Study of reproductive compatibility and morphological characterization of interspecific hybrids in *Sesamum* sp.

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Received 6 February, 2014; Accepted 17 December, 2014

In the present study, three wild species of sesame, *Sesamum alatum*, *Sesamum malabaricum* and *Sesamum radiatum* and one wild variety of *Sesamum indicum*, that is, *S. indicum* var. *yanamalaiensis* were crossed with eight cultivated varieties of *S. indicum* L. in both direct and reciprocal forms. All the wild species exhibited different degrees of cross compatibility with cultivated *S. indicum*. There was no crossed seed set in the direct and reciprocal crosses involving cultivars of *S. indicum* (2n = 26) with *S. radiatum* (2n = 64) and with *S. alatum* (2n = 26). The crosses involving *S. malabaricum* and *S. indicum* var. *yanamalaiensis* having the same chromosome number (2n = 26) as in the cultivated sesame genotypes were fairly successful in producing high percentage of crossed capsules with well filled seeds. The morphology of four wild species along with the cultivated species of sesame and the interspecific hybrids derived were compared. The wild species utilized in the present study differed significantly from the cultivated in branching pattern, leaf pubescence, flower size, color of corolla and anther, size, shape and color of extra floral nectary, capsule size, and shape, texture and size of the seed. All the successful interspecific hybrids showed predominance of wild characters than cultivated *S. indicum*.

**Key words:** Sesame, wild species, cross compatibility, morphological characterization.

INTRODUCTION

Sesame is known to be the most ancient oilseed crop dating back to 3050-3500 B.C. (Bedigian and Harlan, 1986) because of its ease of extraction, great stability, and drought resistance. It is also considered to be important because of its nutritional and antiaging features of high quality vegetable oil with oil content ranging from 50 to 60% (Chayjan, 2010). The sesame oil is highly resistant to oxidative deterioration due to the presence of antioxidants such as sesamin and sesamolin (Erbas et al., 2009) and also has high percentage of unsaturated...
fatty acids (Yermanos et al., 1972). Though sesame is having all these benefits, the productivity is limited due to low seed yield (Ashri 1989; Pham et al., 2010), frequent occurrence of diseases (El-Bramawy, 2006) and stress factors (Sarwar et al., 2007). Therefore, breeding efforts have mainly concentrated on increasing the seed yield of sesame. One of the important ways for increasing seed yield is utilization of diverse sources, especially the wild species for the exploitation of heterosis as well as to impart biotic and abiotic stress resistance. Hence an attempt was made to study the crossability between the four wild and cultivated species of sesame and to evaluate the hybrid vigour expression in the interspecific crosses.

MATERIALS AND METHODS

The experimental materials comprised of three wild species of sesame, *Sesamum radiatum* (2n = 64), *Sesamum malabaricum* (2n = 26), *S. indicum* and one wild form of *Sesamum indicum*, that is, *S. indicum* var. *yanamalensis* (2n = 26) as reported by Devarathinam and Sundaresan (1990) with eight cultivated varieties of *S. indicum* (Figure 1). This includes CO 1, PYR 1, SVPR 1, VRI 1, VRI(Sv) 2, TMV 3, TMV 4 and TMV 7. The wild species were collected from the Species Garden maintained at Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, India. The varietal seeds were obtained from the Department of Oilseeds, TNAU, Coimbatore. The seedlings were raised in earthen pots during Summer, 2010. During flowering, the crossing was effected by utilizing the wild species as both male and female parents. This was done by emasculating the female flower buds (removing the corolla with four stamens) in the previous day evening. The just opened male flowers were collected from the respective parents on the following day morning and pollination was done between 6:30 to 8:30 AM. For this, the 1/3rd of the corolla was removed to expose the stamen outside, which was then smeared on the stigma of the emasculated flower. A small paper tag was tied at the base of the pollinated flowers for easy identification of crossed capsules at the later stage. The entire crossing block was raised in the glass house to avoid insect pollination. The seeds were collected from the crossed capsules and the F₁ generation was raised with the parents, in two replications with each entry in two rows of 5 m length and spacing of 15 × 30 cm during Kharif, 2010. All the recommended package of practices was adopted.

RESULTS AND DISCUSSION

Compatibility relationship

Based on the crossing data, it was evident that all the wild species exhibited different degrees of cross compatibility with cultivated *S. indicum*. The details about direct and reciprocal crosses attempted between the cultivars and the wild species are presented in Table 1. From the data on number of flowers pollinated, number of capsules set and number of hybrid seeds obtained, the crossability between the wild species and cultivated varieties were brought out. The overall cross compatibility relationship is given in Table 2.

Between *S. indicum* (2n = 26) and *S. alatum* (2n = 26)

Though *S. indicum* and *S. alatum* are having the same chromosome number, capsule and seed setting was not observed in both direct and reciprocal crosses of *S. alatum* with eight cultivars of *S. indicum*. Kedarnath (1954) could obtain only shrunken and non-viable seeds in *S. indicum* and *S. alatum* combination and presumed an early abortion of young embryo. Similar attempts were made by Amirtha Devarathnam (1965), Sundaram (1968) and Subramanian (1972) who also failed in producing viable hybrids between these two species. Even though these two species are having the same chromosome status (2n = 26), it is probable that a strong mechanism operates, due to which, hybrid seeds were not obtained.

Between *S. indicum* (2n = 26) and *S. radiatum* (2n = 64)

The direct crosses recorded the capsule setting with the maximum of 6.80% in *S. radiatum* × TMV 7 and minimum of 1.02% in *S. radiatum* × VRI 1. There was no seed set in any of the eight direct crosses between *S. radiatum* and *S. indicum*. The reciprocal cross between *S. indicum* and *S. radiatum* was not successful due to the premature dropping of crossed capsules. Hence, no capsule set and seed set was observed in the reciprocal crosses. Earlier studies involving these species also revealed the failure of these crosses (Dhawan, 1946; Ramanathan, 1950; Amirtha Devarathnam, 1965; Subramanian, 1972; Prabakaran, 1992; Vikas, 2006). The failure was attributed to very early collapse of the hybrid endosperm and the subsequent starvation of proembryo, as observed by Dhawan (1946) through embryiological studies.

Between *S. indicum* (2n = 26) and *S. malabaricum* (2n = 26)

The crosses involving *S. indicum* cultivars and *S. malabaricum* both having the same somatic chromosome number (2n = 26) were fairly successful in producing good number of crossed capsules with well filled seeds. In the direct and reciprocal crosses effected between eight cultivars of *S. indicum* with *S. malabaricum*, successful capsule and seed setting was observed in all the 16 crosses (Figure 2). Only one crossed seed got germinated in the cross between *S. malabaricum* as female with *S. indicum* genotype SVPR 1, but the seedling was died subsequently in the two leaves stage, probably due to the abiotic factors. In the earlier description by John et al. (1950), *S. malabaricum* was referred as the variety of *S. indicum*, as *S. indicum* var. *malabaricum*, which was highly compatible with other genotypes of *S. indicum*. However, Prabakaran (1992)
Table 1. Details of crosses attempted between *S. indicum* and different species of *Sesamum*.

| Crosses                      | Number of flowers pollinated | Number of capsules set | Percent of capsule setting | Mean no. of seeds per capsule | Remarks                      |
|------------------------------|------------------------------|-------------------------|----------------------------|------------------------------|------------------------------|
| **Direct crosses**           |                              |                         |                            |                              |                              |
| *S. alatum* × SVPR 1         | 86                           | 0                       | 0                          | 0                            |                              |
| *S. alatum* × TMV 7          | 106                          | 0                       | 0                          | 0                            |                              |
| *S. alatum* × VRI (Sv) 2     | 96                           | 0                       | 0                          | 0                            |                              |
| *S. alatum* × CO 1           | 126                          | 0                       | 0                          | 0                            | No capsule set               |
| *S. alatum* × TMV 3          | 98                           | 0                       | 0                          | 0                            |                              |
| *S. alatum* × TMV 4          | 94                           | 0                       | 0                          | 0                            |                              |
| *S. alatum* × VRI 1          | 98                           | 0                       | 0                          | 0                            |                              |
| *S. alatum* × Paiyur 1       | 106                          | 0                       | 0                          | 0                            |                              |
| *S. malabaricum* × SVPR 1    | 84                           | 5                       | 5.9                        | 6.7                          |                              |
| *S. malabaricum* × TMV 7     | 143                          | 10                      | 6.9                        | 25.7                         |                              |
| *S. malabaricum* × VRI (Sv) 2| 126                          | 7                       | 5.6                        | 18.9                         |                              |
| *S. malabaricum* × CO1       | 132                          | 6                       | 4.6                        | 14.5                         | Capsule set, and viable seeds|
| *S. malabaricum* × TMV 3     | 102                          | 5                       | 4.9                        | 12.2                         |                              |
| *S. malabaricum* × TMV 4     | 136                          | 7                       | 5.2                        | 10.9                         |                              |
| *S. malabaricum* × VRI 1     | 127                          | 10                      | 7.9                        | 15.2                         |                              |
| *S. malabaricum* × Paiyur 1  | 138                          | 7                       | 5.1                        | 17.9                         |                              |
| *S. i. var. yanamalaiensis* × SVPR 1 | 105                     | 46                      | 43.8                       | 14.7                         |                              |
| *S. i. var. yanamalaiensis* × TMV 7 | 121                     | 56                      | 46.3                       | 14.5                         |                              |
| *S. i. var. yanamalaiensis* × VRI(Sv) 2 | 138                 | 72                      | 52.2                       | 17.9                         |                              |
| *S. i. var. yanamalaiensis* × CO1 | 124             | 39                      | 31.5                       | 14.9                         | Capsule set, and viable seeds|
| *S. i. var. yanamalaiensis* × TMV 3 | 100                     | 0                       | 0                          | 0                            |                              |
| *S. i. var. yanamalaiensis* × TMV 4 | 95 | 0               | 0                          | 0                            |                              |
| *S. i. var. yanamalaiensis* × VRI 1 | 100                     | 5                       | 5.0                        | 7.0                          |                              |
| *S. i. var. yanamalaiensis* × Paiyur 1 | 97                 | 27                      | 27.8                       | 22.3                         |                              |
| *S. radiatum* × SVPR 1       | 94                           | 5                       | 5.3                        | 0                            |                              |
| *S. radiatum* × TMV 7        | 103                          | 7                       | 6.8                        | 0                            |                              |
| *S. radiatum* × VRI (Sv) 2   | 135                          | 6                       | 4.4                        | 0                            |                              |
| *S. radiatum* × CO 1         | 126                          | 4                       | 3.2                        | 0                            | Capsule set, but no viable seeds|
| *S. radiatum* × TMV 3        | 85                           | 2                       | 2.4                        | 0                            |                              |
| *S. radiatum* × TMV 4        | 108                          | 3                       | 2.8                        | 0                            |                              |
| *S. radiatum* × VRI 1        | 98                           | 1                       | 1.0                        | 0                            |                              |
| *S. radiatum* × Paiyur 1     | 120                          | 2                       | 1.7                        | 0                            |                              |
| **Reciprocal crosses**       |                              |                         |                            |                              |                              |
| SVPR 1 × *S. alatum*         | 98                           | 0                       | 0                          | 0                            | No capsule set               |
| CO 1 × *S. alatum*           | 105                          | 0                       | 0                          | 0                            |                              |
| TMV 3 × *S. alatum*          | 98                           | 0                       | 0                          | 0                            |                              |
| TMV 4 × *S. alatum*          | 88                           | 0                       | 0                          | 0                            |                              |
| TMV 7 × *S. alatum*          | 91                           | 0                       | 0                          | 0                            |                              |
| Paiyur 1 × *S. alatum*       | 80                           | 0                       | 0                          | 0                            |                              |
| VRI 1 × *S. alatum*          | 84                           | 0                       | 0                          | 0                            |                              |
| VRI(Sv) 2 × *S. alatum*      | 112                          | 0                       | 0                          | 0                            |                              |
Table 1. Contd.

|                | DC  | RC  | DC  | RC  | DC  | RC  | Capsule set, and viable seeds |
|----------------|-----|-----|-----|-----|-----|-----|------------------------------|
| SVPR 1 × S. malabaricum | 95  | 12  | 12.6| 13.1|     |     |                              |
| CO 1 × S. malabaricum         | 126 | 4   | 3.2 | 26.9|     |     |                              |
| TMV 3 × S. malabaricum        | 106 | 1   | 0.9 | 44.5|     |     |                              |
| TMV 4 × S. malabaricum        | 97  | 2   | 2.1 | 25.7|     |     |                              |
| TMV 7 × S. malabaricum        | 135 | 6   | 4.4 | 55.1|     |     |                              |
| Paiyur 1 × S. malabaricum     | 114 | 7   | 6.1 | 14.0|     |     |                              |
| VRI 1 × S. malabaricum        | 125 | 7   | 5.6 | 22.3|     |     |                              |
| VRI(Sv) 2 × S. malabaricum    | 138 | 11  | 7.9 | 39.4|     |     |                              |
| SVPR 1 × S. i. var. yanamalaiensis | 99  | 14  | 14.1| 12.2|     |     |                              |
| CO 1 × S. i. var. yanamalaiensis | 137 | 6   | 4.4 | 35.2|     |     |                              |
| TMV 3 × S. i. var. yanamalaiensis | 97  | 1   | 1.0 | 14.6|     |     |                              |
| TMV 4 × S. i. var. yanamalaiensis | 89  | 1   | 1.1 | 0   |     |     |                              |
| TMV 7 × S. i. var. yanamalaiensis | 108 | 4   | 3.7 | 47.5|     |     |                              |
| Paiyur 1 × S. i. var. yanamalaiensis | 99  | 5   | 5.0 | 6.34|     |     |                              |
| VRI 1 × S. i. var. yanamalaiensis | 119 | 3   | 2.5 | 27.0|     |     |                              |
| VRI(Sv) 2 × S. i. var. yanamalaiensis | 126 | 5   | 3.9 | 39.3|     |     |                              |
| SVPR 1 × S. radiatum         | 115 | 0   | 0   | 0   |     |     | No capsule set               |
| CO 1 × S. radiatum           | 128 | 0   | 0   | 0   |     |     |                              |
| TMV 3 × S. radiatum          | 105 | 0   | 0   | 0   |     |     |                              |
| TMV 4 × S. radiatum          | 117 | 0   | 0   | 0   |     |     |                              |
| TMV 7 × S. radiatum          | 94  | 0   | 0   | 0   |     |     |                              |
| Paiyur 1 × S. radiatum       | 100 | 0   | 0   | 0   |     |     |                              |
| VRI 1 × S. radiatum          | 123 | 0   | 0   | 0   |     |     |                              |
| VRI(Sv) 2 × S. radiatum      | 88  | 0   | 0   | 0   |     |     |                              |

Table 2. Cross compatibility between Sesamum indicum and other species of Sesamum.

| S. indicum | S. alatum | S. malabaricum | S. i. var. yanamalaiensis | S. radiatum |
|------------|-----------|----------------|---------------------------|-------------|
|            | DC       | RC  | DC  | RC  | DC  | RC  | DC  | RC  | DC  | RC  |
| SVPR 1     | x        | x   | x   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| CO 1       | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| TMV 3      | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| TMV 4      | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| TMV 7      | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| Paiyur 1   | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| VRI 1      | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |
| VRI(Sv) 2  | x        | x   | ✔   | ✔   | ✔   | ✔   | ✔   | ✔   | x   | x   |

DC – Direct cross, RC – Reciprocal cross, x - Cross failed to produce viable hybrids, ✔ - Cross in which viable hybrids produced, ㊙ - Hybrid seedling not survived, ㊙ - Seed not germinated.

referred this as the separate species of sesame as S. malabaricum. He reported that S. malabaricum had possessed distinct morphological features like longer duration, green stem with purple tinge, leathery leaves, purple corolla, highly rough testa as seen against the cultivated sesame. Also, S. malabaricum had shown partial capsule set when crossed with cultivated S. indicum (Prabakaran, 1992). The percentage of capsule setting ranged from 4.6% (S. malabaricum × CO 1) to 7.9% (S. malabaricum × VRI 1) in direct crosses. In reciprocal crosses, it was between 0.9% (TMV 3 × S. malabaricum) and 12.6% (SVPR 1 × S. malabaricum).
In direct crosses, the mean number of seeds per capsule was the lowest in *S. malabaricum × SVPR 1* (6.7) and highest in *S. malabaricum × TMV 7* (25.7). Similarly, the cross SVPR 1 × *S. malabaricum* recorded the lowest number of seeds per capsule (13.1) and the highest was recorded in TMV 7 × *S. malabaricum* (55.1) in reciprocal crosses.

**Between *S. indicum* (2n = 26) and *S. indicum* var. *yanamalaiensis* (2n = 26)**

The cross-compatibility between *S. indicum* and *S. indicum* var. *yanamalaiensis* both having the same chromosome number of 2n = 26 was confirmed both in direct and reciprocal form (Figure 2). But the capsule set and seed set was not observed in *S. indicum* var. *yanamalaiensis* with TMV 3 and TMV 4. The range of capsule setting was from 0 to 52.2% in *S. indicum* var. *yanamalaiensis* × VRI(Sv) 2. The seed setting was ranged from 0 to 22.3% (*S. indicum* var. *yanamalaiensis* × Palyur 1) in direct crosses. In the cross *S. indicum* var. *yanamalaiensis* × VRI 1, crossed seed was obtained but the seeds were small and shriveled and hence not germinated.

In the reciprocal crosses, there was capsule set, but no seed set in TMV 4 × *S. indicum* var. *yanamalaiensis*. The range of capsule setting was from 1.0% (TMV 3 × *S. indicum* var. *yanamalaiensis*) to 14.1% in SVPR 1 × *S. indicum* var. *yanamalaiensis*. The seed setting was ranged from 0 to 47.5% (TMV 7 × *S. indicum* var. *yanamalaiensis*). Since the flowering of both parents had not coincided and hence, the pollination was attempted in the later stage of flowering. Due to this, the seed set was not observed in few of the direct and reciprocal crosses between *S. indicum* var. *yanamalaiensis* and cultivated varieties.

**Morphological characterization of parents and interspecific hybrids**

**Parents**

The morphology of four wild species and the cultivated species of sesame was compared and given in Table 3. The wild species utilized in the present study differed significantly from cultivated one in the branching pattern, leaf pubescence, flower size, color of corolla and anther, size, shape and color of extra floral nectary and capsules, texture and size of the seed. *S. alatum* was profusely branching with completely lobed basal leaves. The corolla color was maroon and glabrous with dark purple corolla lip. The anther was dark purple with purple colored extra floral nectary. The capsules were long and tapering with small and winged seeds. The branches of *S. malabaricum* were profuse with pubescent leaves. The corolla was pink and densely hairy with dark pink colored corolla lip. The calyx also had dense hairs with flower having purple anther. The glands were yellow colored and prominent. The capsules were medium sized and hairy. The seeds were also medium sized with rough testa.

*S. indicum* var. *yanamalaiensis* resembled cultivated *S. indicum* in most of the traits. It differed from cultivars in branching pattern, corolla and corolla lip color and in the size of yellow glands. The capsules were medium sized sparsely hairy with small black colored seeds with smooth testa as in the cultivated varieties. The wild species *S. radiatum* differed widely from *S. indicum*. The stem of *S. radiatum* was pubescent with more number of branches. The leaves were dark green, pubescent with serrated margins. The corolla was hairy, purple colored with dark purple corolla lip. The calyx was also pubescent with flowers having big, cream colored anther. The glands were dark colored with densely hairy capsules. The seeds were small with rough testa. These above mentioned specific traits were not observed in the cultivated *S. indicum* genotypes.

**Inter-specific hybrids**

The observed morphological characters of the direct and reciprocal crosses of wild with cultivated species are given in Table 4. The hybrids developed from the direct and reciprocal crosses involving *S. malabaricum* and *S. indicum* were similar in the expression of qualitative traits. But, the hybrids with *S. malabaricum* as the female parent had taken comparatively more days to germinate, when compared to their reciprocals. This difference was due to the maternal seed traits of the wild parent. The duration taken for germination of hybrids is much more than their cultivar parent.

The hybrids exhibited most of the phenotypic characters of wild parent, indicating the dominant nature of *S. malabaricum*. The direct crosses resembled the wild parent, *S. malabaricum* in branching pattern, leaf pubescence, corolla and corolla lip color, flower having calyx with dense hairs, and light purple colored anther. The nature and color of extra floral nectary resembled the wild parent. The capsules were very small with few seeds, which was medium sized black with rough testa. The crossed seeds had expressed dormancy as in the wild parent and many of the crossed seeds had not germinated for more than two months. The reciprocal crosses had also expressed similar traits as in direct crosses between *S. malabaricum* and *S. indicum*.

The F1 hybrids involving the eight cultivars of *S. indicum* with *S. indicum* var. *yanamalaiensis*, were evaluated for their morphology and it was found that the 12 hybrids resembled the wild parent in branching pattern, corolla and corolla lip color. From this study, it was found that all the successful interspecific hybrids...
Table 3. Morphological characteristics of *S. indicum* and their wild relatives.

| Characters | *S. alatum* | *S. malabaricum* | *S. i. var. yanamalaiensis* | *S. radiatum* | *S. indicum* |
|------------|-------------|------------------|-----------------------------|---------------|--------------|
| Plant      | Annual, erect, indeterminate | Annual, erect, indeterminate | Annual, erect, indeterminate | Annual, erect, indeterminate | Annual, erect, indeterminate |
| Stem       | Green, glabrous, round shaped stem | Green, sparsely hairy, short and straight hair, square shaped stem | Green, glabrous, square shaped stem | Green, sparsely hairy, short and straight hair, round shaped stem | Green, glabrous, square shaped stem |
| Branches   | Alternate, basal, few branches | Alternate, basal, more primary and secondary branches | Alternate, basal, profusely branching | Alternate, basal, profusely branching | Alternate, basal, few primary and secondary branches |
| Leaves     | Green, glabrous, opposite, horizontal angled, basal leaves deeply lobed, upper leaves linear and entire | Green, pubescent, alternate, flat, entire at top and lobed at bottom, horizontal angled, ovate | Green, glabrous, alternate, flat, entire, horizontal angled, lanceolate | Dark green, glabrous, opposite, acute angled, ovate and serrated margins | Green, glabrous, alternate, flat, horizontal angled, ovate at bottom, lanceolate at top |
| Inflorescence | One flower per axil | One flower per axil | One flower per axil | One flower per axil | One flower per axil |
| Calyx      | Glabrous, greenish purple calyx tip | Densely hairy, short and straight hairs, green calyx tip | Glabrous, green calyx tip | Medium hairy, short and straight hairs, green calyx tip | Glabrous, green calyx tip |
| Corolla    | Maroon colored, sparsely hairy | Purple colored, densely hairy | Light purple colored, glabrous | Light violet, densely hairy | White colored, glabrous |
| Corolla color lip | Dark maroon | Dark purple | Purple | Dark purple | White |
| Anther     | Dark purple anther, light green filament | Purple anther, light purple filament | Cream colored anther, white filament | Light yellow anther, white filament | Cream colored anther, white filament |
| Style      | Greenish purple medium style | White colored, short style | White colored, medium style | Green colored, Medium style | White colored, medium style |
| Extrafloral nectar | Small, purple colored | Medium, yellow colored | Small, yellow colored | Medium, dark purple colored | Small, yellow colored |
| Capsules   | Tapered at apex, sparsely hairy, mono- capsular, long beak, four loculed, completely shattering | Broad oblong, medium hairy, mono-capsular, short beak, four loculed, partially shattering | Broad oblong, densely hairy, mono-capsular, short beak, four loculed, partially shattering | Narrow oblong, densely hairy, mono-capsular, short beak, four loculed, partially shattering | Broad oblong, sparsely hairy, mono-capsular, short beak, four loculed, partially shattering |
| Seeds      | Small sized, rough seed coat, dull black, winged | Medium, rough seed coat, dull black, rough testa. | small, black, smooth testa. | Medium sized, bright black, rough seed coat | Medium, colored, different smooth testa |
| Dormancy   | Very high | High | Low | Medium | Low |

Table 4. Morphological characteristics of interspecific hybrids.

| Characters | *S. malabaricum* × *S. indicum* | *S. indicum* × *S. malabaricum* | *S. indicum* × *S. i. var. yanamalaiensis* | *S. indicum* × *S. i. var. yanamalaiensis* |
|------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Plant      | Annual, erect, indeterminate | Annual, erect, indeterminate | Annual, erect, indeterminate | Annual, erect, indeterminate |
| Stem       | Green, sparsely hairy, short and straight hair, square shaped stem | Green, sparsely hairy, short and straight hair, square shaped stem | Green, sparsely hairy, short and straight hair, square shaped stem | Green, sparsely hairy, short and straight hair, square shaped stem |
### Table 4. Contd.

| Branches            | Alternate, basal, profusely branching | Alternate, basal, profusely branching | Alternate, basal, profusely branching | Alternate, basal, profusely branching |
|---------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Leaves              | Green, densely hairy, horizontal angled, entire at top and slightly lobed at bottom | Green, densely hairy, alternate, flat, entire at top and lobed at bottom | Green, glabrous, alternate, flat, entire, horizontal angled, lanceolate, slightly lobed at bottom | Green, glabrous, entire at top and slightly lobed at bottom, horizontal angled, lanceolate, |
| Inflorescence       | One flower per axil                    | One flower per axil                    | One flower per axil                    | One flower per axil                    |
| Corolla             | Purple, densely hairy                  | Purple, densely hairy                  | Light purple, medium hairy             | Light purple, sparsely hairy           |
| Corolla lip color   | Dark purple                           | Dark purple                           | Purple                                | Purple                                |
| Calyx               | Green, dense, short and straight hairs | Green, dense, short and straight hairs | Green, sparse, short and straight hairs | Green, sparse short and straight hairs |
| Anther & style      | Light purple anther, medium style      | Light purple anther, medium style      | White anther, medium style             | White anther, medium style             |
| Extrafloralnectary  | Medium, yellow colored                | Medium, yellow colored                | Small, yellow colored                 | Small yellow colored                  |
| Capsules            | Small, medium hairy, shattering monocular, four loculed, | Small, medium hairy, shattering monocular, four loculed, | Medium, sparsely hairy, monocular, four loculed, shattering | Medium, sparsely hairy, monocular, four loculed, shattering |
| Seeds               | Medium, dull black, rough testa       | Medium, dull black, rough testa       | Small, black, smooth testa            | Small, black, smooth testa            |
| Dormancy            | High                                  | Medium                                | Low                                   | Low                                   |

![Figure 1](image1.jpg)

*Sesamum radiatum*

*2n = 64*

*Sesamum alatum*

*2n = 26*

*Sesamum malabaricum*

*2n = 26*

*S. indicum var. yanamalaiensis*

*2n = 26*

Figure 1. species of sesame.
showed predominance of wild characters than cultivated *S. indicum*. The wild species *viz.*, *S. malabaricum* and *S. indicum* var. *yanamalaiensis* could be effectively utilized for the transfer of essential traits from wild to cultivated through conventional breeding program.

**Conflict of Interest**

The authors have not declared any conflict of interest.

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