

Two biological agents are damaging the invasive weed parthenium in the Amhara Region of Ethiopia

Large tracts of farmlands and pastures in the Amhara Regional State of Ethiopia are infested by the invasive weed parthenium (*Parthenium hysterophorus*). Parthenium reduces yields of major crops and replaces valuable pasture species, decreasing livestock productivity. Parthenium also makes many people sick, causing both skin and respiratory allergies, and displaces native plant species, damaging the region's biodiversity.

In order to combat this weed, a project led by Virginia State University and funded by USAID through the Integrated Pest Management Innovation Lab at Virginia Tech has released two bioagents, the leaf-feeding beetle (*Zygogramma bicolorata*) and stem-boring weevil (*Listronotus setosipennis*). On June 20, 2017, thousands of adult *Zygogramma* and hundreds of *Listronotus* were released at several parthenium-infested sites around the town of Finote Selam.

By mid-August 2017, the bioagents were thriving and damaging parthenium. The *Zygogramma* kills parthenium by defoliating its leaves while *Listronotus* inflicts damage to the weed from inside by burrowing its stem. And native vegetation is starting to make a comeback as parthenium is weakened.

Zygogramma has also moved from the release site to nearby parthenium-infested fields and started to feed on the weed. *Listronotus* also started to damage nearby parthenium plants once it finished damaging the ones it was released on. At the new sites, staff observed larva and newly emerged adults of *Zygogramma*, indicating that the bioagent is reproducing and new generations are in action against the invasive weed.

The effect of *Zygogramma* on parthenium seen at Finote Selam (altitude 6000 ft) are similar to what was observed in Wollenchiti (altitude 4700 ft) after the release of this bioagent in 2016. In Wollenchiti, *Zygogramma* fed on parthenium on the spot it was released near a railway track and then moved to nearby bean and teff fields that were infested by the weed. *Zygogramma* defoliated parthenium without touching bean and teff, showing it only attacks the weed and it is safe to other plants. Biological control of parthenium using these two bioagents and others have been successful in reducing the damage caused by this weed in Australia and India.

However, this is just the beginning of the effort to manage parthenium using natural enemies in Amhara and other regions of Ethiopia where this weed is inflicting damage to food crops and livestock. It will require releasing large number of adults of the bioagents at multiple sites in different parts of the country over several years to reach the level of control achieved in Australia and India. It is unlikely that the bioagents will establish from one or two years of release because of predation by birds, ants, and other general feeders. Their numbers will also be negatively affected by extended dry season due to drought and other unfavorable weather conditions.

The time it takes for the bioagents to establish at a particular locality also affects how long the initial release spot remains undisturbed from ploughing and slashing of the parthenium. The bioagents need sites where they can remain undisturbed as adults in the soil during the dry season. They can only self-perpetuate from season to season if they can remain untouched in the soil, especially during the first few years immediately after release. This biocontrol program will require patience and effort over several years to be successful, but the potential for sustained control of parthenium in Ethiopia is very promising.