Research Article

TRUE VIVIPARY IN MANGO (*MANGIFERA INDICA* L., ANACARDIACEAE)

Kundan Kishore
Central Horticultural Experiment Station (ICAR-IIHR), Bhubaneswar- 751 019, Odisha, INDIA
**Corresponding author's E-mail: kkhort12@gmail.com*

KEYWORDS:
Mangifera indica, Pseudovivipary, true vivipary, vivipary

ARTICLE INFO
Received on: 26.02.2019
Revised on: 19.03.2019
Accepted on: 20.03.2019

ABSTRACT

The occurrence of true vivipary was observed in mango var. Amrapali cultivated under tropical eastern coastal region of India. Viviparous fruits were fully mature, relatively smaller (145 ± 6.8 g), had low pulp stone ratio (4.23 ± 0.21) and high moisture content (46.8 ± 2.3). It may be presumed that the occurrence of true vivipary in mango, a rare biological event, may be due to recalcitrant nature of seed and increase in relative humidity during fruit maturity. To the best of my knowledge this is the first record of true vivipary in mango (*Mangifera indica*).

INTRODUCTION

Vivipary is an unconventional reproductive process wherein seeds germinate inside the fruit prior to abscission from the maternal plant. The germination of viviparous seeds usually occurs while they are still attached in the plant (precocious germination). It is a unique biological phenomenon not only because of its rarity in flowering plants but also due to complex ecophysiological process involved in seed germination. Moreover, it is a specialised trait of evolutionary and biological importance that provides new avenues for survival and mechanism for protecting the embryo from unfavourable conditions (Cota-Sanchez and Abreu, 2007). Vivipary has been documented in about 80 vascular plant families including 143 genera and 195 species representing less than 0.1% of angiosperms (Farnsworth, 2000). Two types of vivipary are known in flowering plants: "True vivipary" (production of sexual offspring) and "Pseudovivipary" (production of asexual propagules).

In case of true vivipary, embryo penetrates through the fruit pericarp and grows to a considerable size to ensure its establishment (Deore and Johnson, 2008). True vivipary has a subcategory "Cryptovivipary" which is characterized by the inability of the fully developed embryo to penetrate pericarp. On the other hand, psuedovivipary is characterized by the production of apomictic or asexual propagules such as plantlets or bulbils in place of seed (Desai and Roale, 2013; Kuzmanovic *et al.,* 2012). In some of the grasses "Induced pseudovivipary" has also been reported wherein plantlets are produced in the inflorescence due to fungal infection (Clay, 1986).

True vivipary is prevalent among plants in tropical shallow marine habitats either in mangrove or in sea grass community exhibiting strong relationship between vivipary and hydrochory (Elmquistan and Cox, 1996). However few terrestrial plants also exhibit true vivipary. In contrary, pseudovivivpary is common in terrestrial habitat. Excepting few, viviparous species are iteroporous and perennial in nature. In addition to being a sporadic event in plants, vivipary is a specialized trait of evolutionary and biological significance providing new strategy for survival and mechanism for protecting the embryo from adverse climatic conditions (Cota-Sanchez and Abreu, 2007). True vivipary has also been reported in some of the horticultural crops *viz. Artocarpous altilis, Artocarpous hetrophyllus, Cocus nucifera* and *Sechium edule,* whereas cryptovivipary has been reported in *Capsicum annum* and *Mangifera indica* (Habib, 1973; Sankaran *et al*., 2012; Yadav *et al.,* 2011; Singh and Chauhan, 2013). Though Indian peninsula is the most important centre of diversity for mango (*Mangifera indica* L., Anacardiaceae) as the region has a large array of cultivated varieties as well as wild types, the occurrence of true vivipary has not been reported yet.

MATERIALS AND METHODS

The occurrence of true vivipary was recorded in 10-12 year old plants of mango during 2015-16 at the research farm of Central Horticultural Experiment Station (CHES),

Bhubaneswar, Odisha. The farm is located in the east coast plains of India. CHES, a regional station of ICAR- Indian Institute of Horticultural Research, is one of the repositories of mango germplasm and varieties in eastern region of India. The research farm is located between the latitude 20.27° N and longitude 85.84° E at an altitude of 45 m amsl. The prevailing climatic condition is tropical hot and humid and the average maximum temperature, minimum temperature; relative humidity and annual rainfall were 35.5 °C, 26.5 °C, 68.5% and 1550 mm, respectively during the fruit development period (March - June).

Fig. 1. In situ germination of seed in mango var. Amrapali

Fig. 2. Protrusion of plumule from seed of mango var. Amrapali

RESULTS AND DISCUSSION

True vivipary was observed in mango var. Amrapali, however the intensity of occurrence was as low as <0.002%. Viviparous fruit had a longitudinal split extending from fruit base to apex (Fig. 1) and the *in situ* emergence of plumule occured at the basal part of fruit (Fig. 2). The splitting in fruit could be due to the pressure exerted by emerging plumule on mesocarp and epicarp of fruit. It was observed that viviparous fruits of mango var. Amrapali were fully mature (117 days after fool bloom) and relatively smaller in size (145 ± 6.8g). The pulp stone ratio of fruit was also low (4.23± 0.21) in comparison to healthy one (5.86 ± 0.27) which was due to the occurrence of enlarged stone. On the other hand, viviparous seeds had higher moisture content (46.8 ± 2.3) than healthy fruits (41.3 ± 1.8%). It was observed that delay in harvesting and prevalence of high humidity (>85%) during fruit maturity favoured vivipary. The exhibition of vivipary in mango may be due to recalcitrant nature of its seed which promotes germination only at higher seed moisture content. It seems that vivipary in mango is the outcome of the interaction among seed behaviour (recalcitrant), seed moisture content, climatic suitability (high humidity) and elevated biosynthesis of gibberellins (germination promoter).

The occurrence of vivipary in mango may be advantageous to ensure its reproductive success under adverse climatic conditions. However low frequency of occurrence of vivipary in mango suggests that this reproductive strategy in response to environment might have not been very successful in nature (Lee and Harmer, 1980). Indeed, vivipary may provide scope for further studies on ecophysiological and evolutionary significance to assess relative fitness of viviparous seedlings. Moreover the role of phytohormone signalling in developing seeds may be instrumental in understanding the unique biological event in plants.

REFERENCES

Clay, K. 1986. Induced vivipary in the sedge *Cyperus virens* and the transmission of the fungus *Balansia cyperi* (Clavicipitaceae). *Canadian Journal of Botany*, 64: 2984-2988.

Cota-Sanchez, J.H. and D.D. Abreu. 2007. Vivipary and offspring survival in the epiphytic cactus Epiphyllum phyllanthus (Cactaceae). Journal of Experimental Botany, 58: 3865-3873.

Deore, A.C. and T.S. Johnson. 2008. Occurrence of vivipary in *Jatropha curcas* L. *Current Science*, 95: 321-322.

Desai, R.J. and V.M. Raole. 2013. Pseudovivipary in *Isachne globosa*, family Poaceae. *Current Science*, 104: 1599.

Elmqvist, T. and P.A. Cox. 1996. The evolution of vivipary in flowering plants. *Oikos*, 7: 3-9.

Farnsworth, E. 2000. Ecology and physiology of viviparous and recalcitrant seeds. *Annual Review of Ecology and Systematics*, 31: 107-138.

Habib, A.F. 1973. Vivipary in *Artocarpus heterophyllus* Lam. *Mysore Journal of Agricultural Sciences*, 7: 120-12.

Kuzmanovic, N., P. Comanescu and D. Lakusic. 2012. First record of vivipary in a species of the genus *Sesleria* (Poaceae). *Botanica Serbica*, **36**: 111-115.

Lee, J.A. and R. Harmer. 1980. Vivipary, a reproductive strategy in response to environmental stress? *Oikos*, **35**: 254-265.

Sankaran, M., V. Damodaran, D.R. Singh, and B.A. Jerad, 2012. Vivipary in *Cocos nucifera* L. var. Andaman Green Dwarf. *Current Science*, **103**: 1139-1140.

Singh, J. and P.S. Chauhan. 2013. Report of vivipary in mango (*Mangifera indica* L.). *Progressive Horticulture*, **45**: 381-383.

Yadav, P.V., M. Kumari and Z. Ahmad. 2011. Occurrence of vivipary in *Capsicum annum* L. cv. California Wonder. *Current Science*, **100**: 1122.

How to cite this article?
Kundan Kishore. 2019. True vivipary in mango (*Mangifera indica* L., Anacardiaceae). *Innovative Farming*, **4**(1): 37-39.