

the fields after crop harvest, was lacking, the fate of left-over bacterial blight-infected rice seeds was investigated.

During the second week of December 1983, infected rice seeds, harvested from a severely blighted crop consisting mixed population of Pusa 169 and a tall 'off-type', were buried in horizontal layers at three depths—5, 15, 25 cm, at 200 g per layer, in soil, belonging to non-cultivated area, filled in cement pots (45 × 45 cm) placed underground upto brim under partially tree-shaded conditions. The seeds were allowed to remain in soil for about 24 weeks under three cropping conditions viz (i) wheat crop, (ii) berseem (*Trifolium alexandrinum*) crop and (iii) fallow. Identical sets with healthy seeds (seeds of disease-free crop) served as checks. At maturity, the *rabi* crops were cut and the pots were left undisturbed till third week of June 1984. Large number of seedlings appeared from seeds at 5 cm depth after showers in April–May. Seeds placed at 15 and 25 cm depths, however, remained unaffected, taken out in the third week of June and allowed to germinate in respective pots. All pots thereafter received regular watering. The crops in pots were regularly observed for appearance of the disease till September when tillers were cut and stalks examined for systemic infection.

During August–September, leaf blight was detected, in traces, in crops raised from infected seeds that remained buried during *rabi* at 25 cm depth with wheat crop and at 15 cm depth under all the three cropping conditions. Microscopic examination of tiller-stalks revealed that systemically infected plants were present in all crops raised from infected seed-lots. The number of systemically infected tillers was, however, noticeably high (5–8) in crops which revealed leaf blight visually. Appearance of 'kresek'-affected ratoon tillers from stubbles further provided confirmative evidences. Examination of crops in check pots did not indicate bacterial blight infection in plants.

The results suggested that in north-west India, bacterial blight-infected rice seeds, buried upto a depth of 25 cm in soil, could retain viability and inoculum through *rabi* season under both cultivated and non-cultivated conditions. The subsoil conditions prevailing at a depth of about 15 cm during *rabi* in the region appeared to be congenial for survival of inoculum in seeds. Partially-shaded conditions, commonly occurring under trees in fields, seemed to provide ideal conditions for successful establishment of the disease in self-sown plants. The number of such foci of primary infection was obviously very low, but the source was potent enough to initiate outbreak of

the disease in rice crops. With early cropping practice, the source was capable of playing very active role in rice nurseries and transplanted crops.

Abundant presence of self-sown rice seedlings, observed during April, in a sugarcane field, planted after rice (*kharif*) and pulse (*rabi*) crops, suggests that the left-over rice seeds in fields get buried in soil during *rabi* field operations and later produce self-sown plants, coming to surface again by *kharif* ploughing operations. Bacterial blight-susceptible rice with seed-shedding characteristic may be potential source of infected self-sown plants in the region.

The present findings provide clues to some baffling disease situations encountered in the region: often appearance in early transplanted crops; occurrence in crops raised from healthy seeds; out of many fields transplanted with same nursery, appearance in certain fields only, often appearance in plants under tree-shades; patchy development in fields. It is imperative that epidemiological and management aspects of the disease in north-west India should be discussed keeping in view the facts revealed herein. Evidently raising nurseries with disease-free seeds may not prove to be an absolutely effective manoeuvre to check occurrence of the disease in fields in the region.

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## IN VITRO DEVELOPMENT OF CAJANUS × ATYLOSIA HYBRIDS

M. S. DHANJU, B. S. GILL  
and P. S. SIDHU\*

Department of Botany, Punjabi University,  
Patiala 147 002, India.

\* Department of Plant Breeding, Punjab Agricultural  
University, Ludhiana 141 004, India.

FOOD legumes which have many utilitarian features, have been neglected in cultivation mainly because of their poor yields and susceptibility to various insect pests and diseases. Pigeonpea, *Cajanus cajan* (L) Mill

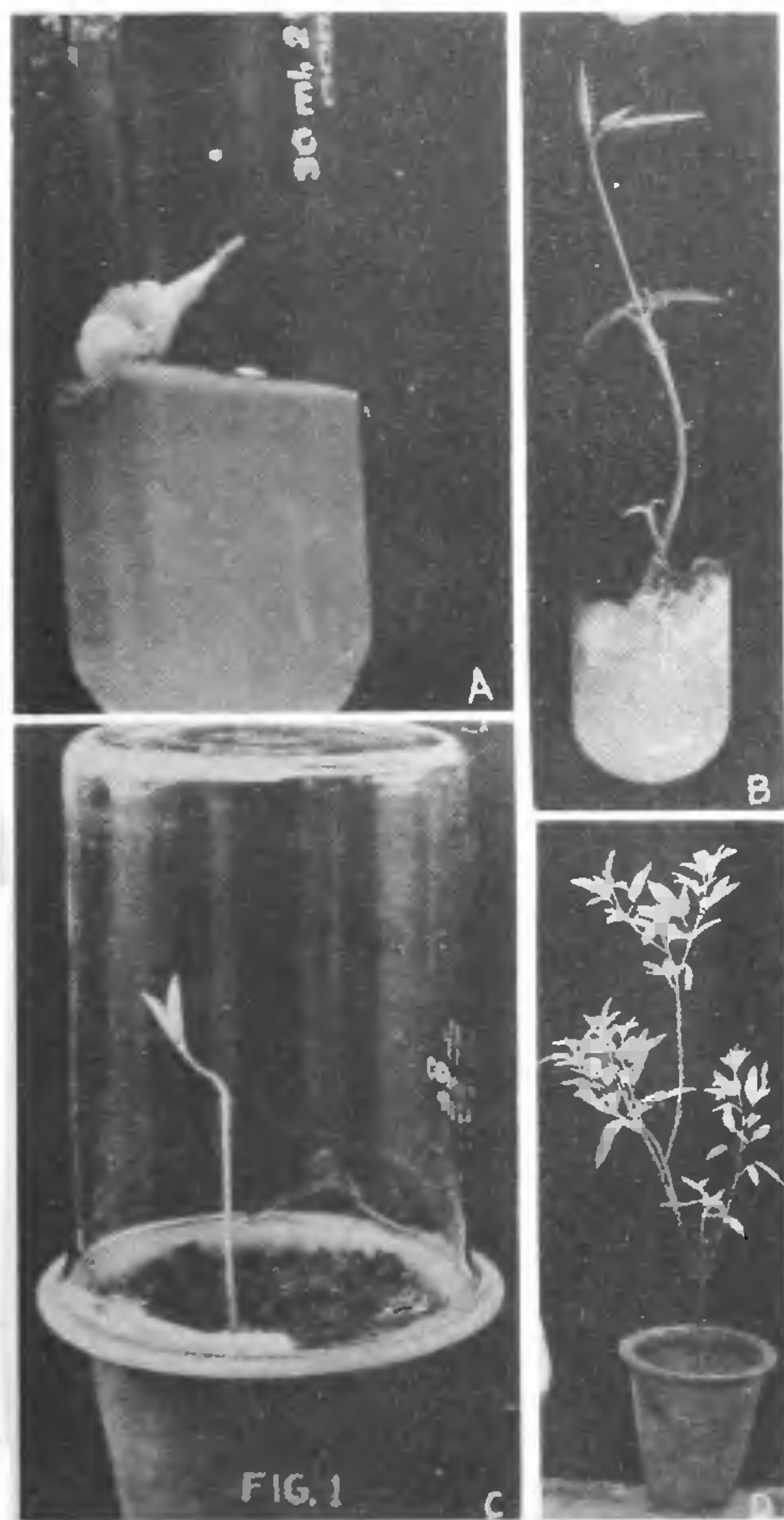


sp is one of the important *kharif* pulse crops. However, its susceptibility to the pod-borer complex and pod-fly, which is as high as 31%<sup>1</sup>, imposes a serious problem. Resistance to pod-borer is available in its wild progenitor, particularly the species of *Atylosia*<sup>2</sup>. The percentage recovery of hybrids between *C. cajan*

and *Atylosia scarabaeoides* through conventional methods, is rather low (0.6 to 12.0%)<sup>3</sup>. To achieve this, the technique of embryo culture<sup>4</sup> holds great promise to combine genes even from secondary and/or tertiary gene pools. In the present investigation, intergeneric hybrids have been successfully obtained between *Cajanus* (cv AL 15) and *A. scarabaeoides* through the application of growth regulators to the developing pods, followed by embryo culture. The objective was to combine the pod-borer resistance from *A. scarabaeoides* with the existing seed yield and quality of pigeonpea.

The emasculated flowers of pigeonpea, pollinated with pollen of *A. scarabaeoides*, were treated with the mixture of growth regulators GA<sub>3</sub> (100 mg/l), NAA (40 mg/l) and Kin (10 mg/l) for consecutive two weeks. Developing hybrid embryos showing signs of abortion were excised from pods (12 days after pollination) and cultured on Murashige and Skoog medium<sup>5</sup> supplemented with IAA (1 mg/l) + kin (0.5 mg/l) + CW (70 ml/l). All manipulations were conducted in the laminar flow cabinet (Klenzaides, Bombay) and cultures were kept in well-illuminated (5,000 lux) room, maintained at 25 ± 2°C.

The daily application of the mixture of growth regulators facilitated retention of greater number of pods (35%) for relatively longer durations. Moreover, the number and the size of the developing ovules were also increased which were then easy to excise and culture. The cultured pigeonpea as well as hybrid embryos resumed growth within four days and complete plants were obtained in 5–6 weeks. *In vitro* culture of the hybrid embryo and its subsequent transfer from test tube to a pot is shown in figure 1. The percentage of plantlet development in hybrid was 76% whereas in *C. cajan* and *A. scarabaeoides* was 82% and 90%, respectively. The hybridity has been confirmed through chromosomal associations which are characterised by the presence of quadrivalents (0–2), trivalents (0–1) and univalents (0–6), in addition to bivalents. Besides, anaphases are abnormal due to the presence of laggards, leading to 51.5% pollen sterility. Further studies involving F<sub>2</sub> generation are in progress to isolate desirable recombinants.



**Figure 1.** A: Hybrid embryo two weeks after culture on MS + IAA (1 mg/l) + Kin (0.5 mg/l) + coconut water (7%). B: A 4-week-old culture showing profuse rooting. C: Five-week-old embryo-derived (hybrid) plant, five days after transferring to the pot containing autoclaved soil. D: A hybrid plant (10 week-old) grow in broad day light.

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### BURROWING NEMATODE *RADOPHOLUS SIMILIS* (COBB) THORNE, 1949 ON BANANA IN MADHYA PRADESH

S. P. TIWARI and G. S. DAVE

Department of Plant Pathology, J. N. Agricultural University, Jabalpur 482004, India.

BANANA is the second most important fruit crop which covers almost 18% of the total fruit crop area of Madhya Pradesh and its cultivation is mainly confined to the Nimar region. A random survey of four districts revealed the occurrence of *Meloidogyne incognita*, *Meloidogyne graminicola*, *Rotylenchulus reniformis*, *Pratylenchus* spp and *Helicotylenchus* spp. However, in a few localities in Bilaspur district burrowing nematode *Radopholus similis* was encountered in the roots of banana. No population of these nematodes was recovered from soil but on examining the roots, the elliptical elongated lesions harboured colonies of the parasite extending as deep as endodermis. These lesions were 0.5 to 2 cm long giving rise to distinct galleries. At five sites their populations were encountered and ranged between 25 and 1350 nematodes per gram of root. The pathogen appears to have been introduced along with the rhizomes which may have been planted in these localities.

The burrowing nematode *R. similis*, has been reported from different southern states of India and Gujarat<sup>1</sup>. However, the pathogen has been recorded in Madhya Pradesh for the first time and intensive surveys are needed to determine its frequency of distribution and damage being caused to banana cultivation in Madhya Pradesh.

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### PENTAPHYLLOUS MUTANT IN *VIGNA MUNGO* (URD)

R. K. SINGH and S. S. RAGHUVANSHI

Botany Department, Lucknow University, Lucknow 226007, India.

*VIGNA MUNGO* ( $2n = 22$ ) belongs to tribe phaseoleae of family Leguminosae. Urd is a warm season crop and is grown both in kharif and rabi season. It is mainly used for human consumption besides green manuring and



Figures 1, 2. 1. Control plant, 2. Mutant plant (Pentaphyllous).