



## Papaya Vivipary: An Unusual Finding of “An Umbilical Cord”

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### ABSTRACT

Vivipary is not a rare finding in papaya fruit. However, this short communication describes the unusual germination of seedling within intra-ovarian ovary. The seedling is attached at two ends of the immature ovary: by radicle at one end, and by elongated tubular structure at the other end. The tubular structure, probably a hypocotyl, mimics an umbilical cord connecting the growing fetus with that of placenta in human embryonic development.

### Introduction

Papaya fruit is one of the widely available fruits, relished by people for its rich food value throughout the year. Papaya is an oviparous plant, however, in the species *Carica papaya*, viviparous germination can be seen. Viviparous germination occurs when seeds or embryos begin to develop before they detach from the parent fruit. This true seedlings germination is seen naturally in some species

of mangroves trees (sexual or true vivipary). However, in *Carica papaya*, when conditions inside the fruit are moist, mimicking that of wet soil in the outside environment, under this circumstance the seed may begin to germinate, while still attached to the parent plant (vegetative vivipary or pseudo-viviparity) (Batygina, 2009).

### Occurrence of vivipary in papaya

In late October, when winter is about to set in, it is dry weather outside, in North India. A papaya fruit purchased in semi ripe condition

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was kept at room temperature for natural ripening. After three days, the whitish fungus was seen growing at the peduncle end of the fruit. The fruit was cut open, and it was found that fungus had started growing inside from that end. The rest of fruit was normal. There was only one normal seed inside (Fig. 1).

However, the presence of a whitish, C-shaped mass attached to placenta side, was an interesting finding. The fruit was otherwise normal, sweet in taste, and not insipid in contrast to what was observed by other studies

(Mani, 2009 and Singh, 2013).

Bergman (1921) was the first one to describe intra-ovarian fruit in papaya. There are other reports on vivipary as well (Mani, 2009; Singh, 2013), but the present case describes the unique development of intra-ovary seedling which has not been mentioned before. In our case, the shining and smooth, whitish, 7 cm long structure identified as the curved immature fruit/ovary, similar to the human fetal position. A seedling is seen attached to the near one end (Fig. 2 and 3).



**Fig. 1.** Papaya cut open shows a black seed and “viviparous germination”



**Fig. 2.** Close view of intra-ovary ovary shows epicotyl (single arrow), tortuous “hypocotyl” (two arrows) and Plumule (curved arrow) Radicle (Two head arrow)



**Fig. 3.** Oblique view of white mass shows tortuous hypocotyl and drying Plumule

Plumule and epicotyl are well demarcated. Surprisingly, a thin tortuous and elongated cord-like structure (assuming it to be hypocotyl) arising from the mid-region of the seedling was seen attached to the other end of large white mass, giving an appearance similar to “umbilical cord” in viviparous humans. The lower segment of seedling (we assume it as radicle) from site of hypocotyl attachment, is straight portion and is fixed to white mass with a broad base. There is no free lower end of the seedling. There are some immature ovules attached to the curved surface of this incompletely developed fruit. We are not sure, if it is similar to viviparous germination in Mangroves, where hypocotyl and radicle have separate tubes, and hypocotyl elongates for several centimetres and pushes radicle.

Funiculus is a plant part equivalent to an umbilical cord in humans. It attaches to the ovule (future seed) to a flower’s ovary (future fruit). The part of the ovary where the funiculus attaches is known as the placenta.

### Conclusion

Viviparous not being a true sexual form of reproduction in Papaya species, shows various forms. In present short communication, “intra-ovarian ovary” mimics the human placenta connected to seedling (similar to human embryo) with an elongated tubular structure (mimicking umbilical cord) at one end, and another structure at the other end. This finding has not been described before.

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