

Some Powdery Mildew fungi of Chhattisgarh State-II

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Twenty powdery mildew fungi were collected from Chhattisgarh State and all these fungi were scientifically studied and documented.

Key words : Powdery mildew fungi, Chhattisgarh state.

Powdery mildews are polycyclic diseases that can impair photosynthesis, stunt growth and increase the rate of senescence of host tissue. The diseases they cause may be slight but (or in some situations), if left untreated, they may result in severe economic losses on crops. Unlike most fungal pathogens, powdery mildew fungi tend to grow superficially on plant surfaces.

During the growing season, hyphae are produced epiphyllously and hypophyllously, although some species are restricted to one leaf surface only. Infections can also occur on stems, flowers, or fruit. Specialized absorption cells, termed haustoria, extend into the plant epidermal cells to obtain nutrition. Most powdery mildew fungi produce epiphytic mycelium. Previously, identification was based largely on the teleomorph and the morphology of the cleistothecium and its appendages, but the morphology of structure is not as conserved as originally assumed. With the new taxonomy, identification of powdery mildews now also requires attributes of the anamorph, so that it incorporates characteristics of the whole fungus. A major distinction for identification is whether conidia are produced in chains or singly.

In Chhattisgarh state, powdery mildew disease appears on many hosts every year, in mild to severe form and causes considerable losses. Some times severe attack results in distortion of affected foliage leading to defoliation. Infection of flowering buds results in reduced fruit setting and poor yields. In the present investigation attempts have been

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made to collect some powdery mildew fungi of Chhattisgarh state and to document these fungi scientifically.

MATERIALS AND METHODS

During survey work diseased leaves collected and packed in alcohol sterilized polythene bags and brought into the laboratory for microscopic examination and identification. The mycelium, conidiophore and conidia were mounted in plane water by pressing the cello tape on diseased portion. The hyphae, conidiophore, conidia and its germination were presented by making camera lucida drawing. All these collections have been described using characters of current taxonomic importance in defining the imperfect stages of erysiphaceae in modern sense. In tropics they mostly occur in conidial states and named on host basis. But this criteria is of limited use since one species may infects several hosts. In characterizing collections of powdery mildew fungi we have used Blumers (1967) conidiophore types based on the work and terminology of Jaczewski (1927) and Brundza (1933) and A & B units of conidiophore in the sense of Hammett and Manners (1973).

RESULTS AND DISCUSSION

Oidium agerati Yen, Cashiers de Pacifique 11, p. 85 (1967)

Mycelium amphiphylous, hyphae up to 7.99 μm in dia., appressoria indistinctly nipple shaped. *Conidiophores* euoidium type, A & B units of 4 to 5 cells, 96.82-193.64 X 12.36-18.54 μm , av. 156.42 X 15.43

μm ., foot cell 45.32-98.88 X 8.24-12.36 μm ., av. 71.68 X 10.79 μm . *Conidia* ovate, 28.84-37.08 X 16.48-20.6 μm ., av. 32.96x17.59 μm ., germ tube lateral to subterminal 1-4, cylindrical (Fig.1).

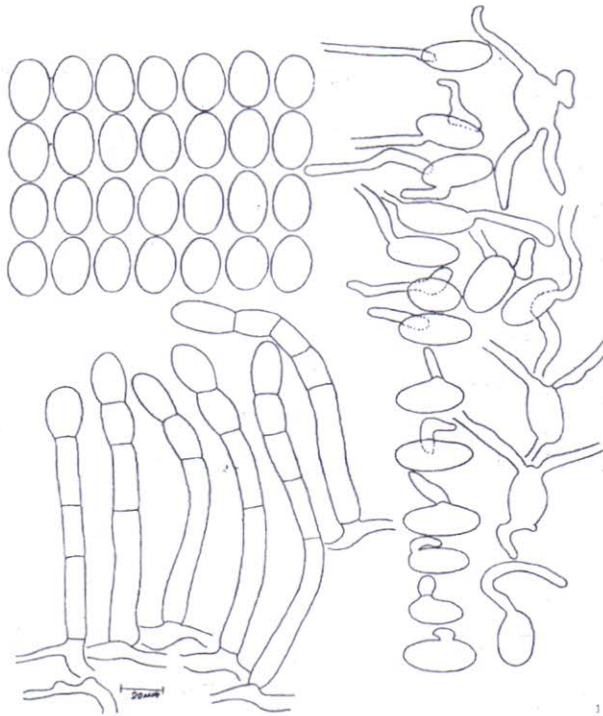


Fig.1: *Oidium agerati*

Habitat:- On leaves and stem of *Ageratum conyzoides* Linn. (Asteraceae), 6.I.2006, Tendua, Abhanpur, Raipur, C. G. Leg. V. K. Yadav. HClO Herb No. 47,279.

Remark: The species *agerati* Yen first reported from Taiwan.

***Oidium euphorbiae-hirtae* Yen, Rev Mycol. 31(4) p. 296 (1966)**

Mycelium amphiphylous, hyphae up to 8.04 μm in diam., appressoria distinctly lobed. *Conidiophores* euoidium type, slightly curved, A and B units of 3 to 4 cells, 113.22-183.15 X 16.65-16.65 μm ., av. 136.53 X 16.65 μm ., foot cell straight 36.63-73.26 X 14.21-15 μm ., av. 53.94 X 14.48 μm . *Conidia* broadly ovate to ellipsoid, 29.97-39.96 X 16.65-19.98 μm ., av.35.96 x19.31 μm . germination lateral, lobbed or simple knob like (Fig.2).

Habitat:- On leaves of *Euphorbia hirta* L. (Euphorbiaceae), 10.IX.2005, IGAU Campus, Raipur, Leg. V. K. Yadav. HClO Herb No. 46,888.

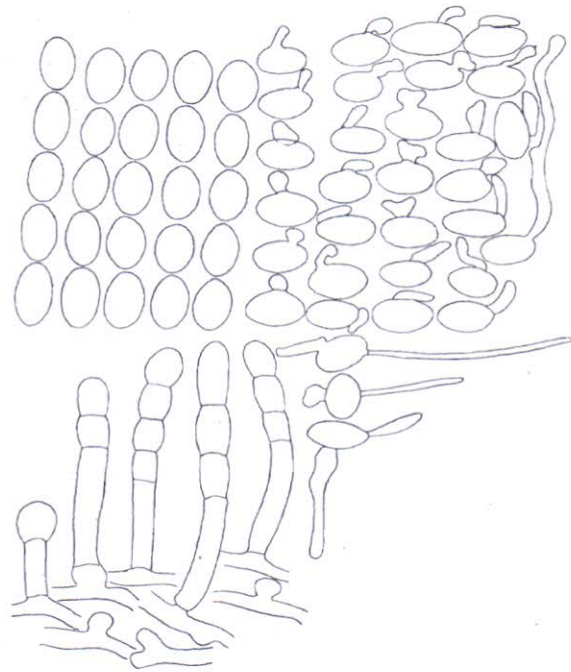


Fig.2: *Oidium euphorbiae-hirtae*

Remark: This is anamorph of *Sphaerotheca euphorbiae-hirtae* U. Braun & R. B. Somani, (Braun, 1986).

***Oidium heliotropii-indici* Sawada**

Bull. Dept. Agr. Govt. Res. Inst. Famosa 61 p.80, (1933)

Mycelium amphiphylous, hyphae up to 7.21 μm in diam., appressoria nipple shaped. *Conidiophores* euoidium type, straight, A and B units of 3 to 5 cells,

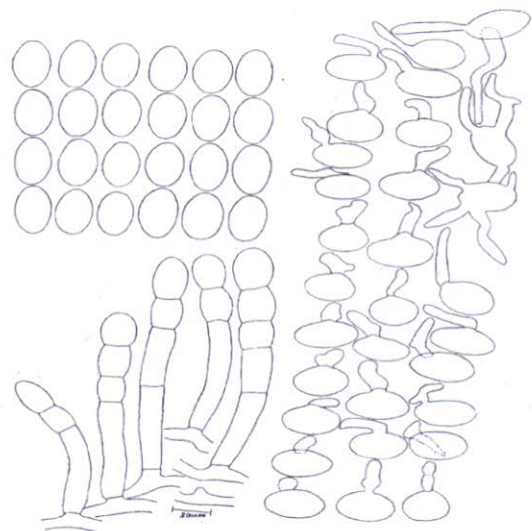


Fig.3: *Oidium heliotropii-indici*

98.88-177.16 X 16.48-20.6 μm , av. 144.2 X 18.36 μm , foot cell straight 49.44-78.28 X 10.3-12.77 μm , av. 64.15 X 12.12 μm . *Conidia* ovate to broadly ovate, 20.6-61.8 X 16.48-20.6 μm , av. 37.02 x 19.14 μm , germ tube lateral, knob like or cylindrical, curved, at times bifurcate, multipolar (Fig.3).

Habitat:- On leaves and inflorescence of *Heliotropium indicum* L. (Boraginaceae), 2.V.2006, College campus, IGAU, Raipur Leg. V. K. Yadav. HClO Herb No. 47,206.

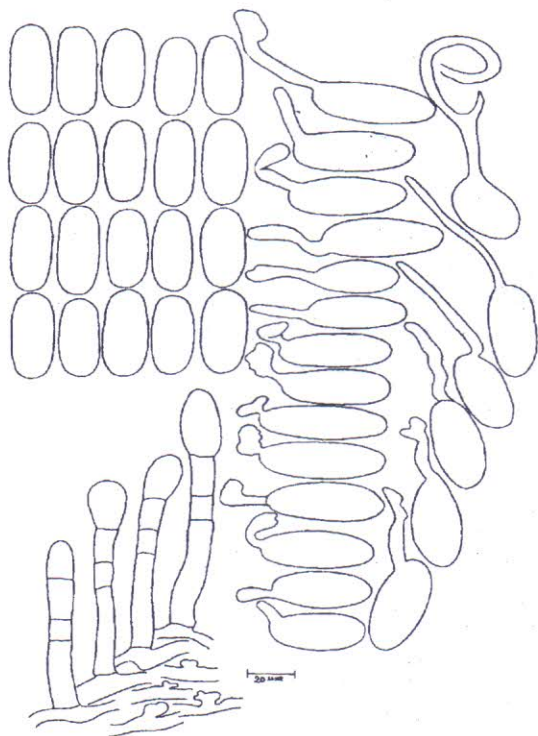


Fig.4: *Oidium ipomaeae*

***Oidium ipomaeae* (Yen & Wang) U. Braun
Mycotaxon 25, p 268 (1986)**

Mycelium amphiphylous, hyphae upto 7.69 μm in dia., appressoria lobed. *Conidiophores* pseudoidium type, A & B units of 3 to 4 cells, 74.16-160.68 X 12.77-21.01 μm , av. 102.45 X 16.61 μm , foot cell 24.72-94.76 X 8.24-10.71 μm , av. 41.61 X 9.22 μm . *Conidia* elliptical to cylindrical, 39.14-56.85 X 16.48-21.01 μm , av. 48.73 x 19.29 μm , germ tube subterminal, swollen terminally or cylindrical (Fig.4).

Habitat:- On leaves of *Ipomoea obscura* (Linn.)

Ker. Gawl. (Convolvulaceae), 1.xi.2006, Krishak Nagar, Raipur, C. G. Leg. V. K. Yadav. HClO Herb No. 46,954.

Remark: *Oidium ipomaeae* also recorded from India, it resembles *O. convolvuli* but further study and comparison needed.

***Oidium peltophori* (Yen) Bosewinkel, Rev. Myc. 46 (2), p.172 (1980)**

Mycelium epiphyllous, hyphae up to 4.17 μm in dia., appressoria lobed, at times opposite. *Conidiophores* pseudoidium type, A & B units of 2 to 4 cells, 53.56-94.76 X 9.48-18.54 μm , av. 77.45 X 14.85 μm , foot cell straight 20.6-49.44 X 5.36-8.24 μm , av. 33.01 X 7.63 μm . *Conidia* ovate to broadly ovate, 28.84-41.2 X 16.48-21.01 μm , av. 36.09 x 18.46 μm . germ tube subterminal to terminal, cylindrical to variously lobed apically (Fig.5).

Habitat:- On leaves of *Peltophorum pterocarpum* Baker ex K. Heyne (Caesalpinaceae), 26.XI.2006, College Campus, IGAU, Raipur, C. G. Leg. V. K. Yadav. HClO Herb No. 47,115.

***Oidium urenae* Yen, Cashiers de Pacifique 11, p. 85 (1967)**

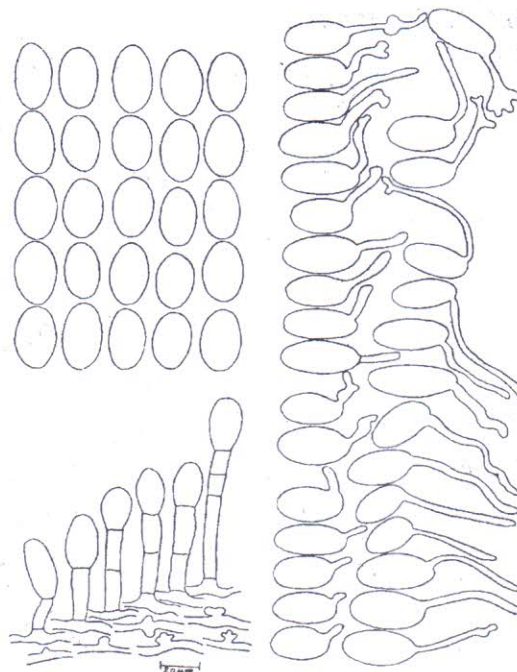
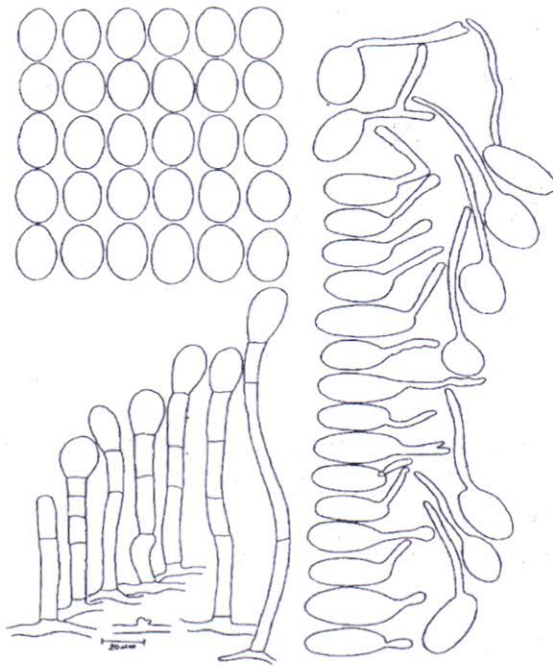


Fig.5: *Oidium peltophori*

Fig. 6: *Oidium urenae*

Mycelium amphiphyllous, hyphae up to 7.69 mm in dia., appressoria lobed. *Conidiophores* pseudoidium type, A & B units of 2 to 5 cells, 8.24-222.48 X 8.65-16.89 μm , av. 131.15 X 14.80 μm , foot cell 37.08-88.58 X 7-8.65 μm , av. 61.52 X 8.12 μm . *Conidia* ovate to broadly ovate, 28.84-41.2 x 18.54-21.01 av. 35.87 x 20.55 μm , germ tube subterminal, cylindrical, moderately long (Fig.6).

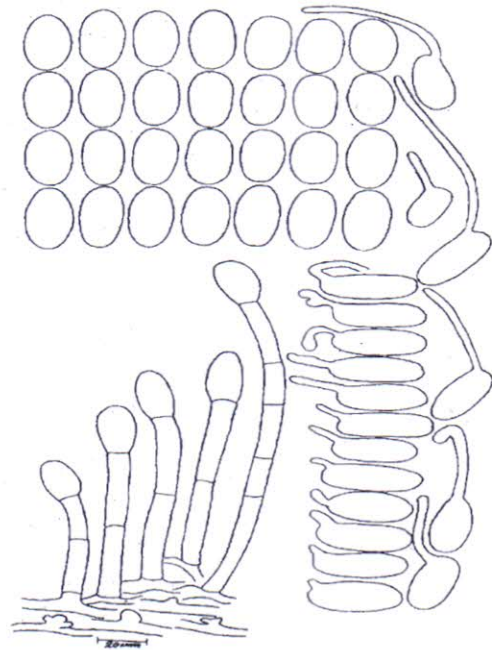
Habitat: On leaves of *Urena lobata* Linn. (Malvaceae), 1.i.2007, Krishak Nagar, IGAU, Raipur, C. G. Leg. V. K. Yadav. HCIO Herb No. 47,282.

Remark: This collection is close to *O. urenae* (compare *O. schmiedeknechtii* the conidia in the former are ovoid to doliform while in later they are cylindrical to ellipsoid and very long foot cells of conidiophore).

Oidium sp.

Collection – I

Mycelium amphiphyllous, hyphae up to 7.8 μm in diam., appressoria distinctly lobed. *Conidiophores* pseudoidium type, slightly curved, A and B units of 3 to 4 cells, 74.16-123.6 X 9.06-12.77 μm , av. 97.50 X 11.32 μm , foot cell straight 30.9-49.44 X 6.59-8.24 μm , av. 38.54 X 7.75 μm . *Conidia* broadly ovate, 24.72-41.2 X 15.65-19.77 μm , av. 34.60 x 16.68 μm , germ tube subterminal, one to two (Fig.7).

Fig. 7: *Oidium* sp.

Habitat:- On leaves and pod of *Aeschynomene indica* L. (Fabaceae), 4.XII.2005, College campus, IGAU, Raipur Leg. V. K. Yadav. HCIO Herb No. 47,116.

Collection – II

Mycelium amphiphyllous, hyphae up to 9.99 μm in dia., appressoria slightly nipple shaped. *Conidiophore* euoidium type, A & B units of 2 to 8 cells, 79.38-234.36 X 9.45-18.9 μm , av. 166.57 X 17.16 μm , foot cell 26.46-94.5 X 7.56-10.96 μm , av. 67.03 X 8.54 μm . *Conidia* ellipsoid to broadly ovate, 30.24-41.58 X 15.12-18.9 μm , av. 35.41 x 17.45 μm , germ tube lateral, fusiform or curved, at times bifurcated (Fig.8).

Habitat:- On leaves of *Jatropha curcas* Linn. (Euphorbiaceae), 21.XII.06, Research Farm, IGAU, Raipur, C. G. Leg. V. K. Yadav. Sample deposited in HCIO.

Remark: No previous record of *Oidium* sp. on this species of *Jatropha*.

Collection – III

Mycelium epiphyllous, hyphae up to 9.22 μm in dia., appressoria nipple shaped to slightly lobed. *Conidiophores* pseudoidium type, A & B units of 2 to 4 cells, 49.44-103.0 X 8.24-13.18 μm , av. 76.26 X 12.55 μm , foot cell 24.72-41.2 X 8.24-8.65 μm , av.

30.81 X 8.34 μm . *Conidia* ovide to ellipsoid, 30.07-37.08 x 14.42-20.6 av. 33.94 x 17.02 μm , germ tube subterminal, 1-3, swollen or curved terminally, usually short (Fig.9).

Habitat:- On leaves of *Moringa oleifera* (Moringaceae), 14.i.2007, Jora Village, Raipur, C. G. Leg. V. K. Yadav. HClO Herb No. 47,280.

Remark: *Oidium* sp. recorded from Israel, no record from India.

Oidium* state of *Erysiphe cichoracearum* DC. FL. Fr. II, p. 274. (1805) var. *cichoracearum

Collection - I

Mycelium epiphyllous, hyphae up to 7.69 μm in diam., appressoria nipple shaped, *Conidiophores* euoidium type, A and B units of 4 to 8 cells, foot cell usually bent at the base, 94.76-230.72 X 12.77-20.6 μm , av. 205.45 X 17.05 μm ., foot cell 57.68 - 107.12 X 11.94-16.48 μm , av. 79.92 X

12.79 μm . *Conidia* ovate, 32.96-41.2 x 16.48-20.6 av. 36.79 x 19.36 μm , germ tube subterminal 1-4, straight or curved (Fig.10).

Habitat:- On leaves of *Benincasa hispida* (Thunb.) Cogn. (Cucurbitaceae), 19.i.2007, Jora Village, Raipur, Leg. V. K. Yadav. HClO Herb No. 47,233.

Collection - II

Mycelium epiphyllous, hyphae up to 9.22 μm in diam., appressoria slightly nipple shaped, *Conidiophores* euoidium type, A and B units of 2 to 6 cells, 94.76-185.4 X 16.48-21.01 μm , av. 144.1 X 20.04 μm ., foot cell 32.54-74.16 X 8.65-12.36 μm , av. 52.57 X 11.34 μm . *Conidia* ovate to broadly ovate, 28.84-37.08 x 16.48-20.01 av. 31.42 x 19.84 μm , germ tube subterminal, cylindrical (Fig.11).

Habitat:- On leaves of *Carthamus tinctorius* L. (Asteraceae), 14.i.2007, Research Farm, IGAU, Raipur, Leg. V. K. Yadav. HClO Herb No. 47,230.

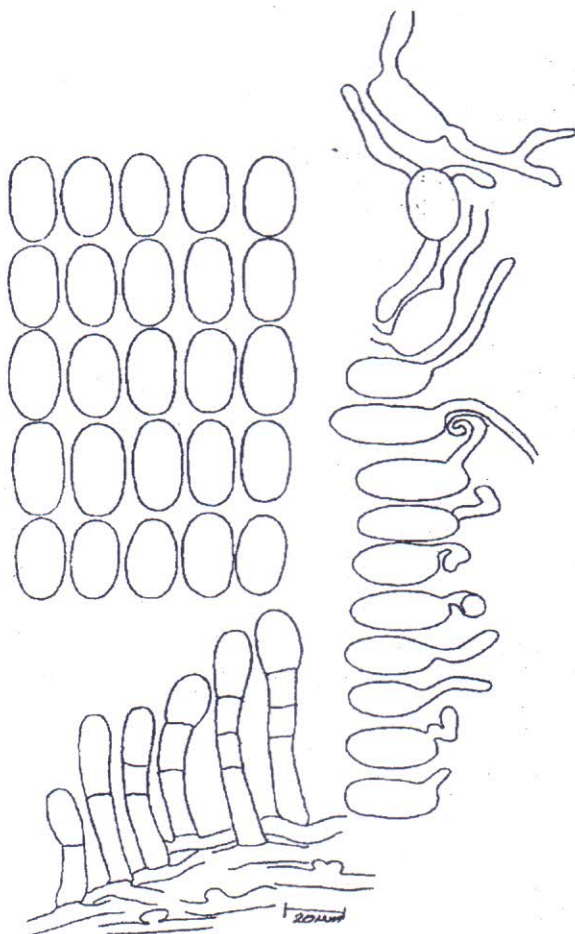


Fig. 8: *Oidium* sp.

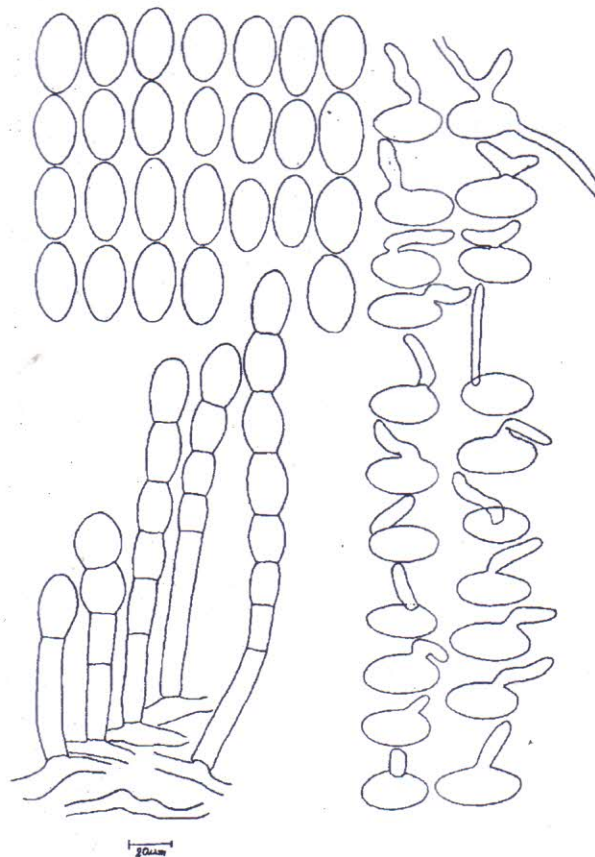


Fig. 9: *Oidium* sp.

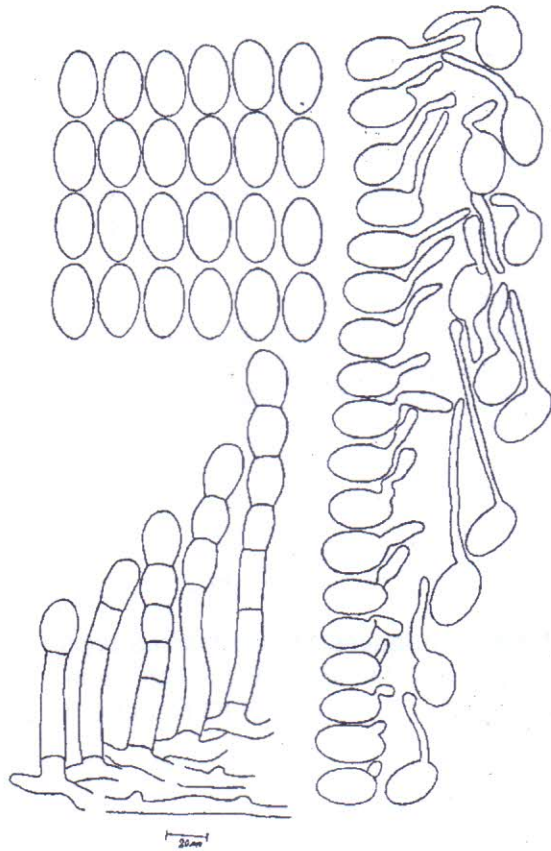


Fig. 10: Oidium state of *Erysiphe cichoracearum*

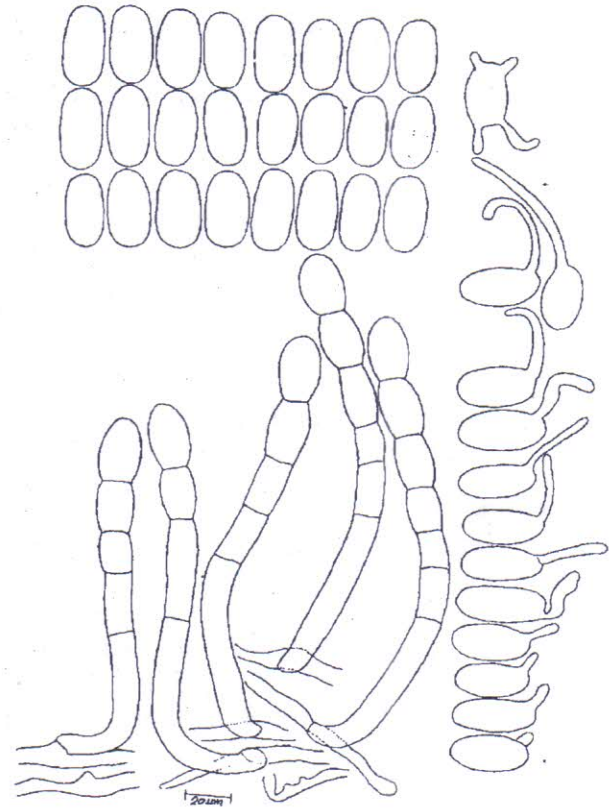


Fig. 11: Oidium state of *E. cichoracearum*

Collection – III

Mycelium epiphyllous, hyphae up to 6.613 μm in dia., appressoria indistinctly nipple shaped. *Conidiophores* euoidium type, A & B units of 4 to 6 cells, 107.12-185.4 X 12.36-18.54 μm , av. 157.38 X 15.90 μm ., foot cell straight to slightly curved 37.08-78.28 X 10.3-12.36 μm , av. 60.97 X 11.77 μm . *Conidia* ovate to broadly ovate, 28.84-37.08 X 16.48-21.42 μm , av. 32.36 x 19.00 μm ., germ tube lateral, cylindrical to fusiform (Fig.12).

Habitat:- On leaves and stem of *Parthenium hysterophorus* L. (Asteraceae), 21.XI.2006, College Campus, IGAU, Raipur Leg. V. K. Yadav. HClO Herb No. 47,114.

Oidium state of *Erysiphe orontii* Cast. emended Braun

Suppl. Cat. Pl. Mars., p. 52 (1851) emended U. Braun

Collection – I

Mycelium amphiphyllous, hyphae up to 7.69 μm in diam., appressoria nipple shaped. *Conidiophores*

euoidium type, A and B units of 3 to 5 cells, 148.32-197.76 X 12.36-16.48 μm , av. 170.62 X 15.88 μm ., foot cell 61.8-94.76 X 10.3-12.36 μm , av. 78.28 X 11.64 μm . *Conidia* cylindrical, 32.96-41.2 X 15.65-19.36 μm , av. 36.94 x 16.98 μm . germ tube subterminal (1-2), cylindrical (Fig.13).

Habitat:- On leaves of *Coccinea indica* W. & A. (Cucurbitaceae), 21.X.2006, Jora Village, Raipur Leg. V. K. Yadav. HClO Herb No. 46,947.

Collection – II

Mycelium amphiphyllous, hyphae up to 6.15 μm in diam., appressoria indistinctly nipple shaped. *Conidiophores* euoidium type, A and B units of 4 to 8 cells, 123.6-218.36 X 14.42-20.6 μm , av. 180.80 X 18.12 μm ., foot cell 41.2-86.52 X 9.47-11.94 μm , av. 68.77 X 11.18 μm . *Conidia* ovate, 30.9-37.08 X 16.48-20.6 μm , av. 34.52 x 18.25 μm . germ tube lateral subterminal, knob like or cylindrical rarely forked (Fig.14).

Habitat:- On leaves of *Solanum melongena* Linn. (Solanaceae), 5.i.2007, Jora, Raipur, Leg. V. K. Yadav. HClO Herb No. 47,277.

Collection – III

Suppl. Cat. Pl. Mars., p. 52 (1851) emended U. Braun *Nova Hedwigia* Beih. 89, 252, 1987. *Mycelium* amphiphylous, hyphae up to 10.76 μm in dia., appressoria lobed. *Conidiophores* euoidium type, A & B units of 2 to 7 cells, 62.21 -164.8 X 10.3-18.54 μm , av. 113.60 X 14.22 μm ., foot cell 24.72-61.8 X 8.24-12.36 μm , av. 41.85 X 10.79 μm . *Conidia* ovate to broadly ovate, 28.84-41.2 x 16.48-20.6 av. 34.45 x 19.03 μm , germ tube lateral (1-4), fusiform or curved (Fig.15).

Habitat:- On leaves of *Hibiscus cannabinus* Linn. (Malvaceae), 12.i.2007, Research Farm, IGAU, Raipur, C. G. Leg. V. K. Yadav. HCIO Herb No. 47,281.

Remark: *Sphaerotheca* and *Levellula* recorded on this host.

Collection – IV

Mycelium amphiphylous, hyphae up to 10.77 μm in dia., appressoria nipple shaped *Conidiophores*

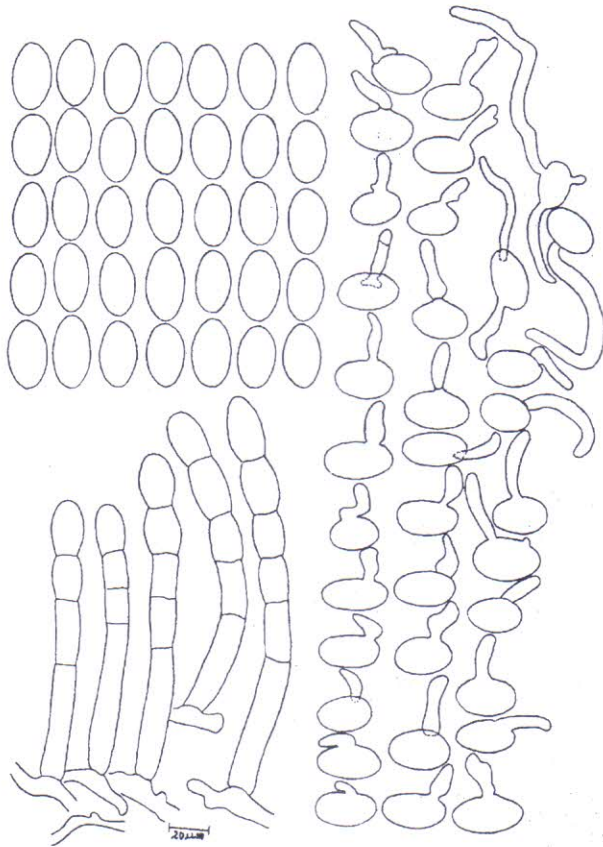


Fig. 12 : Oidium state of *E. cichoracearum*

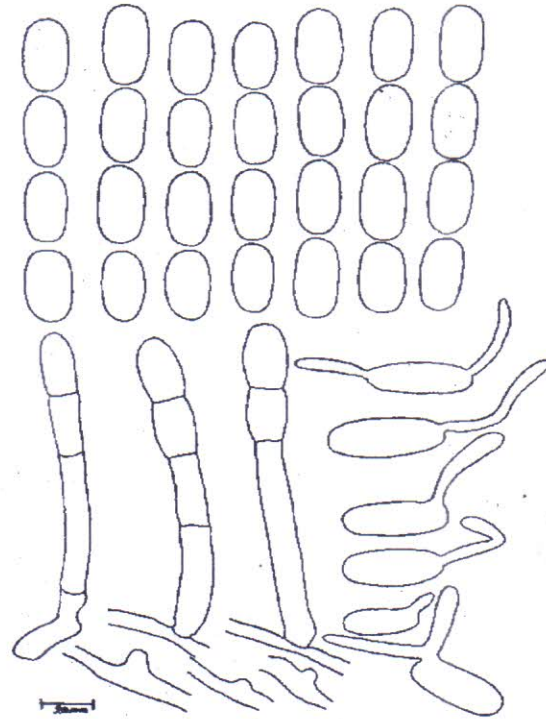


Fig. 13 : Oidium state of *Erysiphe orontii*

euoidium type, A & B units of 2 to 6 cells, 61.8-160.68 X 16.48-20.6 μm , av. 112 X 18.23 μm ., foot cell 28.84-53.56 X 11.94-14.42 μm , av. 39.55 X 12.46 μm . *Conidia* ovate, 28.84-37.08 X 16.48-21.42 μm , av. 32.74 x 20.54 μm . germ tube subterminal to lateral, knob like to cylindrical, short (Fig.16).

Habitat:- On leaves of *Abelmoschus manihot* (Linn.) Medic (Malvaceae), 25.xii.2006, Research Farm, IGAU, Raipur, C. G. Leg. V. K. Yadav. HCIO Herb No.47,209.

Remark: Other powdery mildews recorded on this host are (*Levellula taurica*, *O. abelmoschi* and one more but from US).

Oidium state of *Sphaerotheca fusca* Blumer, Beitr. Krypt.-Fl. Schweiz 7(1), p 117 (1933) emended U. Braun (1985), p. 157

Collection – I

Mycelium amphiphylous, hyphae up to 9.22 μm in diam., appressoria nipple shaped *Conidiophores* euoidium type, A and B units of 3 to 7 cells, 103-206 X 16.48-20.6 μm , av. 142.96 X 17.51 μm ., foot cell 51.5-90.64 X 10.3-12.36 μm , av. 63.65 X 11.94 μm . *Conidia* ovate to broadly ovate, 28.84-38.31 X 16.48-22.66 μm , av. 32.59 x 19.31 μm . germ tube

lateral, straight or curved, at time multipolar germination (Fig.17).

Habitat:- On leaves of *Momordica charantia* L. (Cucurbitaceae), 3.xii.2006, Agriculture University Garden, Raipur, Leg. V. K. Yadav. HCIO Herb No. 47,204.

Collection – II

Mycelium amphiphylous, hyphae up to 9.22 μm in diam., appressoria nipple shaped. *Conidiophores* euoidium type, A and B units of 2 to 7 cells, 90.64-

Habitat:- On leaves of *Merremia emarginata* (Burm. F.) Hallier F. (Convolvulaceae), 15.i.2007, Research Farm, IGAU, Raipur, C. G. Leg. V. K. Yadav. HCIO Herb No. 47,278.

Oidium state of *Sphaerotheca balsaminae* (Wallr.) Kari, *Ann. Univ. Turkuensis A*, 23:99, 1957.

Mycelium amphiphylous, hyphae up to 6.92 μm in

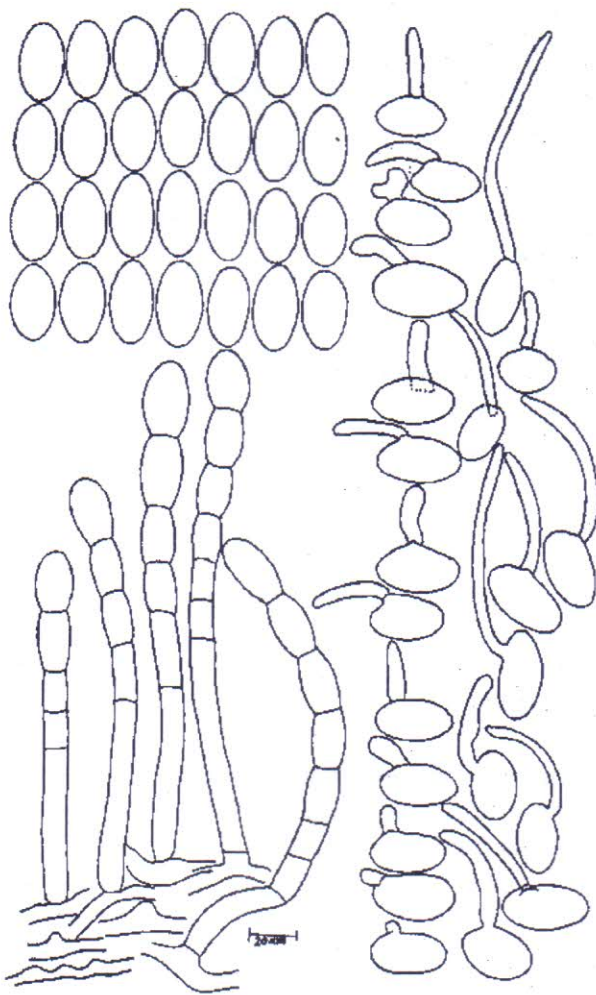


Fig. 14 : Oidium state of *E. orontii*

197.76 X 16.48-20.6 μm , av. 137.63 X 18.9 μm ., foot cell 32.96-65.92 X 8.65-12.36 μm , av. 45.57 X 10.52 μm . *Conidia* ovate to ellipsoid, 28.84-37.08 x 16.48-20.6 av. 32.91 x 19.07 μm , germ tube lateral, at times subterminal, cylindrical or curved (Fig.18).

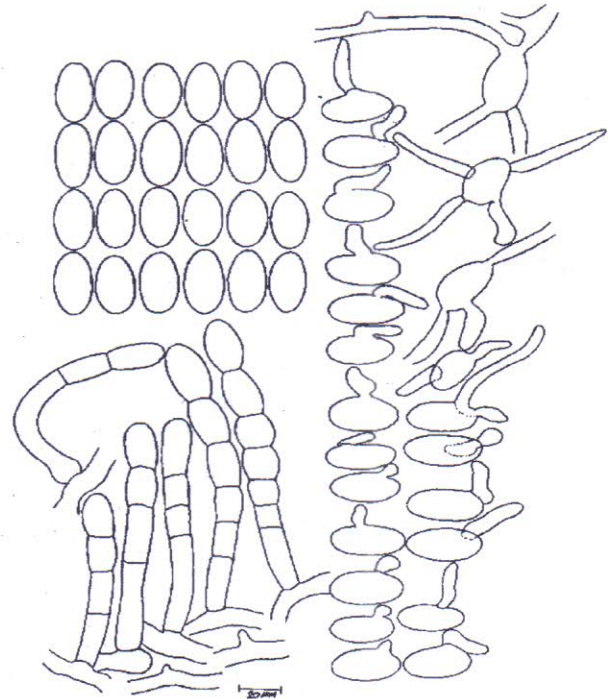


Fig. 15 : Oidium state of *E. orontii*

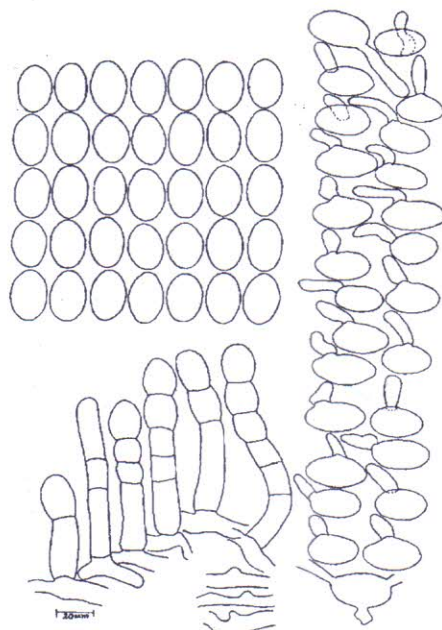


Fig. 16 : Oidium state of *E. orontii*

diam., appressoria nipple shaped. *Conidiophores* euoidium type, straight to slightly curved, A and B units of 5 to 6 cells, $103-177.16 \times 12.36-16.48 \mu\text{m}$, av. $149.96 \times 14.83 \mu\text{m}$. foot cell $32.96-82.4 \times 8.24-14.42 \mu\text{m}$, av. $66.74 \times 11.12 \mu\text{m}$. *Conidia* ovate $29-37 \times 16-17 \mu\text{m}$, av. $33.64 \times 16.48 \mu\text{m}$., germination lateral lobed or simple knob like (Fig.19).

Habitat:- On leaves of *Impatiens balsamina* L. (Balsaminaceae), 6.X.2005, Krishaknagar, Raipur Leg. V. K. Yadav.HCIO Herb No. 46,912.

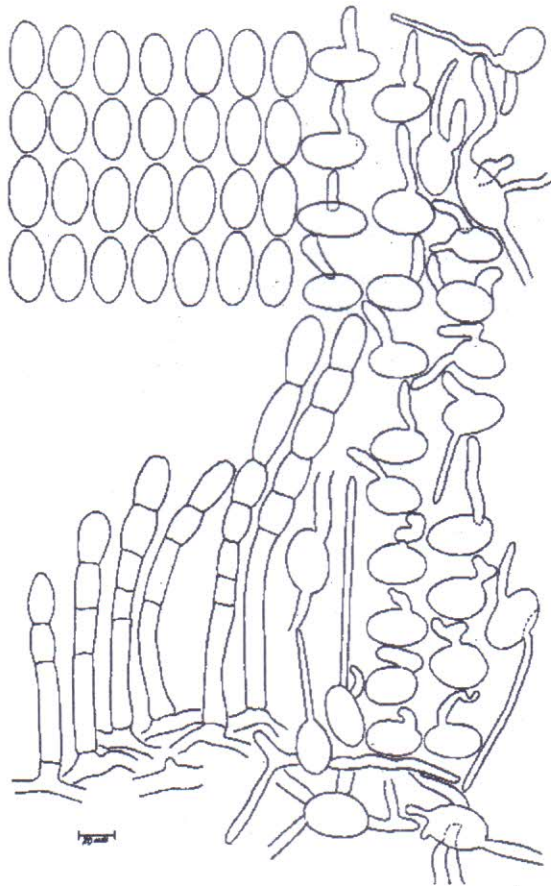


Fig. 17 : *Sphaerotheca fusca*

***Sphaerotheca crotonis* (Ponnappa) U. Braun, Mycotaxon 20:484, 1984.**

Mycelium amphiphylous, hyphae up to $9.22 \mu\text{m}$ in dia., appressoria indistinctly nipple shaped. *Conidiophores* euoidium type, A & B units of 3 to 7 cells, $94.76-177.16 \times 12.36-20.6 \mu\text{m}$, av. $145.02 \times 16.86 \mu\text{m}$., foot cell $28.84-65.92 \times 11.12-12.36 \mu\text{m}$, av. $46.83 \times 12.02 \mu\text{m}$. *Conidia* ovate to broadly ovate, $30.07-41.2 \times 16.48-21.01 \mu\text{m}$, av. $34.03 \times 18.60 \mu\text{m}$, germ tube lateral 1-4, straight or curved (Fig.20).

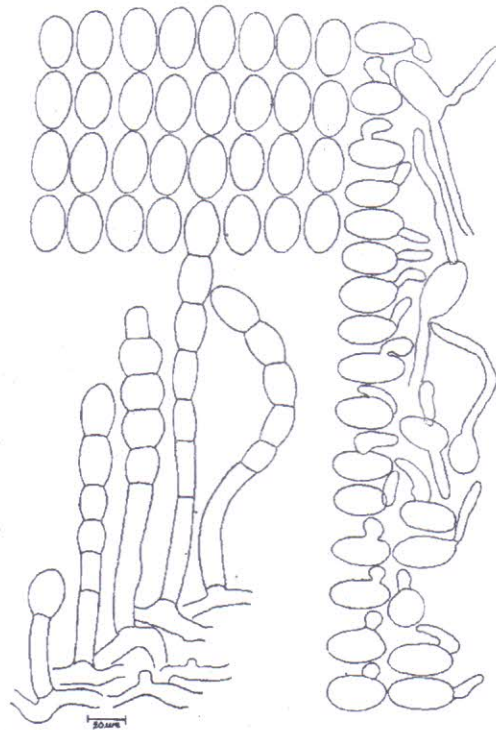


Fig. 18 : *Sphaerotheca* sp.

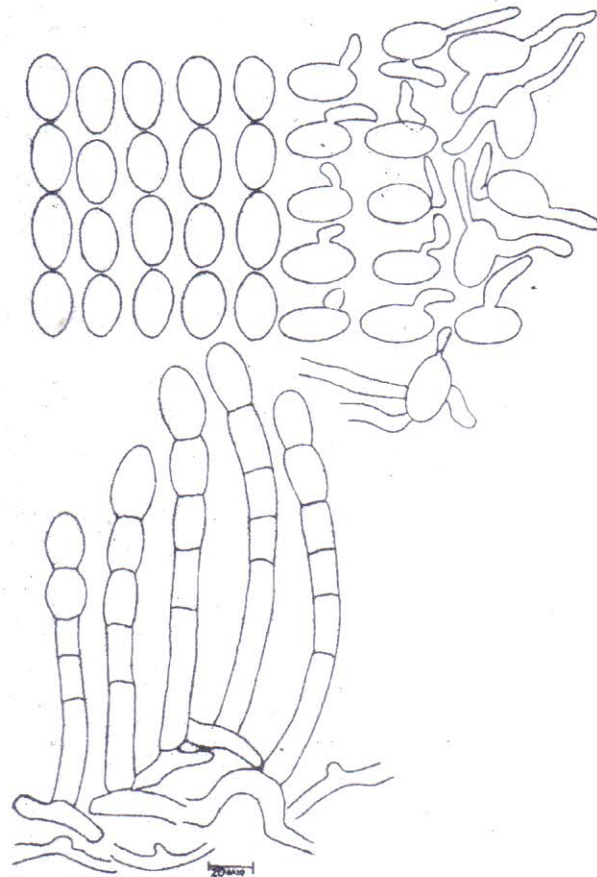


Fig. 19 : *Sphaerotheca balsaminae*

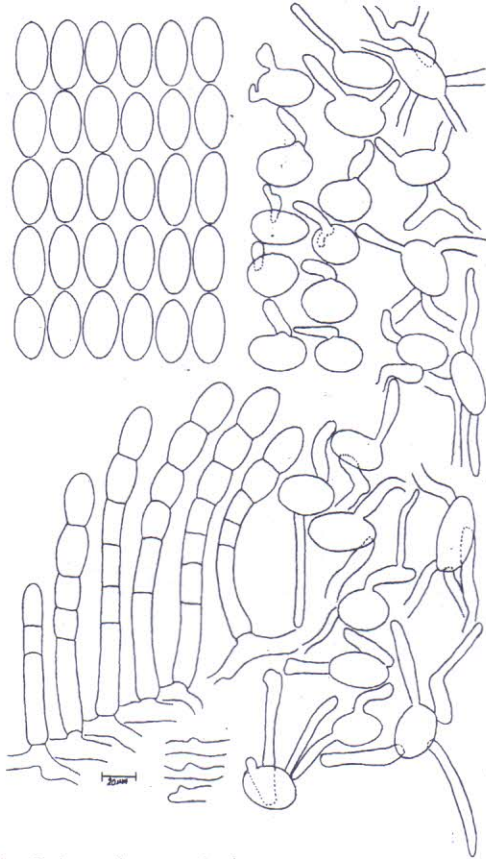


Fig. 20 : *Sphaerotheca crotonis*

Habitat:- On leaves of. *Croton sparsiflorus* (Euphorbiaceae), 25.xii.2006, Avanti Vihar colony, Raipur, C. G. Leg. V. K. Yadav. HCIO Herb No. 47,210.

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