
Morphology and identity of *Phytophthora* isolates from *Piper betle* in India

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Morphology and identity of the isolates of *Phytophthora* were examined using recently emphasised characteristics of the sporangium specially the caducity and the pedicel length of the sporangium. *Piper betle* from M.P. belong to *Phytophthora nicotinae* var. *parasitica* and not *P. palmivora*.

Key words : *Phytophthora*, *Piper betle*, identification

INTRODUCTION

Proper and correct identification of *Phytophthora* species has long been a difficult task due to the similarities between many of the so called species. Among the most frequently used criteria in existing keys to *Phytophthora* species (Frezzi, 1950; Leonian, 1934; Tucker, 1931; Waterhouse, 1964) are the sporangial characteristics as size, shape, length-breadth (L:B) ratio, diameter at exit pore, papilla morphology and/or apical thickening, many of which are known to be extremely variable (Brasier, 1969; Hendrix, 1967; Leonian, 1925). On the otherhand the least emphasized sporangial characteristics are the caducity (sporangium falling at maturity) and length of pedicel, or stalk of the caducous sporangium. Failure to use sporangial caducity and pedicel length, as diagnostic characters, has resulted in occasional misidentifications of the *Phytophthora* isolates. Consequently some reported isolates from the *Piper* species to possess persistent sporangia (Holliday and Mowat, 1963; Waterhouse, 1974) while some others thought them to possess caducous sporangia with long pedicels (Tsao, 1977; Tsao and Tummakata, 1977). Controversy and confusion existed for many years regarding the identity and nomenclature of *Phytophthora* isolates pathogenic to *Piper betle* throughout the betel growing regions. This article reports the morphology and identities of some *Phytophthora* isolates from *P. betle* from central part of India.

MATERIALS AND METHODS:

Three *Phytophthora* isolates from lesions on *Piper betle* leaves were examined and numbered as Isolate 1 (from Sagar, M.P.), Isolate 2 (Jabalpur, M.P.) and Isolate 3 (from Sagar, M.P.). These three isolates were all from central part of India. All the cultures were maintained on oatmeal-agar medium until use.

For sporangial production, standardized mycelial mat colonies on oat meal agar in petri dishes were used. The hyphae were allowed to grow to mat colonies in the dark for 2 days at 25°C. The mat colonies were washed consecutively three times with sterilized deionized water, 15 ml per wash. These mat colonies in water were then incubated under continuous light (two General Electric Cool white 40 watt fluorescent lamps, 60 cm away from cultures, at an intensity of 1700 uw/cm²) for 3 days at 25°C to induce sporangium formation. After 3 days under light, the sporangium-bearing mat colony and suspension of naturally detached sporangia if any were poured into an 18 × 150 mm test tube. The mat in the test tube was shaken on a wrist action shaker for 1 minute to dislodge the detachable mature sporangia. The above procedure was applied to each of three replicates of each isolate tested. Observations were made under the high power of a microscope (x400).

RESULTS AND DISCUSSION

Dastur (1935) described *P. parasitica* var. *piperina* as a causal organism for leaf rot and foot rot of *P. betle* from the central part of the country. He created the variety *piperina* of *Phytophthora parasitica* on the basis of larger oogonial size i.e. 20.4 to 40.8 µm. Dastur's identification of the betel vine pathogen as *P. parasitica* was mainly based on the sporangial measurements and chlamydospore characteristics similar to *P. parasitica* which he has discovered in 1913. Since Dastur did not give Latin diagnosis of the variety *piperina*, *P. parasitica* var. *piperina* was not recognised a valid taxon by Waterhouse (1963). All the three isolates that were examined in the present investigation did not produce caducous sporangia. Sporangial measurements were within the limits of *P. parasitica* (27.5 to 52.5 µm length, 24 to 33.5 µm breadth). Although the present investigators did not have any occasion to examine cultures of *Phytophthora* isolated from *P. betle* from either West Bengal or South India, where conflicting reports were available regarding the identification of *Phytophthora* from *P. betle*. Maiti and Sen (1977) made a comparison of sporangia of two isolates from *Piper betle* leaves with those of *P. nicotinae* var. *parasitica*, *P. parasitica* var. *piperina* and *P. palmivora* isolated from foot rot and leaf rot of betel vine and came to the conclusion that these were more or less identical both in shape and dimension. Maiti and Sen (1977) did not study the caducity of sporangium characteristics while reaching their conclusions.

In the present investigation, all the three isolates of *Phytophthora* do not possess caducous sporangia. The detached sporangia of the three non-caducous isolates, *P. parasitica* did not carry a pedicel, but instead had very infrequently a piece of broken sporogenous hyphae of irregular length.

The identification and nomenclature of *Phytophthora* species pathogenic to *P. betle* and *P. nigrum* have been in controversy and isolates from different parts of the world have been identified by different researchers differently (Al-Hedaithy and Tsao, 1979; Nambiar and Sharma, 1977; Tsao, 1982). Turner (1969) after a comparative study of large number of species concluded, that all *Phytophthora* isolates from *Piper* spp. in South-east Asia were similar and should be referred to as typical strain of *P. palmivora* Butl. It appears that *P. betle* is infected by more than one species of *Phytophthora* in different parts of India. However, the present study clearly indicates that *Phytophthora* from central part of the country is definitely *P. nicotinae* var. *parasitica* and not *P. palmivora*. However, Tsao

(1982) has reported that an isolate S4 sent by Y.R. Sarma from Calicut from India was identified as *P. palmivora* (MF4).

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