**EFFECT OF A RYEGRASS DIET SUPPLEMENTED
WITH POLLEN ON *LISTRONOTUS BONARIENSIS*
(KUSCHEL) (COLEOPTERA: CURCULIONIDAE)
FECUNDITY, FEEDING, AND SURVIVAL**

A.A. EVANS and B.I.P. BARRATT

AgResearch, Invermay Agricultural Centre, Private Bag 50034, Mosgiel

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Previous laboratory observations with caged *Listronotus bonariensis* (Kuschel) (Argentine stem weevil) and dissection of field collected weevils (G.M. Barker, pers. comm.) have suggested that pollen may be an important component of their natural diet. For most insects, proteins are essential for juvenile growth and subsequent optimal egg production (Wigglesworth 1974). The purpose of this experiment was to determine in the laboratory whether pollen provided in addition to ryegrass (*Lolium perenne* L.) resulted in any change to adult survival or fecundity, to determine whether there was any quantitative change in feeding on ryegrass in the presence of pollen, and to determine if the provision of pollen contributed to the optimisation of laboratory conditions for *L. bonariensis* rearing and experimentation.

Twenty adult weevils, field collected in March 1994, were placed in each of four cages 160 x 180 x 75 mm deep fitted with a fine gauze lid. The experiment was conducted in a climate controlled room at $20 \pm 2^\circ\text{C}$, 40-52% humidity and with a 16:8 L:D photoperiod. Grasslands Manawa ryegrass (*Lolium (perenne x multiflorum) x perenne* L.) was grown in commercial seed raising mix in cell trays (27 x 27 x 45 mm deep) with 6-10 seeds per cell. Seed was sown weekly to provide a continuous supply of plants which were provided as food when about 100 mm high (about 2 weeks old). The plants were removed from the cells, intact in the potting mix, and the roots were placed in a 100 x 75 mm plastic bag which was secured firmly at the base of the plants using a plastic cable clip to prevent weevil entry into the bags. One bag of grass was placed in each cage and replaced with fresh plants every 3-4 days. Water was supplied in saturated cotton dental wicks, which were re-soaked as necessary. In two of the four cages, approximately 0.3 g (dry weight) of pollen collected from a pollen trap in a honey bee (*Apis mellifera*) hive was also provided. The pollen was a mixture from undetermined plant species and was replaced approximately every 4 weeks.

At each food change, weevil survival was recorded and dead weevils removed and dissected to determine their sex. Eggs inserted in the ryegrass tillers removed from the cages were counted at this stage by searching the individual tillers under a microscope. At approximately two weekly intervals, ryegrass feeding intensity was assessed by providing fresh ryegrass and measuring the area of feeding scars resulting over a 24 hour period using a microscope micrometer.

The experiment ran for 282 days, by which time surviving weevil numbers had declined to approximately 10% of the original number. Weevil survival between treatments did not differ at any stage of the investigation and remained above 50% until approximately day 200, when mortality in both treatments increased sharply.

Oviposition rates were similar in both treatments until about day 40, after which, in the absence of pollen, egg production per female slowed down. The ovipositional rate of females provided with pollen was maintained (Fig. 1).

Over the course of the experiment the amount of ryegrass consumed by weevils provided with pollen was approximately 45% lower than for those provided with ryegrass alone. Weevils fed on ryegrass consumed in 24 hours a mean of $7.38 (\pm 0.74) \text{ mm}^2$ while those fed pollen consumed $4.08 (\pm 0.42) \text{ mm}^2$ of ryegrass.

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FIGURE 1: Cumulative number of eggs per female produced by *Listronotus bonariensis* provided with ryegrass, or ryegrass plus pollen.

These results have important implications for laboratory based studies of *L. bonariensis* populations. While populations fed on grasses alone may survive, oviposition and possibly other nutritionally based physiological processes may not be optimal. Also, the nutritional requirements of *L. bonariensis* populations parasitised by *Microctonus hyperodae* and *M. aethiopoides* maintained in the laboratory may not be ideal with ryegrass alone. Thompson (1983, 1986) demonstrated that while feeding activity decreased in parasitised *Trichoplusia ni* (Hubner), the level of assimilation increased, and that a higher level of carbohydrates in the host diet significantly enhanced availability of blood sugar to the parasitoid. If ryegrass alone does not meet the needs of a host and parasitoid, the vigour and survival of both may be reduced, and therefore less accurately reflect the natural situation.

Dissection of field collected *L. bonariensis* indicates that females could potentially lay eggs for up to 7 months during spring-autumn (unpublished data). The results from this investigation suggest that while weevil survival is not increased, consumption of pollen or other protein rich food sources may be required to maintain maximum ovipositional effort over this period in the field. This experiment may not accurately reflect field conditions however, due to possible caging effects reducing total egg production (Goldson 1981).

The results of this investigation suggest that adult *L. bonariensis* require food sources other than ryegrass to maintain or maximise reproductive output, but these supplementary food sources do not necessarily enhance survival.

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