Figure 1. Orange fruits showing symptoms of *Phoma citri* infection.

organism over injured and uninjured fruits. Only injured and ripened fruits developed typical symptoms after 15 days. Reisolation from artificially infected fruits yielded pure culture of *Phoma citri*. (Culture deposited in the division of Mycology and Plant Pathology, Indian Agricultural Research Institute, New Delhi.)

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1. Bilgrami, K. S., Jamaluddin and Rizwi, M. A., *Fungi of India, Part II*, Today and Tomorrow's Printers and Publishers, New Delhi, 1981.
2. Granger, K. and Horne, A. S., *Ann. Bot.*, 1924, 38, 212.

OUTBREAK OF *ORGYIA POSTICA* WALKER (LYMANTRIIDAE: LEPIDOPTERA), A NEW PEST ON MANGO IN UTTAR PRADESH

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LARGE-SCALE defoliation of mango by *Orgyia postica* was noticed in orchards of Behat area in Saharanpur district (Uttar Pradesh) during June–July, 1987. Light infestation was also noticed in most of the orchards surveyed in Lucknow. Perusal of the literature revealed that this is the first record of the pest on mango from India. Host range, nature of damage, and some observations on the biology of the pest are reported here.

O. postica is a polyphagous pest attacking *Albizzia* spp., *Anogeissus latifolia, Callicarpa lanata, Erythrina lithosperma, Lagerstoemia flos-reginae, L. indica, Pithecolobium dulce, Ricinus communis, Shorea robusta, Tectona grandis, Ziziphus jujuba* and *Z. xylopyra* in India[1]. Sporadic outbreaks of this pest have been recorded on *Ricinus communis*[2]. Although a pest of broad-leaved species, it has been

Figures 1–4. *Orgyia postica* Walker. **1,** Damaged mango fruit and panicle; **2,** female moth; **3,** male moth; **4,** larva.

found defoliating pines and is considered a potential pest of tropical pines in India[3]. On mango it is recorded from the Philippines[4]. In addition, the authors observed the pest feeding on *Eugenia jambolana* and pear.

The young larvae feed on new flush, also nibbling the leaf and shoot buds and affecting growing points. The later stages feed on leaves and nibble new soft shoots. In case of severe attack, fruit stalks and fruits were also scraped (figure 1), resulting in drying up of affected tissues and rendering the fruits unmarketable.

The female moth, often with under-developed wings or wingless (figure 2), lays eggs in groups (number varied from 2 to 85 in the laboratory). Larval development takes 3–4 weeks. The full-grown larva is a light-brown hairy caterpillar about 3 to 3.5 cm in length with orange-red mouth and creamish-yellow and brown tufts of hairs (figure 4). Pupation takes place on the plant in a thin, papery cocoon covered with larval hairs. Freshly formed pupa appears creamish-white and changes to light brown. The female pupa is bigger. Pupal period is 7 to 10 days. Caterpillars were seen defoliating mango in Lucknow from April to August in 1987.

Larval parasite *Exorista* sp. (Diptera: Tachinidae) and pupal parasite *Brachymeria lasus* Walker (Hymenoptera: Chalcididae) were recorded on this pest from Lucknow.

In view of the severe damage the pest can cause, it may be considered as a potential pest in mango orchards of Uttar Pradesh and other regions of the country.

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1. Beeson, C. F. C., *Ecology and Control of Forest Insects of India and Adjacent Countries*, Vasant Press, Dehradun, 1941, p. 1007.
2. Nair, M. R. G. K., *Insects and Mites of Crops in India*, Indian Council of Agricultural Research, New Delhi, 1975, p. 404.
3. Singh, Pratap, Fasih, M. and Prasad, G., *Indian For.*, 1982, **108**, 93.
4 Tandon, P. L. and Verghese, A., *World List of Insects, Mites and Other Pests of Mango*, Tech. Doc. No. 5, IIHR, Bangalore, 1985, p. 22.

HARVESTING HIGH CELL DENSITIES FOR DEVELOPMENT OF *RHIZOBIUM* CELL CONCENTRATE

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A high number of viable rhizobia in inoculants is vitally important for successful use of the inoculants. Commercial inoculants, however, contain not more than 10^9 viable rhizobia per gram of wet carrier at manufacture[1]. Besides, their population declines rapidly with time, especially when inoculants are exposed to high temperature during storage and transportation, and render the inoculants ineffective. Most of the time it becomes difficult to maintain even the recommended minimum number of viable rhizobia in carrier during prolonged storage of inoculant. Stocks of cell concentrates of *Rhizobium* may overcome this problem to a great extent. They may be prepared well in advance to meet any unprecedented seasonal demand. Any type of (seed of soil) inoculants of required standard may be prepared from them just before use.

Frozen cell concentrates of *Rhizobium* strains have been used in the preparation of inoculants, particularly in North America[2]. These concentrates are easy to store and transport as they occupy approximately 300 times less space than carrier-based inoculants. They can easily be preserved either by freeze-drying or in 40% glycerol for prolonged periods[3]. In spite of many advantages, cell concentrates of *Rhizobium* are not very popular. The main reason for this is the low recovery of viable rhizobia from growth medium, which not only affects the efficiency but also the cost of production.

In this study, we assessed the potential of various growth substrates for harvesting high cell densities of *Rhizobium* from the growth medium.

Yeast extract mannitol (YEM) broth[4] was used as standard medium for comparison in all the growth experiments. However, in some experiments, mannitol, molasses, malt extract or jaggery was added (1 g) in place of 10 g per litre of mannitol. In experiments where a common source of carbon and nitrogen was used, yeast extract and malt extract were added separately (2, 6 and 10 g/l). Cultures of *Rhizobium leguminosarum* (P-3-86) and *Bradyrhizobium japonicum* (SB-16) were grown at 30±2°C for 72 h on a rotary shaker (120 rpm). The cells were recovered from the medium by centrifugation at