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Myxomycetes of Himachal Pradesh — I

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About 180 species of myxomycetes have been described from India and of these twentyfour were collected from Himachal Pradesh, in the Western Himilayas (Thind & Lakhanpal, 1968 a; b; c; d). Thirty two species are recorded in this paper, four species and one var. of which are reported for the first time from India. All the four species have been fully described and illustrated. Most of the specimens were collected during July—September, 1967—1970, at an elevation of about 600—2500 meters above sea level. All the specimens have been deposited in the Herbarium of the Botany Department, Hans Raj College, (HHRC/TNL). Duplicates of Nos. 132, 149 a, 162, 163, 165, 176, 177, 180 and 150, 153, 156, 157 have also been deposited with Professor C. J. Alexopoulos, Department of Botany, University of Texas, Austin, USA. and Dr. D. T. Kowalski, Department of Biology, Chico State College, Chico, California, USA., respectively.

Laboratory methods and identification of the specimens is based on the monograph on „The Myxomycetes" by G. W. Martin and C. J. Alexopoulos, 1969.

1. *Lycogala epidendrum* (L.) Fries, Syst. Myc. **3** : 80. 1829.

Collected on dead wood, Thatchi (Mandi-H. P.), August 14, 1968; and on a freshly cut stump of *Pinus roxberghii*, Hareta (Hamirpur-H. P.), July 3, 1971; Acc. No. HHRC/TNL 180 and 181 respectively. Typical.

2. *Lycogola exiguum* Morgan, Jour. Cinc. Soc. Nat. Hist **15** : 134. 1893.

Collected on dead wood, Manali (H. P.), July 2, 1970. Acc. No. HHRC/TNL 132, 167 and 168.

These specimens are intermediate between *L. epidendrum* and *L. exiguum*. The spores are closer to the former but it has the tessellate protuberances of the latter on the peridium.

3. *Cribraria tenella* Schard., Nov. Gen. Pl. 6 : 1797.

Collected on dead wood, Manali (H. P.), August 24, 1968. Acc. No. HHRC/TNL 159. Typical.

4. *Arcyria denudate* (L.) Wettst., Ver. Zool.-Bot. Ges. Wien **35** : Abh 535. 1886.

Collected on dead wood, Manali (H. P.), August 24, 1968. Acc. No. HHRC/TNL 169. Typical.

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5. *Stemonitis axifera* (Bull.) Macbr., N. Am. Slime Moulds. 120. 1889.

Collected on dead wood, Thatchi (Mandi-H. P.), August 14, 1968. Acc. No. HHRC/TNL 165 and 178. Typical.

6. *Stemonitis fusca* Roth var. *papillosa* Meylan, Bull. Soc. Vaud. Sci. Nat. **58** : 322. 1935.

Collected on decaying wood, Thatchi (Mandi-H. P.), August 14, 1968. Acc. No. HHRC/TNL 164. Typical. New record for India.

Martin and Alexopoulos (1969), pointed out that the status of this var. is uncertain and they adopted it in their monograph to accomodata all forms of *S. fusca* in which the reticulations on the spores seem to be lacking. This collection, however, shows all the characteristics of *S. fusca* var. *papillosa* and differs from *S. fusca* var. *fusca* in the lack of reticulations on the spore wall. It, therefore, definitely deserves a varietal rank if not specific.

7. *Stemonitis inconspicua* Nann. Brem., K. Ned. Akad. Wet. Proc. C. **69** : 350. 1966.

Collected on dead wood, Thatchi (Mandi-H. P.), August 14, 1968. Acc. No. HHRC/TNL 163. New record for India. (Plate I. Figs. 1—3).

Fructification sporangiate, stipitate, total height up to 3 mm; sporangia occour in small clusters, gregarious, erect or slightly bent, flexuous, clay brown or dark brown, narrow towards top, 1.7—2.2 mm long and 0.3—0.4 mm in diameter; stipe 0.8—0.9 mm long i. e. slightly less than half the sporangial length, straight or curved, uniform in width except the expanded base, solid, smooth, shining, extending into the sporangium as columella; hypothallus prominent, confluent, dark brown, iridescent; peridium fugaceous; dehiscence irregular.

Columella central, concolourous with the stipe, narrowing upwards and merging into the capillitial net just below the apex.

Capillitium numerous violaceous brown, prominent, primary branches arising from the columella, branching and anastomosing to form a large meshed net with frequent membranous expansions, ultimate branchlets united to form a small meshed surface net, which is delicate, fragmentary and with many free ends, meshes 10—30 μm wide.

Spores brown in mass, pallid or pale ochraceous by transmitted light, globose, 6—7 μm in diameter, reticulate, 2—4 meshes to a diameter, reticulations prominent, boundry of the spore darker than the reticulations.

This collection resembles *S. inconspicua*. It is characterised by distinctly stalked sporangia occurring in small clusters, attaining a maximum height of 3 mm, delicate capillitial net and reticulate spores with 2—4 meshes per diameter.

8. *Stemonitis splendens* Rost., Mon. 195. 1874.

Collected on dead wood, Thatchi (Mandi-H. P.), August 14, 1968. Acc. No. HHRC/TNL 177.

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This collection resembles *S. splendens* in all respects. This also suggests *S. fusca* but differs from that in more reddish colour, large meshes of the surface net and in lacking any trace of reticulations on the spores.

9. *Lamproderma arcyrionema Rost.*, Mon. 208. 1874.

Collected on dead leaves, Mandi (H. P.) August 29, 1968. Acc. No. HHRC/TNL 161. Typical.

10. *Lamproderma scintillans* (Berk. & Br.) Morgan, Jour. Cinc. Soc. Nat. Hist. **16** : 131. 1894.

Collected on dead leaves, Mandi (H. P.), August 29, 1968. Acc. No. HHRC/TNL 160. Typical.

11. *Comatricha longa* Peck, Am Rep. N. Y. State Mus. **43** : 70. 1890.

Collected on dead wood, Manali (H. P.), August 24, 1968. Acc. No. HHRC/TNL 176. Typical.

12. *Comatricha typhoides* (Bull.) Rost., in Lister Mycet. 120. 1894.

Collected on dead wood, Manali (H. P.), August 19, 1968. Acc. No. HHRC/TNL 162. Typical.

13. *Fuligo septica* (L.) Wiggers, Prim. Fl. Holstat. 112. 1780.

Collected on dead and green leaves, Mandi (H. P.), August 29, 1968; and Jahu (Hamirpur-H. P.), July 3, 1970. Acc. No. 147 and 148.

14. *Leocarpus fragilis* (Dicks.) Rost., Mon. 132. 1874.

Collected on dead wood, Thatchi (Mandi- H. P.), August 14, 1968. Acc. No. HHRC/TNL 183. Typical.

15. *Physarum bivalve* Pers., Ann. Bot. Usteri **15** : 5. 1795.

Collected on dead leaves, Mandi (H. P.), August 29, 1968. Acc. No. HHRC/TNL 182. Typical.

16. *Physarum bogoriense* Racib., Hedwigia **37** : 52. 18 F. 1898.

Collected on dead twigs, *Quercus incana* fruits, green grass, dead twigs and leaves, Mandi (H. P.), August 29, 1968. Acc. Nos. HHRC/TNL. 138, 139 a, 139 b.

These collections are typical of *P. bogoriense*. However, the peridium appears be typically two layered. The fruiting bodies are dehisced and may be the third layer has been lost during dehiscence as pointed out by Martin and Alexopoulos, 1969, "the very delicate inner layer seems to disappear very quickly and it is not present in old and weathered specimens." Further, they also mention the tendency of spores to remain in clusters, in the collection of Dr. D. T. Kowalski, from North Carolina. These collections also show this tendency of the spores. In No. 139 a, the nodes are massed together in the center to form a pseudocolumella.

17. *Physarum cinereum* (Batsch) Pers., Neues Mag. Bot. **1** : 89. 1794.

Collected on dead twigs, Mandi (H. P.), September 14, 1967. Acc. No. HHRC/TNL 145 and 146. Typical. No. 145 shows massing together of the nodes to form pseudocolumella whereas No. 146 lacks it.

18. *Physarum melleum* (Berk. & Br.) Massee, Mon. 278. 1892.

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Collected on dead leaves, Mandi (H. P.), September 14, 1967. Acc. No. HHRC/TNL 143 and 144.

In both the collections the sporangia are typically stipitate, orange yellow or honey yellow and the stalk and columella white or ochraceous-tawny. The sporangia also show a tendency towards stellate dehiscence.

19. *Physarum nicaraquense* Macbr., Bull. Nat. Hist. Univ. Iowa **2**: 382. 1893.

Collected on a freshly fallen log of wood, Mandi (H. P.), August 17, 1969 and from the stem of living *Carica papaya* plant, Hareta (Hamirpur — P. H.), July 12, 1920. Acc. No. HHRC/TNL 149 d, 149 a and 149 b respectively.

All these collections are typical of *P. nicaraquense* except that hypothallii in them are yellowish or dark brown and not black, the pseudocolumella formend by the massing together of the nodes is quite frequent and prominent. Plasmodium white, pale yellow changing to deep yellow at maturity.

20. *Physarum nutans* Pers., Am. Bot. Uster **15**: 6. 1795.

Collected on dead wood and sporophores of fungi, Mandi (H. P.), August 14, 1968. Typical.

It is easily distinguished from *P. viride* by its grey or white sporangia and white nodes. Older specimes of *P. viride* sometimes fade and appear greyish white like *P. nutans* but usually the nodes retain their colour.

21. *Physarum nudum* Macbr., in Peck & Gilbert, Am. Jour. Bot. **19**: 134. 1932.

Collected on green grass leaves, Thatchi (Mandi — H. P.), August 29, 1968. Acc. No. HHRC/TNL 150. New record for India. (Plate I. Figs. 4—6).

Fructifications sporangiate, subplasmodiocarpous and plasmodiocarpous; sporangia gregarious or crowded, sessile, subglobose or pulvinate on a constricted base, 0.25—0.35 mm in diameter, ash grey when lime is present and greyish black when lime is absent; plasmodiocarps few,, small, 0.25—10 mm long and up to 0.25 mm wide, concolourous with the sporangia; hypothallus absent or poorly developed, rotate; peridium single, thin, membranous, ash grey of black, iridescent; dehiscence irregular but mostly the upper portion falls off first leaving behind the lower portion of the peridium with a compact spore and capillitial mass. Columella none.

Capillitium scanty, appearing badhamoid under binocular, physaroid otherwise, consisting of calcareous, large nodes and hyaline, noncalcareous internodes. Nodes variable in shape and size, only a few.

Spores black in mass, violaceous brown by transmitted light, globose or subglobose, spinulose or warted, 9—10 μ in diameter.

This collection resembles *P. nudum* very closely differing in two

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respects only: firstly, the sporangia are small and secondly, the spores dont show clustering of warts. It differs from *P. cinereum* in having a delicate peridium with scanty lime deposit and scanty capillitium.

It is characterised by predominantly sporangiate fruiting bodies, delicate peridium and scanty capillitium which appears badhamoid when dehisced sporangia are seen under binocular. The physariod nature becomes clear only when fruiting bodies are directly mounted in water and examined under the light microscope, less so if the fruiting bodies are first treated with alcohol, revived in KOH and mouted in glycerine. In the second procedure most of the capillitium is lost in processing and only a few nodes may be left in view by the time it is mounted.

22. *Physarum rigidum* (G. Lister) G. Lister, Mycet. ed. 3. 36. 1925.

Collected on dead wood, M a n a l i (H. P.), August 14, 1968. Acc. No. HHRC/TNL 151. This collection is typical of the species. It differs from *P. viride* in the possession of rigid limy bars of capillitium and larger and darker spores.

23. *Physarum vernum* Somm., in Fries, Syst. Myc. **3** : 146. 1829.

Collected on dead wood and twigs, M a n d i (H. P.), September 14, 1967. Acc. No. HHRC/TNL 141 & 142. Typical.

This collection possesses predominantly branched and netted plasmodiocarps with characteristically rugose peridium and violaceous brown spores.

24. *Physarum viride* (Bull.) Pers., Ann. Bot. Usteri **15** : 6. 1795.

Collected on dead wood, M a n a l i (H. P.), August 24, 1968. Acc. No. HHRC/TNL 137. Typical.

25. *Diderma effusum* (Schw.) Morgan, Jour. Cinc. Soc. Nat. Hist. **16** : 155. 1894.

Collected on bark ou *Eucalyptus* sp., M a n d i (H. P.), August 24, 1970. HHRC/TNL 154. Typical.

26. *Diderma hemisphericum* (Bull.) Hornem, Fl. Dan. **33** : 13. 1829.

Collected on dead leaves, M a n d i (H. P., August 29, 1968, Acc. No. HHRC/TNL 153.

This collection resembles *D. hemisphericum*. It, however, differs in that it possesses mostly sessile, less depressed and less discoid sporangia the normally reported. ones.

27. *Diderma rugosum* (Rex) Macbr., N. Am. Slime Moulds 105. 1829.

Collected on dead leaves, M a n d i (H. P.), August 20, 1967. Acc. No. HHRC/TNL 152.

This collection resembles *D. rugosum* in most of the respects. It differs, however, in that the spores in this collection are prominently warted and warts show a tendency to arrange in lines. M a r t i n and A l e x o p o u l o s (1969), mention that this species usually grown on mosses. This collection, however, was found on dead leaves and at quite an explosed place where mosses could hardly grow.

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28. *Didymium crustaceum* Fries, Syst. Myc. **3** : 124. 1829.

Collected on dead wood, T h a t c h i (Mandi — H. P.), August 14, 1968. Acc. No. HHRC.TNL 179. Typical.

29. *Didymium flexuosum* Yamashiro, Jour. Sci. Hiroshima Univ. Ser. B. **2—3** : 31. 1936.

Collected on dead leaves, M a n d i (H. P.), August 20, 1967. Acc. 1968. Acc. No. 10. New record for India (Plate II. Figs. 1—4).

Fructifications plasmodiocarpous, sporangiate; plasmodiocarps long, mostly simple, sometimes branched and approaching a net, terete, laterally compressed, white or cinereous, 0.9—3 mm long, 0.25—0.3 mm in diameter; sporangis few, globose or subglobose, up to 0.25 mm in diameter, cinereous or pallid; hypothallus well developed, prominent, rotate, visible only when fruiting bodies fall off, white; peridium single, thin, membranous, pallid, covered with stellate lime crystals; dehiscence irregular.

Columella well developed, extending like a wall from one end to the other end of the fruiting body, central, calcareous, white or pallid, attached at the base and free above.

Capillitium well developed, consisting of branched and sparsely anastomosed, yellowish brown threads, flattened at joints, broader and brown at the base, narrower and almost hyaline at the tips.

Spores black in mass, dark violet brown by transmitted light, globose or subglobose, completely or incompletely reticulate, 10—12 μm in diameter (including warts), spore like bodies of much larger size (4—5 times larger) and of different shapes, bearing broken reticulations but lacking a boarder, often present.

This collection resembles *D. flexuosum* in most of the respects. The plasmodiocarps in this case are not very frequently branched and rarely do they approach a net. The large vesicular bodies possess very fine broken reticulations and the spores are slightly smaller than the ones reported by the earlier workers.

The species can easly be distinguished by its wall like columella, extending full lenght of the fruiting body, distinctly reticulate spors and the spore like, but much larger vesicular bodies.

30. *Didymium floccosum* Martin, Thind & Rhill, Mycologia **51** : 160. **1959.**

Collected on dead leaves, M a n d i (H. P.), August 20, 1967. Acc. No. HHRC/TNL 155.

This collection is typical of *D. floccosum* described first from D e h a d r u n, India (1959). This is the second report of this species from a place situated almost at the same height as the original place of collection, and growing on a similar substratum i. e. dead leaves. The floccose peridium bearing clusters of stellate lime crystals, mostly attached to the capillitial threads, and densely verrucose spores with obscure reticulations, are the characteristic features of the species.

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31. *Didymium squamulosum* (Alb. & Schw.) Fries, Symb. Gast. 19. 1818.

Collected on green fern fronds, Manali (H. P.), September 1968. Acc. No. HHRC/TNL 158. Typical.

32. *Didymium verrucosporum* Welden, Mycologia **46**: 98. 1954.

Collected on decaying stems of *Euphorbia royalana* and cords of *Saccharum munje,* Hareta (Harmirpur — H. P.), July 5, 1971. Acc. No. HHRC/TNL 156. New record for India (Plate II. Figs. 4—7).

Fructifications sporangiate, stipitate, total height up to 1.5 mm; sporangia loosely gregarious, globose or subglobose, ambilicate below, ash grey, nodding, 0.3—0.5 mm in diameter; stalk well geveloped, 0.6—1.2 mm long, dark brown and broad at the base, narrow and yellowish or pallid above, tapering upwards, curved and sporangia nodding, transluscent under the microscope, non-calcareous throughout, with occasional calcareous granules towards the base, rugose longitudinally; hypothallus poorly developed but prominent, concolours with the lower portion of the stipe, sometimes hardly distinguishable from the substratum; peridium single, thin, membranous, densely covered with stellate lime crystals, transluscent, delicate; dehiscence irregular.

Columella well developed, almost half the sporangial height, white or tawny, calcareous, globose or subglobose.

Capillitium well developed, consisting of greyish brown threads, violaceous brown by the transmitted light, hyaline at the apices, branched, anastomosed-sparingly and bearing nodular thickenings.

Spores black in mass, violaceous brown by transmitted light, profusely warted, warts thick and arranged in clusters, 9—10 μm in diameter.

This collection resembles *D. verrucosporum* in most of the respects and differs in that its spores lack ridges. It differs from *D. nigripes* in the presence of white columella and delicate, colourless peridium; and from *D. nigripes* in its darker stem and capillitium, and from both in its more prominently warted spores.

It is characterised by stipitate fruiting bodies with slightly umbilicate, nodding sporangia, non- calcareous dark stalk-opaque below and transluscent above, colourless or tawny columella and peridium, prominently warted spores with warts arranged in clusters.

Acknowledgement

Thanks are due to Professor C. J. Alexopoulos and Dr. D. T. Kowalski for confirming the identity of a number of species, Professor F. Petrak and Dr. K. G. Muckerji for critically going through the manuscript, and Professor M. M. Johri for providing the facilities.

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: Sydowia

Jahr/Year: 1971/1972

Band/Volume: 25

Autor(en)/Author(s): Lakhanpal T. N.

Artikel/Article: Myxomycetes of Himachal Pradesh - I. 232-239