coleoptile and scutellum, and the presence of a distinct cleft between the lower part of the scutellum and the coleorhiza is seen (figure H). The epiblast is absent. In transverse section the primary leaf with its numerous bundles has overlapping margins (figure I).

Earlier investigations[9-15] have clearly shown for diverse taxa of monocotyledons, the shoot apex and the cotyledon are terminal on the embyonal axis, thus changing the earlier concept that the shoot apex originated from a lateral locus and a single cotyledon from a terminal portion of the proembryo[16]. According to Philip[17] both the loci of epicotyl and scutellum in *Bambusa arundinacea*, a primitive grass, are terminal and situated adjacent to each other. The present taxon also shows a terminally positioned cotyledonary and epicotyledonary sectors, juxtaposed to each other.

The taxonomic placement of *J. griffithiana* has been interpreted in various ways. Bor[8] includes this genus under the group Pooideae. Recently, Hilu and Wright[6] studied the systematics of Gramineae with cluster analysis techniques for 215 grass genera using 85 morphological and microscopic characters including the characteristics of the embryo. Accordingly, this genus is included in the sub-family Panicoideae. Much earlier, Reeder[5], based on the mature embryo structure has classified 6 distinctive embryo types, of which the true panicoids with the formula P-PP are characterized by having panicoid vascularization, no epiblast, a distinct cleft between the scutellum and coleorhiza. In transverse section the primary leaf has overlapping margins and numerous vascular bundles. Since the mature embryo possesses all the features of true panicoids as mentioned by Reeder[5], the present observation lends support to this view that it belongs to Panicoideae.

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MYROTHECIUM POD SPOT OF CLUSTER BEAN AND ITS SIGNIFICANCE

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MYROTHECIUM RORIDUM Tode ex Fr is known to cause leaf spot in cluster bean (*Cyamopsis tetragonoloba* (L.) Taub)[1]. *Myrothecium roridum* is also a severe pathogen of many valuable crops such as *Dolichos lablab*[2], brinjal[3], cotton[4], tomato[5], castor[6], groundnut[7], coffee[8,9] and soybean[10]. So far, *Myrothecium* podspot has not been reported in cluster bean.

During the Kharif season of 1983 in Mysore (Karnataka State) heavy incidence of pod spot due to *M. roridum* was observed in cluster bean crop grown in experimental plots. About 80% of the plants showed infection due to the fungus.

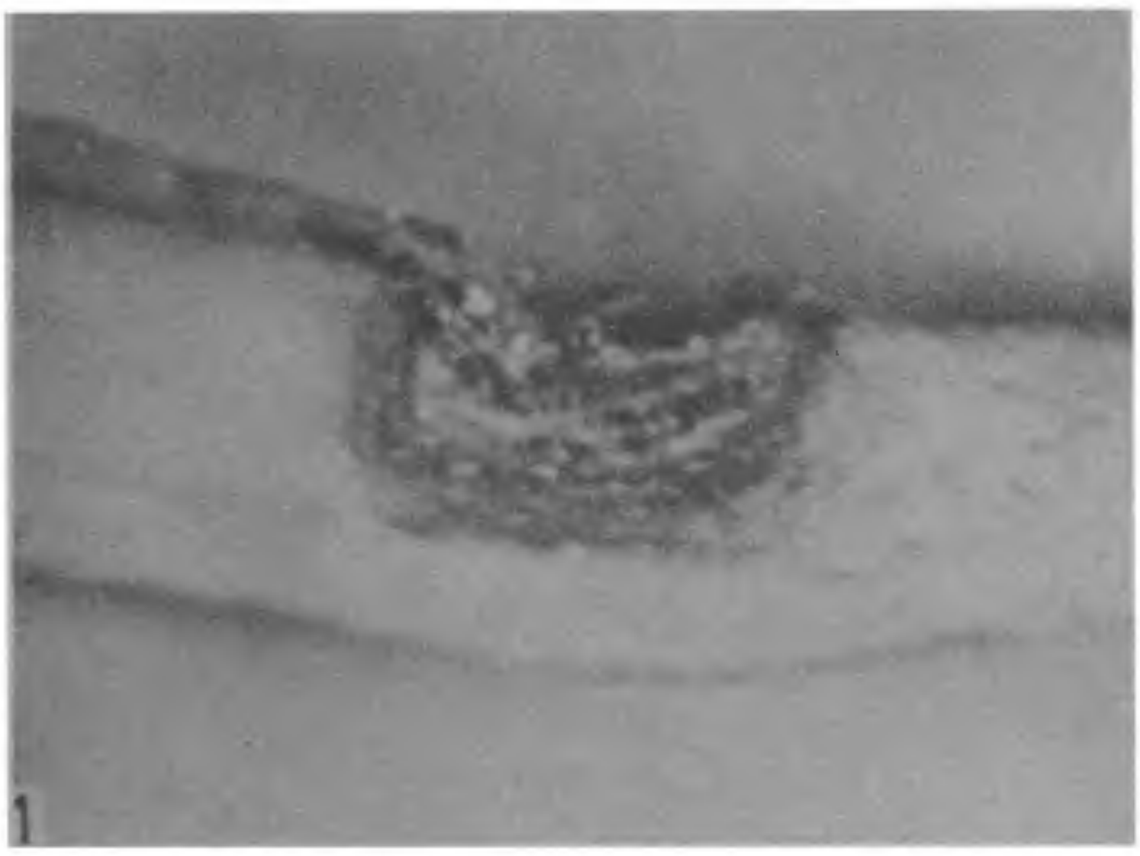
The fungus was isolated on potato dextrose agar medium. Ten-day-old culture of *M. roridum* was inoculated to the stem, leaves and pods to confirm its pathogenecity. The per cent incidence of *M. roridum* in seeds obtained from spotted pods was recorded by standard blotter method[11]. Healthy and infected seeds were subjected to Ragdoll method[12] and seedling vigour was calculated.

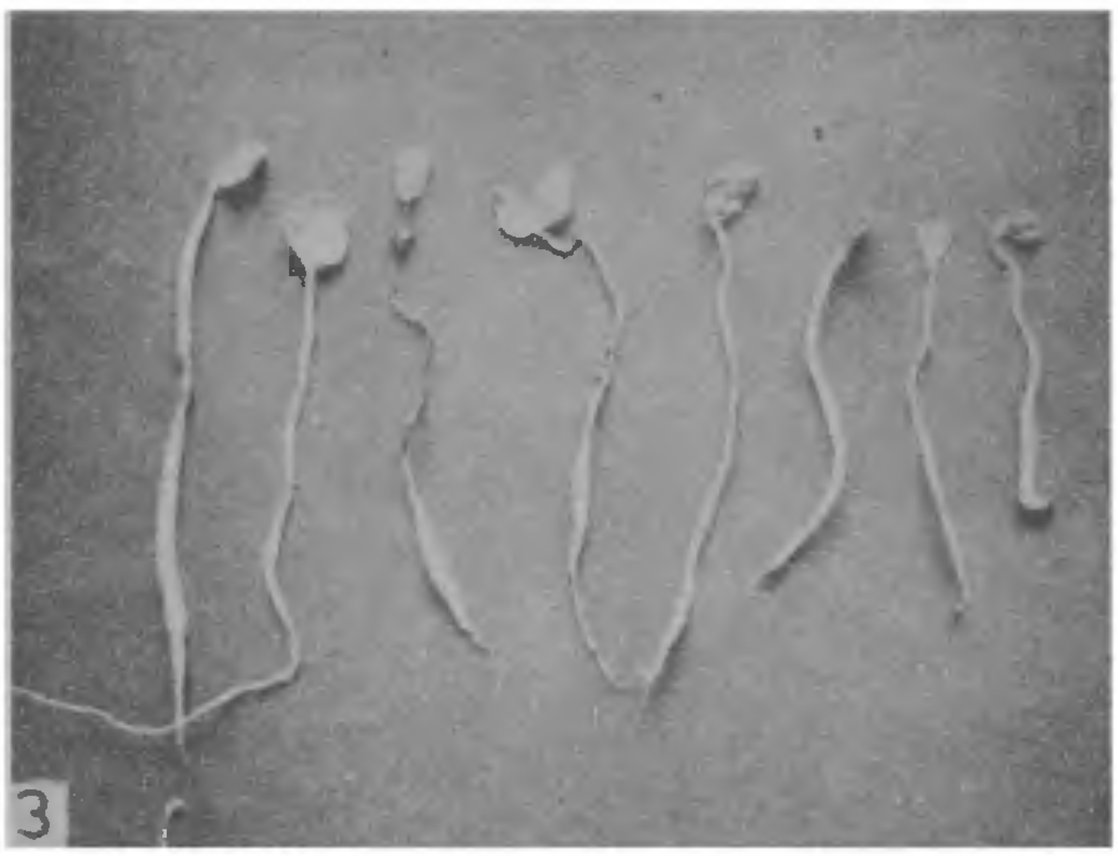
Leaf spot symptom was observed in the early growth stage and pod spots in the fruiting stage of severely infected plants. The pod spot first appeared as a water-

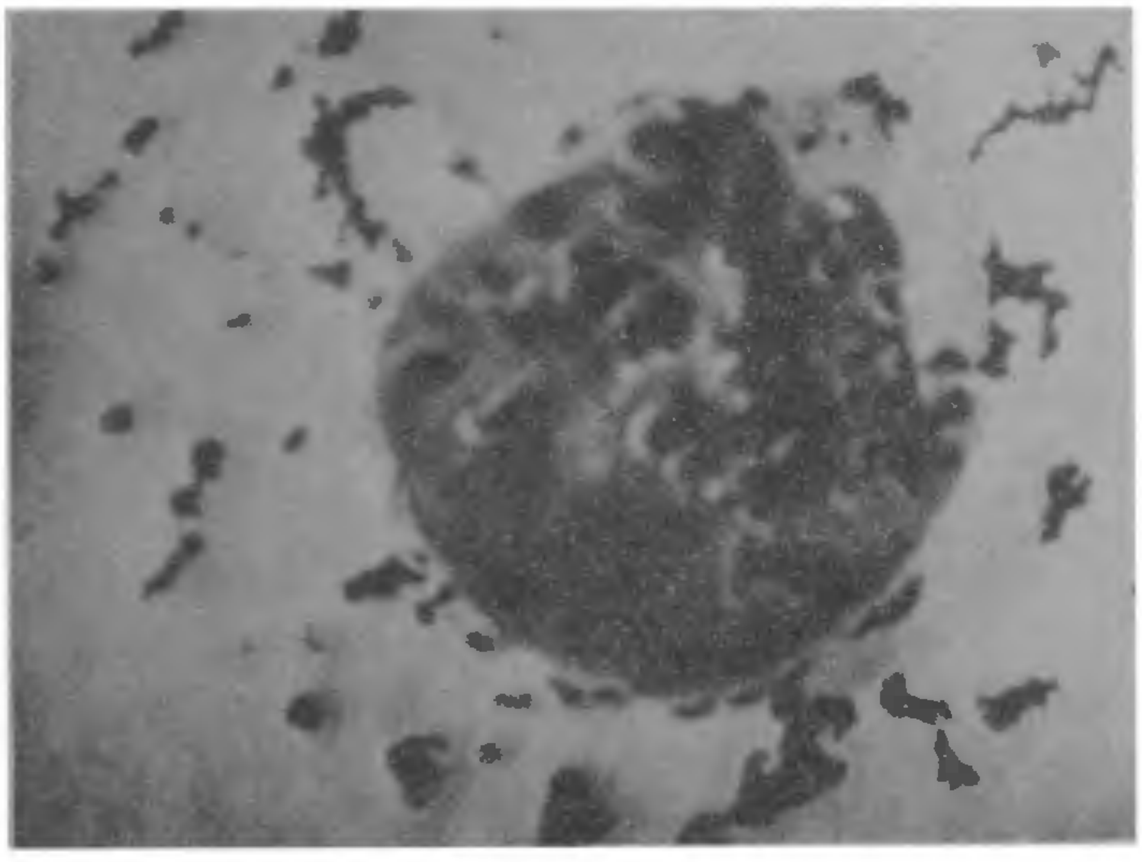
Table 1 *Effect of Myrothecium pod spot on seed germination and seedling vigour*

Source of seed	Percentage of* seeds showing *M. roridum*	Percentage of* seed germination	Root length in cm Mean** ± sd	Shoot length in cm Mean** ± sd	Vigour index (vi)
Seeds free from *M. roridum*	—	74	7.06 ± 4.42	7.71 ± 2.83	530.15
from infected pods	60	41	2.78 ± 1.52	3.92 ± 1.47	117.9

* based on 400 seeds; ** Average based on 100 seedlings







Figures 1–3. 1. Pod spot of cluster bean due to *Myrothecium roridum.* **2.** Sporodochia of *M. roridum* on seed surface and wet blotter. **3.** Seedlings showing gradations of infection due to *M. roridum.*

soaked lesion, became sunken, turned black (figure 1) and later coalesced to form larger spots. Severity of the disease led to pod rot. These spots with or without incubation produced sporodochia in concentric rings. The sporodochia were similar to those described by Preston[13].

Symptoms on stem, leaves and pods started appearing on the third day in the inoculated plants. There was considerable decrease in weight in the seeds collected from infected pods compared to healthy seeds. The infected seeds were shrivelled and showed 60% incidence of *M. roridum.* Such infected seeds failed to germinate and the fungus sporulated on the seed as well as on wet blotter (figure 2). The average root and shoot lengths (2.78 and 3.92 cm) of seedlings obtained from infected seeds were considerably less than that of healthy seeds. The vigour index of the seedlings raised from seeds of infected pods was also very less (table 1). The seedling showed the leaf necrosis slowly progressed to the stem and resulted in damping-off. The infected regions often contained sporodochia. The study clearly indicates that *Myrothecium* pod spot severely impairs the seed health of cluster bean.

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EUPHORBIA PULCHERIMMA, WILLD—A NEW HOST OF PEARL MILLET RUST

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PUCCINIA PENNISETI (Zimm), a heteroecious rust of pearl millet (*Pennisetum typhoides*) is prevalent in all the pearl millet growing areas in India and is reported from South, Central and East Africa and America. The uredial and telial stages occur on *Pennis etum* spp, and the pycnial and aecial stages have been reported on brinjal and other species of *Solanum*[1,2]. During our investigation, a new Euphorbiaceous host was recorded.

Euphorbia pulcherimma, a weed was commonly observed amidst rust-infected bajra plants (figure 1) in the experimental plots of Downy Mildew Research Laboratory and in the farmers' fields around Mysore. On the lower surface of the leaf, concentric rings of orange aecia were observed (figure 2). Rarely aecia were seen on the upper surface. Aecia were also found on petioles and stem. The aeciospores were produced in chains on a fertile layer of elongated cells. Aeciospores were globose to angular, yellowish-orange, thin-walled, smooth with ornamentation and measured 25.5 × 21.5 μm (22.5–30 μm × 18.75–25 μm) (figure 3). The pathogenicity of aeciospores obtained from *Euphorbia* to pearl millet was proved by cross-inoculation study. The spore suspension (ca.5 × 10^3 spores/ml) was sprayed and injected to various parts of the 20-day-old pearl millet plants. In another method infected leaves of *Euphorbia* plant were attached to the pearl millet leaf blade using cellotape with their abaxial surface touching the adaxial surface of the test plant. The plants were covered with moist polythene bags for 12 hr. Uredospores of *Puccinia penniseti* (collected from pearl millet plants) were inoculated to young and healthy *Euphorbia* plants by syringe inoculation as well as leaf bit attachment technique. Healthy and young *Euphorbia* plants were inoculated with aeciospores of infected *Euphorbia* plants by attaching the infected leaf having aecia.

After 10 days of inoculation, pearl millet plants showed pustules on the upper and lower leaf surfaces at the points of inoculation and uredospores were produced in these pustules. The uredospores were oval, elliptic or pyriform having four equatorial germ pores (figure 4) and measured 32 × 25 μm, (25–40 μm × 20–30 μm). The uredospores of *P. penniseti* inoculated to *Euphorbia* plants did not show any symptoms. But inoculation with teleutospores collected from pearl millet produced rust pustules on the *Euphorbia* plants. Healthy *Euphorbia* plants inoculated with aeciospores of infected *Euphorbia*, showed aeciospores within a week.

P. penniseti causes severe losses in bajra when infection occurs at an early growth stage of millet crop. Severe infection results in premature leaf drying. So far only solanaceous plants, particularly brinjal, have been reported as alternate hosts for the rust. *E. pulcherimma* has a short life but multiplies rapidly. Aeciospores infect healthy plants and produce the spores in very large numbers, thus helping in the perpetuation of the fungus.

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