Parasitoids of the fall armyworm in Malawi

What are parasitoids and why are they important?

The fall armyworm Spodoptera frugiperda causes massive losses to maize farmers across Africa. However, ecologically friendly integrated pest management (IPM) strategies are being developed to combat this pest, including the use of parasitoids as natural enemies.

- A parasitoid is an organism, usually an insect such as a wasp or fly, that lives in or on a host and ultimately kills it.
- The female parasitoids lay their eggs inside or on the egg or the larva of a host pest.
- The developing larvae of the parasitoids consume the host's tissues, eventually killing it before emerging as adults.
- Parasitoids are highly specialized and important in natural ecosystems.
- They serve as key agents in biological pest control, helping regulate populations of harmful insects effectively.
- After they have been successfully identified, parasitoids endemic to a particular country can be mass-reared and mass-released in augmentative biological control programs.

The quest for endemic parasitoids of the fall armyworm in Malawi

During July-August 2023, scientists from the International Centre of Insect Physiology and Ecology (*icipe*) and Total LandCare (TLC) embarked on a survey across maize farms in Salima and Mzimba districts to catalogue parasitoids naturally associated with the fall armyworm and document their parasitism ratios.

Through a random sampling technique, egg masses, larvae and pupae of the fall armyworm were collected and reared in the laboratory until parasitoid emergence. Some parasitoid samples were also sequenced to confirm identity.

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Endemic parasitoids of the fall armyworm in Malawi

From the survey, seven parasitoid taxa were recovered from the fall armyworm in Malawi: the egg parasitoids *Telenomus remus* and *Trichogramma sp.;* the egg-larval parasitoid *Chelonus bifoveolatus;* and the larval parasitoids *Cotesia icipe, Charops cf.* diversipes, *Coccygidium luteum* and *Drino sp.*

All these parasitoids are wasps, with the exception of *Drino sp.,* a fly. All recovered parasitoids have previously been reported across Africa, including some in Malawi's neighboring countries of Tanzania, Uganda and Zambia.

Figure 1: *Telenomus remus*, recovered from parasitized fall armyworm egg masses in Salima District, Malawi.

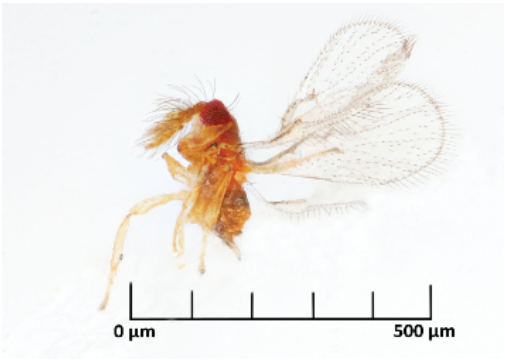


Figure 2: *Trichogramma sp.,* recovered from parasitized fall armyworm egg masses in Salima and Mzimba Districts, Malawi.

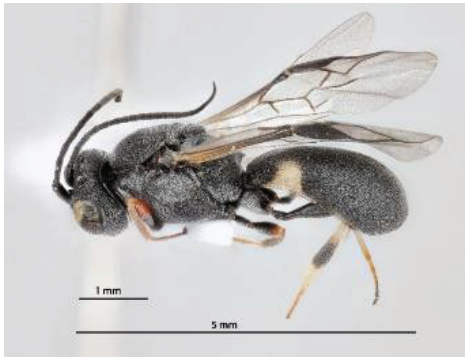


Figure 3: *Chelonus bifoveolatus*, recovered from parasitized fall armyworm egg masses and larvae in Salima District, Malawi

Figure 4: *Chelonus bifoveolatus,* recovered from parasitized fall armyworm larvae in Salima District, Malawi.

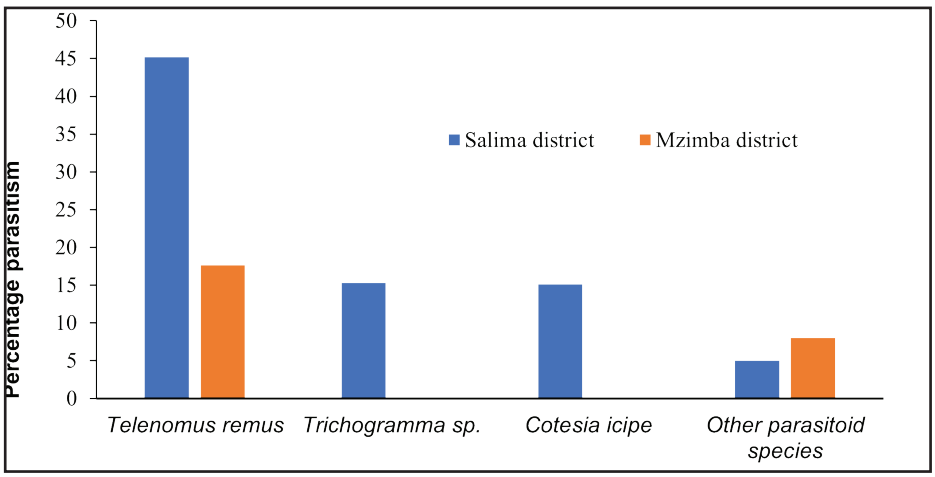
Figure 5: *Charops cf. diversipes,* recovered from parasitized fall armyworm larvae in Salima District, Malawi.

Figure 6: *Coccygidium luteum*, recovered from parasitized fall armyworm larvae in Salima District, Malawi.

Figure 7: *Drino sp.*, a parasitic fly recovered from parasitized fall armyworm larvae in Salima and Mzimba District, Malawi.

Natural parasitism ratios and opportunities for biological control in Malawi

Natural parasitism ratios ranged from 15.1% (for the larval parasitoid *Cotesia icipe*) to 45.2% (for the egg parasitoid *Telenomus remus*), as presented in the graph below. The highest parasitism ratios and parasitoid diversity was in Salima District.



Our survey demonstrated the presence of a natural diversity of several fall armyworm parasitoids. This knowledge paves the way for initiation of an augmentative biological control program in the country using some of these endemic parasitoids. Especially *Telenomus remus* and *C. icipe* are ideally suited for mass production, and these two parasitoids have formed the basis for augmentative control programs in Kenya, Uganda, Tanzania and Zambia.

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