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INCOMPATABILITY IN COCOA GERMPLASM

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ABSTRACT

Compatibility reaction of 57 trees belonging to 7 Malaysian and 25 Nigerian cocoa accessions is reported. Out of 23 Malaysian trees studied, 12 trees were self-incompatible and 11 self-compatible. Out of the 34 from the Nigerian collection 22 were self-incompatible and 12 self-compatible. Both Malaysian and Nigerian collections had similar pattern of distribution for self-compatible and self-incompatible trees. The studies further revealed that though different trees may belong to the same accession, they need not be identical with regard to their compatibility reaction.

Key words: Incompatibility, germplasm, cocoa, *Theobroma cocoa*.

Incompatibility mechanism is known to operate in cocoa (*Theobroma cocoa* L.) since long [1]. The following series of five S alleles controlling fusion of gametes has been postulated to explain the results of incompatibility:

S1 S2 = S3 S4 S5 (Knight and Rogers [5])
Sa = Sb = Sc Sd Sf (Cope [3])

The degree of incompatibility varies between different populations of cocoa [4]. Since this phenomenon determines the nature of pollination and the resultant fruit production, it has important implications in the design and operation of seed garden. Compatibility reaction in important accessions obtained from Malaysia and Nigeria were investigated in the present study to find out their suitability for varietal improvement.

MATERIALS AND METHODS

Compatibility reaction of 57 trees belonging to 32 accessions studied during 1985 and 1986 is described in this study. Among these, 23 trees belonged to 7 Malaysian accessions

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and 34 trees belonged to 25 Nigerian accessions (Table 1). The Malaysian and Nigerian collections were planted as seedlings during 1970 and 1975, respectively.

Flowers of the trees used in this study were protected against insects one day before their opening by covering with polythene tubes with one end covered with wire netting and the other end fastened to the trunk by a sticky substance called 'glazy putty'. About 40 flowers were selfed in each tree to determine their compatibility. The flowers which opened the same day were self-fertilized with their own pollen between 7–9 A.M. In incompatible pollinations, the ovary fails to develop and the flower drops-off within 5–7 days. The trees setting fruits on selfing were classified as self-compatible, and those without fruits as self-incompatible.

RESULTS AND DISCUSSION

Among 57 trees studied, 34 trees were self-incompatible and 23 self-compatible (Table 1).

Table 1. Incompatibility studies in cocoa

Source of accession	No. of trees	Self-incompatible	Self-compatible
Nigeria	34	22	12
Malaysia	23	12	11
Total	57	34	23

The pattern of distribution for compatibility within and between accessions was also studied, so as to determine whether all the trees belonging to a particular accession are identical with regard to their compatibility behaviour and whether Nigerian and Malaysian accessions have similar pattern of distribution for compatibility. For this purpose, 15 accessions with more than one tree each, viz. 6 Malaysian and 9 Nigerian were classified separately (Table 2). The remaining 17 accessions had only one tree each, therefore, the pattern of their compatibility distribution among them could not be determined.

Out of the 23 trees studied in the Malaysian collection, 12 trees were self-incompatible and 11 self-compatible (Table 1). In the accessions Amelanado x Na 33 and Landas 364, all the trees studied were self-incompatible whereas in two other accessions, viz. Pa 35 x Sca 6 and Na 32 x Sca 12, all the trees studied were self-compatible (Table 2). In Amelando x Na 32, 3 out of the 4 trees studied, were self-compatible and one self-incompatible. In Pa7 x Na 32, 4 out of 5 trees studied were self-incompatible and one tree was self-compatible.

Out of the 34 trees studied in the Nigerian collection, 22 were self-incompatible and 12 self-compatible (Table 1). All the trees of the accessions P6 x P4, NC8, NC3 and NC9 (with two trees studied in each) were self-incompatible whereas the two trees of accession NC6

were self-compatible. Four accessions, viz. NC5, NC7, NC13 and C83 had both self-compatible and self-incompatible trees.

Subramanyam (unpublished) studied incompatibility in 24 trees belonging to the Malaysian and Nigerian accessions at CPCRI Regional Station, Vittal and found 19 trees to be self-incompatible and 5 self-compatible. Out of the two accessions, where more than one tree per accession were studied, all the 6 trees were self-incompatible in Landas 364 whereas 3 out of the 5 trees studied in Landas 365 turned out to be as self-compatible. Incompatibility was studied in 28 trees, out of which only 24 trees were found to be self-incompatible [5].

Table 2. Distribution for compatibility among trees within different accessions of cocoa

Accession	Origin	Trees studied		
		total	self-incom-patible	self-compa-tible
Amelando x Na 33	Malaysia	4	4	0
Amelando x Na 32	"	4	1	3
Pa 7 x Na 32	"	5	4	1
Landas 364	"	3	3	0
Pa 35 x Sca 6	"	4	0	4
Na 32 x Sca 12	"	2	0	2
P 6 x P 4	Nigeria	2	2	0
C 83	"	2	1	1
NC 8	"	2	2	0
NC 3	"	2	2	0
NC 6	"	2	0	2
NC 9	"	2	2	0
NC 13	"	2	1	1
NC 5	"	2	1	1
NC 7	"	2	1	1

Note. Data presented only for the accessions represented by more than one tree.

The studies revealed that different trees, though belonging to the same accession, need not be identical with regard to their compatibility reaction. Also both Malaysian and Nigerian collections had similar patterns of distribution of self-compatible and self-incompatible trees. Self compatible clones when intercrossed, can give rise to self-incompatible progenies [3]. Since accessions studied had both self-compatible and self-incompatible trees, it will be necessary to study the compatibility status of each selected tree before they can be recommended as parents for the seed garden.

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