Potential of the Parasitic Wasp, *Lariophagus distinguendus* (Förster) (Hymenoptera: Pteromalidae) as a Biological Control Agent for *Sitophilus zeamais* Motschulsky (Coleoptera: Curculionidae) in Stored Maize

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Introduction

Maize constitutes an important cereal cultivated in the world, being used as staple food for people especially in Africa. Maize weevils, *Sitophilus zeamais*, are major pests of stored grains in the tropics. The use of parasitoids in biological pest control is already common in different agricultural and horticultural fields. At present, grain managers are looking for alternatives to conventional chemical insecticides such as predators, parasitoids, microbes and natural products which are gaining interest among researchers concerned with developing integrated pest management (IPM) approaches for insect control. *Lariophagus distinguendus* (Förster) is a synovigenic, solitary larval and pupal ectoparasitoid of several beetle species that infest stored goods. This study investigated the potential of using this parasitoid for the biological control of *S. zeamais* in stored maize.

Lariophagus distinguendus ***Sitophilus zeamais***

Materials and Methods

All insect cultures were kept at 65±5% relative humidity, a constant temperature of 25°C and a photoperiod of 16h: 8h (L: D). Infested and uninfested maize grains were used for this experiment in a climatic chamber at 25°C and 65%rh. A cylinder from glass and two from plastic (Perspex) (l = 100 cm, Ø= 20 cm) were used for penetration experiments. The maize grain moisture content at the beginning and end of the experiment was determined (12.5%). Holes of 3 mm diameter were drilled through PVC pipes of 20.5 cm length and 20 mm diameter. The pipes were inserted into the holes in the cylinders. Special glue was used to fix the pipes tightly. An acoustic detector served to identify the maize kernels that contained 3 weeks old larvae of *S. zeamais* by their feeding noise. Selected 17 maize kernels each were placed in wire mesh cages with (l = 8 cm, Ø= 2 mm; openings, closed with stopcock). Two of them were introduced in each of the pipes that was subsequently sealed at both ends. Uninfested maize kernels were filled into the cylinder to depths of 20 cm, 25 cm, 30c m, 35 cm, 40 cm, 45 cm, 95 cm and 100 cm, respectively. On layers of 20 cm, 25 cm and 30 cm, **25 adult *L. distinguendus*** - aged between 0-14 days - were released; On layers of 35 cm, 40 m and 45 cm, respectively, **30 adult *L. distinguendus*** were released while on 95 cm and 100 cm thick layers, **100 adult *L. distinguendus*** of the same age were released, each on top of the maize layer. Each treatment was repeated three times with control samples without parasitoids. The experiments lasted 6 weeks. *L. distinguendus* adults that entered the pipe and the wire mesh cage to parasitise the *S. zeamais* infested maize kernel were collected and placed in a 250 ml glass jar. The emergence of *S. zeamais* was recorded in both *L. distinguendus* treated and untreated samples after every week until the 6th week.

Acknowledgement: The Schweisfurth Foundation supported this research

Results and discussion

L. distinguendus penetrated and infested *S. zeamais* stored in the cylinders at the various depths. Faecal volatiles of the host *S. zeamais* are known to attract *L. distinguendus* females. The results showed that *L. distinguendus* was able to find its host in a cylinder with infested maize kernels and produced F_1 offspring (Figs. 1, 2 and 3). *L. distinguendus* also significantly reduced the emergence of *S. zeamais* in stored maize (Fig. 4).

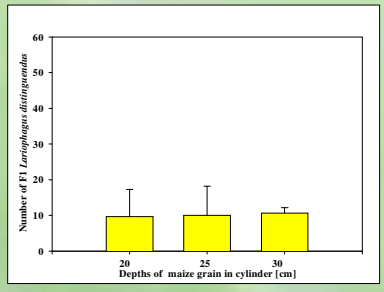

Fig. 1. Mean numbers and SD of F_1 *L. distinguendus* when 25 *L. distinguendus* adults aged 0-14 days were released, n=3

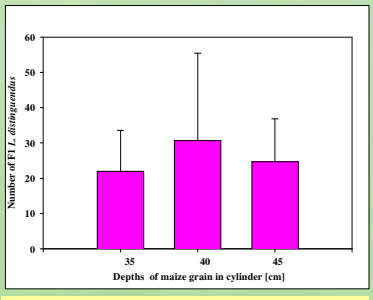

Fig. 2. Mean emerging numbers and SD of F_1 *L. distinguendus* when 30 *L. distinguendus* adults aged 0-14 days old were released, n=3

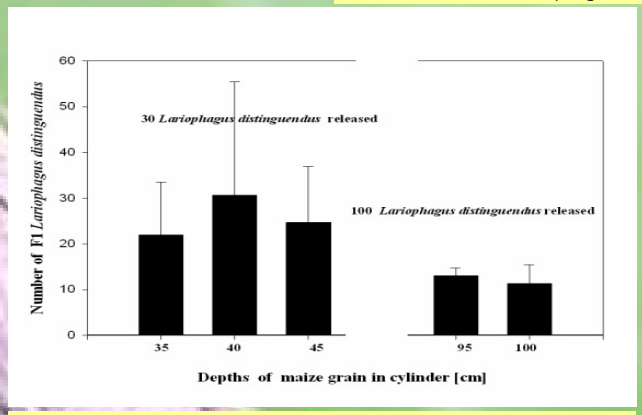

Fig. 3. Mean emerging numbers and SD of F_1 *L. distinguendus* when 30 *L. distinguendus* adults aged 0-14 days were released, n=3

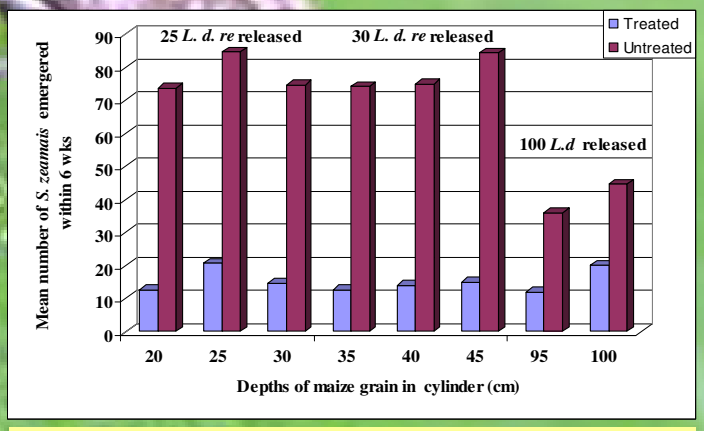

Fig. 4. Mean number of emerged *S. zeamais* when known numbers of *L. distinguendus* were released at different grain depths

Conclusion

- ***L. distinguendus* significantly suppressed the reproduction of *S. zeamais*. It can therefore be concluded that the use of *L. distinguendus* is appropriate to significantly reduce progeny production of *S. zeamais* by direct killing of immature stages of the weevil and thereby preventing the multiplication and development of next generations!**