TABLE I

Measurements of epidermal cell size and stomatal frequency

	Epidermal cell size in μ L	Epidermal cell size in μ U	Stomatal size in μ	Frequency of stomata per sq. mm.	Haris
Olea glandulifera	24 × 14	24 × 25	24 × 17	92	Ng—absent Pg —2–6
O. dentata	22 × 11	15 × 11	25 × 20	124	Ng—Absent Pg —2–7
Syringa vulgaris	28 × 15	40 × 16	23 × 15	100	Ng—Absent Pg —2–6
S. persica	24 × 13	24 × 14	25 × 18	110	Ng—Absent Pg —2–6
Ligustrum robustum	22 × 13	34 × 22	22 × 17	104	Ng—Absent Pg —2–6
Osmanthus fragrans	19 × 12	20 × 15	19 × 16	296	Ng—Absent Pg —2–7
O. suavis	23 × 11	23 × 11	21 × 18	260	Ng—Absent Pg —2–6
Jasminum dispernum	22 × 10	22 × 13	17 × 13	108	Ng—Absent Pg —2–6

L—Lower; U—Upper; Ng—Non-glandular hairs; Pg—Peltate glandular hairs.

Jasminum dispernum the hairs are borne only along the upper surface. The glandular peltate hairs consist of 2–7-celled head and a short slender stalk. These hairs are usually borne in the shallow depressions of epidermis.

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EVIDENCES FOR OUTBREEDING IN *CATHARANTHUS ROSEUS*

Catharanthus roseus (L.) G. Don. (Apocynaceae) commercially known as Vinca, occupies a place of eminence as the source of cancer drugs–the VLB compounds. The commercial crop grown for its roots consists of a free admixture of three horticultural varieties distinguished by pink, white and white with pink eye flower colours. The genetic consequences of cultivation of such varietal mixtures if any, is not understood for want of information on the breeding behaviour of the crop.

As a primary step in a breeding programme initiated at this Institute for the isolation of white and pink flowered plants, separate collections of bulked open pollinated seeds from a source population were used for raising progenies. In progenies of both pink and white flowered plants alien seedlings represented by green and pink stem colour, respectively, were detected and this has been adduced to result from out breeding. The present report examines evidences for out breeding based on data secured from progeny tests and genetic background of the source population.

The relevant genetic informations for this study were drawn from the report on the genetics of flower colour by Flory[1] and verified from observations made by the authors in natural and experimental populations. Flory ascribed pink flower colour to interaction of dominant alleles of genes '*R*' and '*W*'. In absence of such an interaction gene '*R*' causes pink eye and '*r*' white flower colour. In plants with pink and pink eye flowers, stem is pigmented while in white flowered plants stem is green. Since the pigmentation of stem is discernible at seedling stage, it serves as a good marker and facilitates reliable identification of white flower bearing plants at the seedling stage itself.

The percentage of alien seedlings in progenies of both pink and white plants of the source population were 8·5 and 12·3% of 958 and 1228 seedlings scored, respectively. All the seedlings that established bore pink or white flowers and plants with pink eyed flowers were absent.

In order to determine their origin, alien seedlings from the above, with green and pigmented stems were grown separately. Among them ten pink and four green-stemmed plants were progeny tested for seedling pigmentation and flower colour. In the progenies of all the ten pink stemmed (pink flowered) plants, green stemmed seedlings occurred in excess of that detected in the parental source population and the pooled X^2 value gave a good fit for pigmented and green seedlings in the ratio of 3 : 1 indicative of monogenic difference (Table I). In the progenies of four white flowered plants 3·15, 4·17 and 6·12% alien pigmented seedlings occurred in three and none in the fourth. The flower colour in all the 14 plants' progenies were either white or pink and pink eye colour was absent.

TABLE I

Seedling pigmentation in Catharanthus roseus

Seed Source	No. of Seedlings: Green	Pigmented	Total	X^2 (3:1)	P
(i) Pigmented alien plants*	338	977	1315	0·3470	·50–·70
(ii) Source population progeny:					
Plant A	37	138	175	1·39	·20–·30
Plant B	142	437	579	0·0696	·70–·80

* Pooled data of 10 plants.

A total of twelve single plants raised from the seeds of source population consisting of five white and seven pink flowered plants, were also progeny tested. Alien pigmented seedlings occurred in all the five white flowered plants ranging from 1·7 to 13·8%. Of the seven pink flowered plants, alien seedlings were absent in two, while in three constituted 1·3, 13·0 and 13·6% of seedlings scored. The remaining two plants (designated A and B) segregated for pink and green seedlings in 3 : 1 ratio (Table 1). Here again, of the three flower colours, pink eye was not found among the progenies.

Flory[1] ascribed pink flower colour to RRWW, RrWW, RrWw, RRWw genotypes, pink eye to RRww, Rrww genotypes and white to rrWW, rrWw and rrww genotypes. The pink eye flower colour was absent in source population, its first and second generation plants and progenies of alien seedlings. This observation viewed in the context of monogenic difference for flower colour secured in the present study, restricts the genotypes of pink flowered plants of source population to RRWW/RrWW and that of white to rrWW. Data on progeny tests are available for seven pink flowered plants representing first generation of source plants. The genotype for the three plants with none or low (1·3%) frequency of alien green seedlings can be reckoned as RRWW. RrWW genotype can be assigned to plants A and B and also to the two plants of this group with 13·0 and 13·6% alien green seedlings. The deficiency of green seedlings in the latter two may be explained as due to out-crossing with RRWW genotype.

In the light of the above considerations, progeny tests in the white flowered (green stemmed) plants, can be expected to provide direct proof for the occurrence of natural outcrossing in *Catharanthus*. In the present studies outcrossing as evidenced by presence of alien pigmented seedlings occurred to varying extent among first and second generation progenies of white flowered plants of source population. Corroborative evidence is available in the determination of hybrid origin of such seedlings as revealed by the observed monogenic segregation for seedling pigmentation in all the ten progeny tested plants. Indirect evidences for outcrossing is also secured from two pink flowered plants of RrWW genotypes deficient in green seedlings to the extent of 12·0 and 11·4%. However a precise estimation of the extent of natural outcrossing in this crop cannot be resolved from the present study due to paucity of additional marker character(s) to permit detection of outcrosses among white flowered plants. Allowing for this limitation, the extent of outcrossing gleaned from progeny tests among white flowered plants in this study varied from 1·7 to 13·8%.

The results of the present findings is relevant in the context of maintaining varietal purity and in evolving breeding strategy appropriate to this crop. The scope for selection in natural populations of this exotic introduction where a large spectrum of genetic variability is expected to be generated and preserved through natural outcrossing is also borne out by the present study.

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THE ROOT-KNOT NEMATODE ON *GLADIOLUS* FROM INDIA

DURING a survey of plant parasitic nematodes undertaken during 1977-78 at the Experimental Station, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore, it was observed that the root-knot nematode, *Meloidogyne incognita* (Kofoid and White, 1919) Chitwood, 1949 was commonly associated with glandiolus (*Gladiolus* spp.) causing heavy root galling. Numerous adult females and egg masses of the root-knot nematode were observed by dissection of the root galls. The infested plants were stunted in growth, with chlorotic foliage and short and thin floral stalks. Besides invading roots, the nematode was also found on daughter corms and cormels which develop after flowering. The nematodes may survive in corms and cormels which are used as planting material and may serve as source of inoculum for next season and dispersal of the nematode to newer areas. Four varieties of gladiolus, *viz.*, Blue lilae, Cherry blossom, Jowagnar and a hybrid were found infected with *M. incognita.*

Root-knot nematode infestation on gladiolus had been reported from other countries (Minz[1] and Overman[2]). This is the first report of the occurrence of root-knot nematode on field grown gladiolus from India.

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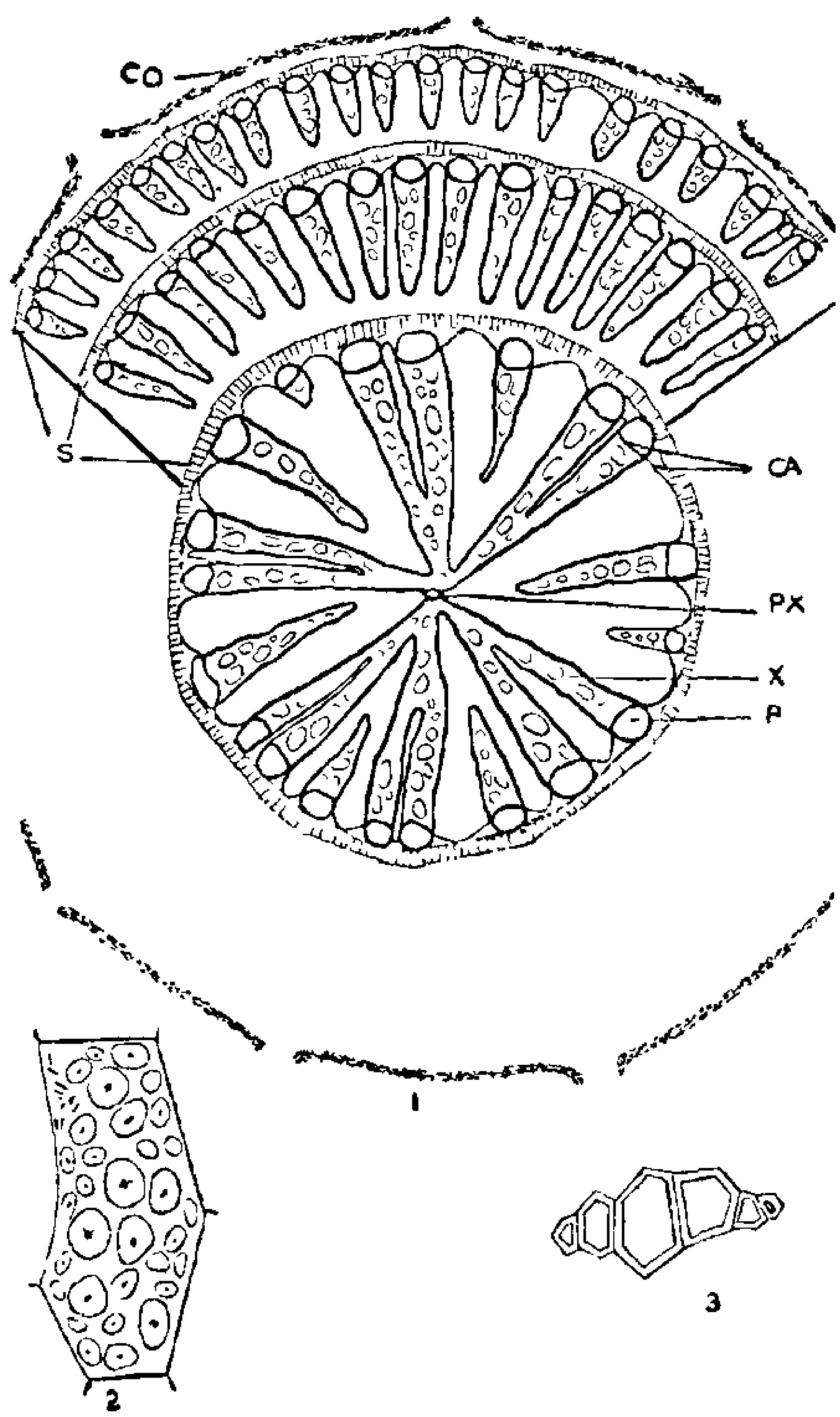
ANOMALOUS SECONDARY THICKENING IN THE ROOTS OF *PACHYGONE OVATA* MIERS.

ANOMALOUS secondary thickening, by the formation of supernumerary rings of cambium, is known to occur in the stems of some of the climbers of Menispermaceae[1] but the nature of the secondary thickening in the roots of such plants remains practically uninvestigated. *Pachygone ovata* exhibits anomalous secondary thickening in the stem but its root anatomy has not so far been investigated. As such a study of the anatomy of the root is reported here.

The root is diarch and each of the exarch primary xylem groups comprises usually three elements (Figs. 1, 3). Secondary thickening commences normally as in dicotlydonous roots by the formation of a cambium and forms secondary xylem towards inside and



FIGS. 1–3. Fig. 1. T.S. root of *Pachygone ovata* (Diagrmmatic), × 10. Fig. 2. A parenchymatous cell showing starch grains and raphides, × 160. Fig. 3. Diarch and exarch primary xylem, × 160. (*Ca*–cambium; *Co*–cork; *Px*–Primary xylem; *P*–Phloem; *S*–sclerenchyma; *X*–xylem.)