

The Distribution of Biological Control Agents for Scentless Chamomile in Saskatchewan

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Abstract

In April 1999, a project was started to develop integrated control programs for noxious weeds that emphasize the role of biological control agents. The focus was on a seed weevil, which was released in 1993, and the 1999 release of a gall midge for scentless chamomile. Both agents have been released at numerous locations in Saskatchewan. The agents were released in many of the municipalities where scentless chamomile can be found. Data on the spread of the agents from a release point was used to estimate the potential distribution of the seed weevil and gall midge across the province. Many rural municipalities have scentless chamomile but the biological control agents may not have spread to the weed. New agent releases should be made in rural municipalities which have had no prior releases.

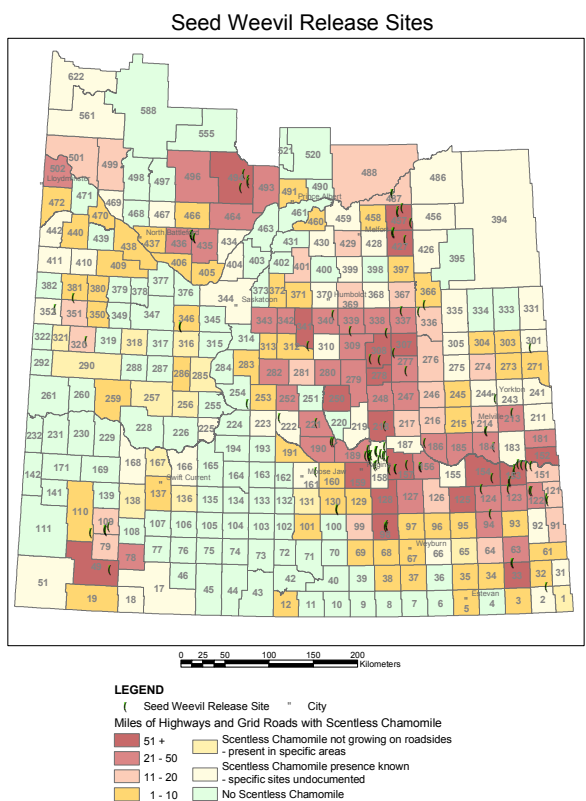


Figure 1. Distribution of seed weevil release sites in Saskatchewan

Introduction

In April 1999, a project was started to develop integrated control programs for noxious weeds that emphasize the need for biological control agents. Integrated weed control is the combination of non-

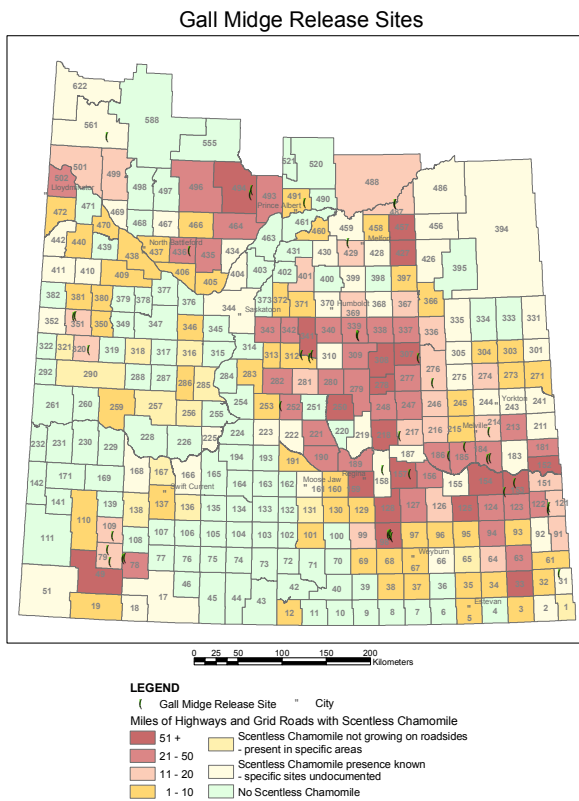


Figure 2. Distribution of gall midge release sites in Saskatchewan

conflicting control methods and/or strategies. When a biological control agent is licensed for release in Canada, the usefulness and role of the agent in an integrated control program is unknown. In Saskatchewan, a seed weevil and gall midge were released initially in 1993 and 1999, respectively, for the control of scentless chamomile. This report documents the release, distribution and spread of the two agents in the province. To achieve their full potential, the agents must be uniformly present on scentless chamomile in the province.

Methods

The focus was on a seed weevil (*Omphalapion hookeri*), which was released in 1993, and the 1999 release of a gall midge (*Rhopalomyia tripleurospermi*) for the biological control of scentless chamomile. Both agents have been released at numerous locations in Saskatchewan.

In Saskatchewan, landowners and occupiers are encouraged to ask their local Extension Agrologist for biological control agents. The names of those requesting agents are maintained on a list and requests are filled when the agents are available. The demand for agents has always exceeded supply.

During 1995 and 1996, seed weevils were collected in Nova Scotia and released at numerous locations in the province. During 1999 to 2001, seed weevils were collected in the fall and overwintered at the Alberta Research Council (ARC) laboratory in Vegreville, AB. The following June, the agents were released at numerous locations in Saskatchewan. In the fall of 2000, seed weevils were collected for the first time in Saskatchewan and overwintered in the Crop Protection Laboratory at Regina. In June, the agents were released in the province. In Saskatchewan, there are 108 documented seed weevil release sites, which are periodically monitored.

Gall midges are distributed throughout the province by transplanting scentless chamomile plants with visible galls. Between 1999 and 2001, suitable transplants were obtained from Vegreville and distributed throughout the province. During the fall of 2002, scentless chamomile plants in the rosette stage showing visible galls were dug out of the ground, distributed throughout the province and transplanted. In the province, there are 41 documented release sites for gall midges.

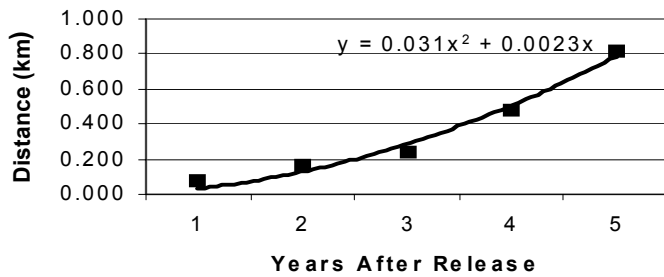


Figure 3. Trendline for seed weevil spread for years 1 to 5

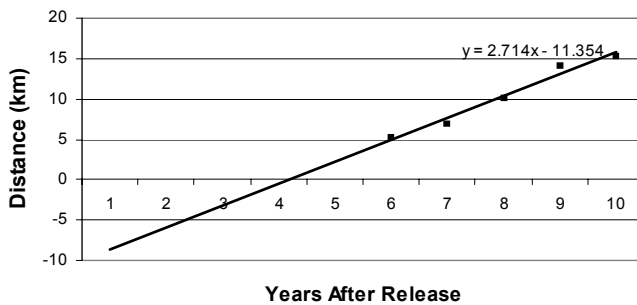


Figure 4. Trendline for seed weevil spread for years 6 to 10

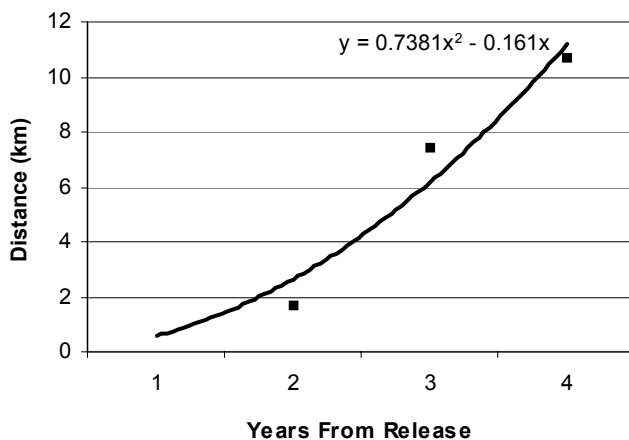


Figure 5. Trendline for gall midge spread

When biological control agents are released, the landowners, land occupiers, Weed Inspectors or Extension Agrologists are asked to complete a release form and return it to the Noxious Weed Coordinator. The release form identifies the release date, release location, environmental condition at release time and a description of the vegetation. Since 2000, the release form contained a request for the latitude and longitude of a release site, which is recorded by a Global Position System (GPS) navigation receiver.

Each year some of the release sites are visited and the establishment of the biological control agent is monitored. This information is updated yearly and maintained in an electronic report, which is called, Scentless Chamomile Biocontrol Agent Information Guide. When a site is monitored, the position of the site is either checked or recorded with a GPS navigation receiver.

The latitude and longitude readings recorded (GPS) for release sites were used to map the distribution of agents in the province. For sites that were not monitored, the latitude and longitude was calculated from legal land locations. The location of each site was plotted on a map of Saskatchewan which showed the distribution of scentless chamomile along road rights-of-ways by rural municipality.

Scentless chamomile that grows along road rights-of-ways was mapped between 1999 and 2001. Rural municipalities were asked to mark the distribution of the weed growing on their roadsides. Replies from 222 rural municipalities were received. For the remaining 75 rural municipalities the presence or absence of scentless chamomile in a municipality was obtained from Extension Agrologists, Weed Inspectors or municipal staff. The spread of the agents across the province up to 2002 was estimated from data collected by Dr. McClay in Alberta. Each year the farthest

distance that a seed weevil or gall midge was found from a release point was recorded. Regression equations were used to represent the data (Figure 3 to 5). The circle on the maps is a "best-case" scenario for the spread of the biological control agents in one direction, based on the time elapsed since release at each site. Agent spread in the other directions is less. Therefore, agent spread does not mean that an agent is present in all parts of the circle.

Results and Discussion

Ten years after release in Alberta, the seed weevil had spread about 15 km from the release point (Figure 3 and 4). The spread of the seed weevil from the release point during the first five years was slow when compared to the spread of the agent after the fifth year. The equation that represented the spread for years 1 to 5 was a second level polynomial whereas the spread of the seed weevil was linear for years 5 to 10. The reason for difference in the spread of the seed weevil before and after the fifth year is unknown. On the fourth year after a gall midge release, the biological control agent had spread 10 km. The spread of the gall midge fit was a second level polynomial equation (Figure 5).

Seed weevil and gall midge release sites are distributed across Saskatchewan in association with the occurrence of scentless chamomile (Figure 1 and 2).

The gall midge is spreading over the Saskatchewan landscape more quickly than the seed weevil.

The practice of allowing landowners, Extension Agrologists or Weed Inspectors to select release sites tends to congregate biological control agents in certain areas within the province (Figure 6). To ensure that the seed weevil and gall midge spread across the province, Extension Agrologists and Weed Inspectors should try to have one release site of each agent in a rural municipality that has scentless chamomile. Then Extension Agrologists and Weed Inspectors should put additional release sites in those rural municipalities that have the weed occupying many miles of road rights-of-ways. Up-to-date information on which rural municipalities have releases is available in the most recent edition of the Scentless Chamomile Biocontrol Agent Information Guide. Each spring the Scentless Chamomile Biocontrol Agent Information Guide is e-mailed to all Extension Agrologists in Saskatchewan.

Conclusions

The seed weevil spread slower during the first five years after release than during the next five years.

After release, the seed weevil can spread up to 15 km in 10 years.

After release, the gall midge can spread up to 10 km in 4 years.

The spread of the gall midge is faster than the spread of the seed weevil.

To ensure that the seed weevil and gall midge spread across the province, Extension Agrologists or Weed Inspectors should try to have one release site of each agent in a rural municipality that has scentless chamomile.

Acknowledgements

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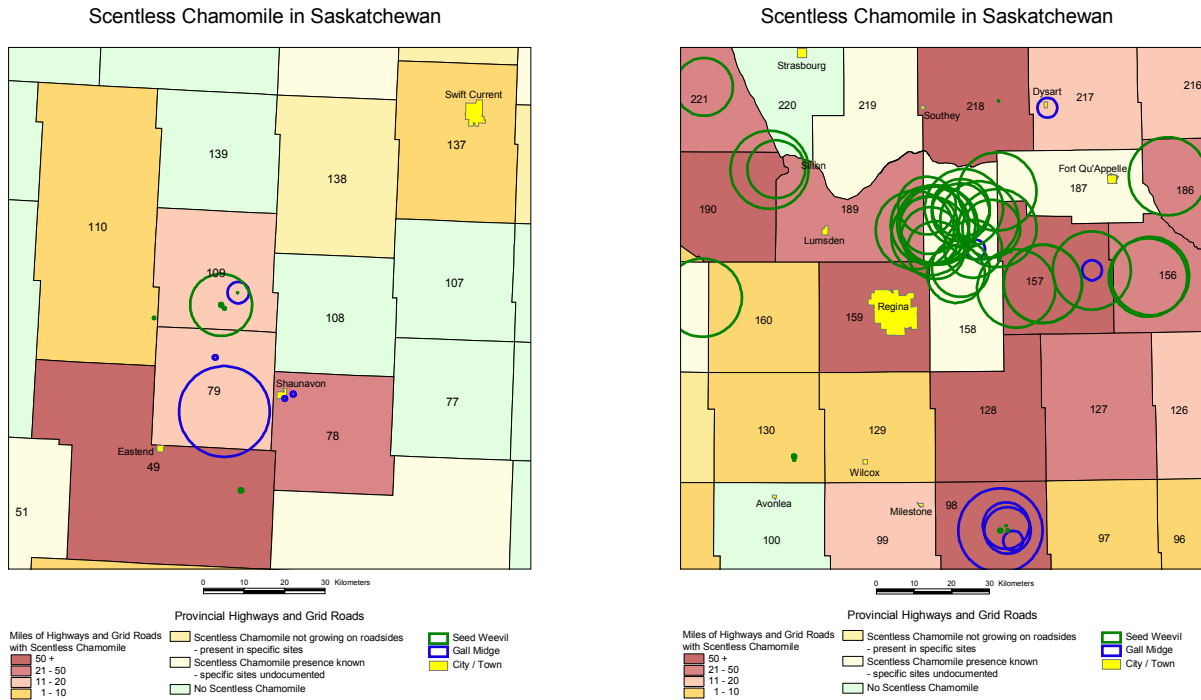


Figure 6. The distribution of the seed weevil and gall midge in the rural municipalities near Shaunavon and Regina, Saskatchewan