

sidiospores. Spore deposit was collected on the upper lid of the Petridish by placing it upside down. Twenty monospore cultures were isolated therefrom following the usual nonquantitative dilution method⁵ and their monokaryotic nature was confirmed by checking the presence or absence of clamp connections in the mycelia.

The monospore cultures were paired among themselves in all possible combinations by placing the inocula 25–30 mm apart on 2.5% malt agar slants and incubated at 25°C for 2 weeks. The hyphae from the confrontation line between the paired mycelia in each tube were examined under the microscope for the presence or absence of clamp connections. The presence of clamp connections indicates the compatible mating of the paired mycelia and the absence of clamp connections indicates incompatible mating. The results were recorded.

Analysis of the results shows that the basidiospores of *H. biennis* fall into four mating groups on the basis of their compatibility. This indicates that the species is tetrapolar with allelomorphs for heterothallism at two loci. The distribution of mating types among the basidiospores studied is given below following the methods of Nobles *et al.*⁶, where the conventional symbols $A_1A_2B_1B_2$ have been used to designate the alleles governing the interfertility:

A_1B_1 : 2, 3, 9, 14, 16, 18

A_2B_2 : 5, 10, 15, 19, 25

A_1B_2 : 4, 7, 8, 22

A_2B_1 : 11, 12, 13, 20, 24

Illegitimate pairings:

$A_1B_1 \times A_1B_2$ — 2 × 8 & 2 × 22

$A_1B_1 \times A_2B_1$ — 2 × 13

Representative culture from each mating group was deposited in the American type culture collection, Maryland, U.S.A.

Oxidase tests were carried out by growing mycelia from tissue culture for 7 days at 25°C on 2.5% malt agar media containing 0.5% gallic acid and tannic acid in separate Petridishes following the method of Davidson *et al.*⁷. Moderately strong diffusion zones were produced in both the media. Blue colorations also appeared when few drops of alcoholic gum guaiacum solution was placed on actively growing cultures. These reactions present positive proof of the production of extracellular oxidase enzymes by the test fungus.

The data from the present investigation, therefore, is compatible with the earlier views^{2,3} that in

Polyporaceae, usually the species which are bipolar, cause brown rots in wood and exhibit negative oxidase reactions in culture; while the species which are tetrapolar, cause white rots and give positive oxidase reactions.

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1. Nobles, M. K., *Can. J. Bot.*, 1958, 36, 883.
2. Nobles, M. K., *Evolution in the higher Basidiomycetes*—The University of Tennessee Press, Knoxville, 1971, 169.
3. Martin, Kenneth, J. and Gilbertson, R. L., *Mycologia*, 1973, 65, 548.
4. Fidalgo, O., *Rickia*, 1969, 4, 99.
5. Smith, G., —*An Introduction to Industrial Mycology*—St. Martin's Press, New York, 1954.
6. Nobles, M. K., Macrae, R. and Tomlin, B. P., *Can. J. Bot.*, 1957, 35, 377.
7. Davidson, R. W., Campbell, W. A. and Blaisdell, D. J., *J. Agric. Res.*, 1938, 57, 683.

PAPAVER RHOEAS AND MORINGA OLEIFERA, TWO NEW HOSTS OF PAPAYA POWDERY MILDEW

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ULLASA AND SOHI¹ reported a new powdery mildew disease of papaya due to *Leveillula taurica*. Since this disease is becoming serious and endemic where varieties like 'Washington' and 'Coorg Honey Dew' are grown, especially during nursery stage and early stages of plant growth, a survey was conducted in July 1982 for possible collateral hosts of this powdery mildew in and around Bangalore. During our initial survey we collected powdery mildew infected leaves of *Papaver rhoeas* L. and *Moringa oleifera* Lam. from seedlings growing in close proximity to papaya nursery beds. Since seedlings of papaya, *Papaver* and *Moringa* were infected by *L. taurica* growing adjacent to each other, cross infection was suspected and further studies were initiated to know the host range and role of these plants as its collateral hosts.

Seedlings of *Papaver rhoeas* showed symptoms when they were one month old. The infection started from lower leaves and gradually covered the upper leaves, stems, petioles and flower stalks and finally the whole plant got infected. The infection spots were always hypophyllous with restricted colony growth and were delimited by veinlets. The growth of the fungus was similar to downy mildew with fluffy mycelial outgrowth. On the corresponding upper side paler and necrotic lesions were produced.

On *Moringa oleifera* the initial symptoms appeared as slight yellowing of the leaves either from the margin or towards the midrib on the lower side of the leaves. Growth of the fungus was very scanty with sparse production of conidiophores and conidia. The infection spots tend to become yellow and corky in advanced stages.

Healthy seedlings of papaya variety 'Washington', highly susceptible to *L. taurica* and seedlings of *Papaver* and *Moringa*, were raised in pots in the glass house. Cultures of papaya, *Papaver* and *Moringa* powdery mildew were raised on their respective hosts. Subsequently cross inoculations were made to check their pathogenicity. Papaya seedlings were dusted with the spores collected from infected leaves of *Papaver* and *Moringa* separately and similarly leaves of *Papaver* and *Moringa* seedlings were cross-inoculated with spores collected from infected papaya leaves. The infection was noticed on papaya, *Papaver* and *Moringa* leaves within 5–7 days. Distinct symptoms were noticed on all the hosts with each culture. It is thus clear that *L. taurica* infecting *Papaver* and *Moringa* is identical to the one of Papaya. Hence it is shown that *Papaver* and *Moringa* act as collateral hosts of papaya powdery mildew due to *L. taurica*. Besides being *Papaver rhoeas* and *Moringa oleifera* are two collateral hosts of *L. taurica*, its occurrence on these two hosts is reported for the first time from India, which are being deposited at HCIO, IARI, New Delhi under Nos. 35001, 35000, respectively.

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1. Ullasa, B. A. and Sohi, H. S., *Curr. Sci.*, 1978, 47, 111.

INTERSPECIFIC CROSS BETWEEN *ATYLOSIA ALBICANS* AND *ATYLOSIA* *SCARABAEOIDES*

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A CROSS between *Atylosia albicans* and *Atylosia scarabaeoides* was successfully attempted. One F_1 plant was obtained, which was semi-fertile and showed the intermediate plant characters. F_2 progeny raised, have shown plants with different morphological traits. Unlike F_1 , some of the F_2 plants were fertile.

The materials comprised of *Atylosia albicans* (W & A) Benth., and *Atylosia scarabaeoides* (L.) Benth., used in the present investigation as female and pollen parent respectively. The seeds of the former were obtained through the courtesy of ICRISAT, Hyderabad. Both the species being perennial, have an advantage of providing more adequate dry season feed reserves. About one hundred crosses were attempted during the winter season of 1979. Meiotic studies were made following propionocarmine staining technique and studies on pollen stainability were made following acetocarmine staining technique.

Only one crossed pod containing two seeds was obtained. Out of the two F_1 seeds, one germinated. Meiotic studies revealed 11 II's in parents and 10 II's + 2 I's in the F_1 plant at metaphase-1 (figures, 1, 2, 3). However, in some of the F_2 s the number of univalents at metaphase-1 were seen to be quite varying (table 1). Pollen stainability in F_1 plant was 53.7% while in the different F_2 plants it ranged from 30.85% to 93.26% (table 1). In contrast to the growth habits met with in parents (figures 4 and 5), enormous variabilities were noticed particularly in some of the F_2 segregants (figures, 6, 7, 8, 9).

Formation of univalents resulted in meiotic irregularity and thus led to varying degree of sterility. More so, in some of the F_2 s, the low seed yield could be attributed to high pollen sterility accompanied by a high degree of univalent formation. However, increase of fertility and chromosomal pairing observed in some of the F_2 s could possibly be due to the existence of close homology in their chromosome complements.

Plants with general growth vigour comprising of higher size of leaflets coupled with profuse branching do possess the forage potentialities and could add to the range land pasture production. As the wild relatives of crop species have been shown to be the source of high protein in broad bean¹; oats^{2,3} and *Atylosia*