Unusual Twins in Coconut

Regi J. Thomas*, M. Shareefa*, Mayalekshmi* and Abe Jacob #
*ICAR-CPCRI, Regional Station, Kayamkulam Krishnapuram P.O., Alappuzha-690533, Kerala State
Coconut Development Board, Kochi - 11

Twins in plants, animals and human beings are always a matter of surprise. It is more surprising to observe twin coconut palms, which are 35-40 years old with exact morphological features and even comparable nut yield. In this article describes different type of twins observed in dwarf and tall varieties of coconut. The probable reason for twinning can be polyembryony and polycarpy.

Polyembryony in coconut

In coconut, ovary is tricarpellary and corresponding to the three carpels, there are three markings, commonly known as 'eye'. Of the three eyes, usually two eyes become abortive at an early stage of development and only one attains maturity and remains comparatively soft. The viable embryo is located beneath this soft/functional eye. The other two 'blind' eyes which represent the two aborted carpels are very hard and do not possess any embryo. Thus one nut on germination gives rise to a shoot. But rarely more than one shoot is seen emerging through a single eye. This phenomenon of producing more than one seedling from a single nut is known as polyembryony. The multiple embryos are found clustered beneath the soft eye of the nut, but they may not share any tissue.

In polyembryonic seedlings, two or more shoots develop from a single soft eye and grow as distinct shoots. These shoots squeeze their way out through the single soft eye, all the while maintaining themselves as separate individuals. The number of shoots that develop may be 2-4, of which one will be zygotic and others from nucellar tissues of the same ovule. There is variation in the growth and vigour of polyembryonic seedlings. Polyembryony is more frequently noticed in dwarf palms. Since dwarf palms are self pollinated, the polyembryonic seedlings are expected to be homogenous.

Polycarpy in coconut

Each carpel of a coconut fruit has an ovule inside, but usually only one seed develops out of

the tricarpic ovary. In some rare cases, two or all the three 'eyes' remain soft or fertile and emerge out as separate sprout from each eye. These palms are morphologically identical and known as twin palms. Twin palms are mostly noticed in talls (WCT).

Differentiating Polyembryony and Polycarpy:

As mentioned, polyembryony is the development of more than one ovule in a single carpel whereas polycarpy is the development of more than one carpel. Polyembryonic seedlings emerge from a single softeye, but polycarpic seedlings emerge separately from different eyes (carpels)

Extremely rare occurrence of twinning and haploidy in coconut:

Whitehead & Chapman (1962) reported a different type of twinning in coconut. The twins reported were found to be completely separated and showed considerable disparity in vigour. The suspicion that the less vigorous plant was haploid was confirmed when it was shown to have 16 rather than 32 chromosomes per cell. The diploid plant had bronze rachis whereas that of the haploid was green and the latter had noticeably more slender leaves. This was also the first report of haploidy in coconut. Such haploid-diploid twins are much less frequent in coconut that diploid-diploid twins.

Similar to the above observation, we hereby report another probable haploid-diploid twin noticed by Mr. Abe Jacob, Deputy Editor, Coconut Development Board, Kochi. One twin seedling had bronze petiole colour and the other had orange petiole colour. The orange petiole coloured seedlings was less vigour (based on collar girth, seedling height and presence of slender leaves). Another probable reason for occurrence of divergent twins may be due to the fact that one seedling (bronze coloured) had zygotic origin (fertilized by Tall male parent) and the other had nucellar origin (similar to maternal/ female parent). As reported by Toting et al., 2020, the other probable reason can be that it might have developed from two different cells in the embryo sac, which were fertilized by two different pollen grains. Detailed studies are needed to pin point the exact reason regarding production of divergent twins in coconut.

Conclusion

Though twins are rare and a matter of surprise, but haploid is really a good material for use in breeding programme. However, its real practical worth depends on the frequency of occurrence of haploids and the ease with which the haploids can be converted to double haploids by standard methods. References: Toting, D.J.A., Nuñez, T.C. and Ferraren, D.O. 2020. Comparative DNA analysis of coconut (Cocos nucifera L.) palms with polyembryonic and monoembryonic origins. Annals of Tropical Research 42 (2): 21-29 Whitehead, R.A. and Chapman, G.P. 1962. Twinning and haploidy in Cocos nucifera. Nature, 195:1228-1229 ■