ARTHROPODS, SILVERTOP, AND GRASS SEED YIELDS

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ABSTRACT
High numbers of various arthropods early in the season, especially thrips, mites, and grass plant bugs, were associated with silvertop injury in six grass seed fields in Saskatchewan in 995. Insect numbers in sweep samples were frequently suppressed for one or two weeks in plots sprayed with an insecticide. Four fields had low levels of arthropods early in the season andœlow incidence of silvertop later on. In a field of Russian wildrye grass with high arthropod populations, seed yield was highest in plots that had been sprayed with insecticide prior to the boot stage of grass growth. In one field of Kentucky bluegrass with moderate silvertop levels, plots that had been burned the previous autumn had higher yields than those that had been scalped (closely mowed) and the residue removed, or that had been mowed and the residue left on the plots.

KEYWORDS
Grass seed production, silvertop, arthropods, insecticides, burning, clipping, mowing

INTRODUCTION
Silvertop is a condition in which individual grass seed heads become papery white andœsterile, while the rest of the plants remain green and healthy. It affects a wide range of grassœspecies, and can cause major seed losses. Many causal agents have been associated withœsilvertop, mainly several species of insects and mites, or the fungal pathogen *Fusarium poae* (Pk.) Wr. There is little information available on the impact of silvertop on yield, efficacious methods for silvertop control, or the correct timing of control efforts. We initiated a study on silvertop in grasses to examine: 1) the reaction of grass species and cultivars to various arthropod pests, 2) efficacy and timing of insecticide application, and 3) residue management practises that could influence silvertop.

MATERIALS AND METHODS
In 1995, experiments were set up at six sites in Saskatchewan, two in fields of Kentucky bluegrass (*Poa pratensis* L.), and one each in fields of Russian wildrye, (*Elymus junceus* Fisch.), crested wheatgrass (*Agropyron desertorum* Fisch.) Shult.), smooth bromegrass (*Bromus inermis* Leyss.) and meadow bromegrass (*B. riparius* Rehmann). Insect populations in the fields were monitored by sweeping the canopy with an insect net at weekly intervals. Each field had four replicates of the following treatments: an application of dimethoate insecticide made with a backpack sprayer on each of three dates, the end of May, mid-June, and the end of June, and an untreated control, in a Latin square design, with plot size dependent on field size. The impact of the insecticide on the insect fauna throughout the season, levels of silvertop, and seed yield were assessed. In one field, an assessment was made of the impact of three residue management treatments applied the previous fall: burning, scalping and residue removal, or mowing and residue retention.

RESULTS AND DISCUSSION
The crested wheatgrass and Russian wildrye grass fields were mature commercial stands three km apart in south western Saskatchewan. Insect species composition and phenology differed greatly in each field. In the wheatgrass field, few insects were present until well into the summer. Levels of silvertop were low, and none of the dimethoate applications affected silvertop incidence or seed yield (data not presented). In the Russian wildrye, phytophagous mites were present in high numbers early in the season, and thrips, plant bugs and other pests were abundant later in the season. Insecticide decreased insect numbers one to two weeks after application (Figure 1). Silvertop levels were high in all treatments, but tended to be lowest in the plots which had dimethoate applied on the earliest date. These plots had higher yields than ones which had not been sprayed or were sprayed later (Table 1).

A field of Kentucky bluegrass cv. Cynthia that had had insecticide applied the previous spring, and which had been well burned in the previous fall, had very few insects and less than 2% silvertop. Seed yields averaged 340 kg/ha and were not affected by spray treatments.

Both bromegrass fields, located near Saskatoon, were in the first year of seed production, and insect numbers in them were low for most of the summer. Silvertop counts were also low, and were not affected by insecticide application. Likewise, seed yields were not related to silvertop levels or insecticide treatments in either species, with smooth bromegrass cv Carleton yields averaging 340 kg/ha, and meadow bromegrass cv Regar yields averaging 310 kg/ha over all insecticide treatments. Levels of silvertop were higher in meadow bromegrass than in smooth bromegrass plots (4.1 vs1.1 %,), consistent with previous observations that meadow bromegrass has higher levels of silvertop than smooth bromegrass (R. Knowles, personal communication).

In a 3-yr-old field of Kentucky bluegrass cv Dormie near Saskatoon, the earliest spray application was two weeks later than at other sites; at the time of application the grass had reached the reproductive stage, with some seed heads having fully expanded peduncles. Probably because of the lateness of treatment applications, silvertop levels did not differ among spray treatments, ranging from 14 to 16%. Likewise, yields among spray treatments did not differ. Yields were dramatically influenced by residue management, with burn treatments having the highest yields, the scalp treatment yields being significantly lower, and mow treatment yields lower still (Table 2). Thus, residue management in the preceding fall had a greater impact on seed yields than did the presence of insects in the field or insecticide treatment once seed heads had emerged from the boot.

In this study, evidence of arthropods as causal agents of silvertop was circumstantial - the fields with the highest numbers of insects and mites early in the season also had the highest levels of silvertop. Insecticide application generally reduced insect numbers. However, the first treatments, at boot stage or later, may have been applied too late in crop development to influence silvertop levels. Like similar research (eg. Gossen, Soroka and Najda, Poster 1837, this session), this investigation points out the importance of proper residue management in maintaining high grass seed yields. Without proper insect control, seed losses are possible; without proper residue management, seed losses are probable.

Table 1
Impact of insecticide application on silvertop in Russian wildrye grass per m^2 at Pambrun, SK in 1995 (n=4).

Application Date	Total No. Heads[1]	% Silvertop	Yield (kg/ha)
June 1	271 a	32 a	145 a
June 13	388 a	41 a	72 b
June 29	358 a	51 a	65 b
Not sprayed	448 a	51 a	59 b

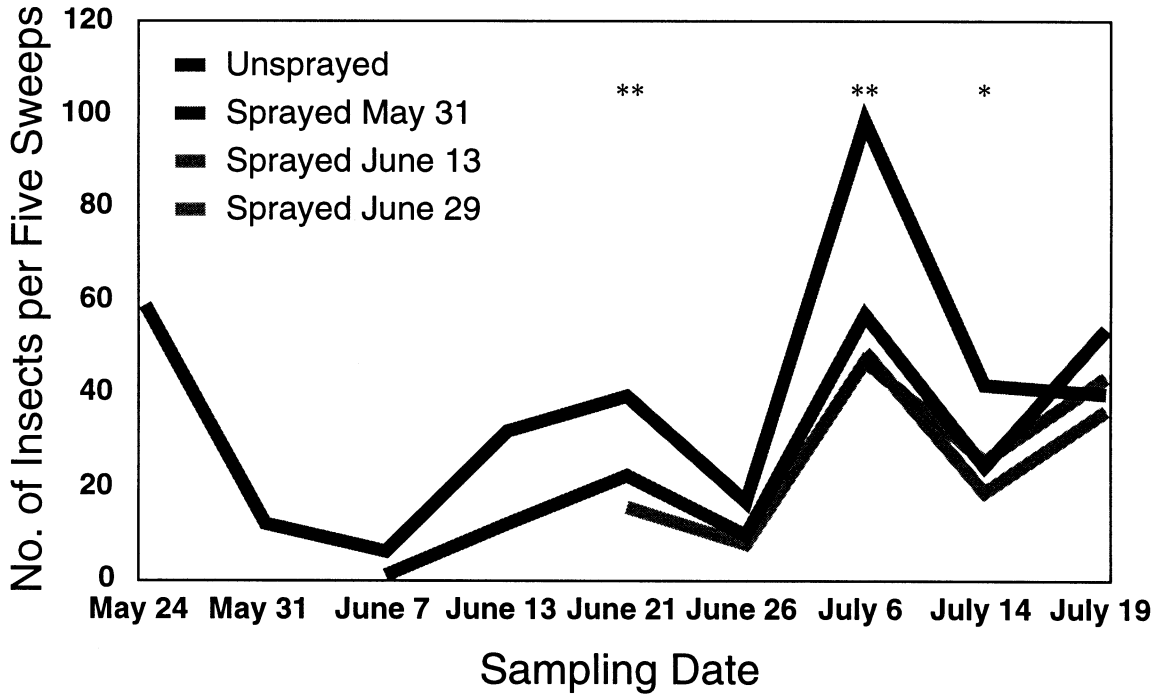
[1] Values within columns followed by the same letter are not significantly different from each other at or P - 0.01 (LSD).

Table 2
Impact of post-harvest residue management in silvertop levels and seed yield of Kentucky bluegrass cv. Dormie per m^2 at Saskatoon, SK, in 1995 (n=6).

Residue Treatment	Total No. Heads[1]	% Silvertop	Yield (kg/ha)–
Burn	2240 a	14 a	180 a
Scalp	2378 a	17 a	
	149 b		
Mow	1982 a	12 a	131 c

[1] Values within columns followed by the same letter are not significantly different from each other at P - 0.01 (LSD).

Figure 1
Number of insects collected by sweeping from Russian Wildrye Grass, Pambrun, 1995



Stars indicate that the treatments for a particular sampling date were statistically different (*P≤0.05, **P≤0.01).