

FORTUITOUS INTRODUCTION OF *ZYGOGRAMMA BICOLORATA* PALLISTER INTO BANGLADESH

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ABSTRACT

The weed *Parthenium hysterophorus* L. was accidentally introduced to India in 1955 and from there it has spread to Bangladesh in 1988. A natural enemy of this weed, the leaf feeding beetle *Zygogramma bicolorata* Pallister was introduced to India in 1983 and it has fortuitously moved into Bangladesh. This communication reports on the first time finding of *Z. bicolorata* in Bangladesh on October 24, 2022.

Key words: *Parthenium hysterophorus*, *Zygogramma bicolorata*, biological control of a weed, leaf feeding beetle, fortuitous introduction, Bangladesh

The alien invasive weed parthenium *Parthenium hysterophorus* L. (Asteraceae) is of neotropical origin but has developed a pantropical distribution (Evans, 1997). It is now found in 92 countries around the globe, of which 44 are possibly in its native range (Shabbir et al., 2019a). Parthenium was introduced to India in 1955 (Rao, 1956), Nepal in 1967 (Mishra, 1991), Pakistan in the 1980s (Shabbir and Bajwa, 2006), Sri Lanka in 1987 and Bangladesh in 1988 (Pallewatta et al., 2003), and Bhutan in 1992 (Parker, 1992) (Fig. 1). It is one of the most damaging weed species present in natural systems and agroecosystems (Bajwa et al., 2016). It is an annual herb with a deep taproot system and it can grow up to two meters in height (McFadyen, 1992).



Fig. 1. Reported establishment of *P. hysterophorus* into South Asian countries

Management options include physical, cultural, chemical, and biological methods (Dhileepan and Strathie, 2009). Physical control involving slashing and pulling the weed can provide short-term relief but this type of control can cause health risks due to exposure to the weed. Management of parthenium with grass cover in Australia, and competitive replacement with *Senna uniflora* (Mill.) Irwin and Barneby, *Senna tora* (L.) Roxb. (Caesalpiniaceae) and *Tagetes erecta* L. (Asteraceae) in India have been reported (Shabbir et al., 2019b). Chemical control is expensive, as this weed grows in vacant lots, roadsides, parks, and recreation areas, and requires repeated applications. Classical biological control is one of the best options available for management of invasive species in general and parthenium in particular.

In Australia, biological control of parthenium was initiated in 1976 and since then 11 agents have been introduced for its management (Dhileepan et al., 2019). The leaf-feeding beetle *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae), a native of Mexico, was imported into Australia in 1980 and field released in 1981. By natural spread as well as deliberate spread by farmers, the beetle has established throughout Central, Southern, and Southeast Queensland (Dhileepan et al., 2019).

In India, biological control of parthenium was started in 1983, with the beetle being released in 1984 in Bangalore (Jayanth, 1987). The beetle has spread throughout the country (Viraktamath et al., 2004), and has fortuitously moved into neighboring countries. The

beetle was reported from the Punjab region in Pakistan in 2003 (Javaid and Shabbir, 2007). It has been collected, reared, and distributed to different parthenium-infested areas in the country (Rehman et al., 2017). The beetle was observed in 2009 for the first time in Hetauda at around 500 masl elevation of Nepal (Shrestha et al., 2010). It was then observed in other lowland areas of Nepal, such as Chitwan, Nawalparasi, Rupandehi in the same year. In 2010, the beetle was observed in Kathmandu at around 1200 masl. Its establishment was reported from Sri Lanka in 2019 (Pakeerathan, 2019) and Bhutan in 2020 (Dorji and Adkins, 2020) (Fig. 2).



Fig. 2. Reported establishment of *Z. bicolorata* into South Asian countries

On July 25, 2021, the USAID mission in Bangladesh awarded a cooperative agreement to Virginia Tech to manage current and emerging threats to agriculture in Bangladesh. Parthenium was identified as one of the weeds to be managed in the project. Current distribution of parthenium and the crops affected by it in Bangladesh have been documented (Karim and Ilias, 2022) (Fig. 3). Beginning in January 2022, the team has been conducting surveys in parthenium-infested areas along the roadsides and fields to detect possible migration of *Z. bicolorata* from India. The surveys were concentrated in the Khulna and Barisal divisions in the southwestern part of Bangladesh and failed to detect it. However, based on the report of establishment of *Z. bicolorata* at Malda district in West Bengal state of India (Dhileepan and Strathie, 2009) adjacent to Bholarhat upazila of Rajshahi division in Bangladesh, the authors conducted a survey on October 24, 2022 by examining parthenium along the roadsides and infested fields. At Chotto Jambaria village under Bholarhat upazila of Chapai

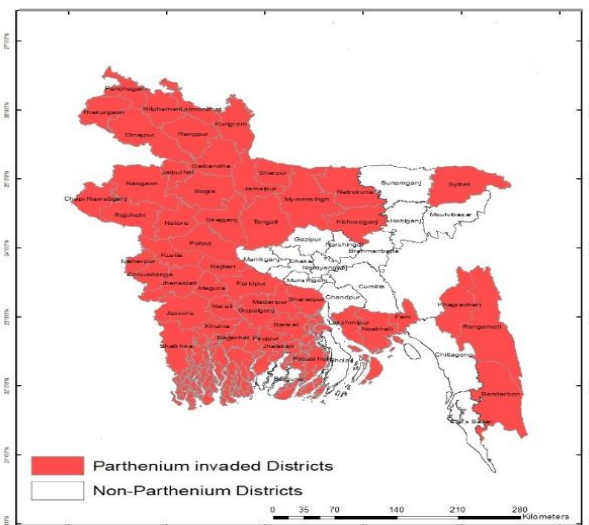


Fig. 3. Current distribution of *P. hysterophorus* in Bangladesh (Karim and Ilias, 2022)

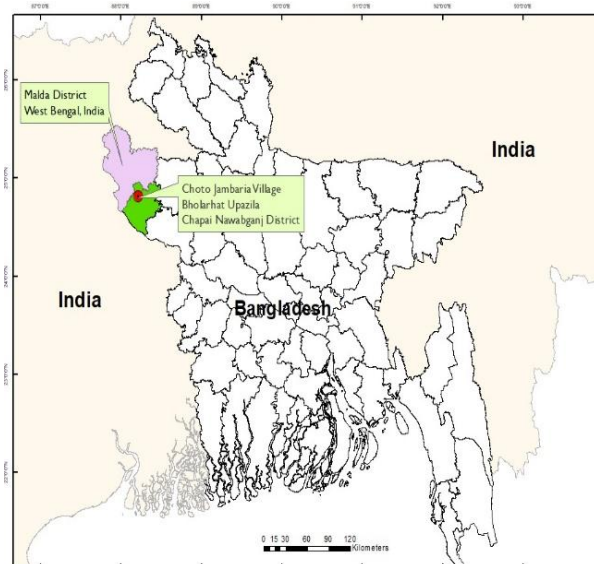


Fig. 4. Location of first finding of *Z. bicolorata* in Bangladesh

Nowabgonj district (24.8204471N, 88.2225504E), *Z. bicolorata* adults were observed on parthenium plants in a black gram *Vigna mungo* (Fabaceae) field. This is the first report of this natural enemy in Bangladesh and it is a fortuitous introduction (Fig. 4). Further surveys will be conducted in Bangladesh to delineate areas wherein *Z. bicolorata* has already established, conduct workshops to share knowledge with national stakeholders to develop an action plan, and rear and release this natural enemy in parthenium-infested areas throughout the country.

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AUTHORS CONTRIBUTION STATEMENT

RM conceived and MCD designed research. RM and MCD conducted field surveys. RM wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST/COMPETING INTERESTS

Authors declare there is no conflict or competing interests.

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