality ratings.

The first trial evaluation occurred eight weeks after the establishment of the trials in British Columbia and Saskatchewan. The summer dandelion count revealed that the initial application of herbicide had reduced the number of established dandelion at all of the sites (Table 2).

Table 2- Dandelion counts on three sites throughout Western Canada, summer 2005.

Treatments		Application Timing	2005 Sites		
			Kelowna	Penticton	Regina
			Dandelions per m^2		
Corn gluten meal	125g/m^2	Spring	1a	4a	3a
Corn gluten meal	125g/m^2	Fall	5a	7a	2a
Corn gluten meal	125g/m^2	Spring & Fall	1a	3a	1a
Corn gluten meal	250g/m^2	Spring	1a	1a	1a
Corn gluten meal	250g/m^2	Fall	4a	3a	2a
Corn gluten meal	250g/m^2	Spring & Fall	3a	2a	1a
Dehulled soybean meal	133g/m^2	Spring	6a	2a	1a
Dehulled soybean meal	133g/m^2	Fall	3a	1a	2a
Dehulled soybean meal	133g/m^2	Spring & Fall	2a	7a	1a
Dehulled soybean meal	266g/m^2	Spring	0a	2a	2a
Dehulled soybean meal	266g/m^2	Fall	2a	2a	2a
Dehulled soybean meal	266g/m^2	Spring & Fall	4a	4a	1a
Selective herbicide	32mls/100m^2	Fall	5a	3a	1a
Untreated control			3a	5a	2a
		$LSD_{0.05}$ =	n/s	n/s	n/s

* Values that have the same letter as a suffix are not significant from each other.

By the fall, the dandelion population within the trial area had increased at all sites. The Kelowna and Regina sites had the greatest increase in dandelion, while at the Penticton and Calgary sites

the dandelion populations remained relatively stable. This rapid increase was thought to be as a result of recovery from root stock and not as new seedlings, so the effectiveness of the initial herbicide treatment at both the Kelowna and Regina sites is questioned (Table 3).

Table 3- Dandelion counts on four sites throughout Western Canada, fall 2005.

Treatments		Application Timing	2005 Sites			
			Kelowna	Penticton	Regina	Calgary
			Dandelions per m^2			
Corn gluten meal	125g/m^2	Spring	21a	5a	17a	13a
Corn gluten meal	125g/m^2	Fall	28a	4a	11a	6a
Corn gluten meal	125g/m^2	Spring & Fall	22a	4a	6a	6a
Corn gluten meal	250g/m^2	Spring	28a	3a	9a	7a
Corn gluten meal	250g/m^2	Fall	22a	8a	21a	6a
Corn gluten meal	250g/m^2	Spring & Fall	23a	2a	13a	13a
Dehulled soybean meal	133g/m^2	Spring	30a	3a	15a	3a
Dehulled soybean meal	133g/m^2	Fall	28a	6a	19a	11a
Dehulled soybean meal	133g/m^2	Spring & Fall	26a	4a	16a	6a
Dehulled soybean meal	266g/m^2	Spring	25a	3a	20a	8a
Dehulled soybean meal	266g/m^2	Fall	25a	3a	22a	7a
Dehulled soybean meal	266g/m^2	Spring & Fall	29a	6a	18a	5a
Selective herbicide	32mls/100m^2	Fall	21a	4a	17a	6a
Untreated control			28a	4a	15a	6a
		$LSD_{0.05}$ =	n/s	n/s	n/s	n/s

* Values that have the same letter as a suffix are not significant from each other.

Turf quality ratings were quite variable from site to site (Table 4). Differences in turf quality are usually the result of application of the treatments. However, since not all of the treatments were in place prior to the fall rating no conclusion can be made.

Only the Kelowna, Penticton and Regina sites had only received spring applications. Generally, the plots which were treated in the spring showed a positive response (Table 4).

The Calgary site had only received the fall treatments. The plots, which were treated earlier in August, generally showed a positive response in the fall (Table 4).

Further differences in turf quality between the sites may be explained by the level of turf maintenance provided at each location.

Table 4- Turf quality ratings at four sites in Western Canada, fall 2005.

Treatments		Application Timing	Kelowna	2005 Sites		Calgary
				Penticton	Regina	
			1 – 9 scale			
Corn gluten meal	125g/m^2	Spring	7.2	5.2	5.8	5.2
Corn gluten meal	125g/m^2	Fall	6.8	4.0	5.3	5.6
Corn gluten meal	125g/m^2	Spring & Fall	7.4	5.2	5.6	5.8
Corn gluten meal	250g/m^2	Spring	7.2	5.4	5.9	5.3
Corn gluten meal	250g/m^2	Fall	6.8	5.3	4.8	5.9
Corn gluten meal	250g/m^2	Spring & Fall	7.0	4.7	6.0	6.1
Dehulled soybean meal	133g/m^2	Spring	7.2	4.2	5.5	5.3
Dehulled soybean meal	133g/m^2	Fall	6.9	5.2	5.1	5.7
Dehulled soybean meal	133g/m^2	Spring & Fall	7.0	5.1	5.3	5.8
Dehulled soybean meal	266g/m^2	Spring	7.0	4.6	5.8	5.5
Dehulled soybean meal	266g/m^2	Fall	6.9	4.2	5.1	5.9
Dehulled soybean meal	266g/m^2	Spring & Fall	6.9	5.0	5.6	6.2
Selective herbicide	32mls/100m^2	Fall	7.0	4.8	5.1	5.3
Untreated control			7.0	5.2	5.2	5.4

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Support for this trial was received from the Cities of Regina, Calgary, Kelowna and Penticton, as well as the Western Canada Turfgrass Association. In addition, we would like to acknowledge the facilitators of the project in each of the four cities, Dave Ellis in Regina, Dave Greene in Calgary, Ian Wilson in Kelown, John Penrice in Penticton and Bob Wick and the Research Committee of the Western Canada Turfgrass Association.