during 1985–86 under the Indo–Italian project on development of temperate climate fruit crops. A portion of the plant material was planted in Government orchard-cum-nursery at Gopalpora near Srinagar. Inspection of the plant material in May 1986 revealed the presence of leaves infected with typical peacock spot symptoms caused by *Spilocaea oleaginea* Cast. S. Hughes (=*Cycloconium oleaginea*), a new disease record in India[2]. Identity of the pathogen has been confirmed from CAB International Mycological Institute, Kew, England, and material has been deposited under IMI 321475.

Incidence of olive anthracnose (*Colletotricum gloeosporioides* Penz.) and Wilt (*Fusarium* spp.) has been reported in Himachal Pradesh[3]. Other fungi, like *Cercospora, Cytospora, Sirodesmium, Stephanotheca* and *Meliola* species, have also been reported on *O. dioica* from Kerala, Maharashtra and Karnataka[2] Peacock spot disease is of major importance in other olive-growing countries, especially in California, USA[4].

At present wild plantations of olives are abundant in the intermediate zone of Jammu and Kashmir (1350–3000 MSL). The state department of horticulture has an ambitious plan for rapid introduction of improved olive cultivars for meeting the olive oil needs of the country from exotic sources. If the imported plant material is not checked/tested for pathogens thoroughly, bulk imports of plant material discouraged and initial symptoms of serious diseases like peacock spot not noted and acted upon, such diseases are likely to pose serious management problems in future olive orchards.

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POLLINATION STUDIES IN *SANTALUM ALBUM* L.

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SANTALUM ALBUM L. is a tree species of Santalaceae. It is distributed throughout India, but grows profusely in the southern parts of India. It is famous for its scented essential oil. The oil is obtained from the heartwood of the plant. The oil content of the heartwood varies from tree to tree, indicating that oil content is a genetically controlled character. For a tree breeding programme aimed at improved oil content, knowledge of the pattern of the genetic variation and of the reproductive biology of the species is a necessity.

Hand pollination and open pollination after emasculation were attempted. The object was to find out the pollination values under the two methods. The plants were selected randomly from the Forest Research Laboratory Campus, Bangalore. The seed source of these plants is not known and almost all the plants are in the 15–40 cm girth class. Five trees were selected for artificial selfing during 1985 and 1986. For natural outcrossing five trees were selected during 1985 and six trees during 1986.

The flower of *Santalum* is very small and non-attractive. A little quantity of nectar present inside the perianth tube is the main attractive agent. Ants, bees and beetles visit the flower for nectar, and by means of these insects the anthers come in contact with the stigma, effecting pollination. Forty to forty-eight hours after anthesis the perianth as well as the stamens turn light red and become shrivelled.

To assess the extent of pollination, the flowers were subjected to different pollination regimes such as hand pollination after emasculation, and bagging with and without emasculation for natural outcrossing. The pollination value was calculated from[1]

$$\text{Pollination value (\%)} = \frac{\text{No. of mature seeds}}{\text{No. of mature seeds} + \text{No. of immature seeds}} \times 100.$$

Repeated trials were made in both flowering seasons on hundreds of flowers. No fruit setting was observed in parthenocarpy and apomixis. However, in a separate experiment, from 500 flowers bagged for obligatory self-pollination, 4 fruits were formed (0.8%). There was success in artificial selfing and natural outcrossing, indicating that *S. album* is an

Table 1 *Artificial selfing in Santalum album*

Tree no.	Pollination value (%) 1985	1986
452	85	25
393	50	26
4203	50	50
398	20	–
A1	71	–
392	–	28
GPB-1	–	100

Table 2 *Natural outcrossing in Santalum album*

Tree no.	Pollination value (%) 1985	1986
452	87	80
393	97	92
4203	83	90
398	89	–
A1	60	–
GPB-2	–	75
190-S	–	89
392	–	93

inbreeding as well as outbreeding species like any other tropical tree[2].

Tables 1 and 2 show pollination values of nine trees in 1985 and 1986 for artificial selfing and natural outcrossing respectively. The overall pollination value in artificial selfing for 1985 and 1986 is 54% and 26% respectively. In natural outcrossing, the overall pollination value is 88% and 98%.

From the pollination values, it can be concluded that *S. album* is a partially inbreeding species. Here all the genotypes showed success in both artificial selfing and natural outcrossing, suggesting that both mechanisms are operating in the population. It can also be noted that the frequency of fertilization is high in both cases, but in a separate experiment, when 500 flowers were bagged, only four fruits were formed, suggesting the involvement of pollinating agents. The variation in pollination value is significantly different for different genotypes, indicating some genetic control.

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INCREASED MYCORRHIZAL COLONIZATION IN GAMMA RAY-INDUCED GREENGRAM MICROMUTANTS

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VESICULAR-ARBUSCULAR mycorrhizae (VAM) occur on a wide variety of crop plants and their beneficial role in plant nutrition is well established[1,2]. It is recognized that this symbiosis can be harnessed by manipulating the three major components, viz. the plant, the mycorrhizal fungus and the soil environment. Krishna *et al*[3] reported host genotype dependence for mycorrhizal colonization in 30 genotypes of pearl millet. The objective of the present study was to determine the extent of root colonization and its relation to phosphorus uptake in four gamma ray-induced advanced micromutants of greengram at M_7 generation under field conditions.

Two cultivars of greengram, viz. LGG 127 and ML–26–10–3 were subjected to gamma irradiation at 30 kR and 40 kR (source ^{60}Co, IARI, New Delhi). At M_6 generation, four micromutants were selected on the basis of their superior performance in yield over the parents. The pedigree of the material is shown below.

Micromutant	Pedigree
LGG 403	LGG–127–40 kR–2
LGG 405	ML–26–10–3–30 kR–39
LGG 407	ML–26–10–3–40 kR–25
LGG 410	ML–26–10–3–40 kR–48.

These four advanced micromutants and their parents were tested in an experimental plot to study the extent of mycorrhizal colonization. The plants were raised in a red laterite soil in the university botanical garden, which is known to harbour a high population of VAM fungi.

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