

from India on decaying cones of *Picea smithiana*². The present collection is a new record of the species from India. Some of the species of the genus are edible and Marasmic acid (an antibacterial substance) has been isolated from *S. conigenus* (Pers ex Fr) Karst. These aspects are being studied with the present material.

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1. Singer, R., *J. Cramer.*, 1975, 349.
2. Rawla, G. S., Arya, S. and Narayana, J., *Indian J. Mycol. Plant Pathol.*, 1984, 14, 247.

INTRODUCTION AND ESTABLISHMENT OF *ZYGOGRAMMA BICOLORATA* ON *PARTHENIUM HYSTEROPHORUS* AT BANGALORE, INDIA

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PARTHENIUM HYSTEROPHORUS L., native to Mexico and the adjacent USA¹, was first observed² in Pune in 1955 and has now spread throughout the country infesting about 5 million hectares of land³. Nearly one-third of the 122 km² city area of Bangalore is infested by *Parthenium*. In addition to encroaching into agricultural and pasture land, the weed constitutes a public health hazard⁴. In India a number of indigenous insects have successfully transferred to *Parthenium*⁵, but none of them cause appreciable damage to the weed.

Surveys in Mexico have resulted in the discovery of a large number of insects attacking *Parthenium*⁶. *Zygogramma bicolorata* Pallister (Coleoptera: Curculionidae), one of the insects identified in the above study, was imported from the Mexican sub-station of the Commonwealth Institute of Biological Control in April 1983. Host-specificity tests conducted under quarantine conditions confirmed the safety of this insect for field liberation in India⁷.

Field releases were carried out in the Sultanpalya area of Bangalore, where an undisturbed stretch of about 10 ha of a pure stand of *Parthenium* was located. A total of 6 releases, consisting 1410

laboratory reared adults, were made between 11th July and 18th August 1984. Releases were confined to an area of about 500 m² at the middle of the site and observations on establishment and dispersal were taken at monthly intervals.

Adults and larvae of *Z. bicolorata* feed on *Parthenium* leaves. The eggs are laid singly or in small groups up to 5, mostly on the undersurfaces of the leaves, and hatch in 4–5 days. The early stage larvae feed on the terminal and axillary buds and move on to the leaf blades as they grow. The full grown larvae entered the soil and pupated. The larval and pupal periods under laboratory conditions lasted 10–15 days and 8–10 days respectively at 28 ± 2°C. McFadyen and McClay⁸ reported that females are capable of laying up to 1786 eggs (mean 836.13).

Establishment of *Z. bicolorata* was observed at the release site in September 1984. By the middle of October the beetle population increased to 1.8 per plant (range 0–6) in the 500 m² release area. Eggs and larvae were also noticed on most of the plants and a slight dispersal to about 2 ha was also observed. However, by the second week of November the *Parthenium* plants started drying up followed by a reduction in the beetle population.

From December 1984 to August 1985 the insect could not be located in the field, although stray *Parthenium* plants were present. *Z. bicolorata* again made its appearance from the third week of September to the middle of November, 1985 after which it again disappeared. During its brief appearance the insect population, which was restricted to about 2 ha, did not exceed 0.01 adults per plant.

A perusal of the rainfall data for Bangalore city indicated that the field activity of *Z. bicolorata* coincided with periods of heavy rainfall. The insects were active during July, August, September and October 1984 when the corresponding rainfall figures were 146, 45, 243.6 and 144.8 mm. Between November 1984 and April 1985 when 0–20.7 mm of rains were recorded *Z. bicolorata* was not observed in the field. The beetle was inactive even during May to August 1985 with 67.8 to 81.4 mm of rainfall. Adults were once again observed in the field in September 1985 when the total rainfall was 139.8 mm. After being active during October and November with 70.9 and 97.3 mm of rainfall the insect disappeared in December 1985 when the rainfall was only 3 mm. However, continuous breeding of the insect was possible under laboratory conditions.

It is thus evident that *Z. bicolorata* undergoes

diapause within the soil during the dry months of the year and emerges with the onset of heavy rains. Further confirmation for this was obtained when emergence was noticed with the commencement of heavy rains in June 1986. *Z. bicolorata* is known to overwinter as adults in the soil in Mexico⁸. In Queensland, Australia where this insect has been introduced for control of *Parthenium* delayed rainfall has been reported to cause poor survival⁹. *Z. bicolorata* may therefore perform better in parts of India which receive well distributed heavy rainfall.

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1. McFadyen, R. E., *News Bull. Ent. Soc. Queensland*, 1981, 8, 89.
2. Rao, R. S., *J. Bombay Nat. Hist. Soc.*, 1956, 54, 218.
3. Gidwani, I., *Current*, 1975, Oct 25, 12, 13, 17.
4. Towers, G. H. N., Mitchell, J. C., Rodriguez, E., Bennett, F. D., Subba Rao, P. V., *J. Sci. Ind. Res.*, 1977, 36, 672.
5. Kumar, S., Jayaraj, S., Muthukrishnan, J. *Entomol. Res.*, 1979, 3, 32.
6. Bennett, F. D., *A preliminary survey of the insects and diseases attacking Parthenium hysterophorus (Compositae) in Mexico and the USA to evaluate the possibilities of its biological control in Australia* Mimeographed report, *Commonw. Inst. Biol. Control.*, 1976.
7. Jayanth, K. P., Nagarkatti, S. *Entomon.*, 1986, (In press).
8. McFadyen, R. E., McClay, A. R. *Proc. 6th Austr. Weeds Conf.*, 1981, 145.
9. McFadyen, R. E., *The biological control programme against Parthenium hysterophorus in Queensland*, Paper presented in VI. Int. Symp. Biol. Contr. Weeds, Vancouver, 1984.

A NATURAL VARIANT BEARING PODS ON THE ROOT-HYOCOTYL TRANSITIONAL ZONE IN GROUNDNUT

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THE cultivated groundnut (*Arachis hypogaea* L.) is a geocarpic annual herb characteristic of producing

Pods inside the soil. It is essentially a self-pollinated legume known to produce both open chasmogamic as well as unopened cleistogamic flowers. The chasmogamic flowers are borne on compressed spikes in the axil of the leaves of the main stem and branches in sub sp *fastigiata* and restricted only on the branches in sub sp *hypogaea*. The cleistogamic flowers common to both the sub sp are formed at the cotyledonary axil which are partly hidden in the soil surface and are capable of producing pods. After fertilization an intercalary meristem at the base of the ovary is activated and peg i.e. carpophore is produced which bears the fertilized ovule at its tip. The peg, strictly geotropic in nature, penetrates the soil up to 7 cm and then it becomes diageotropic and enlargement of the fruit occurs. Thus, the carpophore development is restricted to the nodes on the cotyledonary axil and above ground portion of the plant.

The normal plant does not bear carpophore from the underground parts. However, an atypical plant was noticed in an F₄ generation progeny of the cross



Figure 1. A natural variant in groundnut.