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STUDIES ON FRUCTIFICATION OF COELOMYCETES FUNGI

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Fructifications of Coelomycetes fungi were studied. No system has yet been advanced that will satisfactorily accomodate or distinguish the variability and diversity in form. Consequently there are many exceptions to, and divergence from, the general principles discussed.

Keywords: Acervuli; Coelomycetes fungi; Fructification; Pycnidia; Stromata.

Fructifications of Coelomycetes are specialized pseudoparenchymatic structures within which or on which, conidiogenous cells and conidia are produced. They may be separated into three recognized categories pycnidia, acervuli and stromata. Saccardo[1] proposed six suprageneric categories based on pigmented, hyaline, dimidiate, or cupulate pycnidia and acervuli, but Potebnia[2] retained pycnidial and acervular genera. Vonhohnel[3] recognized five types of fructification. These were pycnidia, acervuli, stromata, cupulate and pycnothyroid pycnidia. This scheme forms the basis of the following discussion, but no system has yet been advanced that will satisfactorily accomodate or distinguish the variability and diversity in form shown by Coelomycetes fructifications. Consequently there are many exceptions to, and divergence from, the general principles discussed.

Pycnidia are basically flask- shaped to globose, variably pigmented, with a papillate to rostrate apex and a single circular ostiole (Fig. 1,2,5, and 6). Some pycnidia have multicellular brown setae. In culture, many isolates produced multiostiolale pycnidia. Pycnidia may be immersed, semi-immersed or superficial in relation to the substrate (Fig .8,10 and 12). The cavity is normally undivided and neither convoluted nor multi-loculate. wall-are pseudoparenchymatic and of varying degree of complexity. The simplest type of pycnidium is one to three cells thick, of very pale brown tissue, but darker near the ostiole (Fig. 2, 5 and 6). The outer wall of pycnidium is thick and pale brown tissue, but darker near the ostiole. The inner wall of pycnidia is hyaline, thick wall differentiated into conidiogenous cell (Fig.10 and 12). While middle wall layer is hyaline with sclerotioid cells. Some pycnidia become loosely aggregated into leaner or botryose groups without development of sterile stromatic tissue. Connecting tissue, if present is prosenchymatous rather than pseudoparenchymous.

The term stroma has come to means a mass or matrix of vegetative hyphae with or without tissue of the host, in which or on which fructifications are developed (Fig. 3 and 4). Its use in Coelomycetes is rather vague, but the present concept excludes genera with separate or aggregated pycnidia. It embraces those with thick wall, pulvinate, columnar, cylindrical, or clavate fructifications with in which conidia are formed in simple or complex cavity (Fig. 4 and 11). The simplest type of stroma is that must closely related to and in some genera scarcely separable from the pycnidium. It is consistently variable and irregular in overall shape, the cavity is convoluted or divided, the wall normally thick and of dark brown pseudoparenchyma, and the ostiole, if present invariably singular cupulate fructificans are separate, astrometic, more or less superficial, often setose and may be pigmented or hyaline(Fig. 3). They are distinguished from individual pycnidia by their ontogeny. The absence of a definite ostiole and the complexity of wall structure. Initially globose and closed, they finally become cupulate with the conidiophore bearing tissue fully exposed. They comprise flat, elongated, hemispherical, or irregular fructifications which are immersed, subcuticular or superficial. They dehisce in a variety of ways including by an ostiole. Slit irregular tears or longitudinal fissures. The arrangement of pseudoparenchymatic cells in the upper wall of the fructification may be radiate isodiametric or convoluted and irregular. The locule may be simple or divided and the conidiogenous cell bearing surface inverted on the upper wall, on the lower surface or both.

Acervuli display none of the complexities shown by pycnidia and stromata (Fig.7,9 and 11). There is a total lack of any definite wall structure, the fructification consisting of an immersed aggregation on pseudoparenchyma from the upper layer of which conidiophores are formed. The developing conidial mass ruptures covering host tissues and there is no specialized method of dehiscence. Fructifications may be subcuticular, epidermal, sub-epidermal or sub peridermal, some acervuli have dark brown setae which are produced amongst the acervulas cells (Fig.7).

Mechanisms of dehiscence are varied, the most

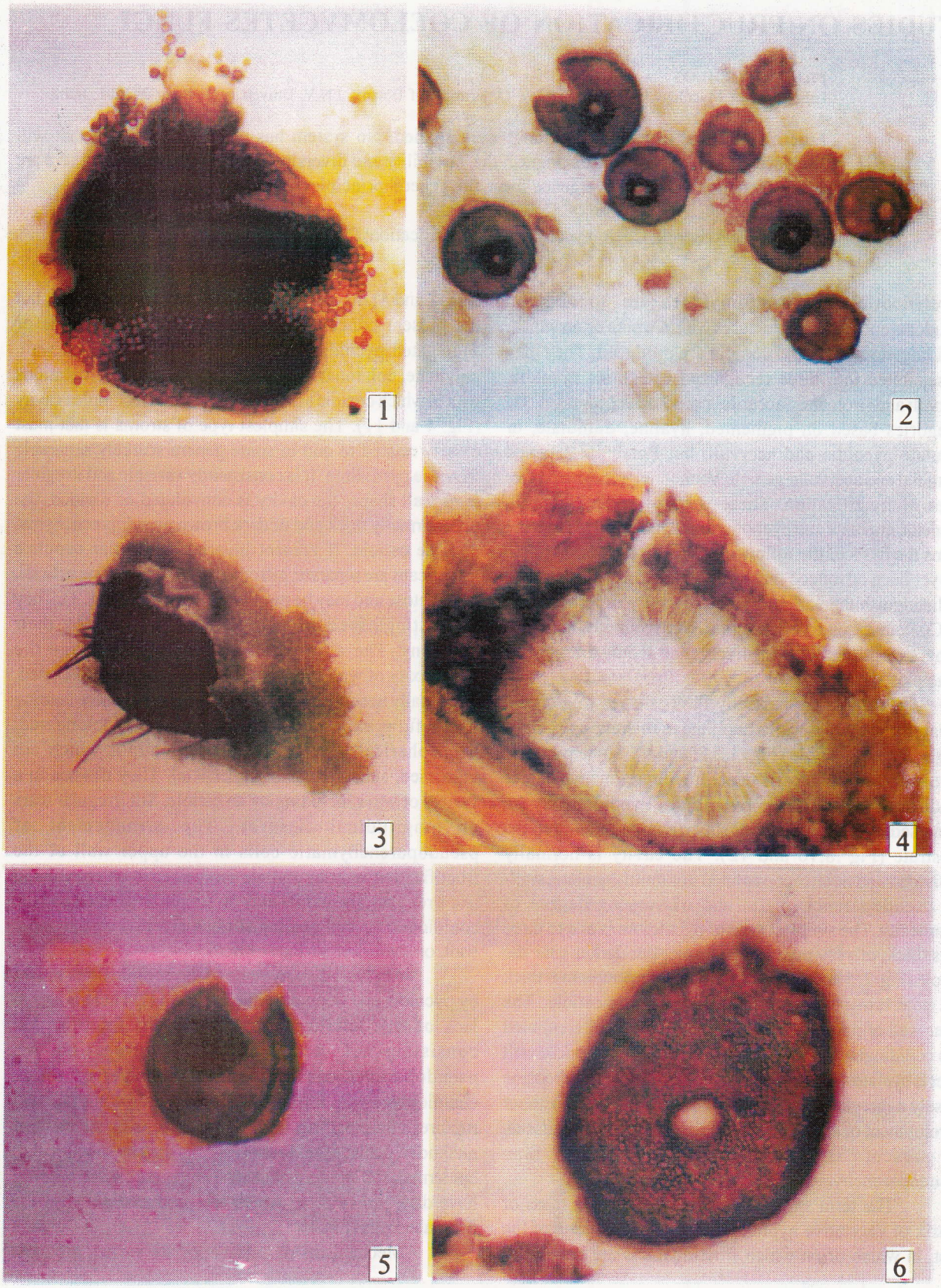

Fig. 1. Pycnidium of *Coniothyrium fuckelii* (X20), 2. Pycnidium of *Macrophomina phaseolina* (X10) 3. Stromata of *Amerosporium polynematoides* (X10), 4. Stromata of *Phacidiella viticola* (X10), 5. Pycnidium of *Microdiplodia minuta* (X10), 6. Pycnidium of *Phoma vitis* (X20).

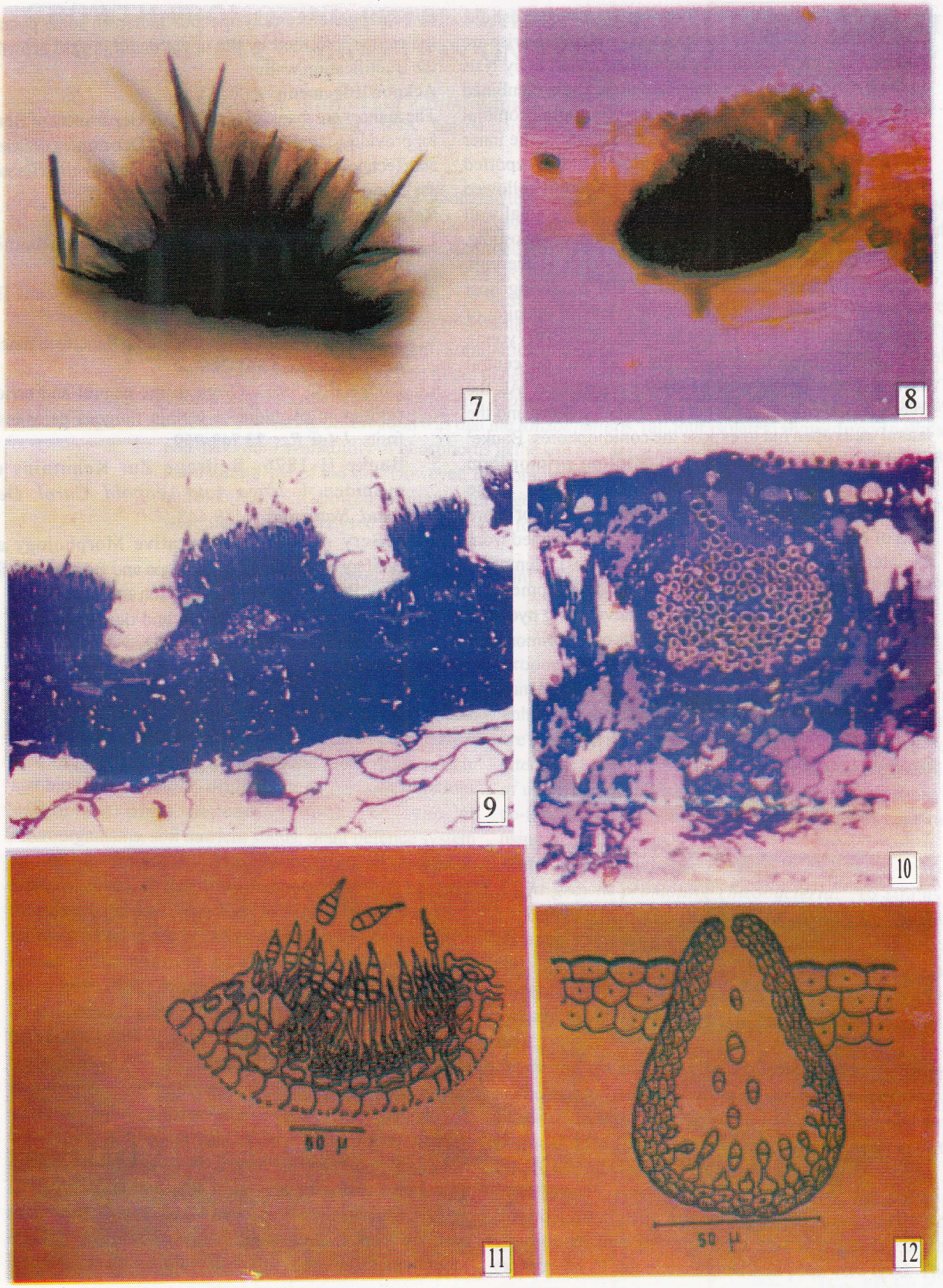

Fig. 7. Acervulus of *Colletotrichum capsici* (X20), 8. Pycnidium of *Diplodia lantanicola* (X10), 9. Microtomy section of acervulus of *C. capsici* (X10), 10. Microtomy section of pycnidium of *Camerosporium quaternatum* (X10), 11. Camera lucida drawing of acervulus of *Monochaetia mangifera,* 12. Camera lucida drawing of

common being by way of a more or less circular ostiole. The methods by which ostioles are considered to arise are diverse. The most frequently reported method is by lysis of the pycnidial wall in a restricted area. Lysis combined with mechanical force exerted by the developing conidial mass was reported. Lysis followed by growth of the inner wall cells to produce a papillate ostiole. Dudge[4] reported buffer tissue formed to break the leaf epidermis followed by perforation and disorganization of the pycnidial wall and upward growth of inner wall cells to produce the ostiole. There is no special mechanism of dehiscence in acervuli, the conidial mass usually splitting the overlying host tissues irregularly. The sequence of events in opening of cupulate fructification is similarly obscure. The young globose fructification entirely closed but with the central tissues in the upper wall of distinct structure. As the fructification enlarges, the central tissues rupture and the lateral walls open out to expose the conidiophores. Bauke[5] differentiated two types of pycnidium primordium formation; deBary[6] independently named these meistogenous (formed from the division of one or more cells of a single hypha) and symphogenous (formed from the intermingling of several hyphal branches). Kempton[7] found the concept applicable to the development of acervuli. Cavity formation by within developing pycnidia were interpreted by rupture of inner cells of the primordium by schizogenous and lysigenous factor. In some pycnidia the cavity is formed by the upward and inward growth of the fructification wall.

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