DEVELOPMENT OF MALE GAMETOPHYTE
AND ORIGIN OF TAPETUM IN SCUTELLARIA
DISCOLOR WALL EX. BENTHAM

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A perusal of literature reveals Scutellaria discolor
remains uninvestigated. The anther tapetum, in a
majority of the plants, develops from the inner
parietal layer of the anther lobe, forming a homog-
genous layer around the microsporangium1.
However, in a few species with dimorphic tapetum,
it has been suggested that the inner part of the
tapetum develops from the adjacent cells of the
connective, while the outer tapetum is formed from
the inner parietal layer2,3. Hence, the structure,
development and differentiation of male game-
tophyte and dimorphic tapetum in S. discolor were
studied.

The young buds and flowers of S. discolor were
collected from Western Ghats in Kodagu District,
and fixed in formalin acetic acid alcohol (FAA).
Customary methods of dehydration, infiltration and
embedding were followed. Sections between 8 and
10 μm were cut and stained in Heidenheim’s iron-
umal haematoxylin with erythrosin as the counter
stain.

The young anther is four-lobed with a micro-
sporangium in each lobe (figure 1). A plate of 6–8
hypodermal archesporial cells differentiates in each
microsporangium (figure 2). As the development
proceeds, each archesporial cell divides periclinally
to produce primary parietal cell to the exterior and
primary sporogenous cell to the interior (figure 3).
A periclinal division in the primary parietal layer
results in the formation of outer and inner parietal
layers (figure 4). The outer parietal layer divides
periclinally to form endotheicum and middle layer.
The inner parietal layer remains undivided and acts
as the presumptive tapetum. A row of connective
cells adjacent to sporogenous tissue, meanwhile,
derivatize into the tapetum (figures 4 and 5). The
undivided inner parietal layer with isodiametric cells
differentiates as outer part of the tapetum whereas
the elongate, vacuolate, cells of the connective
tissue adjacent to the inner face of sporogenous cells
differentiate as inner part of the tapetum (figures 5
and 6). The binucleate tapetum persists for a long
time till the formation of tetrads (figure 7), and
degenerates prior to the anther dehiscence (figures 8
and 9).

The cells of the primary sporogenous layer by
several mitotic divisions give rise to a mass of sporo-
genous cells which ultimately differentiate into
microspore mother cells (figures 5, 6 and 10). The
microspore mother cells divide meiotically to form
tetrahedral tetrads (figures 10–14). The individual
microspores liberated from the spore tetrads enlarge
in size and become spherical (figure 15). The micro-
spore nucleus divides mitotically and form a small
lenticular generative cell which soon enters into
cytoplasm of large vegetative cell (figure 16).

The development of tapetal layer shows a
deviation from the normal course, having a part of
tapetum derived from parietal layer and the
remaining part derived from the contiguous cells of
the connective as reported in Alceia thomsoni3.

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Figures 1–16. 1. Transverse section of a young anther showing four microsporangia; 2. T. S. of
microsporangium showing archesporial layer; 3–5. Same, showing primary parietal and primary
sporogenous layer; note the division of the primary parietal cell; note the division in outer parietal
layer; 6. T. S. microsporangium showing microspore mother cell and binucleate tapetum; 7. T. S. part
of microsporangium showing degenerating middle layer and microspore tetrad; 8, 9. Outline of T. S. of
mature anther showing the confluence of adjacent microsporangia and dehiscence; portion marked X
enlarged, showing epidermis, fibrillar endotheicum and bicelled pollen grains; 10–14. Formation of
tetrahedral tetrads; 15. A microspore; 16. Two-celled pollen grain. (AR-archesporial layer, PP-primary
parietal layer, PS-primary sporogenous layer; OP-outer parietal layer, IP-inner parietal layer,
SP-sporogenous layer, EP-epidermis, EN-endotheicum, ML-middle layer, OT-outer tapetum, IT-inner
tapetum, MMC-microspore mother cell, MT-microspore tetrads, CO-connective region, PG-pollen
grain, GC-generative cell, VC-vegetative cell).
TOXIN PRODUCTION BY ALTERNARIA
ALTERNATA PATHOGENIC TO BRINJAL
(SOLANUM MELONGENA L.)

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SOLANUM MELONGENA L. was found to develop a severe leaf spot disease during the rainy season of 1986. The pathogen was identified as Alternaria alternata (Fr.) Keissler based on the characteristics given by Ellis. As the toxins produced by this pathogen play an important role in disease development, an attempt was made to test the toxicogenic potential of A. alternata pathogenic to brinjal.

The fungus was cultured on Czapek-Dox broth for 30 days as stationary culture at room temperature (28±4°C). The toxicity of the culture filtrate was tested on seed germination and root elongation of tomato at different dilutions (1:0, 1:2, 1:4, 1:8, 1:10, 1:20, 1:40, 1:60, 1:80 and 1:100 of culture filtrate and distilled water). The petri dishes containing the seeds treated with the culture filtrates were incubated for 96 h and the germination percentage and root length were recorded. The detached leaves of brinjal and tomato were transferred to test tubes containing culture filtrate and symptoms were observed after 24 h. Chloroform extracts of the culture filtrates were employed for testing the antibacterial activity against Bacillus megaterium and B. subtilis using the seeded plate method.

The culture filtrates of the fungus grown on yeast-extract-sucrose broth for 30 days were screened for toxins. The developing solvent system employed for TLC analysis was toluene-ethyl acetate-90% formic acid (5:4:1). On the basis of Rf values and fluorescence of spots, selected toxins were cochromatographed with authentic samples of Alternaria toxins and confirmatory tests were made. UV spectral characteristics of the toxins were determined employing ethanol or water as carrier solvents.

The reduction in seed germination and root length over control was as high as 79% and 87% respectively. At lower dilutions only, the toxic principle was inhibitory to tomato, but at higher dilutions it stimulated the seed germination and root elongation. Epinasty with inward rolling of the leaf lamina with necrotic areas were the symptoms observed on detached leaves treated with the culture filtrate. Only wilting was noticed at higher dilutions. The solvent extractable metabolites produced by A. alternata were inhibitory to the test bacteria. The inhibition zones recorded in plates seeded with B. megaterium and B. subtilis were 0.88 and 1.47 cm² respectively.

TLC analysis of the solvent extracts revealed the existence of three phytotoxic compounds: (i) A brown coloured elongated spot with an Rf value extending from 0.25 to 0.36, (ii) and (iii) compounds with blue fluorescence having Rf values of 0.39 and 0.56. Tests with ethanololic ferric chloride, p-anisaldehyde and UV spectral characteristics (peaks at 239 and 279 nm in water and 217 and 277 nm in ethanol) confirm the identity of the brown coloured compound as tenuazonic acid. TLC characteristics of the other two compounds did not coincide with those of alternariol and alternariol monomethyl ether. Besides phytotoxicity, the mycotoxic nature of tenuazonic acid is also well established in recent years. Among Alternaria toxins, only tenuazonic acid is listed in the Rigistry of toxic effects of chemical substances. The natural occurrence of tenuazonic acid in blast diseased rice plants and tomato paste was also reported.

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