AN INTERSPECIFIC HYBRID IN *SESAMUM*
S. ORIENTALE L. × *S. PROSTRATUM* RETZ.

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INTRODUCTION

THE genus *Sesamum* is known to be represented in India by three species,[1] *viz.*, *S. orientale*, *S. prostratum* and *S. laciniatum* Klein, of which the first-named species is grown widely as an important oilseed crop all over India and in other tropical countries; it has also been collected in the wild state round about Delhi and Dehra Dun.[2] The other two species are closely allied and have been found to grow wild in South India

At the Imperial Agricultural Research Institute where a collection of wild relatives of crop plants is being built up and studied in search of favourable genes for utilisation in breeding, *S. prostratum* collected from Madras was found to grow vigorously and remain practically unaffected by the pest and the disease. It has now been grown at the Botanical Section of the Institute for two years along with several types and the wild forms of the cultivated species, and

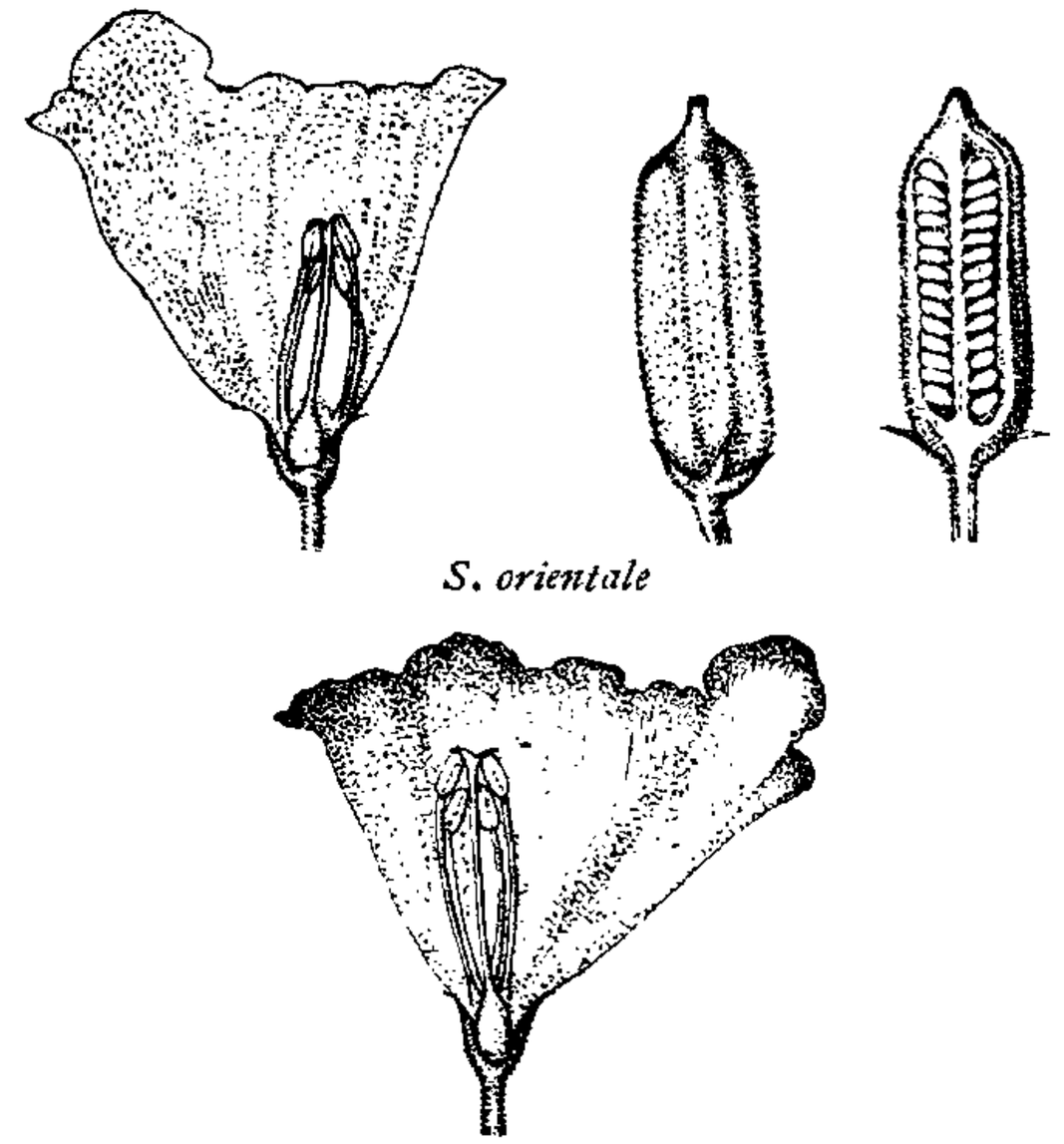
(*a*) *S. orientale* (*b*) *S. prostratum* (*c*) *Hybrid*

FIG. 1

especially on sand hills. The cultivated species is usually subject to a bad attack of a caterpillar, *Antigastra catalaunalis*, in the early stages and to what is believed to be a virus which reduces the floral organs to leafy structures, in the later stages of the crop. The caterpillar has been reported to be a bad pest on this crop in Madras[3] doing considerable damage and the virus disease variously designated as sepaloidy,[4,5,6] phyllody[7,8] and 'green-leaf' disease,[9] has also been known to cause appreciable reduction in yields wherever the crop is grown. At Delhi, our experience has been that it is almost impossible to raise a good crop of this species owing to the ravages of this pest and this disease.

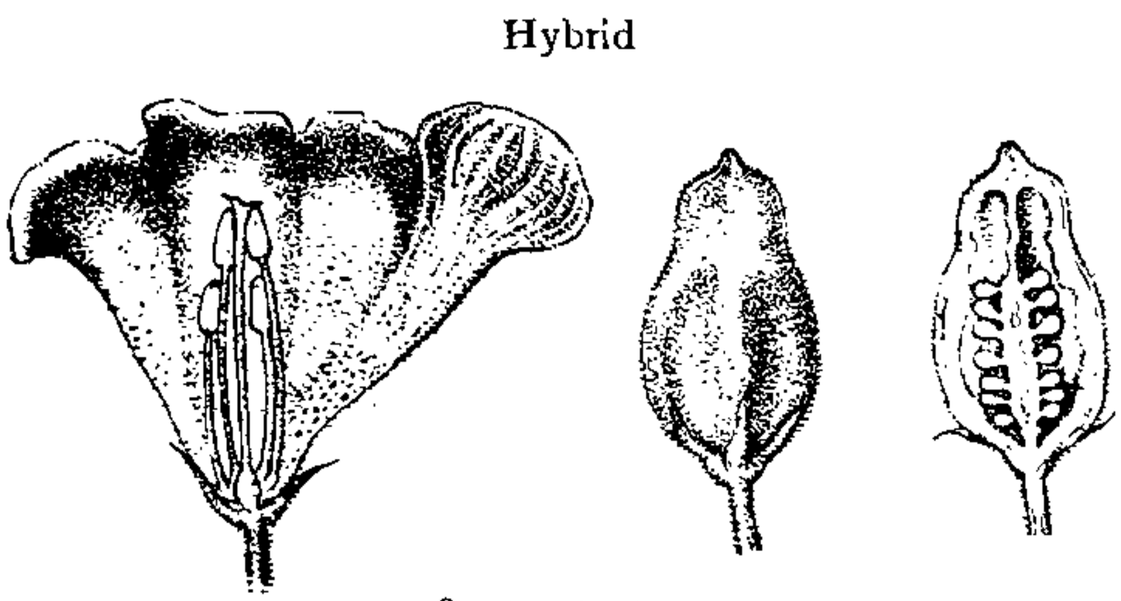
found to be absolutely free while all the latter were badly attacked by the pest and the virus. The caterpillars when artificially made to feed on the *prostratum* plants did little damage and the affected plants recovered remarkably from the minor injuries inflicted on them. As regards virus symptoms, not even a trace was noticed on these plants during the two years and grafting experiments are under way to confirm their immunity to the disease. Another desirable point about *prostratum* plants is that they are likely to be drought-resistant inasmuch as they are known to inhabit sandy tracts. Experiments have also been put on hand to test the relative drought resistance of this wild and the cultivated species.

The chromosome number of *S. prostratum*[10] was determined by the author to be $n = 16$ while that of *S. orientale*[11] is known to be $n = 13$. The oil content of the seeds of the former species was kindly determined by the Imperial Agricultural Chemist to be 32 per cent. while that of the latter is known to range from 45 to 55 per cent.



S. orientale

Hybrid



S. prostratum

FIG. 2
Flowets and Fruits

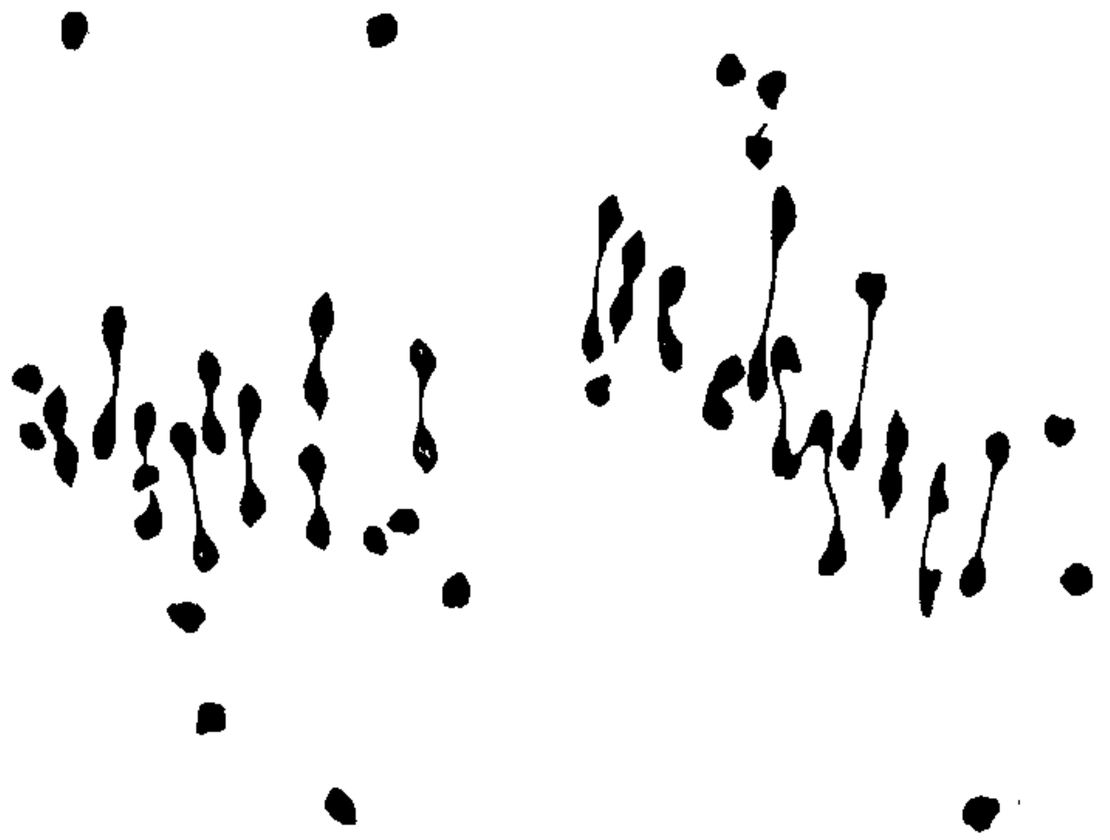


FIG. 3

FIG. 4

FIG. 5

HYBRIDISATION

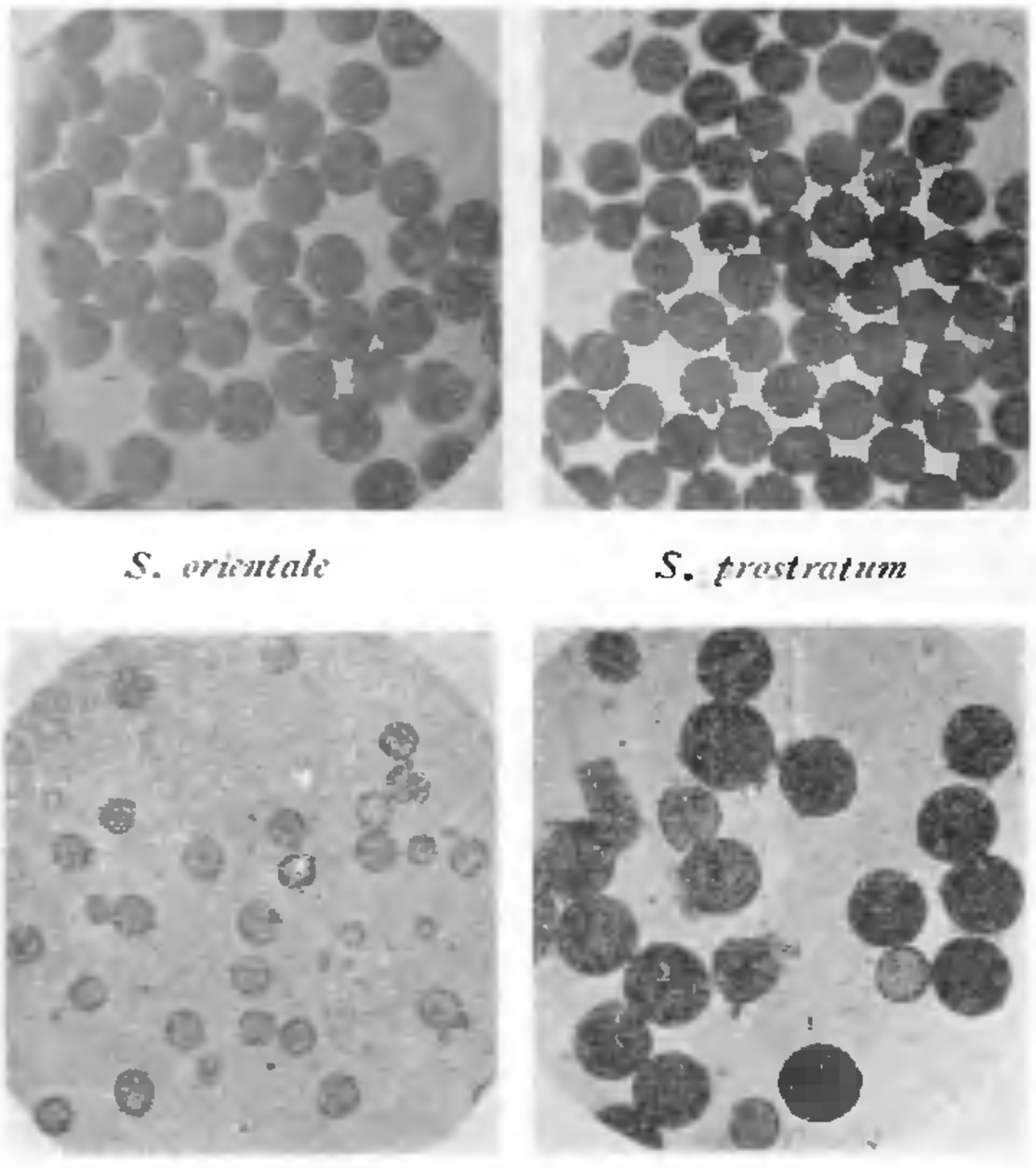
With a view to eventually evolving an economic type of *Sesamum* resistant to the pest and the disease and possibly also to drought, crosses were attempted between *S. orientale* (I.P. 6) and *S. prostratum* reciprocally during the season of 1941. Setting was fair in the crosses and out of 91 crossed seeds sown during 1942, 11 hybrids from

Details of characters	*S. orientale* (I. P. 6)	Hybrid	*S. prostratum*
Habit ..	Erect	Semi-erect	Prostrate
Leaves ..	Petiolate, oblong to ovate, lower divided and upper simple with almost entire margin	Petiolate, and simple throughout with imperfect lobation in a few of the basal leaves	Short petioled, simple orbicular with crenate margin
Inflorescence ..	Raceme, flowers solitary, axillary with two discoid gland-like structures representing rudimentary flowers	Raceme, flowers solitary, axillary with imperfectly developed glandular structures	Raceme, flowers solitary, axillary with no rudimentary structures
Flowers ..	Pedicellate, bracteate, zygomorphic, hermaphrodite with very light purple corolla	Pedicellate, bracteate, zygomorphic, hermaphrodite with light purple corolla	Pedicellate, bracteate, zygomorphic, hermaphrodite with purple corolla
Fruit ..	Capsule four-chambered, quadrangular, opening from above loculicidally down to about the base	No fruits were formed as the gametes were sterile	Capsule ovoid compressed with tough pericarp, opening loculicidally from top to only a short distance below
Seeds ..	Many, white, smooth with thin testa	———	Fewer, black, deeply reticulate with thick testa

the direct cross and 2 from the reciprocal were obtained. The hybrids grew well and flowered profusely.

MORPHOLOGY AND CYTOLOGY OF THE HYBRIDS

The hybrids were intermediate in respect of several characters of the parents, but showed dominance with regard to resistance to the pest and to diseases. The following is a comparative statement of some of the more important characters of the parents and hybrids. There was no essential difference between reciprocal hybrids.



S. orientale *S. prostratum*

Hybrid before treatment Hybrid after treatment

FIG. 6
Pollen Grains

Fig. 1 is a photograph showing the habit of the two parents and a hybrid plant; Fig. 2 represents their floral parts and fruits.

The hybrids, in spite of profuse flowering proved to be practically sterile and set no fruit which was not surprising considering the differences in morphology and in chromosome number between the parental species. An examination of the pollen meiosis in the hybrids showed 29 chromosomes, *i.e.*, a number equal to the sum of the gametic numbers of the two parents. At metaphase I in the hybrid, the chromosomes usually formed varying numbers of bivalents and univalents; occasionally a quadrivalent or a trivalent was also met with in some cells. The maximum number of bivalents noticed in any one cell was eleven. Figs. 3 and 4 represent two metaphases with $9^{II} + 11^{I}$ and $1^{IV} + 9^{II} + 7^{I}$ respectively. Anaphase separation was irregular followed by an equally irregular second division which resulted in the abortion of most of the gametes. Fig. 5 shows a distribution of chromosomes at metaphase II. Back-crossing of the hybrids with the parents failed to produce fruit formation.

COLCHICINE-TREATMENT OF HYBRIDS

With a view to doubling the chromosomes in the hybrid for obtaining a fertile amphidiploid for further work, a number of vegetative buds in a few hybrids were treated with 0·4 per cent. aqueous solution of colchicine. The alkaloid was sprayed on the buds twice daily at 9 a.m. and 4 p.m. on three alternate days. The treated buds developed slowly and showed all the symptoms of induced polyploidy; the leaves were thicker and the flower buds and flowers bigger and more hairy than those of the untreated plants. The pollen of some of the treated plants showed a remarkable change; most of them were bigger and full of contents as compared to the shrivelled and empty grains of the untreated hybrids. In Fig. 6 are shown photographs of the pollen of the two parents and the hybrid before and after treatment with colchicine. As would be expected, many of the treated branches in which flowers with good pollen have been found, are developing capsules. There is no doubt that fertility has been induced in the sterile hybrid as a result of chromosome doubling which is evidenced by the bigger and more numerous functional pollen grains produced. The progeny of this newly-produced double-diploid hybrid is expected to provide material of interest both from the point of view of theoretical and practical genetics.

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