



Natural incidence of agromyzid fly on broomrape

C. Kannan*, Aditi Pathak¹ and Sushilkumar

Directorate of Weed Science Research, Jabalpur, Madhya Pradesh 482 004

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Broomrapes (*Orobanche* spp.) are total root parasitic flowering plants that occur in many agriculturally important crops in India. The most important and common species found in India are *O. crenata*, *O. ramosa* and *O. aegyptiaca* on solanaceous vegetables, tomato, brinjal and potato and *O. cernua* on mustard and tobacco. During survey conducted by the authors in the Billua village (26°02'59,32"N; 78°17'00.03"E) of Gwalior district in Madhya Pradesh, India during January 2013, brinjal (*Solanum melongena*) with chili pepper (*Capsicum annum*) as inter crop, were found infested by *Orobanche crenata*. In the same field flowering stalks of some *O. crenata* were found in various stages of drying, while the host was still healthy and alive. Closer observation of the uprooted stalks revealed the bore holes and extensive tunnels with tiny brown pupae and small white maggots, feeding on the capsules, succulent stalk and tubercles. The field was then marked, number of infected *O. crenata* stalks counted (Table 1) and collected in polythene bags for detailed studies in the laboratory.

The insect species damaging *O. crenata* was identified as *Phytomyza* sp. based on their morphology. The insect specimens were sent to National Bureau of Agriculturally Important Insects, Bengaluru, India for identification and accordingly the insects were identified as *Phytomyza orobanchia* Kal. The DNA sequences of cytochrome c oxidase subunit-I (cox1) gene of the insects were submitted in the gene bank accession p. no. KC732453.1, p. 658 (Rakshit *et al.* 2013).

The samples were brought to the laboratory in DWSR, stored in incubator at 26±0.5 °C. Observations under stereo binocular microscope of the collected specimens revealed that the maggots are white in colour, without legs and did not have a head capsule. Internal skeleton was visible through the transparent body wall and there were no chewing mouthparts on the head region. The adults emerged out at

various periods depending upon the stage of the larvae or pupae. Proportion of emergence of adults was more from the soft and succulent flowering stalks (28/43) when compared to the hard tubercles (15/43). Per cent incidence of *P. orobanchia* in the infested field was 46% while the per cent incidence of the weed in the field was 27.5% (Table 1). Similar observations of variable emergence of adults from different parts of *Orobanche* was also reported by Abu-shall and Amany (2012). The adult flies are generally black in colour with yellow borders to the abdomen segments.

Attempts by the authors to collect the insects from the same fields during next year (2014) were not successful because of the cultivation of green chilies alone in the field. It has been observed that natural infestation of *Orobanche* spp. by *P. orobanchia* is usually not sufficient to cause significant reduction in the populations of *Orobanche* (Klein and Kroschel 2002). However, it is possible to collect the *Orobanche* stalks from areas where *P. orobanchia* occur naturally and the emerging adults can be released in the infested fields as biocontrol agent for management of *Orobanche* as on date there are no effective management strategies for *Orobanche* control (Parker 2012), hence the weed require complimentary integration of all available techniques and strategies for its management in different crops. Biological control is effective and is easy to combine with other control methods and it could be part of an integrated *Orobanche* man-

Table 1. Incidence of *P. orobanchia* in the infested field

Total number of brinjal plants	235
Average number of stalks/plant	4
Percent incidence of <i>Orobanche crenata</i>	27.5
Percent incidence of <i>P. orobanchia</i>	46
Larvae/pupae in spike	48%
Larvae/pupae in flowering stalk	38%
Larvae/pupae in tubercle	14%
Infested <i>O. crenata</i> plants incubated in the lab	25
Total no. of adults emerged	43
No. of adults emerged from the flowering stalks	28
No. of adults emerged from the tubercles	15

*Corresponding author: agrikannan@gmail.com

¹Department of Biosciences, Rani Durgavati University, Jabalpur, Madhya Pradesh 482 001

agement system. Thus in the case of *P. orobanchia*, there is a double advantage of hand weeding the stalks of *Orobanche* from infested fields and using them for rearing the flies and then releasing the adult flies in new areas (Klein and Kroschel 2002). Further since the *P. orobanchia* is capable of reducing the seed production of *Orobanche* (Linke *et al.* 1990), it can be effective in reducing the seed bank for the next cropping season. Compatible herbicides can be screened for use along with the release of these flies. *P. orobanchia* is suitable for both classical and inundative approaches of biocontrol. However their ecological requirements have to be thoroughly studied in order to use them more effectively.

Further it is essential to create awareness among the farmers about the dangers of unscrupulous spraying of insecticides that may destroy the natural incidence of these friendly insects.

SUMMARY

Natural incidence of the oligophagous fly *Phytomyza orobanchie* was observed on *Orobanche crenata* in brinjal (egg plant: *Solanum melongena*) in the farmers' field in Central India during a survey in January 2013. This natural incidence indicates that the bioagent is now established in India. The bioagent has been submitted to gene bank accession (No. KC732453.1, p. 658). It was concluded that if more

intensive surveys are conducted in the *Orobanche* infested areas, there may be chances for more areas to be identified and this insect may be used in the integrated management of *Orobanche*.

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