from the subepidermal region within the placenta. Within the nodules, fully differentiated vascular elements are seen. The size and shape of the nodule is not consistent.

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INDUCED VARIABILITY FOR POD AND SEED SIZE IN LENTIL (*LENS CULINARIS* MEDIC.)

DRY seeds of the variety L-235 treated with 6 and 10 kR doses of Co^{60} gamma rays were sown in the field. The M_2 and M_3 progenies raised from gamma ray treatments were screened for various kinds of mutations. True breeding mutations for pod size were isolated in large M_2 populations (Fig. 1). Large pod and long pod mutants were isolated in 6 kR treatment, while in 10 kR treatment short pod and miniature pod mutants were selected. Such pod variations have been reported in groundnut (*Arachis hypogaea*)[3,4]. The seed size, shape, colour and other characteristics of these pod mutations are given in Table I. The change in pod size also affected the size, shape and coat colour of the seeds. The 1000 seed weight of the long pod mutant was 2 gm higher and 6·4 and 10·4 gm less in the small pod and miniature pod mutations respectively than the parent. It remained unaltered in the long pod mutation. In addition, seed coat colour mutations were also observed. Seeds were light mottled in large and small pod mutants, while it was heavily mottled in long and miniature pod mutations. Seed coat colour mutations were reported in common bean (*Phaseolus vulgaris*)[2], black gram (*Phaseolus mungo*)[1] and cowpeas (*Vigna sinensis*)[5].

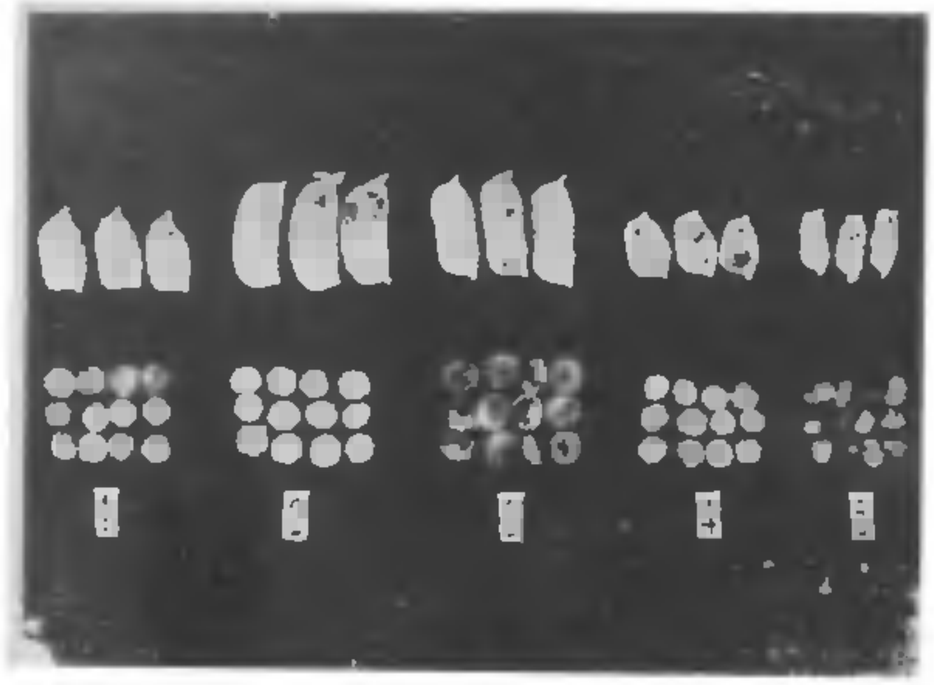

FIG. 1. Induced variability for pods and seed size in the variety L-235.

Left to right: (1) Normal pods and their seeds, (2) Large pods and their seeds, (3) Long pods and their seeds, (4) Small pods and their seeds, and (5) Miniature pods and their seeds.

The increase or decrease in the size of the pod, except in the long pod mutation, was accompanied by a proportionate increase or decrease in the seed size. Lack of increase in the seed size of long pod mutation might have been due to the shrivelled nature of the seeds. The correlation between 1000 seed

TABLE I

Characteristics of pod mutations in the variety L-235

Character	Parent variety (L-235)	Induced pod mutations			
		Large	Long	Small	Miniature
Pod length (mm)	10·5	13·1	13·2	8·6	8·6
Breadth (mm)	5·5	6·1	5·5	4·5	3·0
Surface area (sq. mm)	57·5	79·9	72·6	38·7	25·8
Seed weight (gm/1000)	21·6	21·8	23·6	15·2	11·2
Seed shape	Round and flat	Round and shrivelled	Long and flat	Small and slightly round	Very small and elongated
Seed coat colour	Mottled	Slightly mottled	Highly mottled	Slightly mottled	Highly mottled

weight and surface area of the pod was significant ($r = 0{\cdot}942$). The results indicated that pod size and seed size are closely associated, and the pod size can serve as a convenient basis to select variability for seed size. A knowledge of this association is of great importance in lentil breeding for improving a complex character like yield.

All the pod mutations exhibited monohybrid segregation in succeeding generations, hence they are controlled by a pair of recessive factors.

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EMBRYOLOGICAL STUDIES ON INDIAN SPECIES OF *MORUS*

I. Microsporogenesis

THE microsporogenesis in *Morus* has received very little attention and the earlier studies have not taken. This note reports on the microsporogenesis in three Indian species of *Morus*, *M. alba*, *M. indica* and *M. laevigata*.

A young anther has a homogeneous mass of parenchymatous tissue surrounded by an epidermis (Fig. 1A). It becomes four lobed during further development and three to four vertical rows of hypodermal archesporial cells differentiate in each lobe. This archesporial cells can be distinguished by their conspicuous size, presence of large nucleus and dense cytoplasm (Fig. 1B). The first periclinal division in an archesporial cell results in the formation of an outer primary parietal cell and an inner primary sporogenous cell. The outer primary parietal cell divides periclinally to form a secondary outer and a secondary inner parietal cell (Fig. 1 C). The secondary parietal cells divide periclinally and form four cell layers, endothecium, two middle layers and tapetum (Fig. 1 D–G). The development of anther wall thus conforms to basic type[1].

The cells of the epidermis of young anther undergo anticlinal divisions. They become tangentially elongated and deposit cutin on their walls. The epidermal cells begin to lose cytoplasm when meiosis sets in the microspore mother cells (Fig. 1 G, H). Following the degeneration of epidermis, the endothecial cells show characteristic thickenings. First these thickenings are formed on radial walls (Fig. 1 J), but before the dehiscence of the anther they also extend to inner tangential walls (Fig. 1 K). The tapetum is usually a single layer of cells which are glandular in nature. Occasionally a two-layered tapetum has also been observed (Fig. 1 I). The tapetal cells become bi- to multinucleate at maturity (Fig, 1 H, I).

The primary sporogenous cells undergo several divisions and then behave as microspore mother cells. The latter show meiotic divisions with simultaneous cytokinesis thus forming tetrahedral or isobilateral tetrad (Fig. 1 L–Q). The microspore is somewhat triangular in outline as it separates from the tetrad but it rounds off soon. Its nucleus divides to form a vegetative and a generative nucleus (Fig. 1 R, S). The pollen grains are shed at bicelled stage. The pollen grains are (2) 3 (4)-zono porate, oblate spheroidal ($18{\cdot}4 \times 18{\cdot}9$ microns; range $17{\cdot}2$–$19{\cdot}1 \times 17{\cdot}2$–$19{\cdot}8$ microns in *M. alba*, $14{\cdot}5 \times 14{\cdot}5$ microns; range $12{\cdot}2$–$17{\cdot}2 \times 12{\cdot}2$-18 microns in *M. indica*, $18{\cdot}6 \times 19{\cdot}6$ microns; range $17{\cdot}2$–$19{\cdot}1 \times 16{\cdot}5$-$19{\cdot}8$ microns in *M. laevigata*); amb circular, margins smooth, pore raised and broad; apsis diameter 4·1 microns in *M. alba* (range 3·6–4·3 microns) and 3 microns in *M. indica* and *M. laevigata* (range 2·8–3·6 microns), Mesaspider diameter 17·1 microns (range 16·5–17·2 microns) in *M. alba*; 12·5 microns (range 11·0–15·8 microns) in *M. indica* and 18·1 microns (range 17·2–18·7 microns) in *M. laevigata*. Exine 1·4 microns thick. Ectine thicker than endine, surface psilate.

The development of the anther wall conforms to the basic type, although monocotyledonous type of development of anther wall has been reported for Moraceae[1]. As such Moraceae falls under that category of families where two types of wall formation occur among the component species. The other five families where two types of wall formation are reported so far, are Caryophyllaceae, Combretaceae, Euphorbiaceae, Thymelaceae and Sterculiaceae[1].