



Figure 1. H, Healthy seedling of *O. indicum*; D, root rot diseased seedlings showing various stages of infection.

while roots of healthy plants were white. In some affected specimens even the root collar zone was affected, causing decay. Consistent isolation from the infected roots yielded *Pythium intermedium* de Bary (IMI No. 316590) on potato dextrose agar medium (PDA).

The pathogenicity of the isolate was tested on 2-month-old seedlings raised in pasteurized soil. For inoculation, cultures were raised on corn meal sand medium, blended and mixed separately with sterile soil in aluminium trays, and incubated for 5–7 days. *O. indicum* seedlings were transplanted after washing the root system thoroughly with sterile water. All the trays were transferred to a humidity chamber with >95% RH, and the temperature between 25 and 31°C. Observations on the appearance of disease symptoms were recorded every day.

Typical symptoms of root rot developed after 5–7 days of incubation. On the tenth day most of the seedlings died owing to severe rotting of roots. The pathogen was re-isolated from the infected seedlings.

Pythium intermedium de Bary, a typical soil-borne pathogen, has a world-wide distribution, but predominates in the temperate zone. In temperate countries, *P. intermedium* is known to cause damping off and root rot in seedlings of ornamentals^{1,2} and forest tree species^{3,4}.

Earlier *Synchytrium cassiae*, *S. oroxyli* and *Cercospora oroxyli*^{5–7} were reported from India on *O. indicum*. This is the first report from India of *P. intermedium* causing root rot of *O. indicum*.

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RECORD OF *MIMELA XANTHORRHINA* HOPE (COLEOPTERA: SCARABAEIDAE), AS A NEW PEST OF CARDAMOM *ELETTARIA CARDAMOMUM* MATON

A. K. CHAKRAVARTHY, M. R. SUDARSHAN, N. E. THYAGARAJ and D. RAJAGOPAL
Regional Research Station, Mudigere 577 132, India.

WHILE surveying cardamom plantations for insect pest infestation during February 1988, grubs of *Mimela xanthorrhina* Hope were found to cause severe damage to the roots of cardamom at Ancmahal, Sakleshpur (12°56'30" N, 75°48'38" E, 976 m AMSL) in Hassan district of Karnataka.

The grubs were curved, black, flat-bodied, with brown head and fleshy abdominal ends (figure 1). They were found below the cardamom rhizome in soil, 4–6 inches deep. On an average, 4 grubs/clump ($n=50$ clumps) were found feeding on cardamom roots. The rhizome portion remained undamaged. When grubs were offered roots of two-year-old cardamom plants in the laboratory in a cage (72 cm³), the grubs cut the roots vertically (figure 3). In the field, severely affected cardamom clumps showed stunted growth and the roots lacked matty structure. No new suckers and roots were noticed in affected clumps. The existing suckers showed yellowing and wilting symptoms.

The grubs were collected and enclosed in glass jars (36 × 15 cm) with soil. The beetles emerged in the glass jar in May. The beetles (1.6 × 1.1 cm) were shiny, olive green on dorsal side and coppery brown ventrally (figure 2). When the same cardamom



Figures 1 and 2. *Mimela xanthorrhina*. 1, Grub; 2, Adult.

plantation, extending over a hectare, was visited in June after the rains, a large number of the beetles were observed on the shade tree, *Elaecarpus tuberculatus* Roxby. When fresh twigs of *E. tuberculatus* were offered to beetles in the laboratory, the beetles fed voraciously on the leaves. The observations confirmed that *M. xanthorrhina* grubs were implicated in damage to roots of cardamom and the adults in damage to foliage of *E. tuberculatus* in Sakleshpur. *M. xanthorrhina* has earlier been reported only on tea¹.

Of the 208 shade trees in one acre of the cardamom plantation sampled, *E. tuberculatus* represented 18.27% and all the trees were severely defoliated by adult *M. xanthorrhina*. Almost every twig in all the



Figures 3 and 4. 3, *Mimela*-damaged roots (left); undamaged roots (right). 4, Twigs of *E. tuberculatus* damaged by adult *Mimela*.

plants was damaged by the beetles (figure 4). Three to four mating pairs per branch of *E. tuberculatus* could be noticed on the trees. This suggests that *Mimela* adults prefer *E. tuberculatus* for feeding and mating.

Table 1 Extent of damage caused by grub of *Mimela xanthorrhina* to cardamom roots

Sample no.	Plants	Per cent damage
1	18	83.3
2	15	80.0
3	21	80.9
4	30	70.0
5	36	63.3
6	43	20.93
7	41	70.0
8	52	69.23
9	61	44.26
10	59	71.18
Total	376	

An assessment of the extent of the damage to cardamom was made by random sampling. The insect affected 58.70% of cardamom clumps (table 1).

This is the first record of *M. xanthorrhina* feeding on cardamom roots. Further studies on the insect are in progress.

Thanks are due to Dr R. B. Madge of CAB International Institute of Entomology, London, for identification of the insect.

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ROOTING OF EXCISED LEAVES OF GRAIN LEGUME CROPS

K. S. REDDY, S. E. PAWAR and C. R. BHATIA
Nuclear Agriculture Division, Bhabha Atomic Research Centre, Bombay 400 085, India.

As reported previously¹ excised leaves of mungbean cultured in water developed roots without any application of plant growth regulators (PGRs). They could be maintained for up to 40 days. This simple technique has been found useful in screening for powdery mildew reaction under controlled environment and is now routinely used in our laboratory. The usefulness of this technique for screening for other foliar diseases is being assessed. This communication reports similar rooting in cultured excised leaves of other grain legume crops, particularly in pigeon pea (*Cajanus cajan* (L.) Millsp.), soybean (*Glycine max* (L.) Merr), chick pea (*Cicer arietinum* L.) and groundnut (*Arachis hypogaea* L.). Rooting in excised leaves of groundnut and soybean has been reported previously^{2,3}. In soybean PGRs were used for rooting. However, PGRs are reported to alter disease reaction of barley leaves⁴ and it would be desirable to avoid their use in experiments aimed at studying host-pathogen interactions.

Leaves from field-grown plants of pigeon pea, chick pea, soybean, groundnut and black gram cultivars were used (table 1). The third leaf from the base of 25-day-old seedlings was excised above the pulvinus and inserted through a series of holes in opaque plastic sheets and held in position with

Table 1 Cultivars of the different grain legume crops tested for rooting in excised leaves

Crop	Cultivars
Soybean	Monetta, PK-472, CO-1, Macs-13
Chick pea	Chaffa
Groundnut	JL-24, TG-17, TG-9, SB-11, Robut
Black gram	TAU-1, T-9, LBG-17
Pigeon pea	TT-5, TT-6, TAT-10

cotton plugs. These plastic sheets with leaves were placed over enamel trays containing tap-water so that the lower 2 cm of the petiole was always immersed¹. The trays were kept in a growth chamber maintained at 21°C, 24°C or 28 ± 1°C, with a 12 h/day illumination of 4136 lux.

At 21°C root initiation was observed in soybean and chick pea after 9–12 days and in groundnut and pigeon pea after 15–18 days (figure 1). The rooted

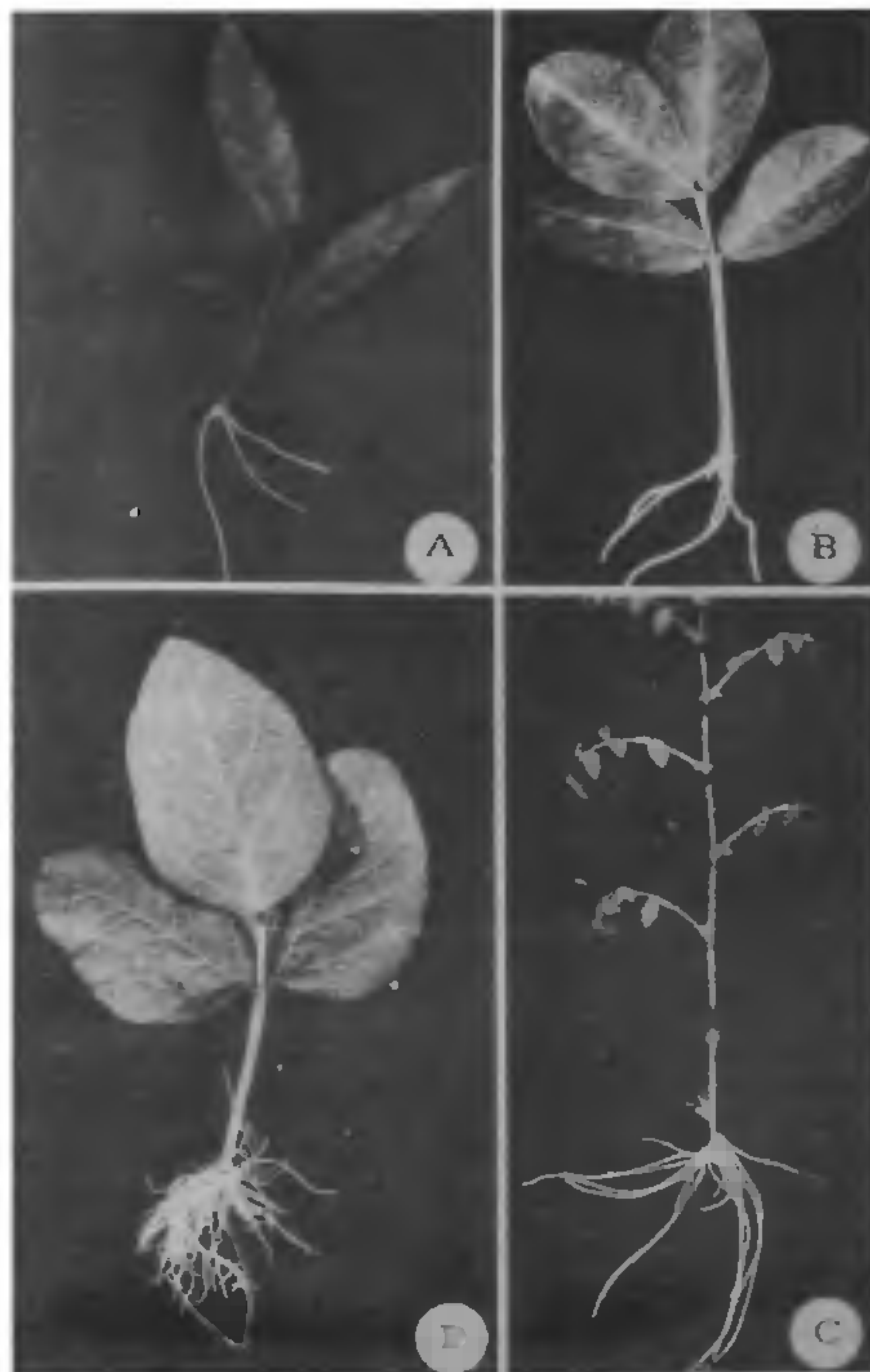


Figure 1. Excised leaves of pigeon pea (A), groundnut (B), chick pea (C), and soybean (D), showing profuse rooting from the basal region of petioles.