

ESTIMATION OF INBREEDING DEPRESSION THROUGH EMBRYO AND KERNEL ANALYSIS IN COCONUT TYPES

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Abstract: The study was undertaken to assess the breeding value of the three Komadan generations, the WCT and the NCD by selfing them and studying the extent of inbreeding depression. The three Komadan generations behaved as a distinct group against WCT and NCD types for weight of embryo and kernel. The significant reduction in embryo and kernel weight in the selfed nuts of NCD and WCT indicated a high degree of inbreeding depression. The results indicate the high degree of homozygosity achieved by the Komadan types through natural self pollination as against heterozygosity in WCT and NCD.

Key words: Coconut breeding, inbreeding depression, Komadan, NCD

INTRODUCTION

Generally cross pollinated species show inbreeding depression when selfed. Expression of recessive lethal genes in the homozygous state which was formerly hidden in the heterozygous condition is attributed as one of the major causes of this depression (Allard, 1960). The extent of inbreeding studies in coconut is limited. Harland (1957) stressed the fact that different varieties of coconut would respond to selfing in different ways and to a different extent. According to him, by mutation a large number of unfavourable recessive genes may have accumulated becoming apparent on selfing. The depression effect might be compensated for by a greater uniformity in yield and other desirable characters. Liyanage (1967) reported a quick method of identifying good genotypes by studying the inbreeding depression on kernel and embryo weight of nuts. If either of these parameters is under genie control, one would expect differential behaviour between genotypes when selfed, depending on the nature of genes involved. If it is largely due to the prepotency exhibited by additive effects of genes, the inbreeding depression may not be significant or even negligible than when it is controlled by hybrid vigour expressed by dominance or epistasis. This makes it possible to isolate palms of high breeding value from phenotypically superior palms by selfing them and studying the depression on endosperm and embryo weight per nut relative to those of the open pollinated nuts from the same palm. This method takes only 12 months to test the

breeding value of a palm as against 12 years required by progeny testing.

MATERIALS AND METHODS

The study was undertaken in the Department of Plant Breeding, College of Agriculture, Vellayani to assess the breeding value of the three Komadan generations viz., first generation Komadan from its centre of origin (K I), second generation Komadan from the Instructional Farm, Vellayani (K II), third generation Komadan (K III) originated from K II and available in the farmers' fields and Vellayani campus, along with WCT and NCD by selfing them and studying the extent of inbreeding depression by the method suggested by Liyanage (1967). Four selfed nuts were collected from each of the 10 palms belonging to the five varieties/types. The weights of kernel and embryo of selfed nuts were compared with those of open pollinated nuts in the respective groups for detecting the extent of inbreeding depression and thereby to identify prepotent palms. Another objective of this study was to assess the level of homozygosity achieved by the Komadan types through natural self pollination prevalent in it.

RESULTS AND DISCUSSION

The mean weights of embryo and kernel of open pollinated and selfed nuts are given in Table 1. There was no significant difference in embryo weight of open pollinated and selfed nuts in K I and K II. However, the embryo weight differed significantly in K III,

Table 1. Mean weight of embryo and kernel

Variety /type	Embryo, mg			Kernel, g		
	Open pollinated	Selfed	CD (0.05)	Open pollinated	Selfed	CD (0.05)
K I	84.4	83.9	2.71	305.88	323.98	11.157
K II	84.8	84.8	5.46	283.58	328.39	15.170
K III	82.2	87.0	4.36	314.10	354.55	17.201
WCT	54.2	40.2	3.85	161.30	149.43	10.255
NCD	89.3	72.1	4.45	289.63	242.40	17.690

WCT and NCD. The kernel weight of open pollinated and selfed nuts varied significantly in all the five varieties/types. The embryo weights of open pollinated and selfed nuts were on par in K I and K II. However, in K III, the weight of embryo of selfed nut was significantly superior to those of open pollinated nuts. However, in WCT and NCD the kernel weight of open pollinated nuts was significantly higher than that of selfed nuts.

The three Komadan generations behaved as a distinct group against WCT and NCD types for weight of embryo and kernel. The significant reduction in embryo and kernel weight in the selfed nuts of NCD and WCT indicated a high degree of inbreeding depression. This indirectly shows the heterozygous nature of these genotypes. Inbreeding depression in coconut has been reported earlier by Harland (1957), Haldane (1958), Menon and Pandalai (1958), Liyanage (1967, 1969), Nambiar and Govindan (1989), Bourdeix *et al.* (1991), Nair and Balakrishnan (1991) and Nair *et al.* (1991). Bourdeix (1988) stated that inbreeding depression was accompanied by a reduction in chiasma frequency which corresponded to a reduction in recombination frequency. In the case of Komadan types, there was either insignificant reduction in the weight of embryo or a significant increase in the weight of kernel in the selfed nuts when compared to open pollinated ones. This result indicates the high degree of homozygosity achieved by the Komadan types through natural self pollination as against heterozygosity in WCT and NCD. This also

indicates the high level of genetic stability achieved by the Komadan types through a few generations of selection by fanners.

ACKNOWLEDGEMENT

This paper forms a part of Ph.D. thesis of the first author submitted to the Kerala Agricultural University in 1992.

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