the neighbourhood of 700° K. and then tend to flatten to another linear domain (Fig. 2 a–c).

The linearity at the lower temperature is obtained from pure sublimation process and the bending at higher temperatures is due to evaporation from a surface transformed from a solid surface to a quasi-liquid one. The same set of constants α and β in Clausius-Clapeyron's equation does not hold under conditions of phase changes. No such change in slope was obtained with Hg—a liquid metal (*cf.* Fig. 2,*d*) where no phase change is suspected in the temperature range (300–400° K.) of investigation.

It should be possible to calculate the absolute vapour pressures at different temperatures from considerations of relations (2) to (4) when the absolute vapour pressure is known at any one temperature. Further work is in progress and details will be published elsewhere.

1. Nesmeyanov, An. N., *Vapour Pressures of the Elements*, Translated and Edited by Carasso, J. I., Infosearch Ltd., London (Ed. 1963).

TWO INTERESTING COPROPHILOUS FUNGI FROM INDIA *

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In the course of studies on the taxonomy and ecology of coprophilous fungi two interesting forms were collected both of which appear to be new to science and are described below.

1. *Tripterosporella coprophila* GEN. *et* SP. NOV. (FIG. 1)

The fungus produces cleistothecia that are scattered, superficial, globose, black and opaque, 315–600 µ in diameter, and covered with hairs. The hairs are brown, septate, up to 600 µ long and about 3 µ wide, paler towards the apex and rounded at the tips. The peridium of the cleistothecium is membranaceous and pseudoparenchymatous. The asci are clavate-fusiform, unitunicate, 8-spored, hyaline, evanescent and 180–280 × 15–23 µ, the spore mass being 126–153 × 15–19 µ. The paraphyses are thin and evanescent. The ascospores are biseriate, sometimes uniseriate or even triseriate especially during early stages of development, obliquely placed; they are at first continuous, long-cylindrical, hyaline, with a single row of refractive globules; the globules disappear later with the further development of the spores and their place is occupied by large vacuoles. When the spores

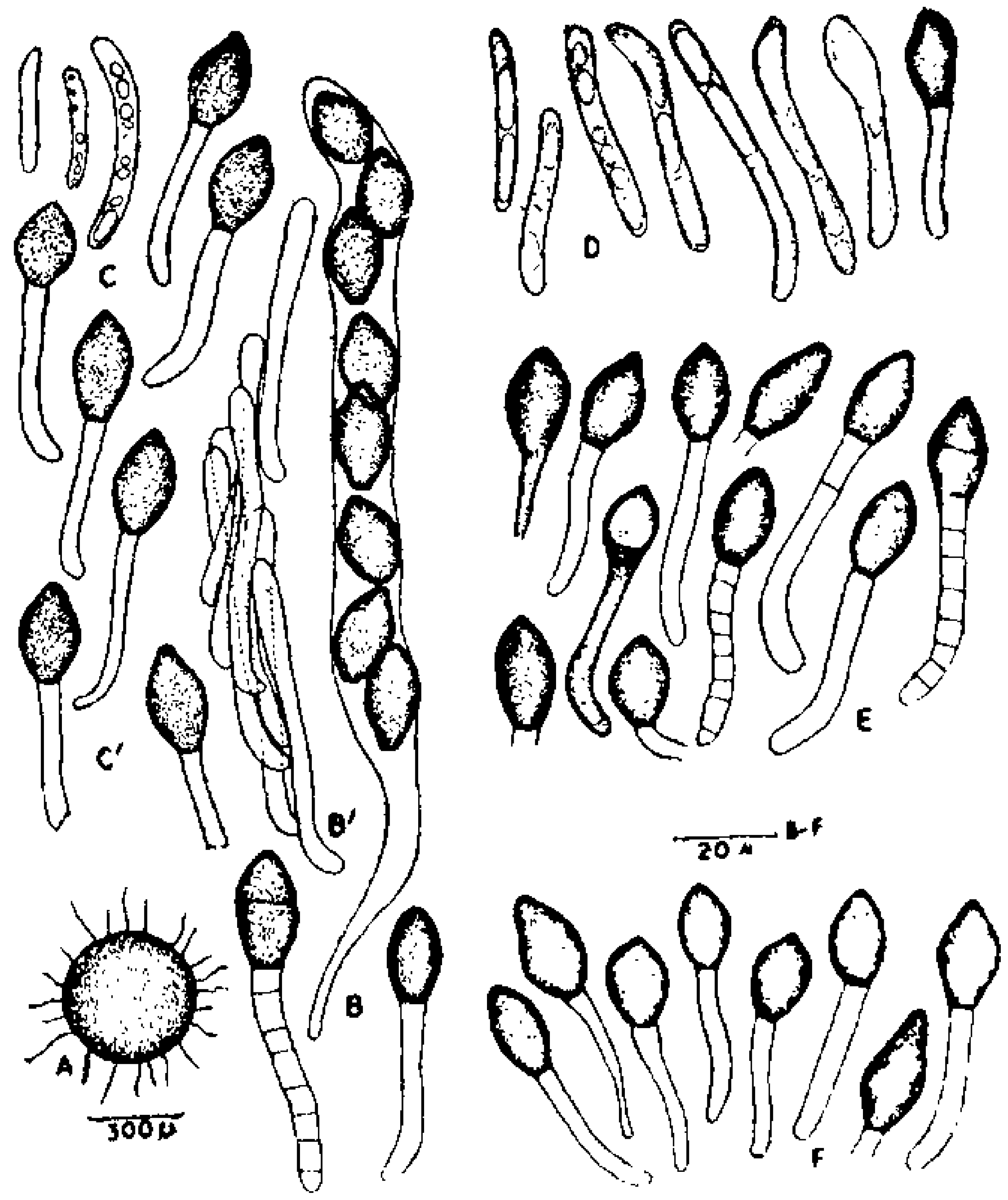

FIG. 1. *Tripterosporella coprophila* from type collection (Herb. RUBL No. 212). A, mature cleistothecium; B, ascus; B′, ascospore-mass showing elongate filamentous aspect of young ascospores (ascus wall not shown); C showing stages of development of ascospores (juvenile stages), C′, mature ascospores; D, stages in the development of ascospores; E, mature ascospores: note that tail-like cells of two ascospores are also pigmented; F, mature ascospores ex collection RUBL No. 196.

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mature the vacuoles also disappear and a swelling develops at the upper end which gets cut off by a septum into a head cell and basal cylindrical tail-like cell. The head cell becomes dark brown or olivaceous brown, opaque, ovate to elliptical with slightly protruding apex and an apical circular germ pore. usually continuous, but rarely once or twice septate (septa seen only in young light brown spores), and 21·6–25·6 × 12·8–14·8 µ. The tail-like cells remain hyaline and are cylindrical, curved near the base, continuous but sometimes septate, and 35·2–43·2 × 4·8–5·6 µ. The septate tail-like cells are sometimes constricted at the septa. The ascospores are without gelatinous appendages or sheaths seen in *Bombardia* and *Sordaria* respectively.

The fungus at first sight appeared to resemble *Tripterospora*.[1] However, the mode of development of the ascospores (Fig. 1, C, D) somewhat differs from that described for *T. longicaudata* Cain[1] (compare Figs. 24–28 in Cain, 1956), the type species of the genus, in that the young spores are long and cylindrical in the fungus described here; on the other hand, in *T. longicaudata* even quite early in development the ascospores assume a clavate shape. A similar difference is also seen between the genera *Bombardia* Fries and *Podospora* Cesati, and in fact is one character on which these two genera are distinguished from each other. A further feature in which the ascospores of the present fungus differ from those of *Tripterospora longicaudata* is the fact that the ascospore or its basal tail-like cell may become septate and usually the free end of the tail-like cell is characteristically curved, a feature which again distinguishes *Bombardia* from *Podohpora.* Since the characteristics listed here as separating the present fungus from the type species of *Tripterospore* are the same as those which separate two well-known Ascomycete genera, *Bombardia* and *Podospora,* it appears logical to place the present fungus in a genus distinct from *Tripterospora*.

Tripterosporella GEN. NOV.

Cleistothecia simplicia, fusca, cum pili vestiti absque ostiolo vel stromate. Asci octospori, clavato-fusiformes, unitunicati. Ascosporæ bicellulares, cellula apicali fusca, cellula basali caudæ simili, absque ulla vagina gelatinosa vel appendice; cellula terminalis ornata germinationis poro; cellula caudalis curvata ad basin, hyalina, ut plurimum continua, interdum septata. **Ascosporæ vermiformicylindricæ in juvenili conditione.** Species typica, *T. coprophila*.

Cleistothecia simple dark-coloured, with hair-like appendages, without ostiole or stroma. Asci 8-spored, clavate-fusiform, unitunicate. Ascospores 2-celled, with a dark head cell and basal tail-like cell (cauda), without any gelatinous sheath or appendages; head cell with a circular germ pore; tail-like cell curved at the base, hyaline, mostly continuous, sometimes septate. Ascospores vermiform-cylindrical during early development.

TYPE SPECIES: ***Tripterosporella coprophila*** SP. NOV.

Cleistothecia dispersa, superficialia, globosa, nigra, non-translucida, 315–600 µ diam., cum pilis vestiti. Peridium cleistothecii membranaceum et pseudoparenchymaticum. Asci fusiformes vel clavati, hyalini, unitunicati, octospori, evanescentes, 180–280 × 15–23 µ; sporarum massa 126–53 × 15–19 µ. Ascosporæ biseriatæ, interdum uniseriatæ vel etiam triseriatæ, præsertim in juvenili conditione, oblique dispositæ, primo continuæ, longo-cylindricæ, hyalinæ, ad maturitatem divisae per septum in cellulam terminalem et cellulam cylindricam caudæ similem basalem; cellula terminalis fusco-brunnea, non-translucida, ovata vel elliptica, apice paulum protruso, germinationis poro apicali circulari ornata, vulgo unicellularis, rarius 1-2-septata (septis notatis tantum in sporis juvenilibus pallide brunneis), 21·6–25·6 × 12·8–14·8 µ; cellula caudalis hyalina, cylindrica, curvata prope basin, continua, rarius septata, 35·2–43·2 × 4·8–5·6 µ. Ascosporæ absque appendicibus vel vaginis gelatinosis ut in *Bombardia* et *Sordaria* respective.

Typus lectus e stercore pecorum at Chakrata a B.C.L. die 3 octobris anni 1962 (Herb. RUBL No. 212); *collectiones alliæ*; e stercore elephantum ad Jodhpur, a B.C.L., Sept. 1962 (Herb. RUBL No. 221); e stercore pecudum at Jodhpur, a B.C.L., 7 julii 1961 (Herb. RUBL No. 196).

2. *Basifimbria aurea* GEN *et* SP. NOV. (FIG. 2)

The colonies on agar are circular, closely adpressed to the substratum and light golden in colour. The hyphæ are creeping, hyaline, smooth, thin-walled, sparsely septate, branched and 4–5 µ wide. The conidiophores arise laterally or terminally from hyphæ. They are usually straight, sometimes slightly geniculate in the upper region, pale yellow, smooth, non-septate or 1–2-septate, simple or branched (once or twice), 146–78 μ long and 4·0–6·5 μ wide. The branches are about the same width as the main conidiophore. Each conidiophore produces at the tip a cylindrical denticle 1–2 μ long. The tip of the denticle enlarges into a globose swelling which finally develops into a

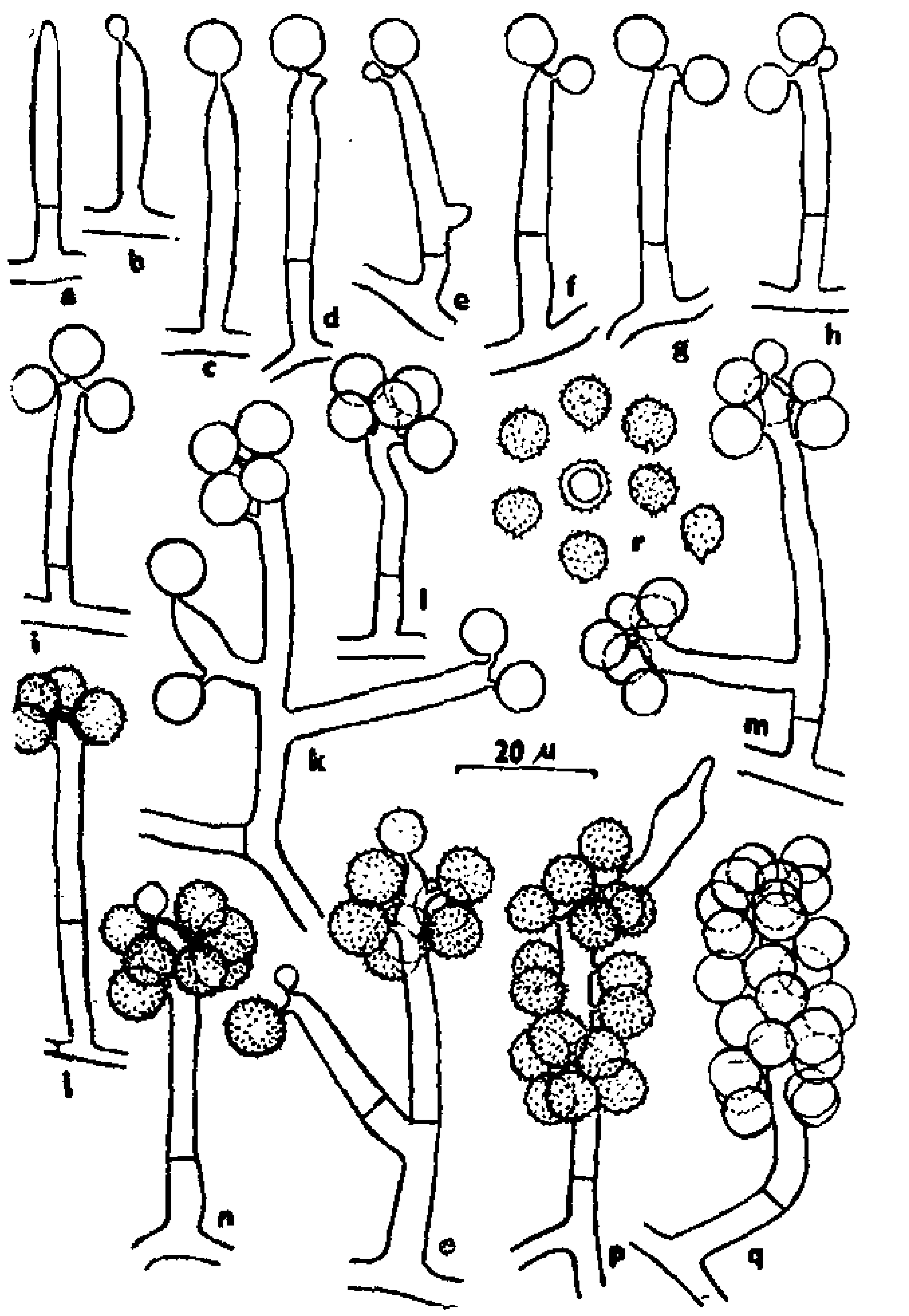

FIG. 2. *Basifimbria aurea* from type collection (Herb RUBL No. 194). *a–q*, stages in the development of conidiophores and conidia; *r*, conidia.

conidium. After the formation of the conidium a septum is laid down in the denticle, separating the conidium from the conidiophore. The development of each conidiophore is sympodial and the conidia are produced acrogenously. Each conidiophore bears numerous conidia and thus looks like an 'ear'. The conidia-bearing region of the conidiophore is 64–88 μ long. The conidia are 1-celled, globose or rarely ovoid, light golden in colour, thick-walled, with verrucations or minute tubercles of almost uniform width, without germ slit or pore, and 6·8–8·8 μ in diameter. The conidia are shed by a break of the denticle at any point below the septum, leaving part of the septate denticle on each conidium.

The fungus was isolated from horse dung from Mussoorie.

The 1-celled conidia borne on distinct denticles and detachment of conidia by a break in the denticle resulting in part of the denticle remaining as a minute frill at the base of the conidium are characteristic. As far as we are aware, no genus of the hyphomycetes combines the features of this fungus and it is therefore considered appropriate to place it in a new genus *Basifimbria*; the generic name is suggestive of the basal frill of the conidium.

Basifimbria GEN. NOV.

Pertinet ad Hyphomycetes, producitque blastosporas. Conidiophora simplicia vel furcata supportant conidia denticulis insidentia in sympodulis. Conidia unicellularia, absque germinationis fissura vel poro, singula denticulo insidentia; denticulis evadentibus septatis; conidia liberantur per fracturam denticuli sub septo, sicque decorantur parte denticuli fimbriarum more ad basin.

Species typica: *B. aurea* SP NOV.

Hyphomycete producing blastospores. Conidiophores simple or branched, bearing conidia on denticles on sympodulæ. Conidia 1-celled, without germ slit or pore, each borne on a denticle; denticle becoming septate; conidia detached by a break in the denticle below the septum and thus carrying part of the denticle as a minute frill at the base.

Type species: ***Basifimbria aurea*** SP. NOV.

Coloniæ pallide aureæ. Hyphæ repentes, hyalinæ, leves, parietibus tenuibus, sparse septatæ, ramosæ, 4–5 μ latae. Conidiophora erecta vel decumbentia, recta, interdum paulum geniculata, pallide lutea, levia, continua vel semel bisve septata, simplicia vel semel bisve furcata, 146–178 μ longa, 4·0–6·5 μ lata, supportant conidia denticulis insidentia in sympodulis. Denticuli angusti, uniformiter lati, 1–2 μ longi, tandem evadentis septati. Conidia unicellularia globosa, rarissime ovoidea, pallide aurea colore, crassis parietibus prædita, penitus ornata projectionibus minutis paxillo similibus, absque germinationis fissura vel poro, 6·8–8·8 μ diam., acrogene producta et successive in sympodulis, liberata per fracturam denticuli sub septo et parte denticuli ad basin minute fimbriata.

Typus lectus e stercore equino, in collibus Mussoorie in U.P. in India, 12 October 1962, a B.C.L. (Herb. RUBL No. 194).

We are grateful to the Rev. Fr. H. Santapau for the Latin translations of the diagnoses of the new taxa. One of us (BCL) thanks the University of Rajasthan for award of a University scholarship and a Fellowship.

1. Cain, R. F., "Studies of Coprophilous Ascomycetes, IV," *Can. J. Bot.*, 1956, **34**, 699.

THE BREEDING OF HIGH PROTEIN RICES

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RICE as a food crop has some important advantageous features, namely, wide adaptability to different soils, high productivity per unit area and also the ability to yield well in plots with standing water. It is generally realised that the protein content of the milled raw rice, being between 5 and 7%, is low especially when compared to wheat. Nutritionists advocate enriching the rice, alternatively supplementing with high protein food. It is a challenge to rice breeders to evolve high protein varieties.

A large number of grain (rice) protein estimations have been made in this Institute using a number of rice genotypes grown in the two rice seasons and under varying manurial treatments. It was consistently found that the rice protein percentage is the end result of genotype/environment interaction. Precise control of supply of the major nutrients is achieved in water cultures and one water culture experiment showed that N absorption upto maturity increased protein content of grain. In another experiment using the popular short duration variety Ptb. 10, and water culture, it was found that with N concentration of 200 parts per million the rice protein could be raised to 18%, when the nutrient solution is retained to maturity. Protein estimation in these and other experiments were from brown rice with intact pericarp and embryo, the factor 6·25 being used to convert N values to protein. A further series of pot experiments showed that the genotype controlled the upper limits of protein, as for instance the cultivated rice of West Africa, *O. glaberrima* surpassed some popular *indica* varieties in protein content at high rates of N application.

In an early study in this Institute, Sampath and Seshu[1] had compared protein content of a few genotypes and had suggested that the morphological character "long glume" may be correlated with high protein content. Subsequent work failed to confirm this suggestion, but in the screening, the variety *Pirurutong* of Philippines' having long glumes was found to have protein content of 10·4% and this is significant when under similar conditions the U.S.A. variety *Rexoro* had a protein content of 7·40%. For, in the *Annual Report of the International Rice Research Institute*[2] (1961-62) a table gives the proximate percentage composition of 16 rice varieties from different countries, and in this group *Rexoro* had the highest protein content.

A project for breeding high protein rices was started in this Institute in 1965, using *Pirurutong* as one parent and the *japonica* variety *Gaisen mochi* as the other parent. The *japonica* was used as the other parent to contribute to productivity of the progeny selection through genes for short height, and manurial response. Chemical analysis of a few F_3 selection showed that the protein percentage varied with the plant, and a few having more than 10% protein were multiplied. In 1967 *Kharif* season (July to October) the cultures were fertilised with ammonium sulphate in two applications, the total being equivalent to 90 lb. N/acre. Analysis of samples showed that there was considerable variation between plants but in four plants the protein content of rice exceeded 15%. These are being multiplied in highly manured plots.