

## Short Communication

# Fruiting efficiency in *Dacryodes edulis* (G.Don): A case study in Ekpoma, south-south, Nigeria

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Fruiting efficiency in 2 varieties of *Dacryodes edulis* were investigated between 2004 to 2007 in Ekpoma. The influence of variety on fruiting efficiency and abortion rate of gynoecium per inflorescence was determined. *D. edulis* had a regular fruiting pattern with no interannual variability. The mean fruiting efficiency per inflorescence for *D. edulis* var. *edulis* and var. *parvicarpa* varieties were 1.21 and 1.36%, respectively. The gynoecium abortion rates were 98.79 and 98.64% for *D. edulis* var. *edulis* and var. *parvicarpa* varieties, respectively. Poor pollen viability, pollination and fertilization failures as well as competing sinks for photosynthate during flowering may be contributory factors to low fruiting efficiency in *D. edulis*.

**Key words:** *Dacryodes edulis*, varieties, fruiting efficiency, inflorescence number, gynoecium-drop.

## INTRODUCTION

*Dacryodes edulis* (G.Don) belongs to the family *Burseraceae*. It is commonly known as the African or Native pear. It extends from South-western Nigeria to Zambia and Angola as well as Principe and Sao Tome. The forest species can attain up to 20 m in height and 1.5 m in girth, usually without buttresses (Keay, 1989). Okafor (1983) distinguished two varieties of the fruit as: var. *edulis* and var. *parvicarpa*. The var. *edulis* is elongated and ellipsoid, usually more than 5 cm long and 2.5 cm across. While var. *parvicarpa* is rounded to more or less conical, usually less than 5 cm long and 2.5 cm across.

Edible fruits of *D. edulis* are one of the most popular and important indigenous forest trees in Nigeria. The fruits are either eaten roasted, boiled or raw, preferably with roasted or cooked maize (*Zea mays*). The dietary contribution of *D. edulis* is enhanced because of its season of availability, when most staples such as rice and yam are not mature (Okafor, 1998; Emebiri and Nwufo, 1990). The *mesocarp* is rich in cooking oil. Omoti and Okiy (1987) reported that African pear fruits were highly nutritious with an average crude protein content of 25.9% and oil content of 31.9%, respectively.

One of the major problems of *D. edulis* is that the spe-

cies has not been widely cultivated in plantations. Existing stands are mainly from homestead and traditional agroforestry systems (Aiyelaagbe et al., 1998; Okafor, 1999). In addition, the species is faced with extinction due to large-scale deforestation of the tropical forests. Ecological consequences of deforestation have been reported by many authors (Akachuku, 1997; 1999, 2006; Adedire, 1991; Ojo 1996).

A study on aspects of the species such as fruiting pattern will provide some information on its fruiting efficiency and abortion rate for planning of tree improvement, conservation and large scale plantation programmes. Hence, the need to select from varieties of *D. edulis* with desirable traits. The objective of this study was to determine the influence of variety on fruiting efficiency and abortion of gynoecium per inflorescence in *D. edulis*.

## MATERIALS AND METHODS

### Study area

The study was carried out in Ekpoma, Esan West Local Government Area of Edo State. Ekpoma is within the tropical lowland rainforest belt and located between lat. 6°45'N and long. 6°08'E. The mean annual rainfall of the area is about 1500 to 2000 mm per annum, which is bimodal in distribution. Temperature range is between 27 to 35°C.

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**Table 1.** Mean fruiting efficiency per inflorescence of *D. edulis* in Ekpoma (%).

<i>Dacryodes</i> variety	Inflorescence number	Flowering season			
		2004/05	2005/06	2006/07	Mean
Var. <i>edulis</i>	200	1.33a	0.98a	1.32a	1.21a
Var. <i>parvicarpa</i>	200	1.32a	1.41a	1.35a	1.36a

Means with same letter do not differ at 5% level of probability.

**Table 2.** Mean abortion rate of gynoecium per inflorescence of *D. edulis* in Ekpoma (%).

<i>D.edulis</i> Variety	Inflorescence number	Flowering season			
		2004/05	2005/06	2006/07	Mean
Var. <i>edulis</i>	200	98.67a	99.02a	98.68a	98.79a
Var. <i>parvicarpa</i>	200	98.68a	98.59a	98.65a	98.64a

Means with same letter do not differ at 5% level of probability

### Data collection and analysis

Ten (10) sample trees each of *D. edulis* var. *edulis* and var. *parvicarpa* were randomly selected in a traditional agroforestry farm at Ekpoma, in association with *Theobroma cacao* (cocoa), *Dennettia tripetala* (pepper fruit), *Musa sapientum* (banana), *Musa paradisiaca* (plantain) and *Garcinia kola* (bitter kola). The stands were established in 1981. 20 inflorescences were randomly selected per tree. Mean fruiting efficiency and abortion rate per inflorescence were evaluated between 2004 and 2007 flowering seasons respectively.

Fruiting efficiency per inflorescence (%) = (Number of fruit set / Total number of flowers produced) x 100, and abortion rate of gynoecium per inflorescence (%) = (Number of gynoecium aborted / Total number of gynoecium produced) x 100 were determined and analysis of variance was conducted on the data.

### RESULTS AND DISCUSSION

The mean fruit efficiency per inflorescence in *D. edulis* is shown in Table 1. The influence of variety and year on fruiting efficiency of *D. edulis* was not significant at 5% level of probability. The mean fruiting efficiency for *D. edulis* var. *edulis* and var. *parvicarpa* were 1.21 and 1.36%, respectively. Similarly, the mean gynoecium-drop per inflorescence was not significant between the 2 varieties at 5% level of probability. The mean abortion rates of gynoecium were 98.79 and 98.64% for *D. edulis* var. *edulis* and var. *parvicarpa*, respectively (Table 2). Analysis of variance indicates that year and variety did not significantly affect fruiting efficiency and gynoecium-drop in *D. edulis*. The species were consistent in yearly fruiting pattern with no interannual variability. The 2 varieties showed low fruiting efficiency and high abortion rate of gynoecium. After fruit set, abortion of gynoecium per inflorescence occurred immediately.

Many authors have investigated fruiting efficiency in tropical forest species (Asada, 1999; Ashton et al., 1988; Kelly, 1994; Koenig, 2000; Koenig et al., 2003; Sakai, 2001; Sakai, 2002; Wright et al., 2005). Among the array

of reproductive parameters in tropical forest species, fruiting efficiency is the most remarkable to the commercial farmer, because it determines the overall yield of his crops per hectare. Low fruiting efficiency implies low harvest yield and vice versa. The mean fruiting efficiency of 1.21 and 1.36% recorded for *D. edulis* var. *edulis* and var. *parvicarpa* were lower than the 21% obtained by Oni (1990), who worked on *Terminalia ivorensis*. Oni and Adedire (1987) also reported 26% fruiting efficiency for *Terminalia catappa*, which is very much higher than the result of fruiting efficiency in *D. edulis* reported in this study.

Several reasons have been attributed to low fruiting efficiency and high rate of fruit-drop, among tropical forest species. These are pollination limitations and shedding of pollen before stigma receptivity (Bawa and Webb, 1984; Carthew, 1993). However, in this study, there may be dangers in over-generalizing across varieties of *D. edulis*. Generalizations about the factors responsible for low fruiting efficiency and high rate of gynoecium drop among tropical forest plants will only be possible through extensive studies on reproductive biology of the species.

### Conclusion

The reason for the low fruiting efficiency and high rate of gynoecium abortion in *D. edulis* is complex and not fully understood in this study. However, the observed low fruiting efficiency and high abortion rate could be attributed to exhaustion of photosynthate on continuous vegetative growth during flowering. Any competing sink for photosynthate during flowering could have negative impact on fruiting efficiency. Thus it remains unclear whether low fruiting efficiency and high fruit drop is climate dependent or a reproductive strategy among tropical forest species. The application of vegetative growth retardant sprays during flowering and fruit set may

improve flower : fruit set ratio in *D. edulis*.

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