OIL PALM SYNTHETIC SEEDS

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648

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An artificial or synthetic seed (SS) is defined as a somatic embryo (SE) or other selected tissue within a coating of a specific material, resembling a zygotic seed. The synthetic coating serves as an endosperm, consisting of among others, carbon sources, nutrients, growth hormones and anti-microbial agents. The synthetic coat must be non-damaging to the embryo, serve as a protection to the embryo from mechanical damages during handling but allow germination of the embryo. The coating and the embryo seed may be hydrated (to resemble a recalcitrant seed) or dessicated (to resemble a true seed). Synthetic seeds have been proven to be useful in many crops such as *Citrus reticulate* (Autonietta, 2007), rice (Roy and Mandal, 2008), ginger (Sundararaj *et al.*, 2010) and cauliflower (Rihan *et al.*, 2011). However, there are still problems that hinder the routine production of SS in large numbers that can be planted as true seeds. Selection of good cultures, coating materials, hardening and germination processes need to be optimised for production purposes.

OBJECTIVE

To develop a synthetic coating material for the encapsulation of oil palm zygotic embryos, embryogenic aggregates and shoot apices that allow germination *in vitro*.

BENEFIT

Oil palm synthetic seeds offer a convenient and practical means for long distance delivery.

METHODOLOGY

Plant Materials

Zygotic embryos, embryogenic aggregates and *in vitro* shoot apices were used for encapsulation (*Figure 1*).

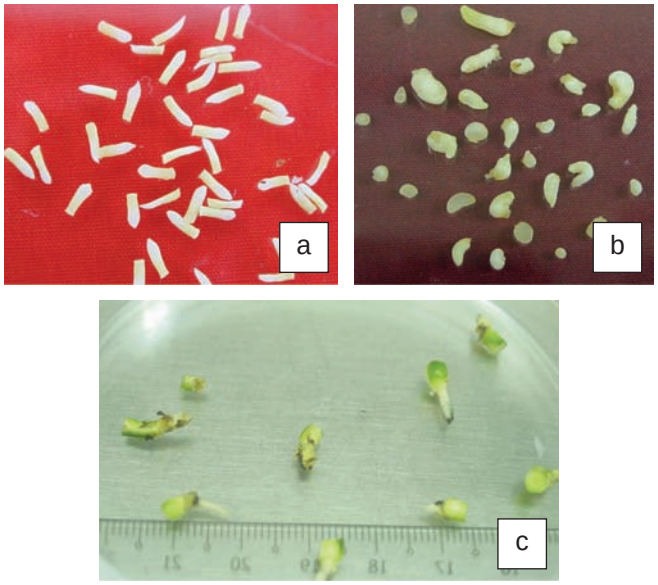

Figure 1. Tissues for encapsulation: (a) zygotic embryos, (b) embryogenic aggregates and (c) shoot apices.

Media for Encapsulation

Sodium alginate media. Sodium alginate solution (3%) in liquid MS supplemented with 3% sucrose and 0.0168 g litre^{-1} naphthaleneacetic acid (NAA) and autoclaved at 121°C under 105 kPa pressure for 15 min.

Calcium chloride solution. The 0.1 M $CaCl_2$ in liquid MS supplemented with 3% sucrose and autoclaved at 121°C under 105 kPa pressure for 15 min.

Encapsulation Process

The encapsulation process is shown in *Figure 2*. Zygotic embryos, embryogenic aggregates or shoot apices were placed in sodium alginate media for a few seconds, picked up and placed in a sterile aqueous solution of calcium chloride with occasional agitation. Calcium alginate beads encapsulating the tissues were formed within 15–30 min. The beads were recovered by decanting the $CaCl_2$ solution, then washed with sterile

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distilled water and surface dried with a sterile blotting paper. The beads were then cultured on solid MS medium.

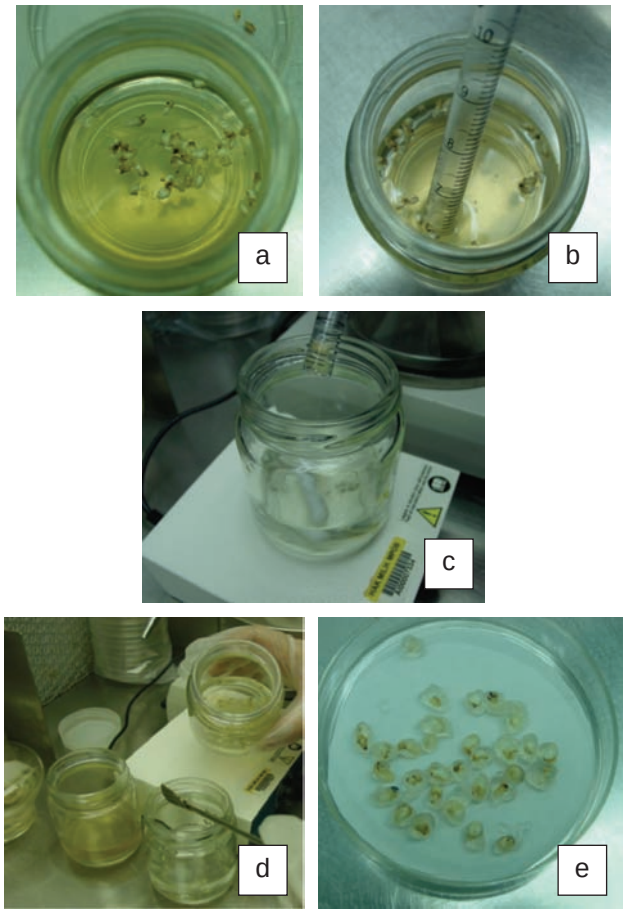

Figure 2. Selected materials in the sodium alginate media (a), picked up and placed in a sterile aqueous calcium chloride (b), with occasional agitation (c). Beads recovered by decanting the $CaCl_2$ solution, then washed with sterile distilled water (d) and surface dried with a sterile blotting paper (e).

RESULTS AND DISCUSSION

Zygotic Embryos

The germination rate of encapsulated embryos was 50%-80 % .The germination rates depend on the quality of the seeds (*Figure 3*).

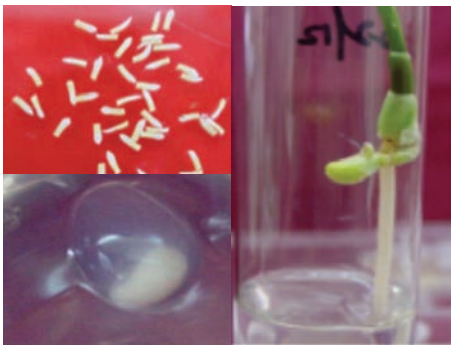

Figure 3. Germination of encapsulated zygotic embryos.

Embryogenic Aggregates

About 90% of encapsulated embryogenic aggregates produced shoots on solid MS media (*Figure 4*).

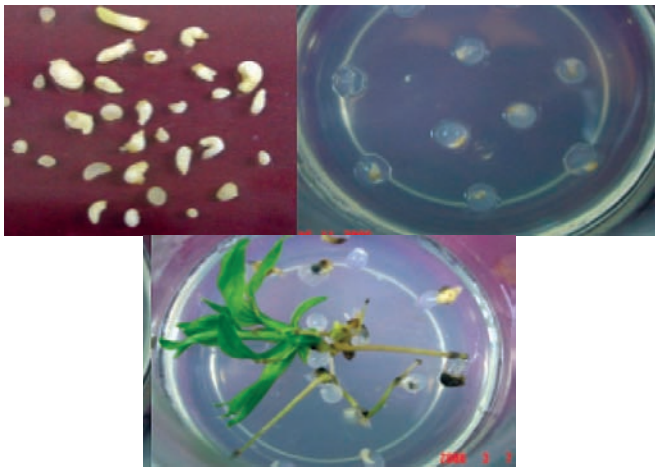

Figure 4. Germination of encapsulated embryogenic aggregates and plantlets.

Shoot Apices

All encapsulated shoot apices produced shoots when cultured on solid MS media (*Figure 5*).

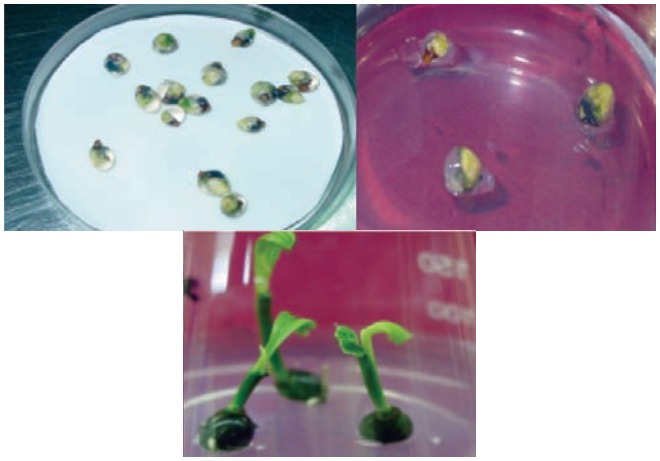

Figure 5. Germination and plantlets of encapsulated shoot apices.

CONCLUSION

Among the three oil palm tissues, shoot apices were the best tissue for synthetic seed production. The seeds can be readily germinated *in vitro* and developed into plantlets.

SERVICE PROVIDED

Basic training on encapsulation of various oil palm tissues for synthetic seed production.

The indicative fee in 2013 is RM 200 per day per trainee and subject to change. The minimum number of days suitable for the training is two days.

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