effect is specific to some extent. For example the effect of glutarate is more pronounced on GDH and that of glyoxal on GOGAT activity (table 1). Malonate, a TCA cycle inhibitor inhibited both the enzymes but the inhibition is more pronounced in the root tissue. The root protein increased by 20% by supply of malonate and consequently it reduced the specific activity of the enzymes. Malonate possibly restricts, the supply of carbon skeleton and/or metabolic energy to the process of glutamate synthesis. DCMU[3–(3, 4-dichlorophenyl)–1, 1-dimethylurea] inhibits the activities of GDH and GOGAT only in leaves by 19 and 29% respectively possibly by restricting photosynthetic production of NAD(P)H.

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AECIDIUM PAINAVUENSIS SP NOV FROM IDUKKI, KERALA, INDIA

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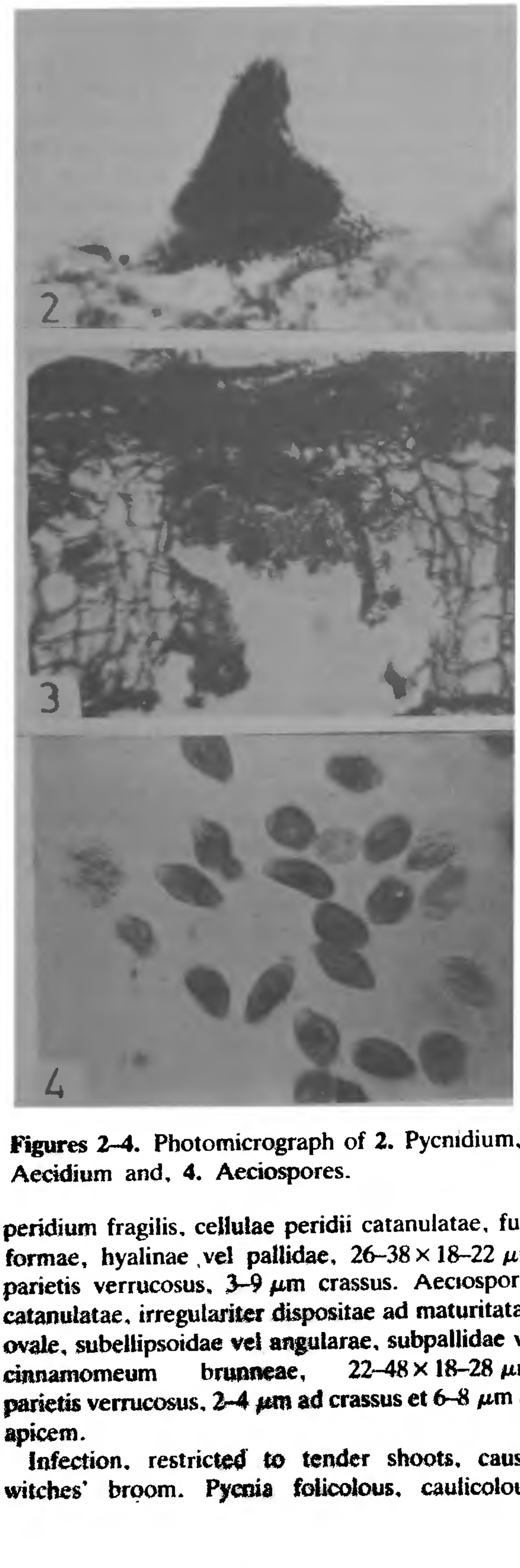
DURING a survey and study of rust fungi in the forests of Idukki Hydroelectric Project area, the plant *Meliosma pinnata* (Roxb) Walp ssp *arnottiana* (Wight) Beus, was seen to be infected with a fungus. Infection was restricted to the growing tender shoots and a few leaves below the growing tip. Infected shoots were brick-red coloured and showed a typical symptom of witches' broom. The leaves immediately below the infected shoots showed hypertrophied lesions. Infection was not observed on old leaves. A little disturbance to the infected shoots released a cloud of spores into air and such infected plants could easily be detected by their appearance even from a distance. Microscopic study of this fungus revealed that it belongs to the form genus *Aecidium* Pers.

Aecidium painavuensis Hosagoudar, sp nov (figures 1–4)

Contagio restringo mollis surculus, efficio witche's broom. Pycnia folicola, caulicola, amphigena, subcuticularia, brunnea vel nigra, applanta vel conoidea, hymenium planus, paraphyses terminalibus pallidus vel brunneus, 86–120 × 34–100 μm. Pycniosporae rotundae vel ovalae, minutae, hyalinae vel pallidae. Aecia folicola, caulicola, amphigena, subepidermalia, cupulata, innata, erumpenta ad maturitatus, 243–342 × 135–306 μm;

Figure 1. Infected young tender shoot showing the symptom of witches' broom.



Figures 2–4. Photomicrograph of **2.** Pycnidium, **3.** Aecidium and, **4.** Aeciospores.

peridium fragilis, cellulae peridii catanulatae, fusiformae, hyalinae vel pallidae, 26–38 × 18–22 μm, parietis verrucosus, 3–9 μm crassus. Aeciosporae catanulatae, irregulariter dispositae ad maturitatae, ovale, subellipsoidae vel angularae, subpallidae vel cinnamomeum brunneae, 22–48 × 18–28 μm; parietis verrucosus, 2–4 μm ad crassus et 6–8 μm ad apicem.

Infection, restricted to tender shoots, causes witches' broom. Pycnia folicolous, caulicolous, amphigenous, subcuticular, brown to black, applanate to conoid, hymenium flat, terminal paraphyses pale yellow to brown, 86–120 × 34–100 μm. Pycniospores round to oval, small, hyaline to pale yellow. Aecia folicolous, caulicolous, amphigenous, subepidermal, cupulate, innate, erumpent at maturity, 243–342 × 135–306 μm; peridium fragile, peridial cells catenulate, fusiform, hyaline to pale, 26–38 × 18–22 μm, wall verrucose, 3–9 μm thick. Aeciospores catenulate, irregular at maturity, oval, subellipsoidal to angular, pale yellow to cinnamon brown, 22–48 × 18–28 μm; wall verrucose, 2–4 μm thick at sides and 6–8 μm thick at apex.

Holotype: On the living leaves, petioles and tender shoots of *Meliosma pinnata* (Roxb) Walp ssp *arnottiana* (Wight) Beus, near Painavu, January 10, 1982, *A. Diraviadoss*, deposited in MACS, Pune, under AMH. no. 6788.

Paratype: Deposited in the Botanical Survey of India, Southern Circle, Coimbatore under BSI/ISV/ 78937, 78978.

So far five species of *Aecidium* Pers have been recorded on *Meliosma* Bl namely *A. hornotinum* Cum[1], *A. meliosmae-myrianthiae* P. Henn[2], *A. meliosmatis-pungentis* P. Henn and Shirai[3], *A. meliosmae-wightiae* Ramakr and Sund[4] and *A. wareorense* Cum.[5] Of these, *A meliosmae-myrianthiae* P. Henn and *A. meliosmae-wightiae* Ramakr and Sund have been recorded from India. The former causes leaf spots while the latter causes woody galls. The present species differs from all the reported species on *Meliosma* in producing a characteristic symptom of witches' broom. Hence, it is proposed here a new species.

The species is named after its collection locality.

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GALL formation occurs in many plants such as *Quercus*, *Acacia*, *Eugenia*, *Prosopis*, *Salvadora*, *Artemisia*, *Mangifera* etc. Gall represent a unique and complex interspecific interaction and mutual adaptation between the plant and the gall maker. The gall formation is due to an abnormal behaviour of cells of the affected plant organ to protect itself from the attack of cecidozoa or it is a case of extreme parasitism on the part of the insect to obtain free shelter and nourishment from the plant. The primary reaction of the plant is the neutralization of the toxin produced by the insect. Gall formation is caused by fluids injected into the plant tissues by the cecidozoa during feeding or egg laying. Investigations[1–3] have shown that the cecidogenesis is associated with the salivary secretions of cecidozoa. The development of a gall involves more or less pronounced localized enrichment of nutritive material and amino acids to an abnormal degree. Therefore, the present investigation is aimed at studying the free amino acid content in insect-induced plant galls.

Both healthy and gall formed plant portions of *Artemisia scoparia* L, *Prosopis spicigera* L and *Salvadora oleoides* Dine were collected as detailed in table 1.

Artemisia stem and leaf galls, *Prosopis* leaf and rachis galls, *Salvadora* stem and leaf galls, and curly leaf and corresponding healthy portions for comparison were collected separately. The galls thus collected were divided into two age groups, young and old, considering the size and colour of the gall. Both the healthy and galled parts were fixed in 70% ethyl alcohol to extract free amino acids. the insects were removed before fixing the material to avoid any possible extraction of amino acids from the insects. Later the fixed materials, both healthy and galled, were crushed and centrifuged to obtain clear extracts which were then transferred to 50 ml beakers and dried in an oven at 30–40°C. The residue thus obtained was weighed each time before dissolving in absolute alcohol to obtain equal concentrations. A known volume of normal and galled tissue extracts was used for spotting so that visual comparison for amino acids on the chromatogram was possible. Both paper and thin layer chromatography (TLC) were employed to separate free amino acids using butanol:acetic acid.water (4:1:5) and butanol:water (3:1) as solvent systems respectively. In both instances, plate or paper was air-dried, sprayed with 0.3% ninhydrin in 90% butanol and kept at 60°C. The chromatograms were obtained thrice for both control and gall tissue extracts using both paper and TLC. The intensity of colour developed was compared with the standard amino acid chromatograms.

Amino acids present in galls and normal plant parts were almost similar but the concentrations differed as noted by the colour intensities (table 2). The data showed 8 amino acids in *Artemisia* and 6 amino acids each in *Prosopis* and *Salvadora* galls. Proline which was found only in *Artemisia* decreased in quantity as the gall aged. Asparatic acid which was found only in *Prosopis*, increased in amount in galls. Valine and lysine were found only in *Salvadora* galls and their concentrations increased in leaf and stem galls whereas the amount decreased in curly leaf. However, the general observation was a gradual increase in the amount of amino acids in gall

Table 1 *Details of materials collected*

Name of the plant species	Time of collection	Parts affected	Causal organism
Artemisia scoparia	October to December	Shoot axis and leaf	*Rhopalomyia* sp
Prosopis spicigera	November	Leaf and	*Eriophyes prosopidis*
Salvadora oleoides	September to December	Stem and leaf	*Thomasiniana Salvadorae*