

chemicals have been used to control 'ich'^{1,2,6,7} there appears to be no published report about the use of acridine orange so far.

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A WHITEFLY TRANSMITTED YELLOW VEIN MOSAIC DISEASE OF *COSMOS SULPHUREUS* CAV.

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COSMOS SULPHUREUS Cav., a common winter annual ornamental suffers from a severe disease characterized by yellow vein mosaic on leaves (figure 1), general stunting of the infected plants and deterioration in quantity and quality of blooms. Disease incidence as observed in the year 1982 through 1984 ranged between 60 to 90 % at the gardens of NBRI, Lucknow. In this communication we report some of the biological and morphological characteristics of the virus associated with the disease.

Diseased plants of *Cosmos sulphureus* were brought

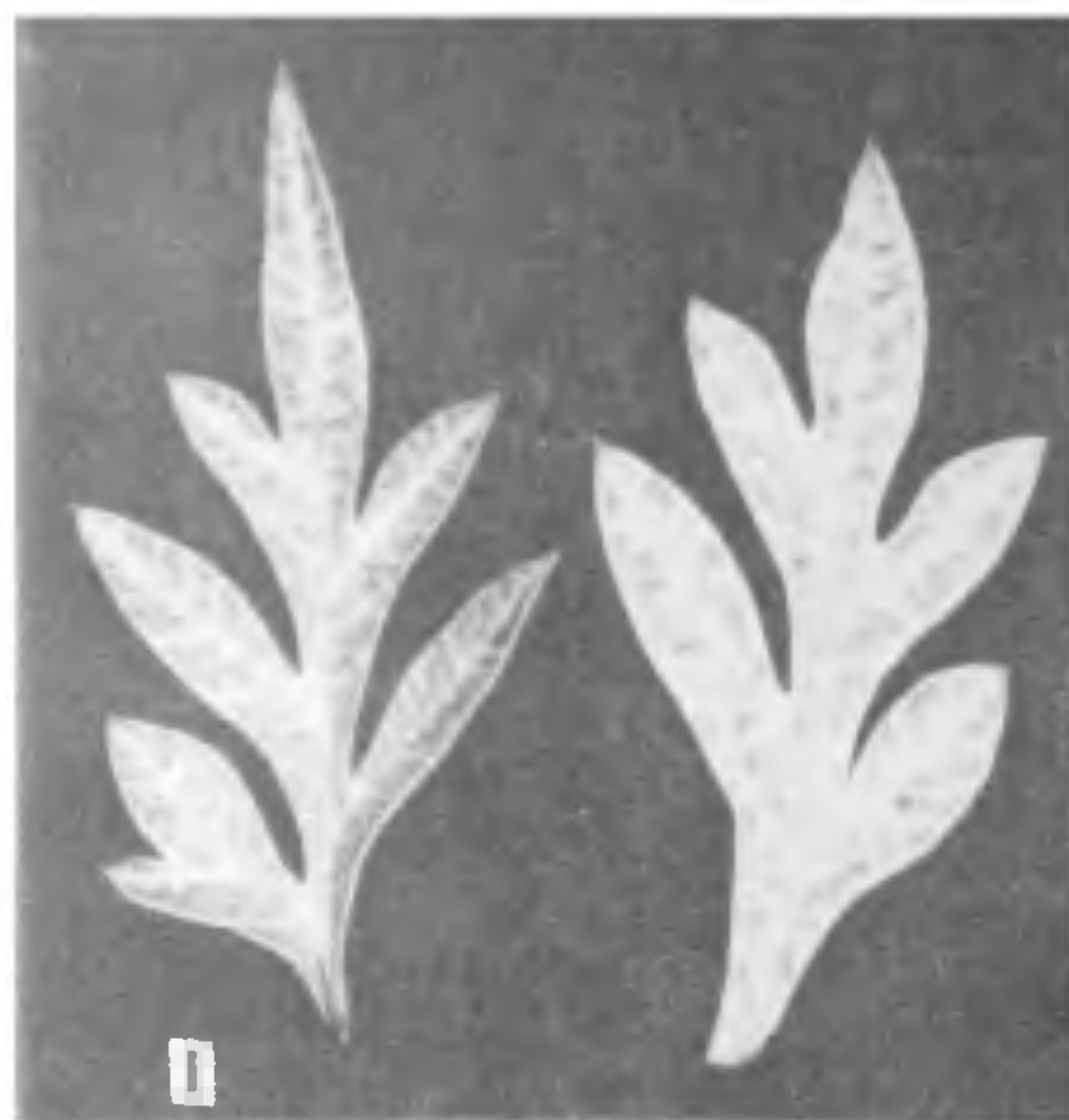


Figure 1. Leaves of *C. sulphureus* showing yellow vein symptoms.

to glass house for maintenance of culture. Sap transmission tests were done using inocula prepared in phosphate buffer (pH 7.0, 0.1 M) containing 0.01 M sodium diethyldithiocarbamate (DIECA), 0.01 M 2-mercaptoethanol, 0.5 % sodium sulphite and 0.1 % thioglycolic acid either singly or in different combinations. Aphid transmission tests were carried out employing virus-free colonies of *Myzus persicae* Sulz. and *Aphis craccivora* Koch. Young nymphs (2–3 days old) were starved for 3 hr and thereafter given an acquisition (2 min) and inoculation access (4 hr) on diseased leaves and healthy plants respectively. In another set, aphids were given an acquisition access of 6 hr followed by an inoculation access of 48 hr. Transmission tests using *Bemisia tabaci* Genn. were carried out as reported earlier^{1,2}. At least five test plants were used in each transmission test and each plant received 10 insects. *Cosmos sulphureus*, *Nicotiana glutinosa*, *N. tabacum* var. Samsun NN, *Datura stramonium*, *Chenopodium amaranticolor* and *Gomphrena globosa* were used as test hosts for transmission studies.

Leaf dip preparations for electron microscopy were prepared by: i) Brand's leaf dip method³, ii) Leaf

pieces were chopped with scissors in 5 ml of 0.1 M phosphate buffer (pH 7.0). The buffer was decanted in a 25 ml beaker and ultrasonicated for 1–2 min. Sample thus prepared was employed for loading the grids. Phosphotungstic acid (pH 7.0; 2%) was used as a negative stain. The grids were examined in a Philips-420 electron microscope.

The disease agent could not be transmitted by either sap inoculation or through aphids viz *M. persicae* and *A. craccivora*. The whitefly (*Bemisia tabaci*) transmitted the disease efficiently from *Cosmos sulphureus* to *Cosmos sulphureus*. Transmission with whitefly was 100% when more than 5 insects were used per plant. A single whitefly transmitted the disease agent but with a lower transmission rate (30% based on 10 plants). Test plants other than *C. sulphureus* mentioned in Materials and Methods remained immune to infection when inoculated through whiteflies.

Preparation for electron microscopy obtained by conventional leaf dip method³ did not reveal any virus-like particles in 5 out of 6 occasions. However, at one occasion, a single particle of 640 × 13 nm dimension was observed. Preparation for electron microscopy obtained through ultrasonification, however, showed several straight to slightly flexuous particles of different lengths but of uniform width of 13 nm (figure 2). Length of particles as observed in this preparation was always less than 640 nm. This is probably due to damage caused to intact virus particles by ultrasonication. Samples prepared in similar way from healthy levels did not show any virus-like particle.

Cosmos bipinnatus has been recorded as an exper-

imental host of tobacco streak⁴ and beet curly top viruses⁵. In present investigation, rod shaped particles were found associated with the diseased plants but were absent in healthy plants following similar methods of isolation and observation. We, therefore, suspect that the rod shaped particles are the causal agent of yellow vein mosaic of *C. sulphureus*. The disease agent is transmitted by whiteflies. Recently whitefly transmitted viruses have been found to have geminate particles⁶. However, the virus under investigation is close to Carlaviruses with regard to particle morphology and size⁷ and differs from them in having whiteflies as vectors. Literature reveals that some whitefly transmitted viruses are exceptionally rod shaped and similar to carlaviruses with regard to particle length and width⁸.

It has recently been proposed that the rod shaped whitefly transmitted viruses of 650 × 13 nm dimension should be removed from the Carlavirus group and left unclassified until the taxonomic significance of vector type and inclusion formation have been fully evaluated⁸. The disease agent associated with yellow vein mosaic of *C. sulphureus* reported in this investigation is thus a first record of a whitefly transmitted rod shaped virus occurring in India. It remains to be seen whether this isolate also induces brush like inclusions as reported in the case of rod shaped whitefly transmitted cowpea mild mottle virus^{8,9}.

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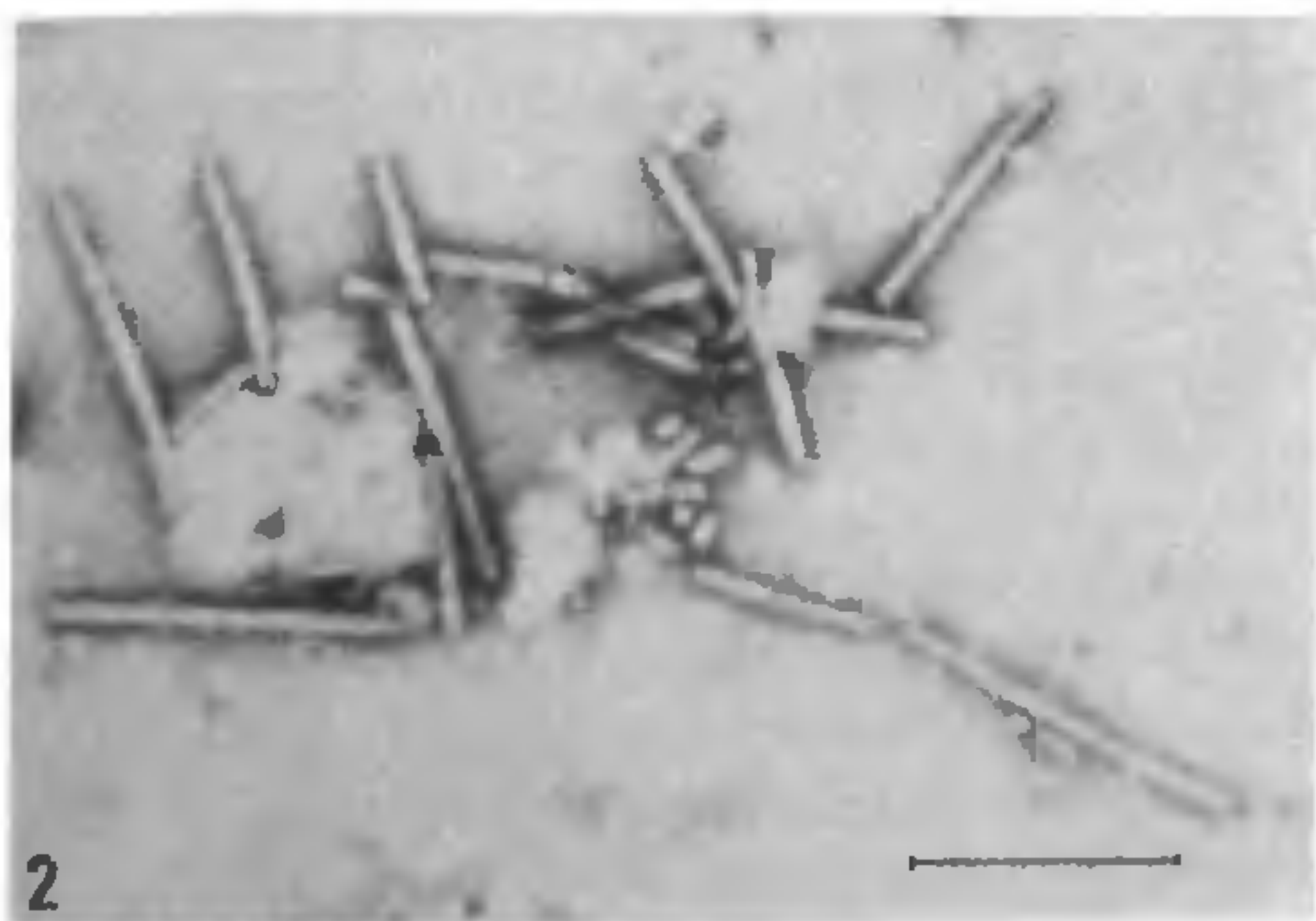


Figure 2. Broken virus particles obtained through ultrasonification, Bar equals 200 nm.

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RECORD OF *ANKYLOPTERYX OCTOPUNCTATA CANDIDA* (FABRICIUS) (NEUROPTERA: CHRYSOPIDAE), AS EGG AND LARVAL PREDATOR ON *OPISINA ARENOSELLA* WLK., THE LEAF EATING CATERPILLAR OF THE COCONUT PALM

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THE chrysopid *Ankylopteryx octopunctata candida* (Fabricius) was newly recorded in association with the larval galleries of *Opisina arenosella* on coconut palms. They were first collected during 1982 from an experimental field at Kannelty, Quilon Dt., Kerala. Further observations revealed that they consumed the eggs and early instar larvae of *Opisina arenosella*. As early as 1934, Takano had reported this insect as a predator of the sugarcane aphid *Oregma lanigera* in Formosa. The present record is an addition to the check list of predators of *O. arenosella* on the coconut palm. Adults of *A. octopunctata candida* are green in colour, females measuring 8 mm long and 22–23 mm wide (wing expanded) and males 7.0–7.5 mm long and 20–21 mm wide; with soft body and elongated filiform antennae.

Adults are nocturnal and during day time they rest on the leaflets of the palm. The larvae are predacious and possess long hairs on the body and carry exuviae of prey on their back. They feed on the eggs and early instar caterpillars of *O. arenosella*.

Feeding trials have revealed that each first instar larva consumed 2 to 3, second instar 60 to 100 and third instar 100 to 130 eggs of *O. arenosella* per day under laboratory conditions. It was also observed that the third instar predator larva consumed as many as 11 to 19 first instar caterpillars of *Opisina* per day.

The adult of the predator lays pedunculate eggs in batches on the infested coconut leaflets, which hatch in two days. The larval period ranges from 9 to 11 days and larva has 3 instars. Pupation takes place in or near the leaf axils and the pupal period ranges from 10–12 days. The average longevity of the females was 66.4

days (range 50–72 days) while it was 23 days (range 17–35 days) in males, when fed with honey under laboratory conditions.

The chrysopid predator appeared in the field during April and continued to be present till October and absent from November to March. Maximum predator population was noticed during June and July months.

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GENETIC VARIATION FOR SEED PROTEIN OF *VICIA FABA* L.

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FABABEAN (*Vicia faba* L.), locally known as *bakla*, is one of the under-utilized food legumes in India. This legume seems to be exceptionally productive, and is a valuable source of novel protein. Rain-fed fababean yields 20 g of seed per ha¹. However, seed yield as high as 30 q per ha may be obtained with irrigation. Fababean is used more and more exclusively for its seeds, whose lysine and protein make a good complement to cereals². With sufficient breeding and agronomic research support, it could become a top ranking pulse crop of India. The present investigation was conducted to critically examine genetic variation for protein content of seeds in exotic and local fababean collection and determine the scope for improvement of protein along with seed yield.

Eighty four exotic cultivars from West Germany and nine indigenous cultivars from the main centres of All-India Co-ordinated Pulse Improvement Project were evaluated in the field at Hissar during the winter season of 1983 following a randomized complete block design. Each entry was accommodated in 3 m long single row plots spaced 50 cm apart. The spacing between plants within a row was 20 cm. The seed protein was estimated using micro-kjeldahl method and expressed in percentage. The statistical para-