

REPRODUCTION OF LEAFCUTTING BEES FORAGING ON ALFALFA,
CLOVERS AND CANOLA¹

By

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The leafcutting bee is the recommended pollinator for alfalfa (*Medicago spp.*). However, studies in the Peace River region have shown that this bee can effectively pollinate clovers (*Trifolium spp.* and *Melilotus spp.*), birdsfoot trefoil (*Lotus spp.*), sainfoin (*Onobrychis viciifolia*) vetches (*Coronilla varia L.*, and *Astragalus L.*) and canola (*Brassica spp.*).

In addition to cross pollination and the consequent benefit of increased seed yields, bee increase as measured by the ratio of cells introduced at the beginning of the growing season to that obtained at the end, should be equal to or greater than unity to ensure survival. This aspect is investigated in the present study for alfalfa, alsike clover, red clover and canola.

Large fields of alsike clover, red clover and canola (minimum 40 ha) that were isolated from different crop kinds were required to determine bee cell increases, without the confounding effects of bee loss, to competing bloom and shelter position bias by topography. For each of the above cases, an alfalfa field was selected in the same vicinity as the candidate crop. Differences attributable to location were accepted as unavoidable factors.

Culture and management of leafcutting bees were identical to those used by Fairey et al. (1988). For each shelter, 20 000 bee cells with the natural male-to-female ratio of 2:1 were introduced into each field when about 10% of the crop was in bloom. The bees came from a population maintained since 1966 at the Agriculture Canada, Research Station, Beaverlodge, Alberta.

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The ratio of cell increase and the proportions of viable, male and female cells (VIAB) in each shelter were determined from 100 g (W100) subsamples as described by Fairey et al., (1988).

Viabale and female cell production

There were no significant differences between the yields of viable cells, or the number of females for bees foraging on each candidate crop as compared to that obtained with alfalfa (Table 1). A large proportion of the cells produced were viable, usually, in excess of 90%, irrespective of crop. About 30% of these cells were female.

Table 1. Percent viable and female cells (approximate standard error in parentheses) expressed as a proportion of the total weight of cells from each shelter.

Year	Viable		Female	
	Alfalfa	Red clover	Alfalfa	Red clover
1	97 (0.6)	97 (0.7)	34 (1.7)	33 (1.7)
2	94 (0.9)	97 (0.6)	34 (1.7)	37 (1.7)
3	98 (0.5)	98 (0.5)	28 (1.6)	31 (1.7)
4	96 (0.7)	95 (0.8)	26 (1.6)	33 (1.7)
5	97 (0.6)	97 (0.7)	34 (1.7)	29 (1.6)
	Alfalfa	Alsike clover	Alfalfa	Alsike clover
1	97 (0.5)	96 (0.8)	26 (1.3)	29 (2.1)
2	97 (0.7)	95 (0.8)	33 (1.9)	31 (1.9)
3	94 (1.2)	93 (0.8)	31 (2.3)	35 (1.5)
	Alfalfa	Canola	Alfalfa	Canola
1	93 (1.1)	93 (1.1)	33 (1.5)	37 (1.6)

Ratio of bee cell increase

For all candidate crops there was no significant difference between the ratio of cell increase for alfalfa and the candidate crop (Table 2). This ratio varied from 1.5 to 3.2 and was affected by year.

Table 2. Ratio of cell increase (approximate standard error in parentheses)

Year	Alfalfa	Redclover
1	2.39 (0.216)	1.50 (0.178)
2	2.70 (0.106)	1.69 (0.149)
3	2.16 (0.106)	2.23 (0.160)
4	2.66 (0.104)	2.59 (0.082)
5	3.24 (0.088)	2.12 (0.080)

	Alfalfa	Alsike clover
1	2.61 (0.101)	2.65 (0.150)
2	3.18 (0.136)	2.28 (0.136)
3	2.44 (0.163)	2.48 (0.101)

	Alfalfa	Canola
1	2.38 (0.90)	2.16 (0.079)

On all crops in the present study, the ratio of cell increase was greater than unity and there was a net gain on all crops. The proportion of viable cells of over 90% that was obtained with all candidate crops and the 2:1 ratio of males to females compares favourably with that reported for alfalfa (Fairey et al., 1988; 1989). However to be a successful pollinator of crops other than alfalfa, in addition to bee cell increase, seed yields should be equal to or better than the average yields obtained with other pollinators. Pollen and nectar collection by this insect was examined in the crops in the present study. Evidence to date suggests that cross pollination occurs and seed set is increased in all these crops. However, in the case of canola, cross pollination by bees is not obligatory for seed production (Mohr et al., 1988). Canola was used as a candidate crop because of interest in using the extensive hectareage in the region for bee increase.

References

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