

BIOLOGICAL CONTROL OF *ACHYRANTHES ASPERA* AND *XANTHIUM STRUMARIUM* IN PAKISTAN

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Abstract

Achyranthes aspera L., and *Xanthium strumarium* L. are two troublesome weeds that generally grow on wastelands. A mealy bug species was found to be a biological control agent severely damaging these two weeds. Very heavy infestation of mealy bug was recorded on these two weeds during the months of October and November in an open undisturbed area in Quaid-e-Azam Campus, University of the Punjab, Lahore. Mealy bug was feeding on terminal and axillary buds, stem surface and inflorescence. The invaded plants first showed the symptoms of die back and ultimately dead. The mealy bug attack was not found on rice, maize and sorghum, the main crops in the season. Three wasteland weeds, however, viz., *Malvestrum tricuspidatum* A. Gray, *Sida spinosa* L., and *Parthenium hysterophorus* L., were found to be attacked by the mealy bug. Further study regarding the screening of other important crops against mealy bug attack is required before its use as a biological control agent against the studied weeds.

Introduction

Hearleaf cocklebur (*Xanthium strumarium* L.) is a weed, which is predominant in some countries in the world including Pakistan (Baloch *et al.*, 1968), India (Deshpande, 1982), Australia (Wapshere, 1974), Canada (Weaver & Lechowicz, 1983), America (Hilgendorf & Goeden, 1982) and Turkey (Kadioglu, 2004). It is a weed of wastelands as well as of agricultural crops. It is especially abundant in moist localities and causes damage on the crops like cotton, onion, sunflower and some vegetables, mostly during the summer (Kadioglu *et al.*, 1993; Kadioglu, 1997). Cutler & Cole (1983) reported that potassium carboxyatractyloside and hypoglycaemic isolated from the residues of this weed strongly inhibit the hypocotyl of wheat and cause a serious decaying and dwarfing in the corn seedlings. Recently Kadioglu (2004) found that this weed reduces the germination considerably in *Triticum vulgare* L., *Hordeum vulgare* L., *Lolium perenne* L. and *Avena sterilis* L.

Prickly chaff-flower weed (*Achyranthes aspera* L.) is a perennial herb of the family Amaranthaceae. The weed is also found in many other countries of Asia as well as Africa, America, Europe and Australia (Whistler, 1980; Orchard, 1994; Swarbrick, 1997; Florence, 2004; Lange *et al.*, 2004). It is a very common weed of waste places and roadsides in Pakistan. The weed bears spiny fruits, which provide a great hindrance in movement of both humans and animals.

The present study describes the potential of a mealy bug species in controlling the two wasteland weeds viz. *A. aspera* and *X. strumarium* under natural field conditions.

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Fig. 1. Mealy bug on fruits (A) and stem surface (B) of *Xanthium strumarium*.



Fig. 2. Mealy bug on *Achyrathes aspera*.

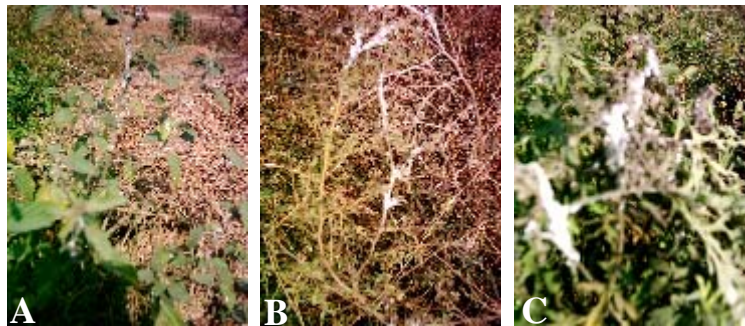


Fig. 3. Mealy bug on *Malvestrum tricuspidatum* (A), *Sida spinosa* (B) and *Parthenium hysterophorus* (C).

Materials and Methods

Surveys of Lahore and Sialkot districts were undertaken in 2005 in order to search for pests on two problematic weeds viz., *A. aspera* and *X. strumarium*, to be used as biological control agents. A mealy bug species was found feeding on the two target weeds in some undisturbed areas in University of the Punjab, Quaid-e-Azam Campus, Lahore, Pakistan. The invaded plants were checked periodically to study the effect of mealy bug feeding on the host weed species. Further field surveys were carried out to find if the mealy bug attacks on crops or any useful weed in the area.

Results and Discussion

Mealy bug was found feeding on upper portions of the stem forming a very dense white colony at the stem surface in this region. The mealy bug was also found feeding on fruits and apical and lateral buds, however, very few bugs were found feeding on the mature leaf surface (Fig. 1). The invaded plants initially showed symptoms of die-back and progressively the whole plant dry up to death. Insect associated with *X. strumarium* have also been studied earlier in India (Wilson, 1960) and Pakistan (Baloch *et al.*, 1968). However, neither area provided useful biocontrol agents. Baloch & Ghani (1969) suggested that using a combination of several insect species with different feeding habits would improve the chance of suppressing *Xanthium* populations. The present study reveals that this species alone has the potential to be used as a biocontrol agent against *X. strumarium*.

The feeding pattern of mealy bug on *A. aspera* was similar to that of *X. strumarium*. Mealy bug generally attacked on the upper portions of stem in nodal regions and at the leaf base. In severe cases the whole stem surface in upper portion was covered with the dense colony of larvae. The insect larvae also feed on the inflorescence. The invaded host plant initially showed the symptoms of die back and ultimately dried up to death (Fig. 2).

None of the major crop of autumn season in the area including rice, maize and sorghum was found to be attacked by the mealy bug. However, three wasteland weeds viz., *Malvestrum tricuspidatum* A. Gray, *Sida spinosa* L. and *Parthenium hysterophorus* L., were also found to be attacked and fed by the mealy bug (Fig. 3). The present study reveals that this mealy bug species has high potential to be used as biological control agent against certain uneconomic and troublesome weeds. However, since among the hosts of this mealy bug species are the weeds of the family Malvaceae and Asterceae, therefore, further studies regarding the screening of cotton and sunflower in the studied as well as other areas of the country should be undertaken before its recommendation as a biocontrol agent on a large scale.

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