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Nodulisporium terra: a new fungal species explored from soil of paddy field, Ramankari, Kerala, India

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In the present investigation, a new fungal species, *Nodulisporium terra* was isolated and identified from the soil samples collected from Paddy field of Ramankari, Kerala state of India. The current study is the first study ever done to report the said species. The above new species were reviewed and compared with the previously known species, and the differentiating characteristics were reviewed and considered to represent a new species.

Key words: Ascomycota, Fungal diversity, Kuttanadu, mononematous, soil microfungi, Xylariaceae

INTRODUCTION

The genus *Nodulisporium* was erected *from Germany based on type species Nodulisporium ochraceum* Preuss. The type species reportedly is not dematiaceous. The generic concept of *Nodulisporium* has been well summarized and illustrated.Thus the genus *Nodulisporium* contains both dematiaceous and non dematiaceous members and occur in nature worldwide, through being conidial anamorphs of certain wood decay ascomycetes like *Hypoxylon, Xylaria, Daldinia, Entonaema*, and *Biscogniataia.*

Conidial genera that can be confused with *Nodulisporium* include *Calcarisporium, Geniculosporium, Hansfordia, Phaeoisaria, Rhinocladiella, Sporothrix,* and *Virgaria.* The *Nodulisporium* anamorph grows in conjunction with the developing stromata briefly during favourable conditions and, in few cases, is able to grow independently on various organic matter with *Nodulisporium* like conidiophore branching pattern, whereby successive dichotomous or trichotomously branched conidiophores gives rise to multiple levels of terminal branches and all bearing 1–3 (rarely more) conidiogenous cell.

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MATERIALS AND METHODS

Soil samples were collected from paddy field of Ramankari ,Kuttanad, Alapuzha district, Kerala, randomly from a depth of 0-15 cm and mixed together to get one composite soilsample. The soil dilution method on Potato Dextrose Agar was used as isolation technique.(Waksman, 1922)

RESULTS

Nodulisporium terra Shigi and Neeta,sp.nov.(Fig 1 A–H)

Mycobank MB 837464
Etymology:—The specific epithet is named after it isolated from soil

Mycelium superficial to partially immersed, hyphae colored, rough to denticulate, loosely septate 1.5 – 2.5 ìm wide. Colonies on PDA growing up to 7.8 mm in diameter after 10 days at 25^0± C, finely floccose, zonate, slightly cream to yellowish colored with white margin later turning with greyish-brown surface, yellowish pigment diffuse in culture medium. Stromata and any other odor were not observed. *Conidiophores mononematous, macronematous, branched usually at terminal end, flexuous, olivaceous to pale brown,*

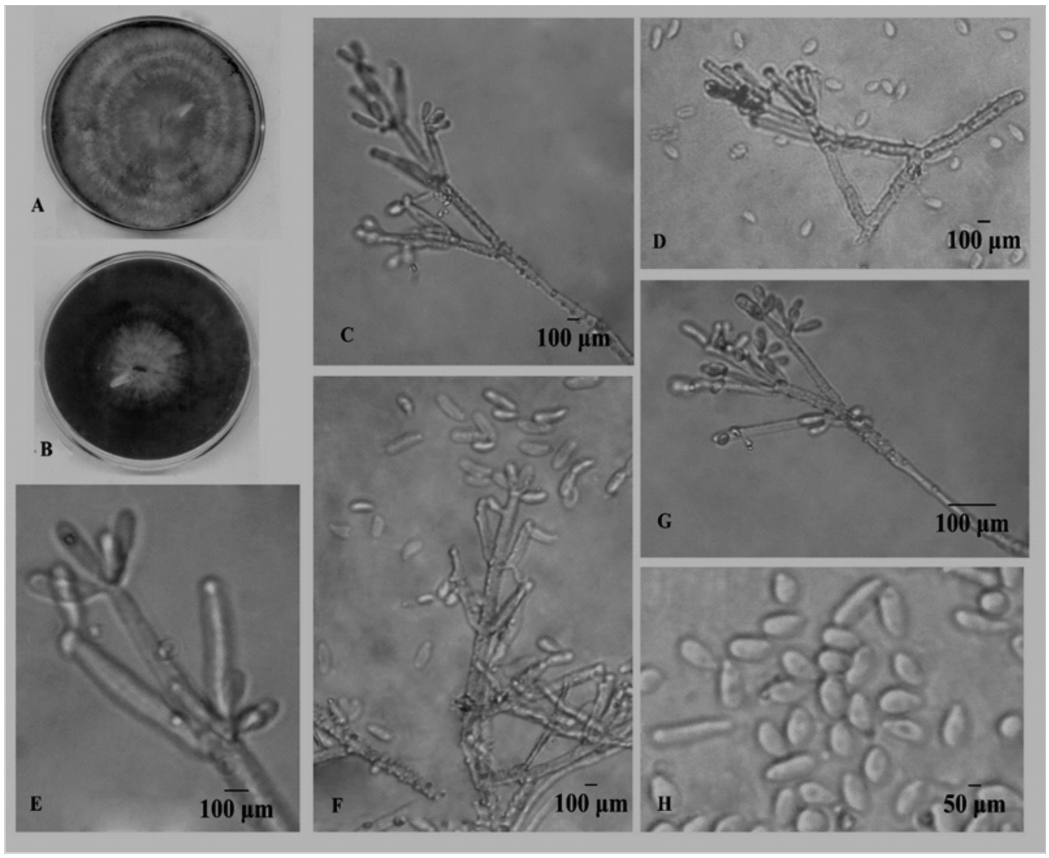

Fig.1: *Nodulisporium terra* A – B Colony on potato dextrose agar (top and reverse). C Conidiophore type. D Rough mycelial structure. E Conidiogenous cells with conidia.F– G Conidiophore branching pattern. H Conidia.

*septate, smooth at basal portion or denticulate up to terminal end*mostly 600 –750 ìm long × 6.5 ìm wide towards the base, 5 um wide towards the apex. *Conidiogenous cells develop on the branches of conidiophores, polyblastic, integrated or terminal or discrete, solitary or arranged penicillately, sympodial, cylindrical up to* 30 ìm long × 6 ìm wide*, denticulate; denticles short, fragile,* sometimes swollen in the middle otherwise long cylindrical bearing conidia at the swollen tip or some time along the side denticles , holoblastic conidiogensis. Conidia hyaline, nonseptate, smooth, guttulate with 1–2 oil globules, variably shaped, ellipsoidal to fusoid orobovoid, pyriform, and cylindrical, 10–12 ìm long × 5.5 ìm broad, with small flat truncate basal scar of 2–3 ìm diam,. Soil samples from Paddy field of Ramankari, Alappuzha district, Kerala state of India. Collected by Shigi Joseph July, 2019, NCFT, No 9811.20.

DISCUSSION

The new species was compared with species of Hughes, (1958) who erected seven *comb novo* based on genus *Botrytis, Haplaria, Sporotrichum, Dematium* and *Trichosporum* namely *Nodulisporium atroviride*, *Nodulisporium affine* and *Nodulisporium ellisii* based on (= *Botrytis atroviridis*, *Botrytis affinis*, *Botrytis ellisii*) respectively in addition to *Nodulisporium corticioides* of (=*Haplaria corticioides*)*, Nodulisporium fulvum* of (=*Sporotrichum fulvum*) , *Nodulisporium episphaerium* of (=Dematium episphaericum), *Nodulisporium tabacinum* of (=*Trichosporumtabacinum)*. Thereafter, Deighton, (1985) made four *comb novo* based on genus *Isaria* and *Verticillium* species namely *Nodulisporium radians*, *Nodulisporium acervatum*, *Nodulisporium umbrinum* based on *Isaria radians*, *Isariaa cervata, Isaria umbrina* respectively while, *Nodulisporium puniceum* of Verticillium puniceum and *Nodulisporium sylviforme* which is exclusively based on mononematous structure and typical *Nodulisporium* type branching pattern of conidiophores.

Eleven *Nodulisporium* species cited above were reviewed for their taxonomical characters with

regards to colony growth, conidiophores, conidiogenous cell and conidia formation in the light of their shape, size, color, septation, formation to justify the new taxon. Amongst the above cited species none were found taxonomically closer in above cites characters to the new taxon of *Nodulisporium terra.* However, amongst the above, *Nodulisporium sylviforme* which have particular character of mononematous conidiophore and typical *Nodulisporium* type branching pattern were specifically compared with new proposed species while other remaining species excluded due to presence of having different stages like *Botrytis, Haplaria, Sporotrichum*, *Dematium, Trichosporum,Isaria*,and *Verticillium* type. In contrast, the new species have rough to denticulate mycelial structure, longer conidiophores, smooth, larger *conidiogenous cells, longer conidia with enlarged to cylindrical in shape with distinct oil globules , thus Nodulisporium terrasp.nov*is is being proposed.

Collado *et al*. (2001) reported a *Nodulisporium sp*. from *Quercus ilex* in central Spain as the anamorph of *Biscogniauxia mediterranea*. Umabala *et al.* (2001) isolated a species of *Nodulisporium* from a cerebral phaeohyphomycosis case. Conidia arose singly and successively on denticles at the tips of conidiogenous cells; the first conidium was formed apically. Subsequent conidia were formed sympodially in more or less basipetal succession, forming heads. Nigg *et al*. (2014), isolated a *Nodulisporium* species from *Cassia fistula.* Polishook *et al.* (2001) studied the biogeography and relatedness of *Nodulisporium* strains producing nodulisporic acid. Morgan *et al.* (2012) reported that some *Nodulisporium* sp could produce volatile organic compounds having bioactivity and fuel potential.

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