ings suggest that the release of parasites and application of NPV can be done in a compatible manner in the management of the pest. However, further field experiments should be carried out to confirm this.

Joint action of entomopathogenic viruses and parasitic arthropods may be advantageous due to transmission of pathogens by parasites; e.g. *Malacosoma disstria* (Hb.) NPV was transmitted by *Sarcophaga aldrichii* (Paker)[8], *L. dispar* NPV by *Apantelcs melanoscelus* (Ratz)[9], and *Pieris rapae* (L.) granulosis virus by *Apanteles glomeratus* (L.)[10]. Incidence of NPV was positively correlated with the incidence of parasitoids in the population of *L. dispar* indicating mutually advantageous joint action[11].

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1. Rabindra, R. J., Navarajan Paul, A. V., Vasantharaj David, B. and Subramanian, T. R., *Curr. Sci.*, 1975, **44**, 273.
2. Roberts, L. I. N., *N.Z. Entomol.*, 1979, **7**, 52.
3. Triggiani, O., *Entomologica*, 1969, **5**, 69.
4. Hamm, J. J., *J. Invertebr. Pathol.*, 1966, **8**, 125.
5. Hotchkin, P. G. and Kaya, H. K., *J. Invertebr. Pathol.*, 1983, **42**, 51.
6. Kaya, H. K. and Tanada, Y., *J. Invertebr. Pathol.*, 1973, **21**, 211.
7. Meshkova, U. L. and Gamayunova, S. G., *Lesovod. Agrolesomelior.*, 1981, **61**, 26.
8. Stairs, G. R., *Can. Entomol.*, 1966, **98**, 1100.
9. Raimo, B., *J.N.Y. Entomol. Soc.*, 1975, **83**, 246.
10. Kelsey, J. M., *Proc. 11th Int. Congr. Entomol., Vienna*, 1960, p. 789.
11. Reardon, R. C. and Podgwaite, J. D., *Entomophaga*, 1976, **21**, 333.

A NEW DISEASE ON PAPAYA FRUIT STALK

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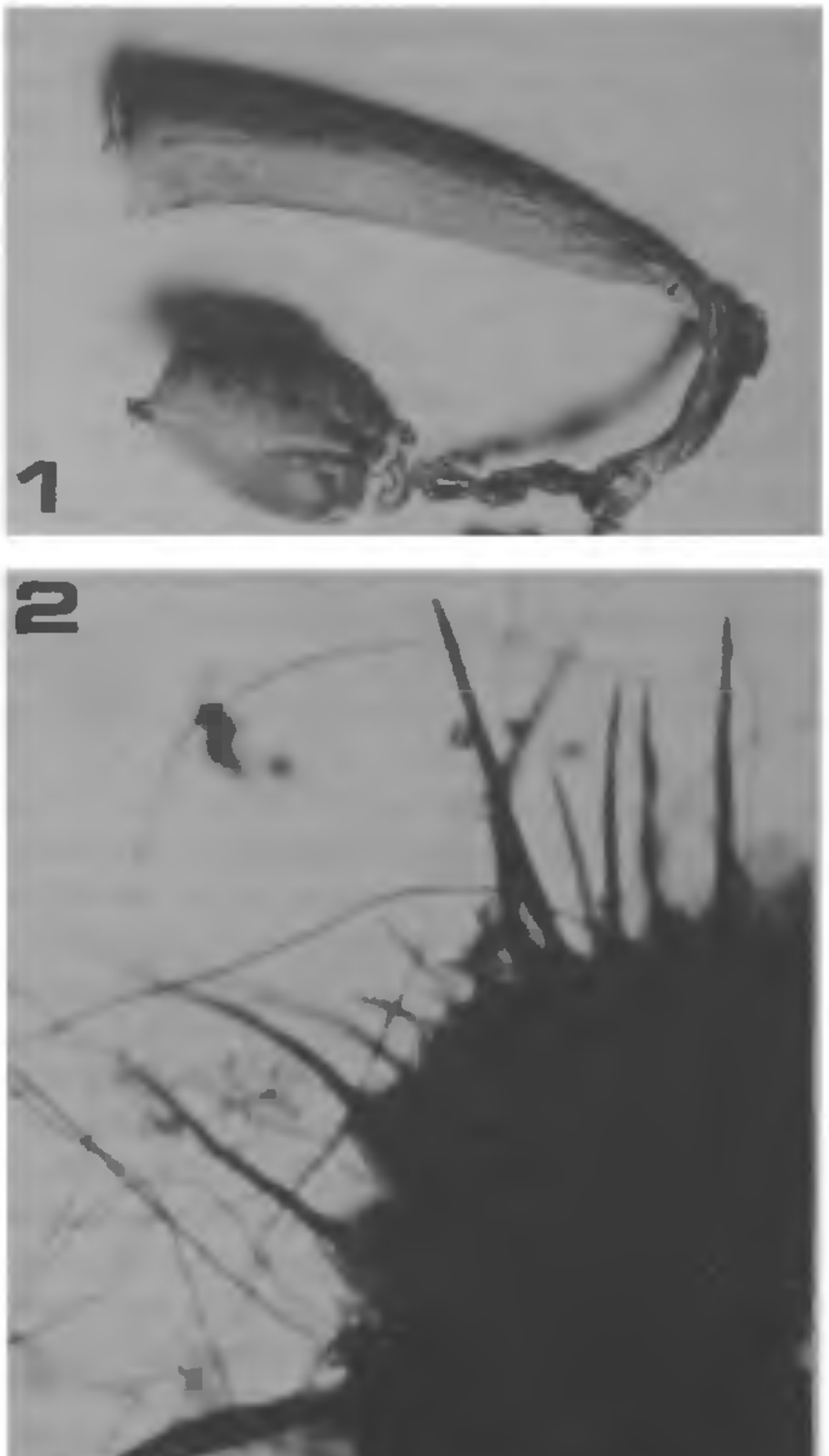
DURING March 1984, a severe disease incidence was observed on the stalk of the papaya (*Carica papaya* L.) fruit of Coorg Honey Dew variety at Burdwan, West Bengal. The infection was noticed on the proximal end of the stalk as blackish streaks which later spread backwards. The affected tissues shrivelled, dried and shreaded leading to dry-rot



Figures 1–3. 1. Infected fruit stalk of *Carica papaya* L. of Coorg Honey Dew variety showing the symptom; **2.** Acervulus of *Colletotrichum circinans* (Berk.) Vogl. showing the setae; **3.** Conidia of *Colletotrichum circinans* (Berk.) Vogl.

(figure 1). As the stalks were unable to hold the fruits at this condition, they were dropped on the

ground in premature condition when they were only 4–6 cm long and 2–3 cm in diameter. The extent of damage was evaluated which revealed that 40–60% fruits were dropped at a very early stage due to this disease resulting in 40–60% loss of yield.

The pathogen was isolated from the infected tissues on potato dextrose agar (PDA) medium. Colony on PDA was dark-brown. The pathogen was identified as *Colletotrichum circinans* (Berk.) Vogl. A brief description of this fungus is given below: acervuli showing abundant dark-coloured, pointed, septate, up to 120 μ long and 5–8 μ wide setae (figure 2); hyaline, one-celled, falcate, fusiform, thin-walled, guttulate, 19–21 × 3.5–3.7 μ conidia (figure 3) produced on short, unbranched, hyaline, thin-walled, 35.2–40.5 × 3–5 μ conidiophores.

Pathogenicity tests carried out with conidia from 10-days-old culture resulted in the development of typical symptom 12–18 days after inoculation. Reisolations from induced lesions established identity with the original isolate. The present note therefore makes an addition to the host index of *C. circinans*.

A survey of literature[1–3] reveals that the disease reported herein is a new record on papaya.

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1. Bilgrami, K. S., Jamaluddin and Rizwi, M. A., *Fungi of India*, Parts I and II, Today and Tomorrow's Printers & Publishers, New Delhi, 1979, 1981.
2. Fröhlich, G. and Rodewald, W., *Pests and diseases of tropical crops and their control*, Pergamon Press, Oxford, 1970.
3. Western, J. H., *Diseases of crop plants*, MacMillans, London and Basingstoke, 1971.

LEAF-SURFACE EFFECTS OF ENVIRONMENTAL POLLUTION ON *PUTRANJIVA ROXBURGHII*

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CONSIDERABLE information is available on the effects of pollution on plants under natural and controlled environmental conditions. Chamberlain[1] was one of the early workers to note the detrimental influence of air-pollution on conifers, particularly *Pinus banksiana*. Scheffer and Hedgcock[2] revealed the specific action of sulphur dioxide on leaves in the forests of north-western United States. Solberg and Adams[3] noticed the collapsed tissues of spongy mesophyll and epidermis as affected by sulphur dioxide and fluoride. Duggar *et al*[4] found that bean (*Phaseolus vulgaris*) plants were damaged by phytotoxins regardless of the closed and open condition of the stomata. Feder[5] claimed a decrease in floral productivity and branching in geranium subjected to oxidant-type pollutants. Although foliar traits have been employed in ecological work[6,7], only a few recent investigations[8–11] were devoted to a determination of the importance of leaf cuticular patterns as indicators of environmental pollution. The ever-increasing levels of atmospheric pollution have necessitated the development of a methodology to assess air quality easily and rapidly. The present study is aimed at understanding and identifying various plant species and their attributes as biomonitors of air-pollution. This communication deals with leaf-surface features in probing environmental pollution and ascertaining their potential as an index of pollution.

Putranjiva roxburghii Wall., a member of the family Euphorbiaceae, is a small tree of the Indo-Malayan region, being quite common in and around Calcutta. Fully grown leaves were collected in late winter (January 1987) from seven different areas

Table 1 *Distribution and environment of populations of P. roxburghii (no. of samples studied: 4 in each population)*

Population	Location	Relative pollution level	Source of pollution
A	BBD Bag	High	Automobiles
B	Esplanade	High	Automobiles
C	Dum Dum	High	Jet Airport, automobiles, domestic
D	Manicktala	Considerable	Automobiles, industry, domestic
E	Ballygunge	Marginal	Automobiles, domestic
F	Rashbehari Avenue	Marginal	Automobiles, domestic
G	Baruipur, 24 parganas	Minimal	Domestic