

84–400 μ in diameter (figure 2A); conidiophores hyaline, simple, short; spores hyaline, unicellular, thin-walled, globose to oval, $3.75\text{--}8.75 \times 3.75\text{--}5 \mu$ (figure 2B)

On the living twigs of *Eucalyptus* sp. Jabalpur (M.P.) India. The culture of the organism has been deposited at CMI., Kew IMI No. 249233 and in R.F.R.C. Jabalpur.

The species produced slightly smaller conidia as compared to other species of *Dothiorella*³. The epithet of the species was given after the name of River Gaur near the campus of this research centre.

Cytospora agarwalii sp. nov.

Colonia clara pleraque brunnea, senescens exhibet stroma prolatum. Stroma prolatum, cylindratum, usque ad 0.5 cm altum, terminans in cacumine acuto. Basis stromatis aliquantum erumpens, globosus, proferens partem fertilem frugis. Pars fertilis proferens pycnidia cum singulis vel pluribus loculis, ovalia vel irregularia, $100\text{--}450 \times 100\text{--}350 \mu$; conidiophora unicellulares, hyalini, leviter prolata; proferentes conidia a terminis conidiophorum; conidia unicellularia, cylindrata, hyalina, cum pariete tenui, leviter curva $2.5\text{--}5 \times 1.0\text{--}1.25 \mu$.

Colony light, mostly brown, on ageing there was development of elongated stroma. Stroma elongated, cylindrical, upto 0.5 cm in height, ending in a pointed tip, base of the stroma somewhat erumpent, globose, bearing fertile region of the fruit body. The fertile region consists of pycnidia with one to many chambers; oval to irregular, $100\text{--}450 \times 100\text{--}350$. (figure 3 A); conidiophores single celled, hyaline, slightly elongated, developing conidia from the ends of conidiophores; conidia single celled, cylindrical, hyaline, thin walled, slightly curved, $2.5\text{--}5 \times 1\text{--}1.25 \mu$ (figure 3 B).

On the living twigs of *Eucalyptus* sp., Jabalpur (M.P.) India. The culture of the fungus has been deposited in herbarium CMI., Kew, IMI No. 249224 and in R.F.R.C., Jabalpur.

The species of *Cytospora* described here was not correlated with the other species of *Cytospora* due to smaller spores³. The epithet of the species was given after the name of Prof. G.P. Agarwal to memorise his contribution to mycology.

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SYMPTOMATOLOGY AND TRANSMISSION OF WITCHES' BROOM DISEASE OF SOYBEAN IN INDIA

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A DISEASE resembling Machismo^{1,2} of soybean in symptomatology has been observed in soybean crop at the farm of Indian Agricultural Research Institute, New Delhi every year since 1976. The disease incidence varied from 2–5% in some cultivars. In the epidemic year of 1978, the cultivars viz., PK 73–148, 74–203 and 74–275 showed 30–50% infection causing considerable loss to the crop. The present paper describes the symptoms of 'Witches' broom' disorder and its transmission by the insect vector *Orosius* sp.

Symptoms were recorded from soybean plants infected naturally and artificially. The first symptoms of witches' broom were observed about the time of blooming or after initiation of pod formation. Symptoms comprised of curved, flat, thin pods usually in upright position with no beans formed or the pods were transformed into corrugated leaf like structures resembling phyllody. Later, excessive proliferation of buds from leaf axils occurs anywhere on the plant resulting in typical witches' broom appearance (figures 1–2). Sepals from flowers showing witches' broom are usually longer giving the appearance of small leaves as compared with healthy sepals. The size of flowers is reduced and they remain closed. Under field conditions it is common to find plants in which just one large branch or a maximum of two branches showing symptoms of the disease while the rest of the plant remains apparently healthy with normal development of flowers, pods and beans. In such plants the affected branch usually occurs close to the soil. In some cases the seeds germinate in the



Figures 1-4 1. Witches' broom affected shoots of soybean vars. PK 74-275 and 2. PK 73-148 showing excessive proliferation of axillary buds. 3. Phyllody affected plant of soybean var. PK 71-21 showing stunting and smalling of leaves and 4. Transformation of floral parts into green leafy structures resulting sterility.

relatively immature pods (Vivipary). The beans formed on the affected shoots are usually of no commercial value while beans formed on the apparently healthy branches of infected plants ripen late than that of healthy plants. The diseased plants remained green longer than the healthy plants.

The disease agent was not transmitted by mechanical inoculation and there was no evidence of seed transmission. It was transmitted to the extent of 50-70% though grafting and only 20-30% by the leaf hopper, *Orosius* sp. The initial symptoms of the disease appeared after 4-5 weeks of grafting or by inoculation with the infective leaf hoppers (3-4 days of acquisition feeding on diseased plants followed by 5-7 days test plant feeding and 10-20 leaf hoppers per test plant). All the five varieties of soybean viz., Bragg, PK

71-21, PK 73-148, PK 74-203 and PK 74-275 were susceptible.

Symptoms reproduced under glasshouse conditions by artificial inoculations either by grafting/leaf hopper were identical to those observed in the field. Transmission experiments clearly showed that the leaf hopper *Orosius* sp., is a vector, of the disease. The present disease resembled 'Machismo' disease of soybean transmitted by leaf hopper, *Scaphytopius fuliginosus* in symptomatology but differed in leaf hopper vector involved. The disorder resembled witches' broom disease of soybeans in Japan and Indonesia both in symptomatology as well as in vector transmission. In Japan the vector of witches' broom is *Orosius orientalis* whereas in Indonesia its vector is *O. argentatus*. It differs from "Q disease"³ a disorder of soybeans reported from Louisiana (USA) in symptomatology, seed transmission and vector. The "Q disease" is transmitted by the leaf hopper *S. fuliginosus* and is seed-borne. It differs from soybean phyllody⁴ in symptomatology (figures 3-4.)

Based on symptomatology, non-transmissibility by sap or through seed, positive transmission through leaf-hopper vector, long incubation period of the pathogen in the plant and remission of symptoms with antibiotics of tetracycline group (unpublished)-a mycoplasmal etiology is suspected. Further studies are in progress.

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