

# Has *Ensete ventricosum* physical-morpho-physiological seed dormancy?

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*Ensete ventricosum* (enset) is an important drought tolerant crop in Ethiopia. Enset, belonging to Musaceae, looks similar to banana plants. Enset has been cultivated for food, fodder, fibre, medicine and as an enhancer of environment during thousands of years, and numerous clones with different characteristics occur.



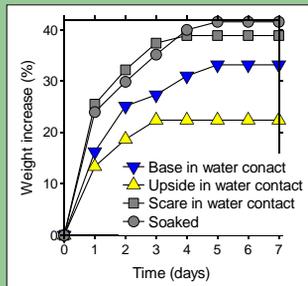
Enset flowers, and produces a "banana stock" with nice orange "bananas" several months later. However, the plants are usually cut off at the time of flowering, to get high yield of starch-rich food.

We have found cultivated plants without fruits and with seed-less fruits, but our impression is that most cultivated plants and all wild plants set seeds. In the case of seed setting, the ripe "banana" is full of large (1-2 cm), hard seeds.



Upside Base including micropyle  
Scarified seeds

The seeds imbibe slowly (5-6 days) and the imbibition requires that the base of the seed is exposed to moisture.



Embryo  
"Tube" in seed coat, from inside



Cross-section

The embryo is so called underdeveloped (ca 3 mm long and maximum diameter ca 5 mm). It is located just inside the water permeable area of the seed coat. The embryo is partly placed in a small "tube" (ca 1 mm wide) across the seed coat, the "tube" has a thin seed coat cover outside the bottom of the embryo, in the base of the seed – this is the probably location for water intake.



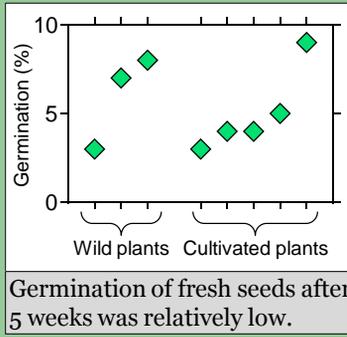
The radicle develops from the undifferentiated embryo.



Germination begins with the "tube cover" being detached.



Followed by the shoot. The seed coat remains intact.



Germination of fresh seeds after 5 weeks was relatively low.

Seeds came from 8 different plants, wild and cultivars. The plants grew within ca 300 km<sup>2</sup> in southern Ethiopia. Germination tests were done with 100 seeds per plant on moist sand at ca 25°C.



Time between root and shoot was 3-7 days.

**No effect**  
Acid  
Hydroxide  
Chlorite

Treatments that often increase germination in case of hard seed coat had no or negative effect. In enset, it is not enough with increased imbibition; the underdeveloped embryo and its interaction with endosperm play an additional roll.

**Negative effect**  
Ethanol  
Scarification

The seed coat is very hard, and impermeable to water except for a specific construction.

Physical dormancy

The embryo is small in relation to the seed coat (underdeveloped embryo).

Morphological dormancy

After being fully imbibed, only a small fraction of seeds germinates within 5 weeks.

(Possible) physiological dormancy

**Conclusion:** enset has, following the system proposed by Baskin & Baskin, physical and morphological seed dormancy (physical-morphological dormancy); this combination is to our knowledge not reported before. Further studies regarding special germination requirements and treatments known to affect physiological dormancy are ongoing. Is *Ensete ventricosum* the first recorded species with the combination physical-morpho-physiological seed dormancy?

