TABLE I

Effect of Polaris treatment on Banganapally fruits

Treatment	Days after harvest								
	0				10				
	% reducing sugars (as glucose)	% Non-reducing sugars (as invert sugars)	% total sugars	% total soluble solids	% reducing sugars (as glucose)	% Non-reducing sugars (as invert sugar)	% total sugars	% total soluble solids	Acidity (% citric acid)
Control	2·1	4·2	6·4	9·5	3·8	11.9	15·6	18·0	0·08
0·5% Polaris	2·5	5·7	8·2	14·5	5·0	11·7	16·7	19·0	0·14
5·0% Polaris	2·8	11·1	13·9	17·5	6·6	11·4	18 0	19·5	0·11

Data from a composite sample of 4 fruits.

In organoleptic tests, no off-flavours or other ill-effects were noted in Polaris-treated fruits.

Thanks are due to Monsanto (India) Ltd., Madras, for supplying Polaris.

Fruit Research Station, Sangareddy 502 001, *March* 23, 1977.

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TRICHODERMA PILULIFERUM AND *T. HAMATUM*—NEW RECORDS FROM INDIA

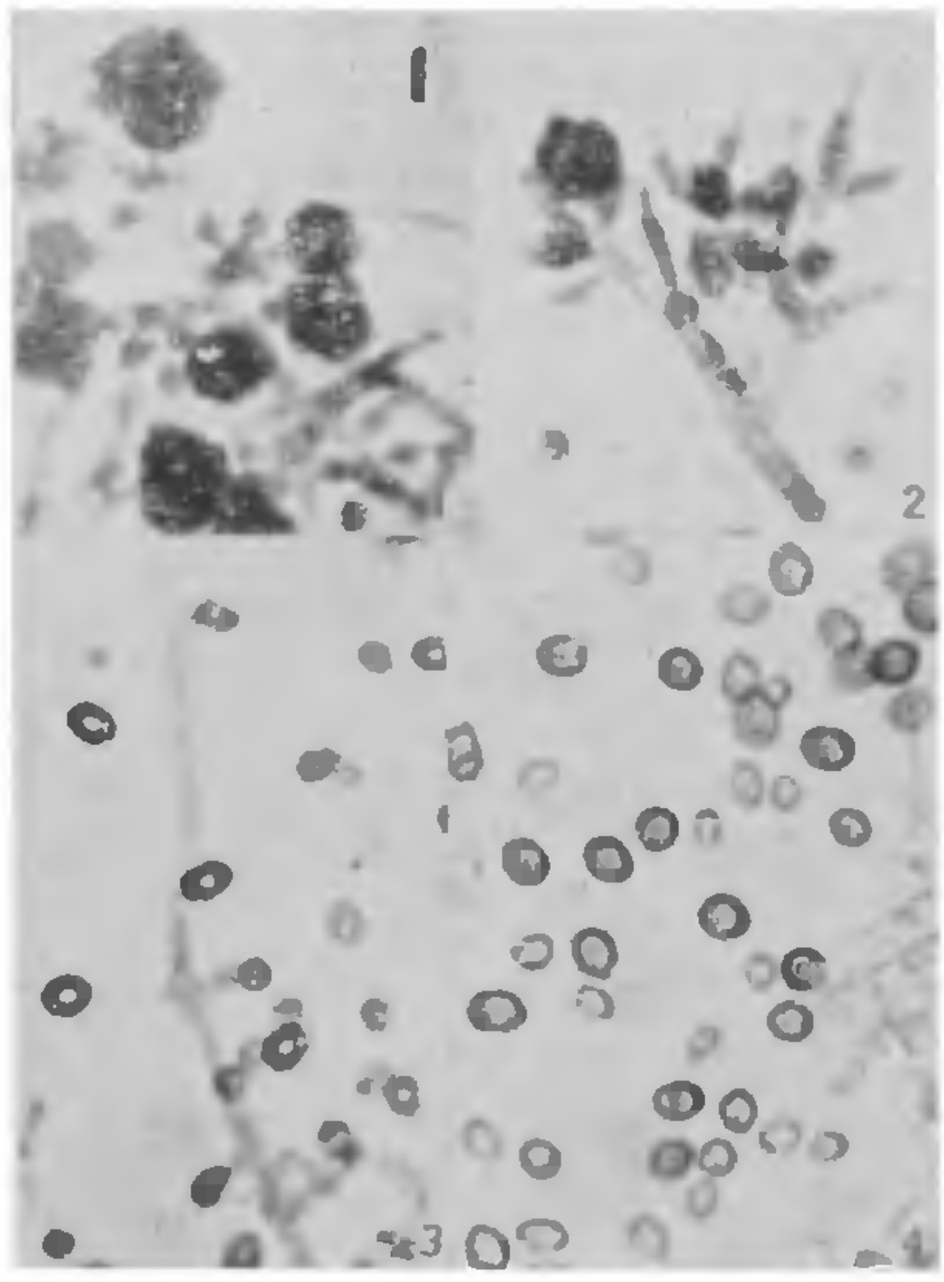
RIFAI[1] recognised nine species of *Trichoderma* in a recent critical comparison of the various isolates of the genus. Of these three were already reported from India, *viz.*, *T. harzianum*, *T. koningii* and *T. viride*. The previously reported *T. album* and *T. lignorum* (most of its strains) were relegated to *T. polysporum* and *T. harzianum* by Rifai (*op. cit.*). The present work contributes two hitherto undescribed species of *Trichoderma* from Indian soil.

Trichoderma piluliferum Webster and Rifai

It tallies with the original description of Rifai. Culture deposited at the Indian Type Culture Collection as No. ITCC–2083, Mycology and Plant Pathology Division, IARI, New Delhi.

T. hamatum (Bon.) Bain.

This fungus closely agrees with the description of the typical representative of *T. hamatum* (Bon.) Bain. as reported by Rifai but it differs in having broader phialospores. He also noted that different isolates of *T. hamatum* may show variation in size and shape of phialospores. However, our isolate comes close to Palmer's ascosporic isolate in the size of the phialospores.



Figs. 1–4. *Trichoderma piluliferum*. Figs. 1–2. Showing compact tufts of conidiophores, phialides and phialospores, × 400. Figs. 3–4. *Trichoderma hamatum*. Showing sterile hyphal elongation and phialospores, × 400

Culture deposited at the Indian Type Culture Collection as No. ITCC–2084, Mycology and Plant Pathology Division, IARI, New Delhi.

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WITCH'S BROOM OF COWPEA—A MYCOPLASMAL DISEASE

SINCE 1969, a witch's broom disease of cowpea[5] was observed at various places in northern India. Incidence of the disease varied from season to season. Mostly less than 1% plants were found infected, but in certain seasons (1974 *kharif*) up to 6% infection was recorded in some fields. The diseased plants give typical witch's broom appearance; at later stages trail on the ground, and produce phylloid flowers. Symptomatically, similar disease also occurs in southern India[2]. In this paper histopathology and chemotherapy of the disease are reported.

The culture of cowpea witch's broom disease (CpWB) was maintained on cowpea cv. Pusa Dophasli by grafting. Sap and non-persistent type of transmission by *Aphis craccivora* Koch., were tested by the methods described earlier[4]. For persistent type of transmission. *A. craccivora* were given an acquisition access time of 8 hours to 2 days and inoculation access time of 3 days. Dodder transmission was tested by simultaneously establishing *Cuscuta* sp. on diseased and healthy plants. At least ten cowpea plants were used for each transmission test. For examining the effect of tetracycline antibiotics on disease development, 250 ppm solutions of achromycin (tetracycline hydrochloride), agrimycin 100 (streptomycin + oxytetracycline hydrochloride 1·5%), aureomycin (chlortetracycline hydrochloride) and ledermycin (demethylchlortetracycline hydrochloride) were sprayed on plants twice a week. For electronmicroscopy small pieces (not more than 2 mm wide) of stem and leaves of cowpea cv. Pusa Dophasli, infected with CpWB and of healthy plants were fixed in 2·5% glutaraldehyde in cold for 12 hours, washed thoroughly in cacodylate buffer 0·05 M, post fixed in 1% osmium tetraoxide in cacodylate buffer (0·05 M) pH 7·0 for 2 hours, dehydrated in acetone and embedded in Spurr's low viscosity embedding medium in Beem's capsules. Ultrathin sections were cut with a LKB ultramicrotome UM1 using a diamond knife. Sections were picked on carbon coated grids, post stained with uranyl acetate and lead citrate, and examined in Philips EM 300 Electron Microscope.

CpWB was not transmitted by sap or *A. craccivora*. Graft transmission was more efficient than dodder transmission, as 72% of the test plants were infected by grafting and only 20% by dodder.

Spraying of plants with achromycin and ledermycin, starting six hours after graft inoculation, completely prevented establishment of the disease (Table I).

TABLE I

Effect of antibiotics on development of symptoms of witch's broom in cowpea cv. Pusa Dophasli

	Treatment* of plants after development of symptoms			Treatment of plants immediately after graft inoculation				
Antibiotic (250 ppm)	No. plants used	Remission	Recurrence after days**	No. plants used	% of plants† showing symptoms at different times after grafting			
					19	25	43	73 days
Achromycin	8	Complete	14	12 (5)‡	0	0	0	0
Agrimycin 100	8	Nil	..	13 (10)	10	50	60	60
Aureomycin	8	Partial	7	10 (7)	0	0	29	29
Ledermycin	8	Complete	19	15 (11)	0	0	0	0
Control (Water)	16	Nil	..	26 (16)	19	45	69	69

*15 biweekly sprays given.

** The time taken by the plants to redevelop the symptoms after the last spray.

†% of plants calculated on the basis of number of successful grafts.

‡ Number of plants grafted (number of plants retaining scion up to 5th day).