The Great Lakes Entomologist

Volume 23
Number 1 - Spring 1990 *Number 1 - Spring 1990*

Article 3

April 1990

Survival and Longevity of *Otiorhynchus Ligustici* (Coleoptera: Curculionidae) in Alfalfa Hay Bales in Eastern Ontario

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SURVIVAL AND LONGEVITY OF *OTIORHYNCHUS LIGUSTICI* (COLEOPTERA: CURCULIONIDAE) IN ALFALFA HAY BALES IN EASTERN ONTARIO

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ABSTRACT

The alfalfa snout beetle, *Otiorhynchus ligustici*, a pest of European origin, has recently spread into mainland Ontario. A two-year study showed that dispersing adults incorporated into bales of alfalfa during harvest can survive therein for up to 46 days of storage in a mow. Furthermore, they can remain fertile for most of this period. This has important implications with respect to the shipment of hay from infested areas.

In 1986, the alfalfa snout beetle, *Otiorhynchus ligustici* (L.), was discovered in large numbers in eastern Ontario (Loan et al. 1986). This was the first mainland record in Canada, although it had been found two decades earlier on Wolfe Island, at the junction of Lake Ontario and the St. Lawrence River (G.G. Gyrisco, pers. comm.). The new infestation is believed to be an extension of an historic infestation from Europe that is slowly spreading from northern New York. It is presently limited to alfalfa fields on 10 farms in the Prescott area (Harcourt and Guppy 1987).

The life history of the snout beetle in Ontario has been outlined by Guppy and Harcourt (1989). The life cycle requires two years and there are even- and odd-year broods, designated as Brood A and Brood B. Both broods are present in Ontario (Harcourt and Binns 1989). The flightless adults emerge from the soil in early spring and migrate in search of suitable host plants by walking from one field to another. They disperse during a 4–6 week period but their seasonal movement is limited to a few hundred yards (Neilson and Edmonds 1969). On the other hand, they may be transported for longer distances on farm machinery or in shipments of soil and plant material. Because all of the adults are parthenogenetic females, a single beetle accidently introduced into a non-infested area is capable of starting an infestation.

The new discovery has prompted questions regarding the need for a quarantine on the shipment of alfalfa hay from the infested area to other locations in Canada and the eastern United States. However, a decision on the imposition of such a quarantine is difficult to make in the absence of data on the incidence and survival of the adults in bales of hay. The present study was undertaken to obtain such data.

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MATERIALS AND METHODS

'Seeding' of the bales

The study was carried out in 1987 and 1988 at Robinson Farms, Maynard, Ontario, 3 km west of Prescott. To "seed" the bales, i.e. incorporate the beetles into the bales, they were fed by hand into the compression chamber of a tractor-pulled conventional baler (Hesston Model #4500) as it picked up windrowed alfalfa during the harvesting process. The bales were rectangular (35 × 40 × 90 cm), twine-tied, and weighed 18 to 22 kg. The 'seeded' bales were tagged and immediately loaded on a hay wagon, hauled to a well ventilated barn and stored in the mow along with a supply of 'unseeded' bales to serve as checks. In 1988, the 'seeded' bales were loosely wrapped in plastic window screening (16 × 16 mesh) to contain any beetles that attempted to crawl out.

'Seeding' rates were 10 adults per bale in 1987, and 30 per bale in 1988; 21 and 22 bales were 'seeded' in the two years, on June 19 and June 24, respectively.

To facilitate detection of the beetles, their elytra were painted dark red, using automotive touch-up paint (General Motors of Canada, B1 Red #81). The painting was done a day or two prior to 'seeding'. Each year, 20 marked specimens were placed in a quarantine laboratory and kept under observation for the duration of the study.

Recovery from the bales

In 1987, the 'seeded' bales were removed from the mow and examined for beetle content on six occasions: 3 days postharvest, and weekly thereafter for 5 weeks. Three to six bales were sampled on each date. These were opened on the surface of a canvas sheet, apportioned between three or four observers, and carefully hand sorted to recover dead and living specimens. Those living were returned to the laboratory and fed on fresh alfalfa sprigs. A total of 110 'unseeded' bales was examined 9 to 18 days postharvest.

In 1988, the 'seeded' bales were sampled on nine occasions: immediately after harvest, 4 days postharvest, and weekly thereafter for 7 weeks. On each occasion, two or three bales were examined and living specimens were again returned to the laboratory for rearing. Four check bales were examined 11 days postharvest.

Longevity and fecundity of the adults was recorded in the laboratory at 25 °C.

RESULTS AND DISCUSSION

Painting of the beetles did not appear to affect longevity and oviposition. Marked specimens reared in the laboratory lived for an average of 47 days and laid a total of 261 eggs per beetle (range 93–360), compared to 50 days and 310 eggs per beetle (range 40–1180) in a laboratory colony maintained by J. C. Guppy (personal communication).

Roughly half of the 'seeded' adults, 48% and 47% respectively, were recovered from the bales in 1987 and 1988 (Table 1). An additional 3% were captured in the screening used to wrap the bales in 1988. The remainder were lost in the seeding procedure or not detected during the examination of the bales. Those recovered were widely distributed throughout the bale.

There were year-to-year differences in beetle longevity (Table 1). In 1987, living adults were recovered from the bales for up to 10 days from 'seeding'. However, none of them deposited eggs. By contrast, in 1988, living adults were recovered from the bales for up to 46 days from 'seeding'. Moreover, those recovered during June and July laid an average of 89 eggs. Those recovered after 31 days of baling did not deposit eggs.

The higher mortality rate in 1987 may be partially attributed to a variable degree of molding near the center of the bales. In an attempt to comply with the schedules

Table 1.—Incidence and longevity of *O. liqustici* adults in baled hay, Prescott, Ont.

Sample date	Days from baling	Bales examined	No. adults recovered alive	dead
		1987 (10 per bale)		
22 June	3	3	3	13
29 June	10	3	1	19
9 July	20	6	0	20
15 July	25	3	0	16
21 July	30	3	0	19
28 July	36	3	0	10
Totals		21	4	97
		1988 (30 per bale)		
24 June	0	2	31	6
28 June	4	2	18	4
5 July	11	3	28	21
12 July	18	3	14	30
19 July	25	3	21	30
25 July	31	3	5	26
3 Aug	40	2	0	29
9 Aug	46	2	2	27
18 Aug	55	2	0	19
Totals		22	119	192

of cooperating personnel, we infested and harvested the 21 'seeded' bales a day or two before the alfalfa was properly cured. The remainder of the crop in 1987, including the 'unseeded' bales, and the entire crop in 1988, was fully cured prior to baling.

In the two years, a combined total of 6 unmarked beetles was found in the 'seeded' and 'unseeded' bales. Although the number was low, this showed that the harvesting process can result in uptake of the pest and its incorporation into bales of hay.

The present study demonstrates that *O. ligustici* adults can infest, survive and retain their fertility in bales of alfalfa. Based on our data, it is apparent that such bales should not be shipped from infested farms for a period of at least 6 weeks following harvest. A waiting period of two months would be preferable.

ACKNOWLEDGMENTS

The authors wish to thank G. Quesnel of the Plant Industry Branch, Ontario Ministry of Agriculture and Food, Kemptville, C. Slight of the Plant Health Division, Agriculture Canada, Ottawa, and L. Cass, J. Walker and V. Margetts of the Plant Research Center, for their assistance in this study.

This article is contribution No. 1224 of the Plant Research Center.

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