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GENETIC ANALYSIS OF MULTICAPSULED CHARACTER IN SESAME*

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Amongst the oil seed crops of India, sesame (*Sesamum indicum* L.) occupies an important place in respect of area as well as production. It is grown in an area of about 24 lakh hectares yielding nearly 5 lakh tonnes of seed. Sesame is the most valued annual oil seed crop of Kerala and is grown in an area of nearly 12000 hectares, yielding 3500 tonnes of seed every year. The chief factor limiting the productivity of sesame is the lack of high yielding varieties suited to different seasons and tracts. Most of the improved varieties bear a single capsule in each axil. Varieties of sesame with multicapsuled (3 capsules per axil) conditions have already been identified (Fig. 1). The high seed production potential of multicapsuled varieties over single capsuled ones is very evident. This character thus deserves special attention in breeding programme aimed at varietal improvement of sesame. An understanding of the genetic basis of the multicapsuled character will enable its effective manipulation for increasing productivity.

Materials and Methods

Varieties of sesame were collected from different sources and raised in observational plots at the College of Agriculture. Vellayani. Six types possessing different patterns of the multicapsuled (3 capsules per axil) conditions were selected (T_1 to T_6). The local improved variety Kayamkulam–1 which is single capsuled was selected as the standard (T_7). These seven types viz., six multicapsuled and one single capsuled where crossed in all combinations and hybrids were raised along with the parents. The genetic analysis of the multicapsuled character was made by a comparative study of the hybrids and parents with respect to this character.

The capsule type in the hybrids between each of the six muiticapsuled types and the single capsuled Kayamkulam–1 indicated the dominant-recessive relationship between the multicapsuled and single capsuled character. The capsule types of hybrids between the multicapsuled types indicated the genetic relationship between them. When the hybrid of two multicapsuled types exhibited the multicapsuled condition, it is inferred that the two parents contained the same gene for that character. Conversely, if the hybrid expressed the single capsuled condition the parents contained different genes for the character.

Results and Discussion

The six multicapsuled types differed between themselves in a number of morphological characters including the capsule type (Fig. 2 and 3). The salient features of these types in comparison with the standard are presented in Table 1.

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The results of the cross between the 7 types are presented in Table 2. The comparisons of capsule types between the parents and hybrids are shown in Fig. 4.

All the six hybrids between the multicapsuled types and the single capsuled one produced single capsule. This denotes the recessive nature of the multicapsuled to the single capsuled condition- The recessive nature of multicapsuled condition in sesame has already been reported by Pal 0934) Langham (1945), Sikka and Gupta (1948) and Culp (1960). This is also in agreement with the report of Nair *et al*. (1975) on the spontaneous multicapsule mutant in the variety Kayamkulam-1.

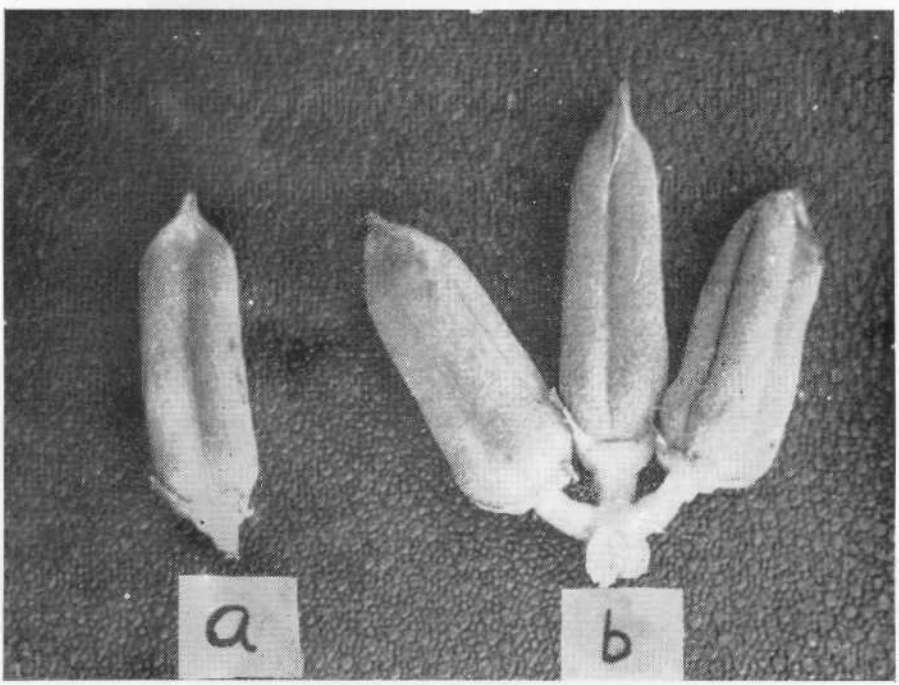
In the cyclic cross between the six multicapsuled types, the hybrids in certain cases were multicapsuled whereas in certain other cases were single capsuled. The relationship between the seven parents and their hybrids is represented in Fig 5. The bold lines in the diagram indicate that the hybrid has multicapsules and the broken lines indicate that the hybrid has single capsules. In crosses between the multicapsuled types, the multicapsule condition in the hybrid indicates that the parents possess the same gene for this character whereas the single capsuled condition in the hybrid indicates the involvement of two independent recessive genes in the parents concerned. It is clear from the diagram that among the hybrids of cyclic crosses between the multicapsuled types, those involving type-1 were always single capsuled. But all the other crosses between the multicapsuled types produced

Table 1

Morphological characters of selected sesame varieties

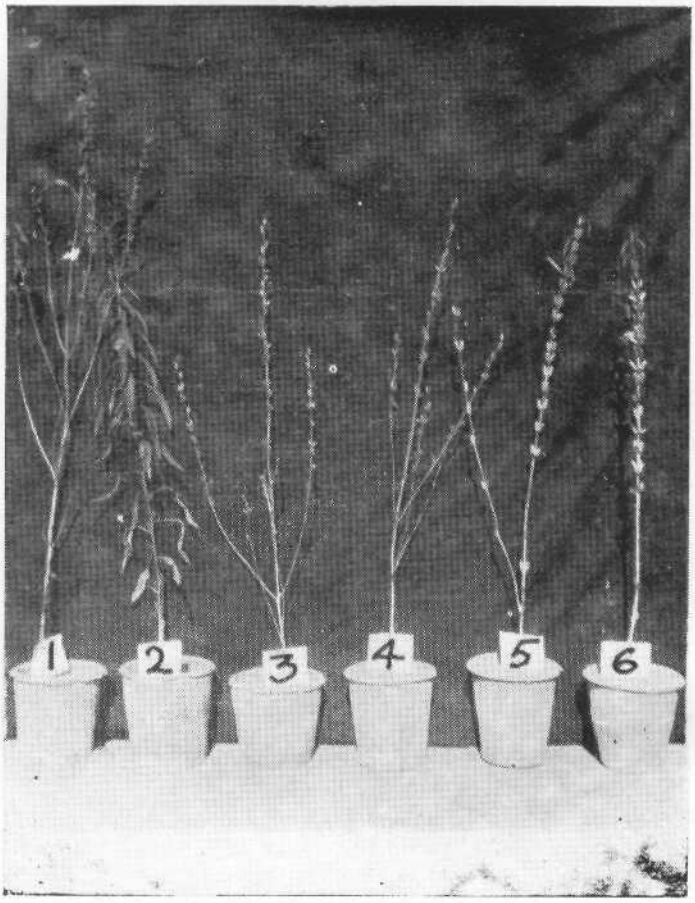
Types	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Stature	Tall	Medium	Medium	Tall	Dwarf	Dwarf	Medium
Branching	Medium	Non-branching	High	Medium	Low	Non–branching	High
No.of fruiting nodes per plant	39	44	37	39	**37**	21	67
No.of capsules per axil	3	3	3	3	3	3	1
Capsule length (cm)	1.5	**3.0**	2,0	**2.4**	3.0	3.0	**2.5**
No.of seeds per locule	13	20	11	15	19	18	17
Seed colour	Dark brown	White	Black	Black	White	White	Black

Fig. 1 The capsule types in sesame



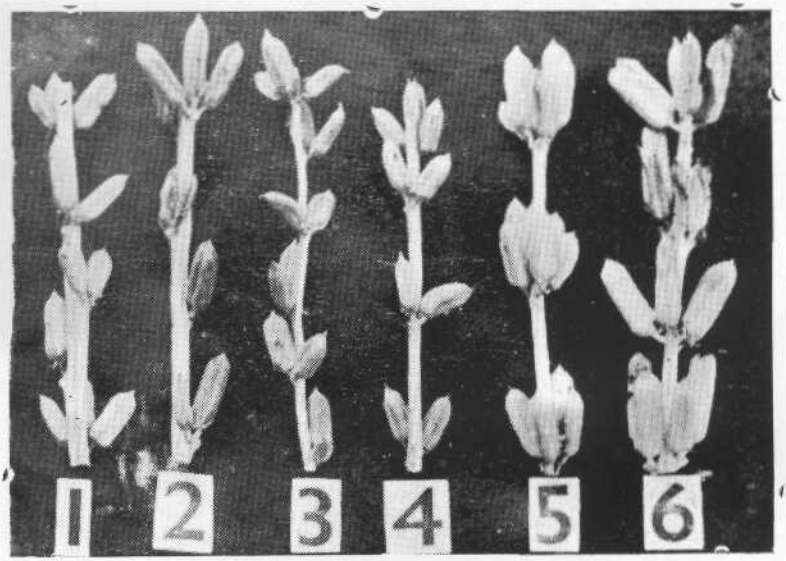
a) Single capsuled b) Multicapsuled

Fig. 2 Multicapsuled plant types



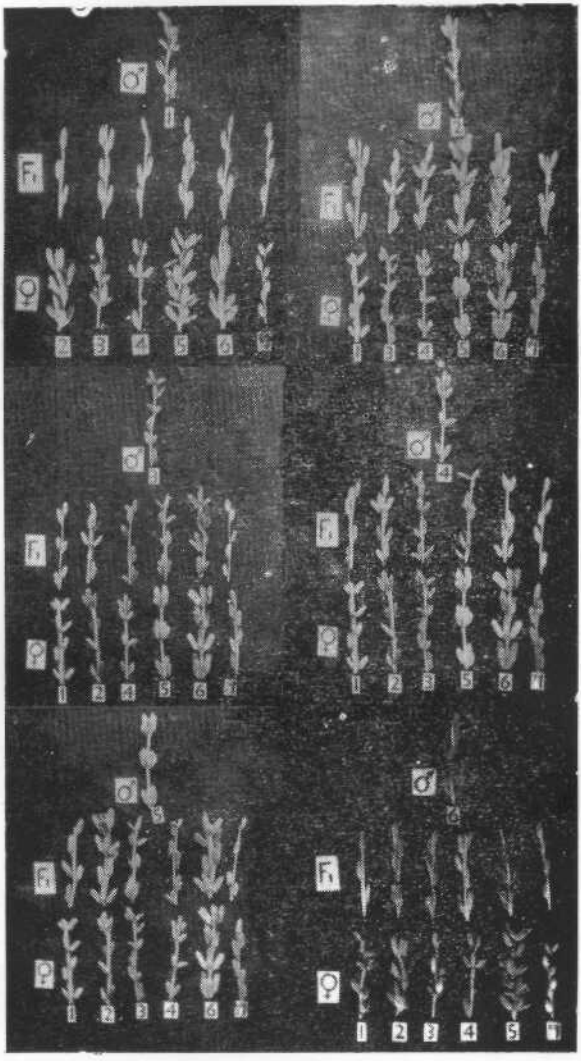
1—6 Multicapsuled types (T_1—T_6)

Fig. 3 Capsule types of the multicapsuled varieties



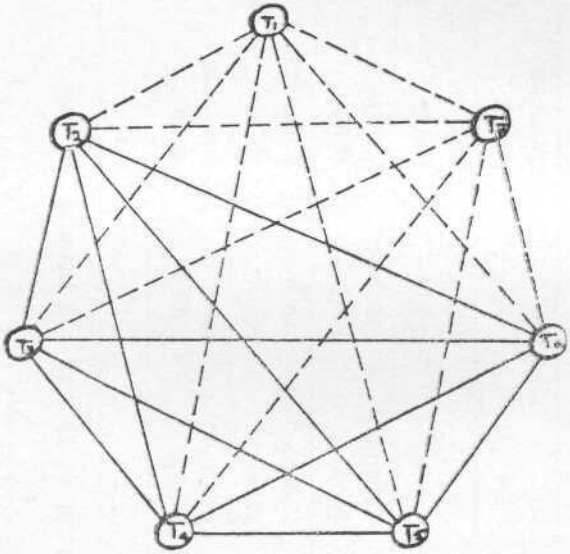
1—6 Multicapsuled types (T_1—T_6)

Fig. 4 F_1 of cyclic crossess between multicapsuled types and the standard



1—6 Multicapsuled types (T_1—T_6), 7 Single capsuled standard (T_7)

Fig. 5 Genetic analysis of multicapsuled condition



——— Multipoded
.— — — Single poded.

Table 2

Comparative study of hybrids and parents

Parents	T_1	T_2	T_3	T_4	T_5	T_6	T_7
T_1	Multicapsuled	Single capsuled	Single capsuled	Single capsuled	Single capsuled	Single capsuled	Single capsuled
T_2		Multi-capsuled	Multi-capsuled	Multi-capsuled	Multi-capsuled	Multi-capsuled	Single capsuled
T_3			Multi-capsuled	Multi-capsuled	Multi-capsuled	Multi-capsuled	Single capsuled
T_4	–	—	—	Multi-capsuled	Multi-capsuled	Multi-capsuled	Single capsuled
T_5	—	—	—	—	Multi-capsuled	Multi-capsuled	Single capsuled
T_6	—	—	—	—	—	Multi-capsuled	Single capsuled
T_7							Single capsuled

multicapsuled hybrids. Thus the six multicapsuled types could be grouped into two viz., Group I including type-1 alone and Group-II including the remaining five types (T_2 to T_6). These two groups correspond to two independent recessive genes for the multicapsuled condition.

The present results thus indicate the operation of two independent recessive genes for this character. They may be symbolised as 'p_1' and 'p_2'. Either of these in the homozygous condition produced multicapsuled expression. A better expression of this character can be brought about by combining these two genes into a single double recessive genotype. This is possible through hybridisation between the multicapsuled tpye-1 and any other multicapsuled type (2 to 6) and selecting the segregants with maximum expression of the character in the F_2 and later generations.

Summary

Genetic analysis of the multicapsuled condition in sesame was undertaken. Six multicapsuled types isolated from a varietal collection and a single capsuled type were crossed in all possible combinations. The capsule type in the hybrids was compared to that of the parents and conclusions drawn.

The multicapsuled condition was recessive to single capsuled condition. Estimation of the number of genes responsible for this character revealed the operation of two independent recessive genes symbolised as 'p_1' and 'p_2'. Either of these genes together in a genotype in the double recessive condition can produce a better expression of this character.

സംഗ്രഹം

ഒരു ഞെട്ടിൽ ഒരു കായ് മാത്രമുള്ള കായ്കുളം–1 എന്ന എള്ളിനവും, ഒന്നിൽ കൂടുതൽ (മൂന്ന്) കായ്കളുള്ള ffioo" ആറ് ഇനങ്ങളും തമ്മിൽ സംയോഗസങ്കരണം നടത്തി. സങ്കര ഇനങ്ങളെ മാതൃപിതൃ ഇനങ്ങളുമായി താരതമ്യപഠനം നടത്തുകയുണ്ടായി. ഒരു ഞെട്ടിൽ ഒന്നിൽ കൂടുതൽ കായ്കളുള്ള സ്വഭാവം, ഞെട്ടിൽ ഒരു കായ്മാത്രമുള്ള സ്വഭാവത്തിന് അപ്രകടം ആണ്. 'p_1' 'p_2' എന്നീ രണ്ടു ജീനുകളം ബഹുകായ് സ്വഭാവത്തിനെ നിയന്ത്രിക്കുന്നു. മേൽപ്പറഞ്ഞ രണ്ടു ജീനുകളും ഒരുമിച്ച് അപ്രകട ജീനരൂപ അവസ്ഥയിലായിരുന്നാൽ ബഹുകായ് പ്രരൂപം കൂടുതൽ പ്രകടമായി കാണുമെന്ന് അനുമാനിക്കാം.

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