A. *Abnormalities in Pre-meiotic Stages*

The tapetal cells quite prior to the onset of meiosis either degenerated or enlarged abnormally (Figs. 4, 5). In either case, sporogenous cells also degenerated. Such anthers possessed only procambial vascular strand; showed very irregular outline and much compressed locules.

B. *Abnormalities in Post-meiotic Stages*

In heavily infected flowers, the tapetal cells remained intact for longer period of development and degenerated only after the breakdown of microspores (Fig. 6). In a limited number of cases, the tapetal cells became abnormally enlarged crushing the microspores (Fig. 7). Such anthers were indehiscent and their procambial strands failed to differentiate.

It is concluded from the above-mentioned findings that :

(1) The development of fibrous bands of the endothecial cells is controlled by tapetum as also suggested earlier[4–6]. According to these authors, the fibrous thickenings develop in the endothecial cells only after tapetal breakdown.

(2) In infected plants pollen abortion is associated with tapetal abnormalities similar to those recorded in a large number of cytoplasmic, genic and chemically induced male-sterile[7–8] as well as variously infected plants[9–11].

(3) Tapetal abnormalities are found to be associated with inhibition of vascular differentiation in anther connectives and this finally lead to the abortion of pollen[8,12].

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MICROSPOROGENESIS AND MALE GAMETOPHYTE IN *JASMINUM PUBESCENS* WILLD.

A review of literature shows that embryological investigations on the family Oleaceae and especially *Jasminum* are inadequate[1,2]. In the present study, microsporogenesis in *Jasminum pubescens* reveals some interesting features of embryological and cytological importance.

The anthers are large, tetrasporangiate and bithecous. Male archesporium is hypodermal and multicellular, consisting of a plate of four to six cells. Anther wall is five to six layered and its development conforms to Dicot type[1]. The single layered epidermal cells are more or less papillose and slightly thickened with spiny thickenings on its outer side. The persistent endothecium develops fibrous thickenings and it becomes biseriate at places. The middle layers are two and are ephemeral. These get completely obliterated at the microspore stage. Many cell layers of the connective region are seen to develop fibrous bands.

The tapetum is dimorphic and has a dual origin. The tapetal cells on the outer and lateral sides are radially elongated, uni- to bi-seriated and form a hood around the sporogenous mass. The cells on the connective side form a multilayered hemispheric shield, being angular and markedly smaller than the outer cells. Most of the tapetal cells are eventually seen to become binucleate. Tapetum as a whole is of secretory type and it disintegrates after the formation of the microspores. The arc of polygonal spore mother cells assumes a dumb-bell shaped appearance when observed in trans-section.

Cytological studies show that the process of meiosis is asynchronous, exhibiting several microsporogenetic abnormalities like the degeneration of pollen mother cells, precocious movement of the chromosomes, lagging chromosomes, formation of micronuclei, formation of two to four spindles at metaphse II, etc. Such irregularities ultimately result in the formation of more than four microspores at the close of cytokinesis (Fig. 1). These microspores are of varied sizes and range in number from four to eleven per pollen mother cell. Cytokinesis is of simultaneous type and the microspore tetrads are tetrahedral. The micro-

spores are of special interest in being much vacuolated with scanty cytoplasm, indicating under-development and leading to a large scale degeneration. The mature pollen grains are tricolpate with deep furrows and are one- to three-celled at anthesis. They exhibit polymorphism with a viability count of 5·33%. This discouragingly low amount of pollen fertility in this particular garden variety, however, leaves very little hope of producing fruit and seeds even after artificial pollination.

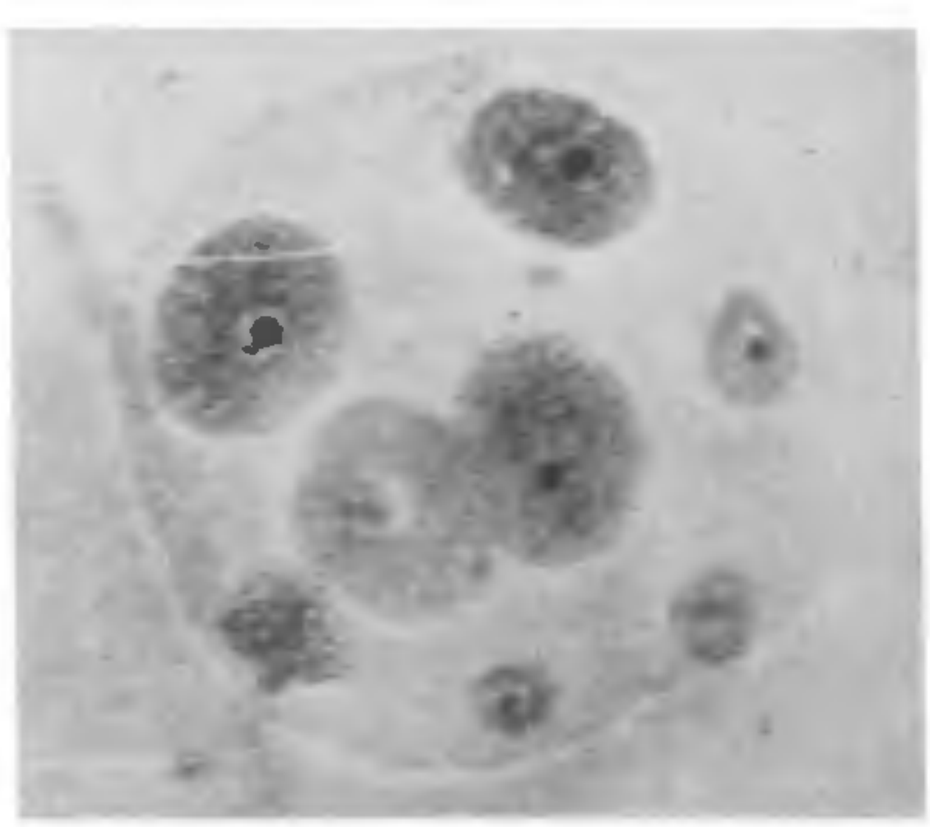

FIG. 1. Formation of heteromorphic polyads.

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KAPPA PHAGE ADSORPTION ON THIAMINE INDUCED PIGMENTED CELLS OF PIGMENTLESS *SERRATIA MARCESCENS* STRAIN 9-3-3

Bacillus prodigious or *Serratia marcescens* was named after its distinguishing red pigment 'prodigiosin'. Biosynthesis of prodigiosin is complex and involves two different pathways to the intermediate precursors 4-methoxy-2,2'-bipyrrole-5-carboxaldehyde (MBC) and 2-methyl 3-amylpyrrole (MAP) *plus* enzymatic coupling of the two to form prodigiosin[1]. Mutant 9-3-3 of *S. marcescens* strain HY is blocked in synthesis of MAP but can synthesize MBC[2,3] and the enzyme that couples these two moieties to form prodigiosin[4]. If furnished with MAP on certain synthetic monopyrroles, strain 9-3-3 forms either prodigiosin or prodigiosin analogues[5]. The mutant 9-3-3 is similar to wild type in its cellular morphology, staining or colony characteristics, biochemical reactions and antibiotic sensitivity.

As reported by Goldschmidt and Williams[6] when thiamine was added to the growth medium, strain 9-3-3 produced a red pigment which has been identified as prodigiosin. Thiamine did not cause reversion of strain 9-3-3 to a pigmented state, nor did it favour the selection of a spontaneous pigmented mutant. When red pigmented cells of strain 9-3-3 were harvested, washed and then inoculated into fresh medium without thiamine, their ability to form prodigiosin was lost.

The pigmentless strain 9-3-3 adsorbed 70·4% of the kappa phage whereas the thiamine induced pigmented cells of strain 9-3-3 showed an increase in phage adsorption (Table I). Thiamine, at all the concentration tested, had no effect on kappa phage adsorption in the wild type *S. marcescens* strain HY.

TABLE I

Study of kappa phage adsorption on S. marcescens *strain HY and* 9-3-3 *after overnight growth in the presence of thiamine-hydrochloride in peptone-glycerol medium*

Conc. of thiamine-HCl* µg/ml	Strain			
	S. marcescens HY		*S. marcescens* 9-3-3	
	Pigment µg/ml	Kappa phage adsorption (%)†	Pigment µg/ml	Kappa phage adsorption (%)†
00	32·10	97·28	0·00	70·43
05	32·10	98·10	4·82	85·56
10	32·10	98·10	10·34	88·69
25	35·15	97·96	22·58	90·43
50	35·15	98·18	26·17	92·86

* Thiamine-hydrochloride was added to peptone glycerol medium after autoclaving. The cells after overnight growth were harvested and used for phage adsorption after suspending in saline containing 5×10^{-3} M $MgSO_4$.

† Phage input $5·75 \times 10^7$ pfu/ml at a multiplicity of infection 1. The unadsorbed phages were estimated from the supernatant.