

The occurrence of alfalfa weevil and its major parasitoid *Bathyplectes curculionis* across Saskatchewan, Canada

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Introduction

The alfalfa weevil *Hypera postica* (Gyllenhal) (Coleoptera: Curculionidae) is one of the most destructive insect pests of alfalfa herbage in North America. Palearctic in origin, the weevil was first found in North America near Salt Lake City, Utah, in 1902 (Titus 1911), with the first Canadian record in southeast Alberta and southwest Saskatchewan in 1954 (Hobbs *et al.* 1959; Beirne 1971). Alfalfa weevil became an economic pest on the Canadian prairies only in the area of first location, and its distribution remained below the 51st parallel North latitude for about 40 years. In the mid-1990s, however, the weevil expanded its distribution eastward across southern Saskatchewan and into the neighbouring province of Manitoba (Soroka and Goerzen 2002), where heavy infestations in the last decade caused serious losses to alfalfa hay quantity and quality (Gavloski 2008). Many parasitoids of alfalfa weevil were introduced into North America from Europe in the last century, and the species that established in the eastern half of the continent (Soroka and Otani 2011) have been effective in reducing the impact of the weevil there. The larval parasitoid *Bathyplectes curculionis* (Thomson) (Hymenoptera: Ichneumonidae) is the only parasitoid that is well established in western North America, and its distribution on the Canadian prairies is uncertain.

This study was undertaken to determine the distribution of alfalfa weevil in Saskatchewan, Canada, in order to evaluate the potential impact of the pest on the 1.5 million ha of alfalfa and alfalfa/grass hay production in the province. Further, we wished to determine the occurrence of *B. curculionis* and the possible effect of the parasitoid on the weevil.

Methods

In 2010, Agriculture and Agri-Food Canada (AAFC) and the Saskatchewan Ministry of Agriculture collaborated to conduct a survey of insects in alfalfa fields in Saskatchewan. Alfalfa hay fields were sampled using sweep nets and visual inspection of stems in the latter part of June and first part of July. Fields selected were at least 50 km apart, and were composed of at least 50% alfalfa. Insects were collected by taking 10 walking sweeps of 180 at each of 10 locations per field using a standard 38 cm diameter insect sweep net. The insects were placed in plastic bags and sent to AAFC - Saskatoon Research Centre. Three alfalfa stems were examined at each of the 10 sites per field for evidence of feeding by the alfalfa weevil. The insects were identified and categorized as pest, beneficial or other insects. Numbers of alfalfa weevil adults and larvae, and *B. curculionis* adults were determined. The survey was repeated in 2011 and 2012.

Results

In total, 48 alfalfa fields were surveyed in 2010, 45 in 2011, and 42 in 2012, with an alfalfa content per field ranging from 50 to 95%. Found at low levels in 2010, principally in the south central area of the province, alfalfa weevils expanded in number and range in 2011 and 2012 (Table 1). The highest number of alfalfa weevils found in 2010 was in a field in south central SK with 63 larvae per 10 sweeps, while the highest number found in 2011 was 1350 larvae per 10 sweeps at a field in southeast Saskatchewan; in 2012, 1180 larvae were found per 10 sweeps in a field in the south eastern corner of the province. Alfalfa weevils

Table 1. Number of alfalfa weevils (AW) per 10 sweeps and *Bathyplectes curculionis* per alfalfa field in six regions of Saskatchewan, Canada, mid-summer 2010-2012.

Region	Year	AW/10 sweeps	<i>Bathyplectes</i> /field	Region	Year	AW/10 sweeps	<i>Bathyplectes</i> /field
South West	2010	1.8	0	North West	2010	0.03	0
	2011	6.8	5.2		2011	0.02	0
	2012	59	1.5		2012	0.70	0
South Central	2010	22	1.2	North Central	2010	0.06	0
	2011	84	0.3		2011	3.4	0.3
	2012	437	0.1		2012	33	0.3
South East	2010	12	1.0	North East	2010	0.70	0
	2011	726	3.3		2011	22	0.2
	2012	529	1.5		2012	231	0.2

were present in 29 of 48 or 60% of locations surveyed in 2010, in 37 of 45 fields or 77% of the fields surveyed in 2011, and in 37 of 42 or 88% of fields in 2010. In all three years the lowest alfalfa weevil numbers were found in the north western region of the province (Table 1). In 2012 two fields in the south east that had had extremely high numbers of weevils in the previous year had lower numbers of weevils than expected. Some of the weevils from these fields were found to be infected with an unidentified fungus, with one field having approximately 20% of the larvae infected.

During the investigation the wasp *B. curculionis* was reared from the alfalfa weevil, a first Saskatchewan record. Numbers of adult *Bathyplectes* recovered from sweep samples were low in all years. In total 26 adult *Bathyplectes* wasps were collected from sweeps at seven locations across the province in 2010; the greatest number of wasps per location, 9, was found in the field in south central Saskatchewan that had the greatest number of alfalfa weevils in the survey in that year. In 2011 36 wasps were found over eight locations; the greatest number per location, 19, was collected from a field in the south west, the region of the province in which alfalfa weevils have been present the longest. The range of the wasp appears to be slowly extending across the province, for 22 wasps were found in 10 locations in 2012, including the north central region where numbers of the weevil host were low (Table 1).

Conclusion

The survey provided a snapshot of insect species and numbers present in alfalfa forage fields in Saskatchewan. It highlighted the tremendous increase in alfalfa weevil numbers across most regions of the province over a three year period. The increase in weevil numbers may in part be due to the mild winters of 2010-2011 and 2011-2012 in the province, for the numbers of all insects collected increased at most sites in the latter two years of the survey.

Bathyplectes curculionis has likely been in the south western area of province since its location in nearby Alberta in 1954, the same year that the weevil was discovered. Its spread to other regions of the province, albeit slow, bodes well for increase of its numbers and for potential control of the weevil. The spread of the parasitic wasp, the presence of fungal spores on weevils, and an increase in the number of other beneficial insects found in the survey are positive indications that biological control is becoming important in control of alfalfa weevil populations in Saskatchewan.

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