similarly be followed. But the effects are much less striking than in the case of the red flowers.

Since, in all cases, the absorption by the flowers of pelargonium appears in the yellow and the green sectors of the spectrum, we are justified in recognising the material responsible for the observed colour as Florachrome B. It is also evident that the colour variations observed are due essentially to the quantity of the pigment present in the petals being substantially different in the different cases.

INTERPRETATION OF CONIDIAL TYPES IN *DRECHSLERA**

C. V. SUBRAMANIAN

University Botany Laboratory, Madras-5

In a study of conidial types in *Cochliobolus sativus* (Ito and Kurib.) Drechsler ex Dastur [= *Drechslera sorokiniana* (Sacc.) Subrm. and Jain], Subramanian and Jain[1] reported production of several kinds of conidia. Apart from the common (non-furcate) conidia, they observed also many furcate conidia. Three types of non-furcate conidia were found, *viz.*, (*a*) porospores, which were typical of the species; (*b*) gangliospores; and (*c*) blastospores. Both mono-ascospore and mono-conidial isolates were included in their study and the authors observed that "though non-furcate porospores were typical of the species, the consistent production of gangliospores by all isolates and of blastospores by two of them was noteworthy". In later work, Jain[2] investigated conidial types in a number of species of *Drechslera* and observed production of gangliospores, besides typical porospores, in several of them such as *D. bicolor* (Mitra) Subram. and Jain, *D. maydis* (Nisikado) Subram. and Jain, *D. cookei* (Sacc.) Subram. and Jain, *D. triticivulgaris* (Nisikado) Ito, and two possibly new species of *Drechslera* (taxonomic species 1 and 2). Luttrell[3] observed both porospores (= his porogenous conidia) and gangliospores (= his murogenous conidia) in *Helminthosporium sorokinianum* Sacc. (= *Drechslera sorokiniana*). He stated that the murogenous pattern of development was common when the fungus was grown at higher temperatures (say 31° C), whereas at lower temperatures (below 25° C) the porogenous method of development prevailed. Both Subramanian and Jain[1] and Jain[2] found production of porospores and gangliospores on the same conidiophore in mono-conidial clones and, therefore, according to them, Luttrell's[3] observation that formation of murogenous conidia (=gangliospores) may be a temperature-response needed further investigation. In a recent intensive study of the effect of temperature on conidial types in several species of *Drechslera*, my colleague Bhat[4] has very clearly shown that the pattern of conidial morphogenesis is, in fact, governed by temperature. Working on several species of *Drechslera* (*D. sorokiniana*, *D. oryzæ* (Breda de Haan) Subram. and Jain, *D. bicolor*, *D. biformis* (Mason and Hughes) Subrm. and Jain, and *D.* tax sp. 2), he found that several isolates of some of these typically produced porospores at 24° C, porospores and some gangliospores at 28° C, and mostly or entirely gangliospores at 34° C.

Both for the student of morphogenesis and for the taxonomist for whom conidial ontogeny has great significance, these findings should be of some interest. The fact that a mono-ascospore or a mono-conidial clone of a taxon produces three different kinds of conidia raises the important problem of whether there could be any basic similarity in the morphogenetic patterns that lead to the production of the porospore, the gangliospore and the blastospore in the fungi which are being discussed in this paper. The fact that three conidial types have been found at once suggests differences, but what are the differences ?

That a conidium may be produced through a pore on the conidiophore was first suggested by Hughes[5] and the term "porospore" was proposed by him for such conidia. Although porospores have been reported in several genera, critical studies of the development of the porospore are few. Studies at the ultra-structural level seem absolutely essential for a proper understanding of conidial ontogeny and, although such studies are few, Campbell's[6] thorough and painstaking investigation of *Alternaria brassicicola* (Schw.) Wiltshire leaves little room for doubt that in this fungus

* Memoir No. 82 from the Centre for Advanced Studies in Botany, University of Madras.

"spores are formed by the growth of a bud through a fairly well-defined pore, which is apparently produced enzymically, for there is no sign of mechanical rupture". If electron micrographs are a guide, the pore is formed in the outer layer of the wall of the conidiophore, permitting a blowing out of an inner layer of the conidiophore wall which is evidently extensible, and there is naturally no continuity between the wall of the conidium and the outer layer of the conidiophore wall (Fig. 7).

In the development of a blastospore, no pore is involved, but a narrow zone of the conidiophore wall, which is obviously extensible, blows out. Sidce the blowing out is restricted to a narrow zone, a conspicuous constriction separates the conidium from the conidiophore; this constriction is also the point of separation of the conidium and conidiophore. The wall of the conidium is continuous with that of the conidiophore. It is pertinent to add here that what Luttrell[3] interpreted as murogenous conidia developing a constriction at the point of separation between conidium and conidiophore (*see* his Figs. 31, 32) are, in fact, blastospores (= his blastogenous conidia) and not gangliospores (= murogenous conidia).

Another type of conidium consistently produced by certain isolates of some species of *Drechslera* under certain conditions is the gangliospore. As defined by Subramanian,[7] a gangliospore is the swollen tip of a hypha transformed into a conidium, and a conidium initial may or may not be delimited. The observations of Jain[2] and of Bhat[4] on the ontogeny of the gangliospore in several species of *Drechslera* show that even in the same species and, indeed, in the same culture, a conidium initial may be delimited early sometimes, but not always. What appears significant is the fact that, irrespective of whether a conidium initial is delimited or not, in the development of a typical gangliospore, the apical part of a hypha swells gradually, a zone of the hyphal wall at least equal in diameter of the hypha itself, and often extending down to an appreciable length, from the tip of this hypha, becoming extensible and swelling gradually to a size and shape characteristic for each species or isolate; the swollen part is transformed into a conidium. In the species we have investigated, conidia formed in this way remain attached to the hyphæ on which they are produced, being not easily shed from the hyphæ on which they are borne.

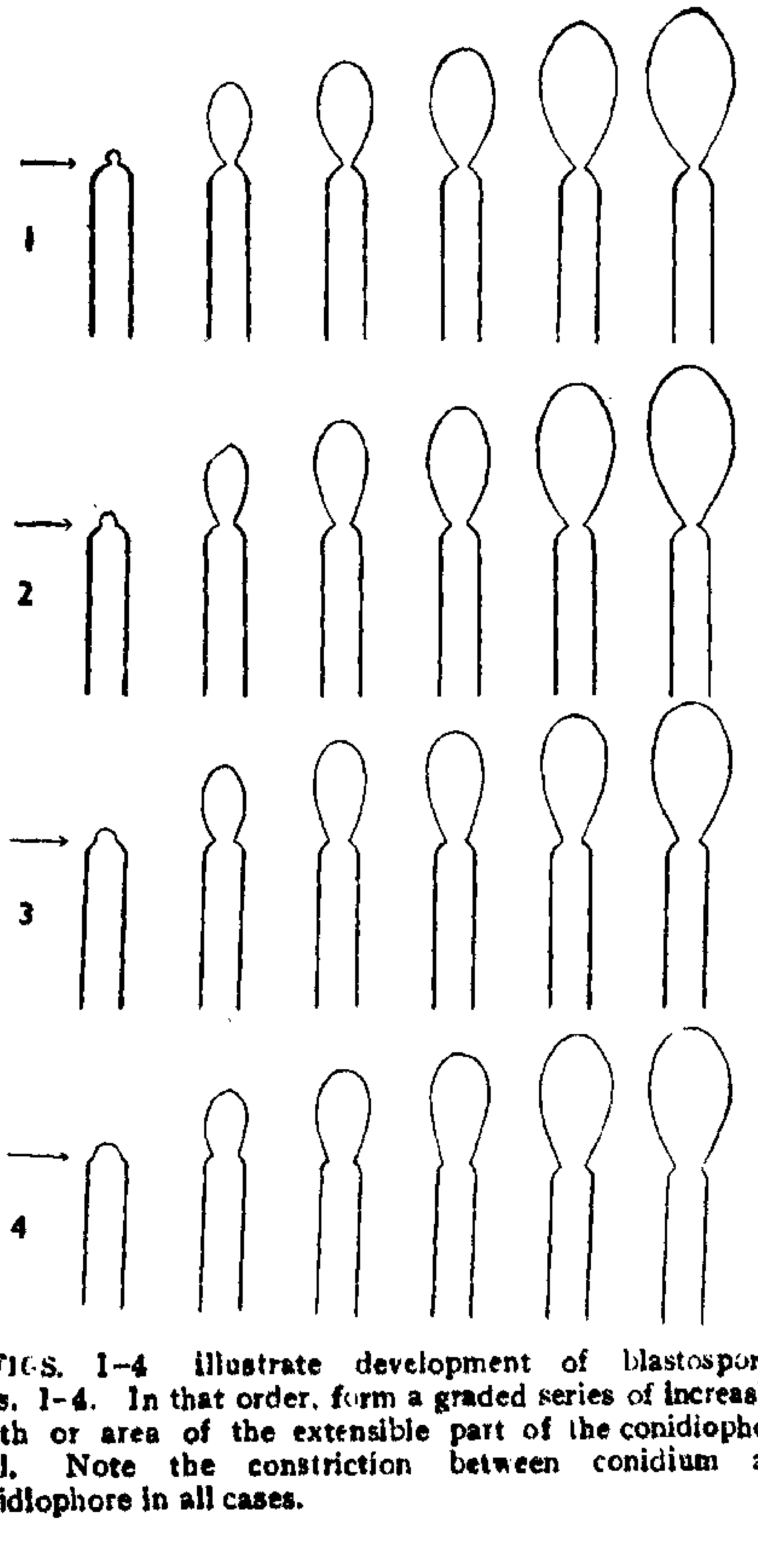
Essentially then, blastospores and gangliospores are both products of extensibility and plasticity of the wall of the conidiophore, and this reflects the basic similarity between them. However, the width or area of the wall that is extensible relative to the width of the conidiophore is different in the two cases and these differences are represented in Figs. 1-6. A similar situation would also explain the variations in the width of origin of germ tubes from germinating spores of *Mucor rouxii* (Calmette) Wehmer reported by Bartnicki-Garcia and Nickerson[8] who found that the point of origin of germ tubes was narrow when the fungus was incubated under CO_2, and wide when incubated under air (*see* also Romano[9]). In quantitative terms, blowing out of an area or zone less than the width of the conidiophore apex would give rise to a blastospore (Figs. 1-4) and in such cases a constriction between conidium and conidiophore is

1

2

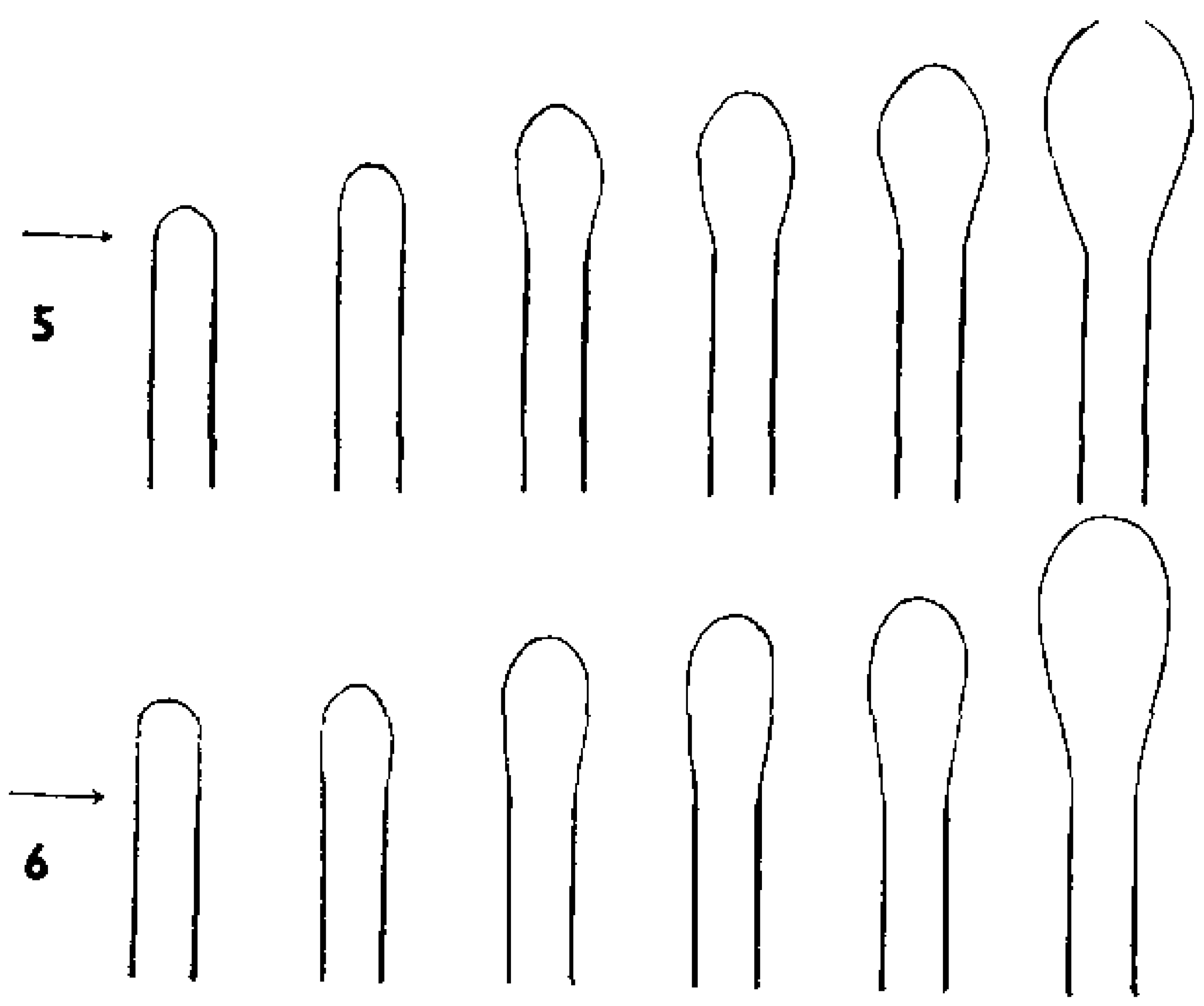
3

4



FIGS. 1-4 illustrate development of blastospores. Figs. 1-4. In that order, form a graded series of increasing width or area of the extensible part of the conidiophore wall. Note the constriction between conidium and conidiophore in all cases.

always present. If one makes a critical study of conidial ontogeny, in most cases it should, therefore, be possible to distinguish a blastospore from a gangliospore on the basis of the constriction between conidium and conidiophore which is present only in the case of the blastospore (Figs. 1-4) but not the gangliospore (Figs. 5-6); but, as stressed by Subramanian,[10]



FIGS. 5–6 illustrate development of gangliospors: a larger zone of the wall is extensible and gradually swells in the series in Fig. 6 than that in Fig. 5.

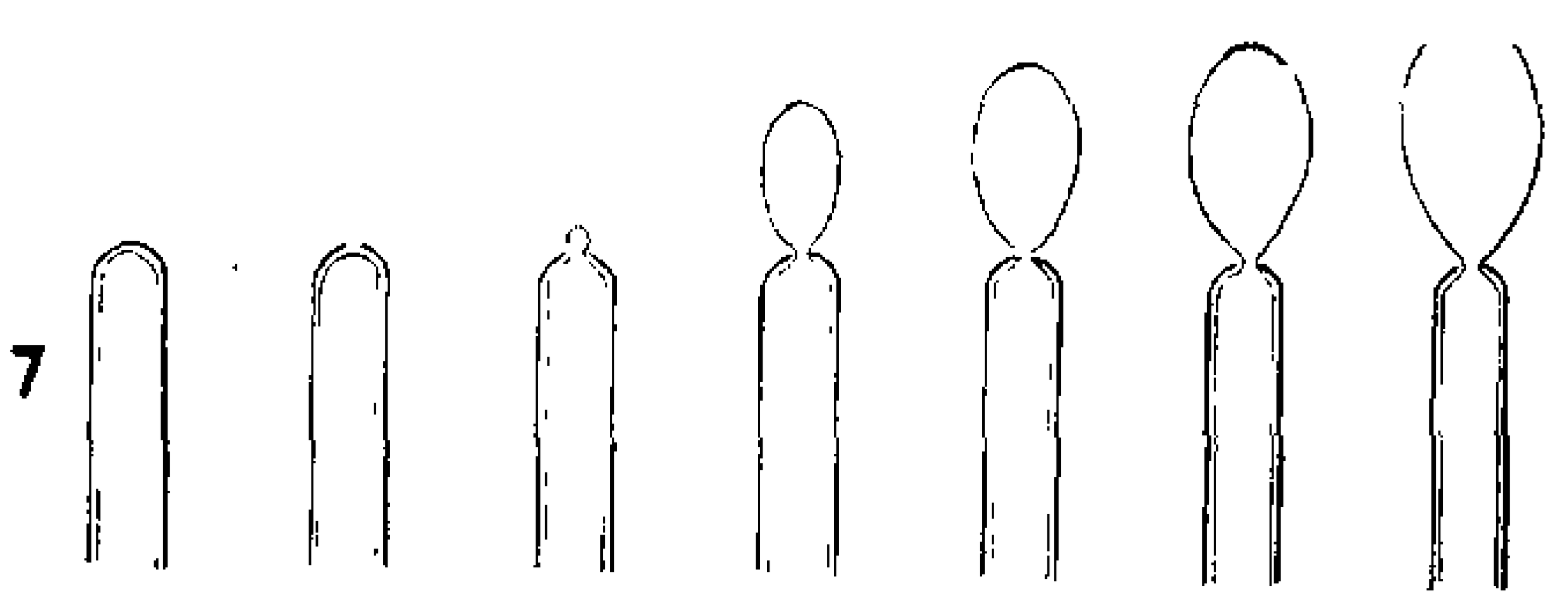


FIG. 7 illustrates the development of porospores in which a pore is formed on the conidiophore and an inner wall or wall-layer blows out through the pore and develops into a conidium. (Area or part of conidiophore wall above arrow extensible.)

"the line between a blastospore and a gangliospore at maturity may be dubious" sometimes. This is because considerable variation in the width of this constriction can be seen and a graded series can be built up between the two extremes of a blastospore produced by the blowing out of a narrow zone of the conidiophore wall and the gangliospore formed by the swelling of an extensive zone of the conidiophore including its entire apex (Figs. 1-6), and if the width of the conidiophore producing conidia at its tip is relatively narrow, it would be difficult to state precisely to which of these two categories a conidium may be assigned.

The most significant point about the three patterns of development observed in the case of the *Drechslera* spp. investigated is the fact that, in the development of the porospore, the wall of the conidiophore, or its outer layer, according to interpretation, seems to contribute nothing to the wall of the developing conidium and the conidial wall seems to be the blown out of an extensible inner wall or wall-layer; on the other hand, in the development of the blastospore and the gangliospore, the wall as a whole, and not merely an inner layer, becomes extensible permitting the development of a bud in the case of the former and a generalized swelling in the case of the latter. I believe that closer scrutiny of relationship of wall or wall-layers in elucidating conidial ontogeny would contribute considerably to the correct interpretation of conidial types and a better understanding of conidial morphogenesis in imperfect fungi.

1. Subramanian, C. V. and Jain, B. L., *Trans. Br. mycol. Soc.*, 1964, **47**, 613.
2. Jain, B. L., *Doctoral Thesis*, University of Rajasthan, 1968.
3. Luttrell, E. S., *Mycolbeia*, 1963, **55**, 643.
4. Bhat R., 1969 (Unpublished).
5. Hughes, S J., *Can. J. Bot.*, 1953, **31**, 577.
6. Campbell, R., *J. gen. Mycrobiol.*, 1969, **54**, 381.
7. Subramanian, C. V., *Curr. Sci.*, 1962, **31**, 409.
8. Bartnicki-Garcia, S. and Nickerson, W. J., *J. Bact.*, 1962, **84**, 829.
9. Romano, A. H. *in* Sussman, A. S. and Ainsworth, G. C. (Eds.), *The Fungi, An Advanced Treatise*, 1966, **2**, 181.
10. Subramanian, C. V., *Mycopath. mycol. appl.*, 1965, **26**, 373.

CHOLESTEROL MOBILISING ACTIVITY OF TESTOSTERONE PROPIONATE

M. K. VYAS*

It is known that adrenaline administration causes a decrease in lipemia associated with elevation in the basic metabolism and a sensible increase in fat of the liver, particularly of the cholesterol esters. The thyroid also participates as an important regulator of the blood cholesterol level. Testosterone was found to mobilise unesterified fatty acids from the body fat stores, as demonstrated by increased level of serum fatty acids in female rats by Laron and Kowadlo.[1] They had injected 10 mg. of

* Present address: V.P. Chest Institute, University of Delhi, Delhi-7.