Bromegrass Seed Midge Control in Hybrid Bromegrass

Caution: Assail, Cygon, Matador, and Movento insecticides are not registered for bromegrass seed midge control in hybrid bromegrass. The researchers involved and the Saskatchewan Forage Seed Development Commission do not recommend their use.

Introduction

The bromegrass seed midge (*Contarinia bromicola*, Figure 1) is a common pest of smooth bromegrass (*Bromus inermis*) in Saskatchewan, reported to cause seed yield reductions up to 50% (Knowles 1973). Seed midge damage has not been reported in meadow bromegrass (*Bromus riparius*) in Saskatchewan but some seed growers have reported damage in hybrid bromegrass (*Bromus riparius x Bromus inermis*), which was developed from hybridizing smooth and meadow bromegrass.

Two generations of seed midge occur with the adult midge emerging when bromegrass panicles are emerging and again during flowering. Bromegrass seed midge larvae feed on developing flowers and seed and increase seed shattering which reduces seed yield (Neiman and Manglitz 1972). Midge larvae of the second generation that feed on developing seed go into diapause and some fall to the ground within shattered florets, re-emerging the following year as adults.

A tiny chalchid wasp (*Tetrastichus* spp., Figure 2) is a parasite of bromegrass seed midge and commonly parasitizes 30-75% of the midge larvae (Curry et al. 1983). Wasp larvae feed on developing midge larvae and eventually adult wasps emerge by chewing a small hole in the floret. The hole in the undeveloped floret is visible just prior to seed maturity and is an indicator of parasitism levels and seed yield loss.

Controlling bromegrass seed midge in smooth bromegrass with insecticides has been investigated previously in Saskatchewan (Curry et al. 1983). Carbofuran and dimethoate were applied just before the emergence of the adult midge at boot (just prior to panicle emergence) and pre-flower stages of bromegrass development. The insecticides reduced the number of adult midge and wasps emerging but they did not reduce re-infestation of midge larvae in every year and the impacts of controlling seed midge on seed yield and quality were not determined.

Materials & Methods

Two field experiments in 2011 and 2012 were conducted to investigate the effects of insecticides on bromegrass seed midge, parasitic wasps, and hybrid bromegrass seed yield and quality.

Insecticides were applied after the emergence of the second generation of adult midge in 2011 during the flowering stage of hybrid bromegrass (var. Success) development. Matador (lambda-cyhalothrin) at 34 ml/acre was applied on July 5, 2011 and Movento 240 SC (spirotetramat) at 56 ml/acre plus 0.25% v/v Pro-Surf, a non-ionic surfactant, was applied on July 12, 2011 in 38 L/acre of water at the Nipawin site (seeded in 2006). Assail (acetamiprid) at 22.7 g/acre and Movento 240 SC at 56 ml/acre plus 0.25% v/v Pro-Surf, a non-ionic surfactant, were applied on

July 9, 2011 in 57 L/acre of water at the Carrot River site (seeded in 2009). In 2012, insecticides were applied after the emergence of the first generation of adult midge when hybrid bromegrass (var. Success) panicles were starting to emerge. Cygon 480 AG (dimethoate) at 0.4 L/acre was applied in 38 L/acre of water on June 12, 2012 at the Nipawin site (seeded in 2011) and on June 9, 2012 at the Carrot River site (seeded in 2010).

Bromegrass seed midge and chalchid wasps were collected using a sweep net (10 x 180 degree sweeps in 2011; 15 x 180 degree sweeps in 2012) from each plot throughout the growing season. Adult wasps and shattered florets (developed and undeveloped seed) were collected by using a sweep net (5 x 180 degree sweeps) just prior to swathing. Shattered florets were examined to determine the number of florets with wasp exit holes per sweep. Bromegrass stems were taken from each treatment prior to swathing and florets from fifty randomly selected spikelets (five spikelets from each of ten panicles) were examined to determine the percentage of florets that developed into seed (floret fertility) and the percentage with wasp exit holes. The centre portion of each plot was swathed late July/early August, harvested mid August and weighed to determine gross seed yield (Figure 3). A seed sub-sample of each treatment was taken to determine dockage, seed size, and germination.

The 2011 growing season (April 1 to August 15, 2011) in NE Saskatchewan can be described as normal to above normal for precipitation (85 to 150% of normal) and temperature (-1 to +2 degrees C of normal) with the exception of spring moisture (April 1 to June 6, 2011) which was below normal (less than 85% of normal). The 2012 growing season (April 1 to August 6, 2012) in NE Saskatchewan was above normal for precipitation (115 to 200% of normal) with the exception of spring moisture (April 1 to June 4, 2012) which was normal (85 to 115% of normal). Temperature for the 2012 growing season was normal to above normal (-1 to +4 degrees C of normal) (http://www.agr.gc.ca/pfra/drought/drmaps_e.htm).

It is very important to note that this is a demonstration trial, statistical analysis was not carried out and differences may or may not be significant.

Results and Discussion

Insect Control

Bromegrass seed midge and chalchid wasp infestation varied between treatments before insecticide application in 2011 (Figures 5-8) and 2012 (data not shown). Seed midge were rarely found in the treated and untreated plots following insecticide application, which means the adult seed midge life-cycle was nearly complete or complete when the insecticides were applied in 2011 (Figures 5-6). Movento had little apparent detrimental effect on wasp numbers at Carrot River in 2011, but Assail may have (Figure 7). Likewise, Movento did not appear to decrease wasp numbers at Nipawin in 2011, while Matador did (Figure 8). The number of seed midge and wasps were very low in the treated and untreated plots at both sites during the sampling period in 2012 (data not shown).

Treated plots at swathing time in 2011 generally had fewer wasps, wasp exit holes in shattered florets and less floret shattering with the exception of the Matador treatment at the Nipawin site which had a higher number of wasps then the unsprayed treatment (Table 1). The Matador

treatment also had a higher number of adult seed midge on the June 30, 2011 sampling date which was prior to insecticide application at the Nipawin site (Figure 6). In 2012, no consistent difference was observed for the number of wasps and amount of shattered florets but the number of florets with holes per sweep was less in the treated plots at both sites (Table 2). No consistent difference was found in terms of floret fertility and florets with holes when florets from randomly selected bromegrass stems at swathing time were analyzed (Tables 3-4).

Seed Yield and Quality

Seed yield response to insecticide application was inconsistent but seed size and germination tended to increase (Tables 5-6). The lack of seed yield response and the low percentage of florets with wasp exit holes (0-2.3%) at harvest time suggests seed midge damage in hybrid bromegrass was low in these trials in 2011 and 2012.

Extension

This project was described to forage seed producers and the support by the Ministry of Agriculture for the project was acknowledged during the following extension activities:

- Due to extremely wet field conditions, the planned July 2011 field day was cancelled.
- The interim report was included in the Fall 2011 issue of the SFSDC Prairie Seeds Newsletter mailed to SFSDC levy payers (160) in November 2011.
- The project was described at the grower information session (30 attending) on Dec. 6, 2011.
- The project plans for 2012 were outlined in the Spring 2012 issue of the Prairie Seeds Newsletter mailed to SFSDC levy payers (175) in July 2012.
- The project site near Carrot River was visited during the July 25, 2012 field day (Figure 4).
- The final report will be highlighted at the SFSDC Annual Meeting on December 5, 2012.
- The final report will be posted on the SFSDC Website.

Acknowledgements

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References

Curry, P. S., Knowles, R. P. and J. Waddington. 1983. Seasonal occurrence and chemical control of bromegrass seed midge, Contarinia bromicola (Diptera: Cecidomyiidae), in Saskatchewan. Can. Ent. 115: 75-79.

Knowles, R. P. 1973. Bromegrass seed midge. Canadex 127.622. Agriculture Canada, Ottawa.

Neiman, E. L. and G. R. Manglitz. 1972. The biology and ecology of the bromegrass seed midge in Nebraska. Bull. Univ. Neb. 252. Lincoln, Neb.

Figure 1. Bromegrass seed midge (*Contarinia bromicola)*.
Source: Saskatchewan Agriculture

Figure 2. Chalchid wasp (*Tetrastichus* spp.).
Source: Saskatchewan Agriculture

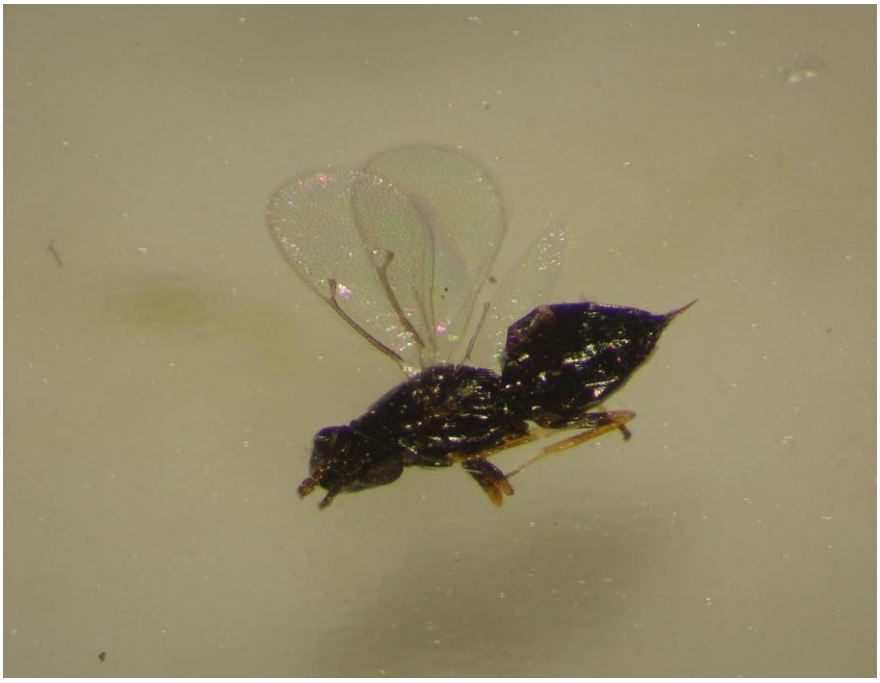

Figure 3. Weighing hybrid bromegrass seed near Carrot River, SK in 2011. Source: PICKSEED Canada

Figure 4. Bromegrass seed midge site near Carrot River, SK in July 2012. Source: SFSDC

Figure 5. The effects of insecticides on the relative abundance and seasonal development of the bromegrass seed midge in hybrid bromegrass near Carrot River, SK in 2011.

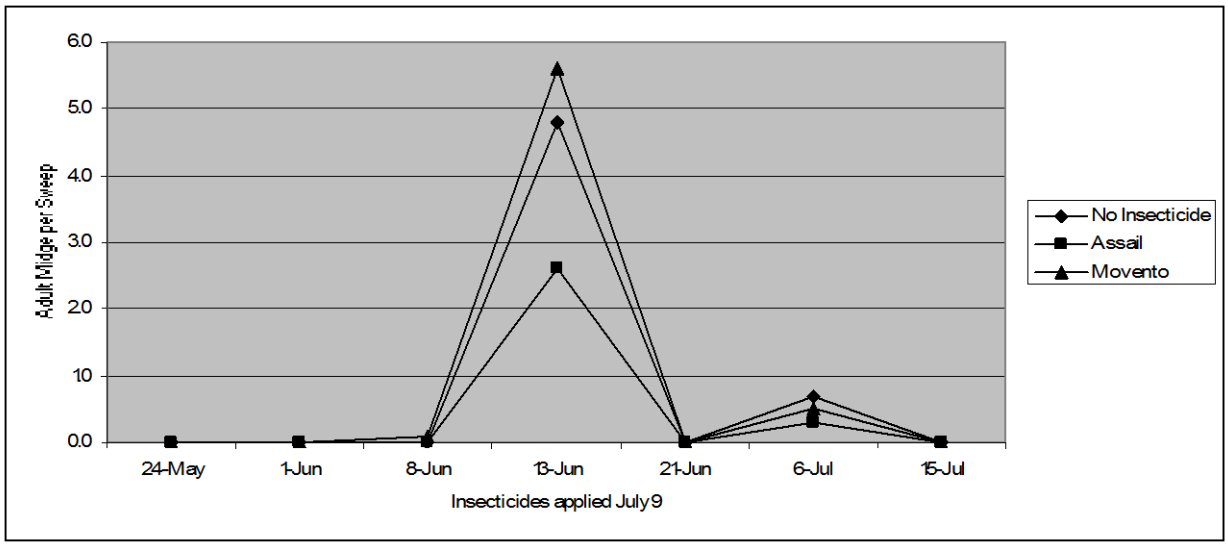

Figure 6. The effects of insecticides on the relative abundance and seasonal development of the bromegrass seed midge in hybrid bromegrass near Nipawin, SK in 2011.

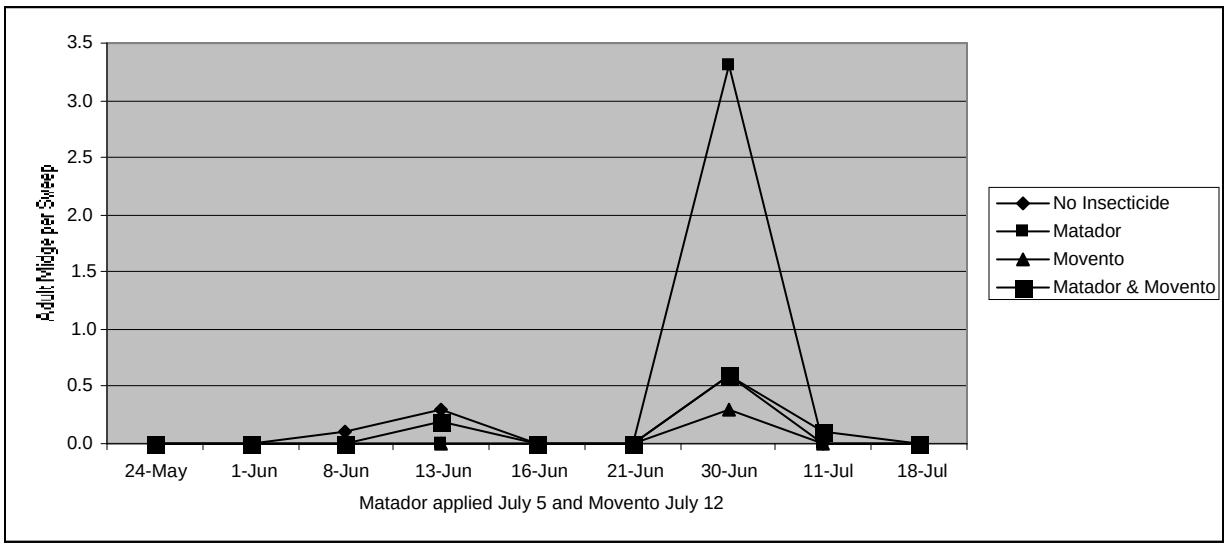

Figure 7. The effects of insecticides on the relative abundance and seasonal development of the chalchid wasp in hybrid bromegrass near Carrot River, SK in 2011.

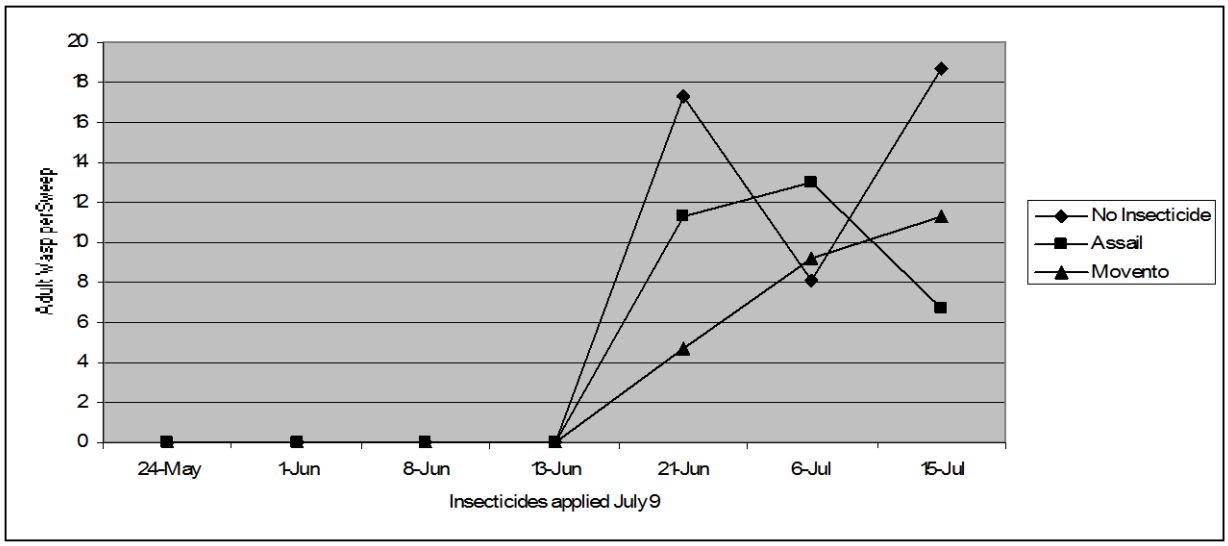

Figure 8. The effects of insecticides on the relative abundance and seasonal development of the chalchid wasp in hybrid bromegrass near Nipawin, SK in 2011.

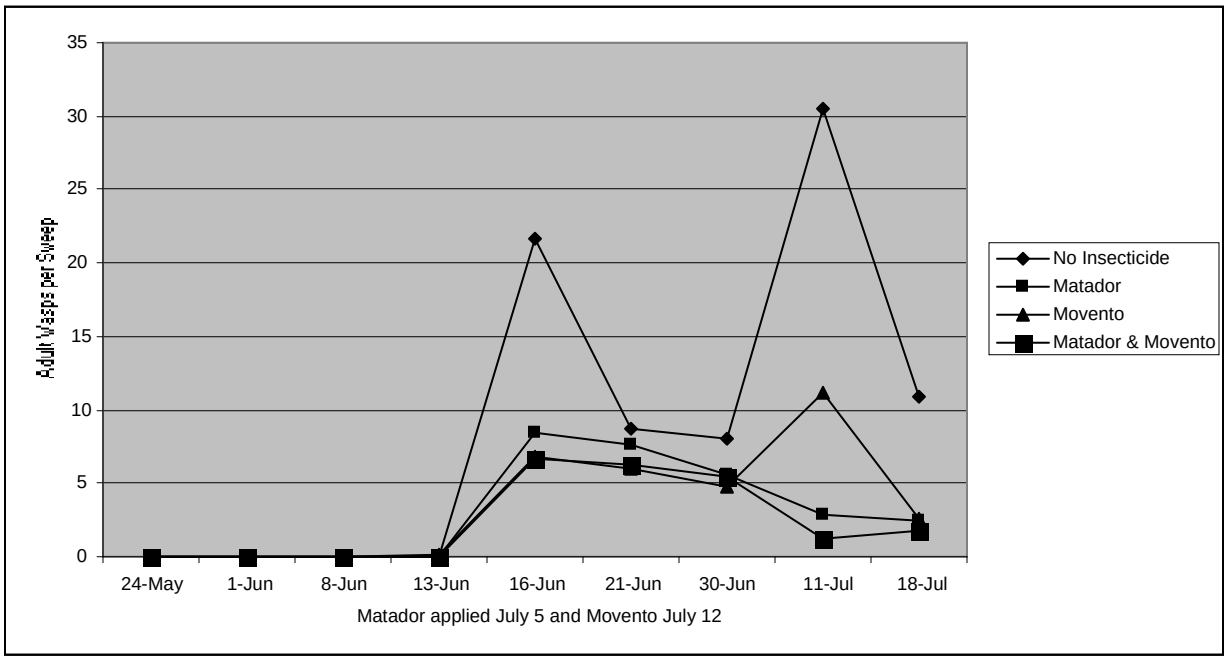

Table 1. The effects of insecticides on adult wasps, florets with holes and floret shattering in hybrid bromegrass at swathing time near Nipawin and Carrot River, SK in 2011.

	Adult Wasps #/sweep		Florets with Holes #/sweep		Floret Shattering g/sweep	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	5.4	9.0	2.2	36.0	2.2	3.0
Assail	.	4.2	.	13.4	.	1.9
Matador	16.0	.	0.0	.	1.1	.
Movento	4.8	3.8	0.0	12.8	1.3	2.1
Matador & Movento	2.2	.	0.0	.	1.0	.

Table 2. The effects of insecticides on adult wasps, florets with holes and floret shattering in hybrid bromegrass at swathing time near Nipawin and Carrot River, SK in 2012.

	Adult Wasps #/sweep		Florets with Holes #/sweep		Floret Shattering g/sweep	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	5.2	9.0	0.1	0.4	3.1	2.8
Cygon	6.1	6.2	0.0	0.2	3.4	2.6

Table 3. The effects of insecticides on hybrid bromegrass fertility and florets with holes at swathing time near Nipawin and Carrot River, SK in 2011.

	Floret Fertility %		Florets with Holes %	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	60.7	58.2	0	0
Assail	.	58.0	.	0
Matador	51.5	.	0	.
Movento	51.7	54.9	0	2.3
Matador & Movento	61.9	.	0	.

Table 4. The effects of insecticides on hybrid bromegrass fertility and florets with holes at swathing time near Nipawin and Carrot River, SK in 2012.

	Floret Fertility %		Florets with Holes %	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	40.5	58.0	0.4	0.0
Cygon	53.0	54.0	0.6	0.0

Table 5. The effects of insecticides on hybrid bromegrass seed yield and quality near Nipawin and Carrot River, SK in 2011.

	Seed Yield lbs/acre		Seed Size g/1000 Seeds		Germination %	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	286	227	3.8	3.7	86	62
Assail	.	235	.	4.0	.	72
Matador	260	.	3.9	.	89	.
Movento	285	224	4.0	3.8	89	70
Matador & Movento	300	.	3.9	.	89	.

Table 6. The effects of insecticides on hybrid bromegrass seed yield and quality near Nipawin and Carrot River, SK in 2012.

	Seed Yield lbs/acre		Seed Size g/1000 Seeds		Germination %	
Treatment	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**	**Nipawin**	**Carrot River**
No Insecticide	432	363	3.8	3.8	92	87
Cygon	448	323	3.9	4.2	94	87