Centurion
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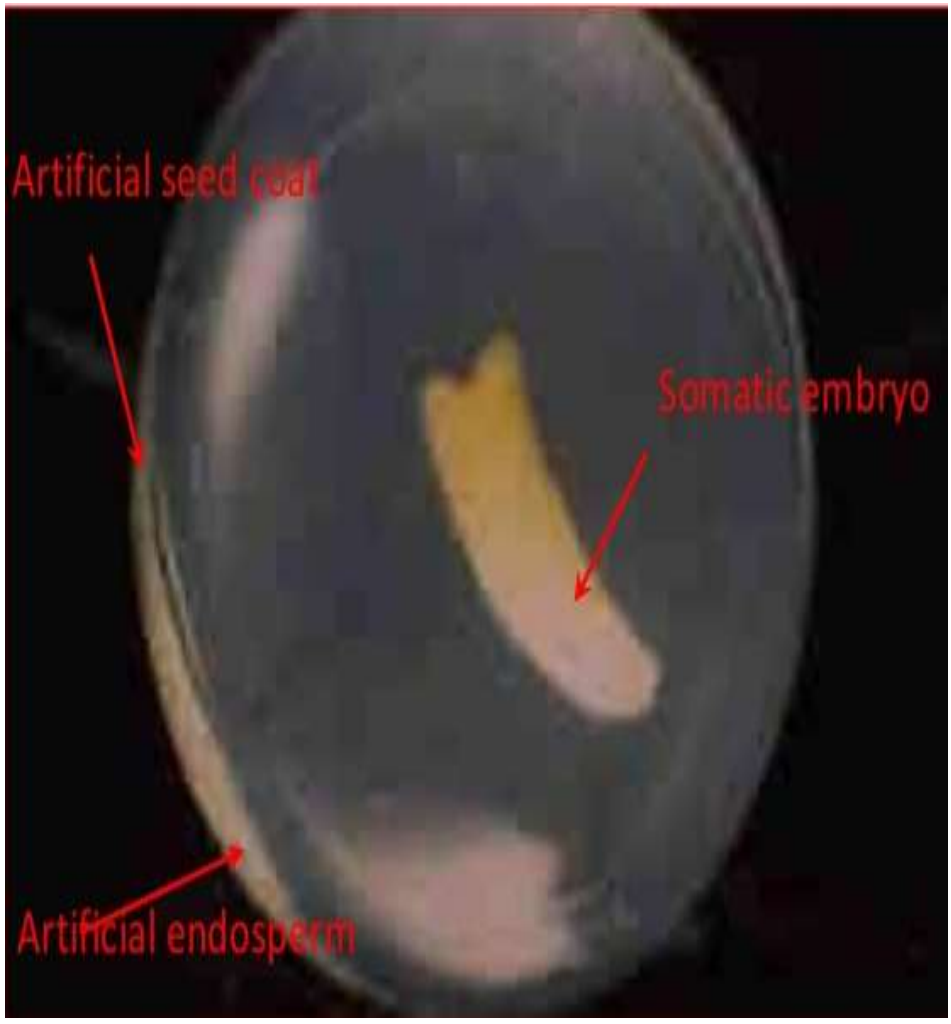
Session 58: Synthetic Seeds

Introduction

Ripened ovule containing embryo has the capability to regenerate is called seeds, the vehicle of that connects plant kingdom from one generation to another.

Synthetic/artificial seeds: arterially encapsulated somatic embryos, shoot buds, cell aggregates or any other tissue that can be used for sowing as a seed and that possess the ability to convert into a plant under in vitro or ex vitro conditions and that retain this potential also after storage.



Need of synthetic seeds

Most of the recalcitrant seeds cannot be preserved in slow growth cultures media or under cryopreservation, can be only propagated as synthetic seed

Many fruit crops are difficult to multiply through conventional propagation methods

Seed propagated hybrids can be multiplied through tissue culture and propagated by using synthetic seeds rapidly

History of synthetic seed

Seward et al and Reinnert (1958): first proposed somatic embryos and procedure of somatic embryogenesis in carrot

T. Murashige (1977): was first time given the idea of synthetic seed

Redenbaugh et al., (1984) developed a technique for hydrogel encapsulation of individual somatic embryos of alfalfa

Sunderland (1977) demonstrated that the production of hundreds of morphologically uniform embryos from *Datura* and *Nicotiana* pollen

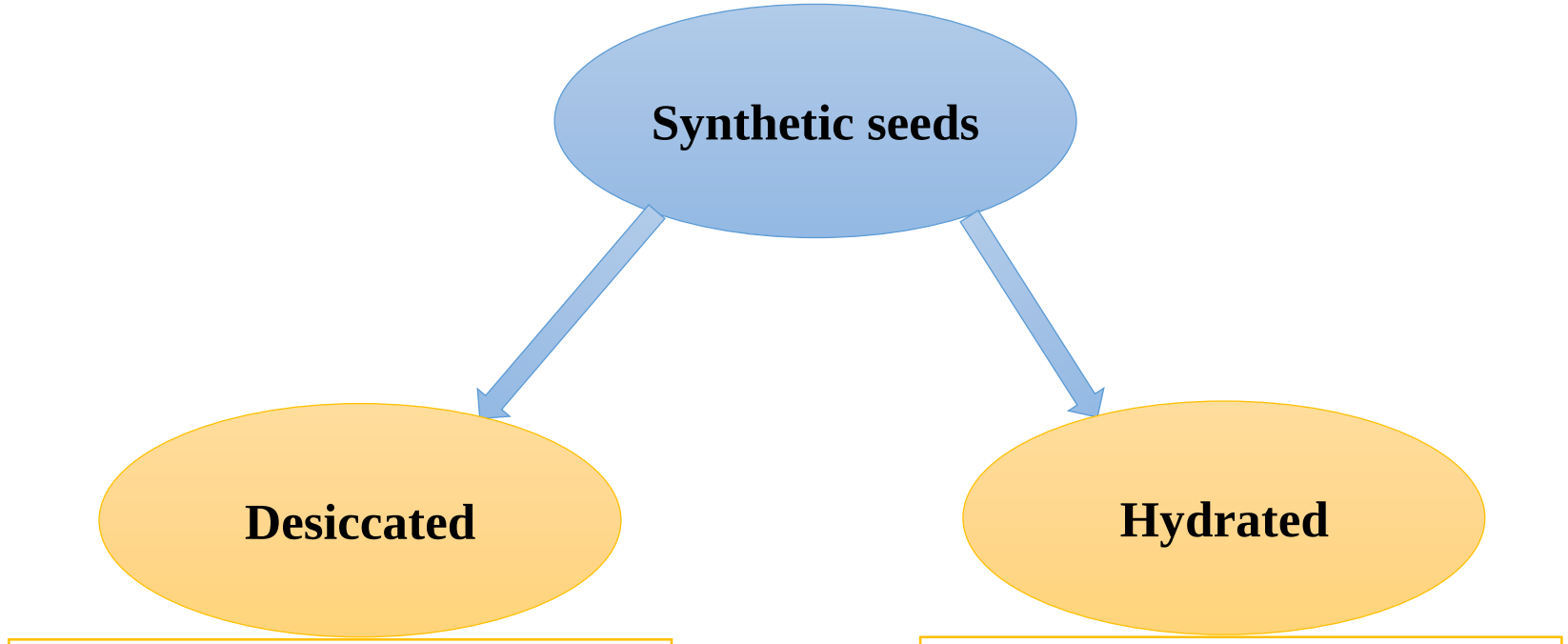
Kitto (1982) and coworkers prepared first synthetic embryos in carrot

Bapat et al., (1987) proposed the encapsulation of shoot tip in *Morus indica*

P. S. Rao's group from BARC, Trombay reported artificial seeds prepared from shoot bud for plant propagation

Kitto and Janick (1985), Akhtar (1999) and Ara ett al (1999) produced synthetic seeds by encapsulating somatic embryo of *Brassica campestris*, *Mangifera indica L. Mango cv. Amrapali* and *Solanum melongena* (Eggplant), respctively

Types of synthetic seed



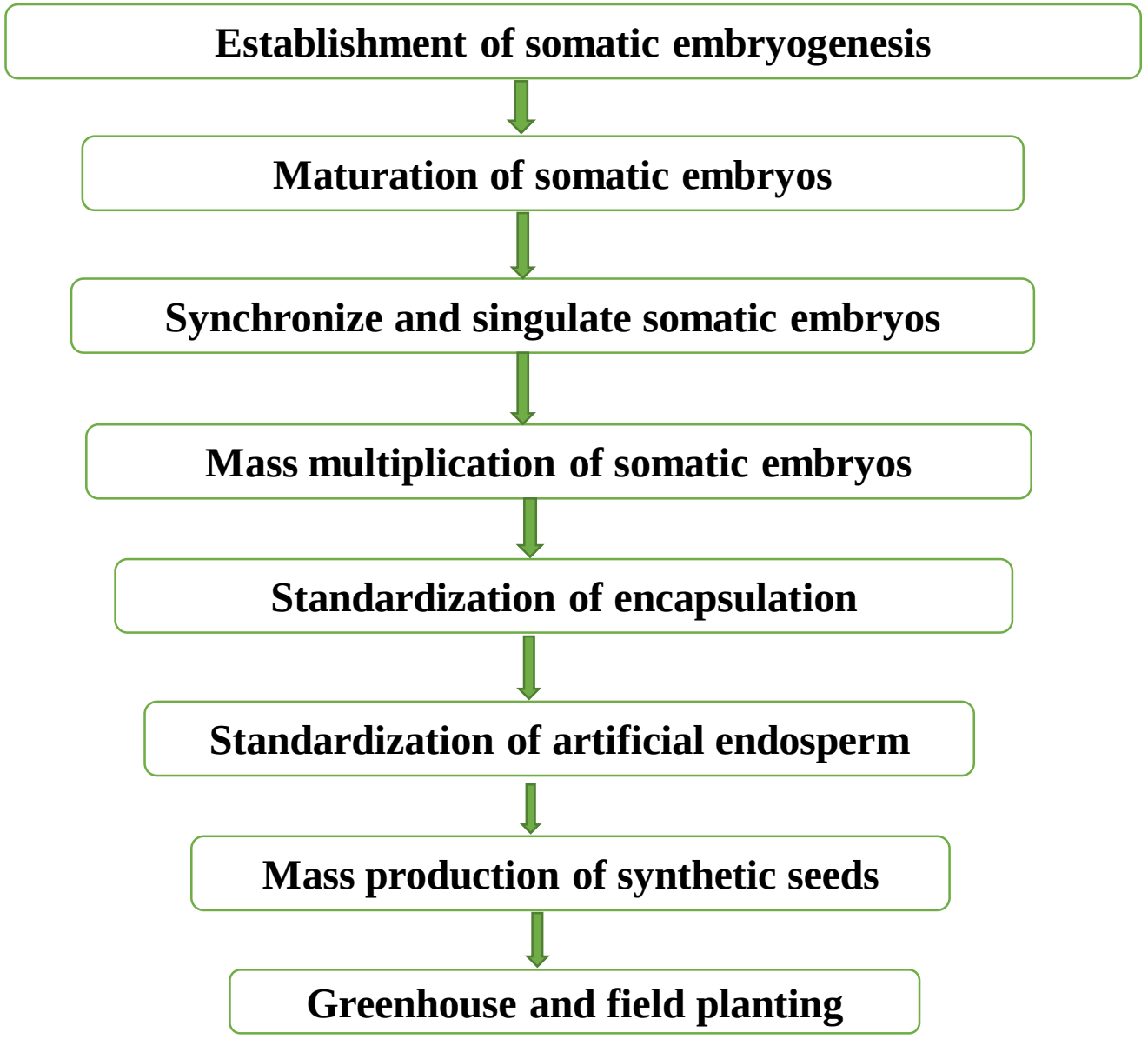
Either naked or encapsulated in polyoxyethylene gkycol followed by their desication

Ex: Carrot, Celery embryo

Produced by encapsulating somatic embryos in hydrogel capsules

Ex: Alfalfa, Barley, Sandal wood

Steps involve in synthetic seed production



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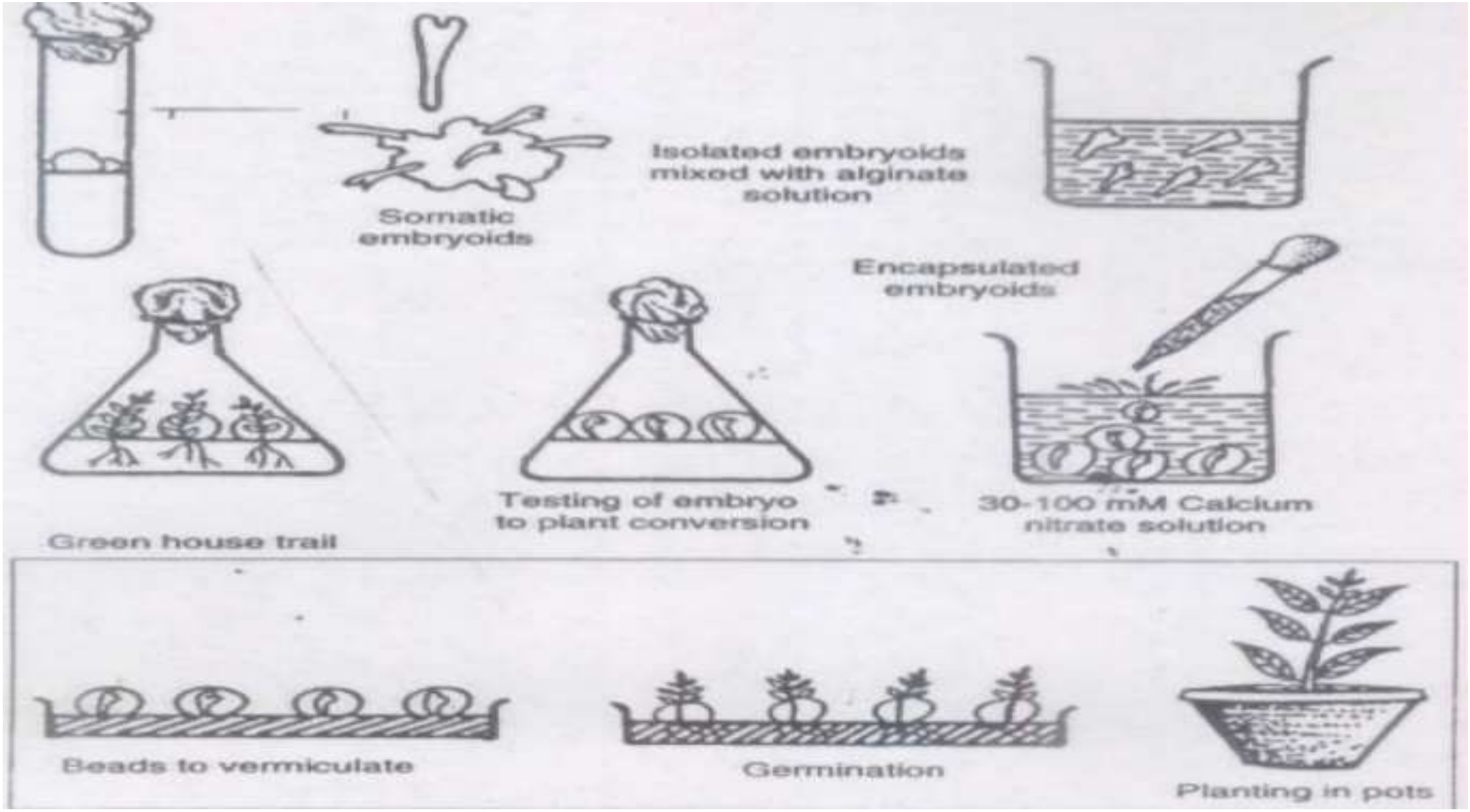
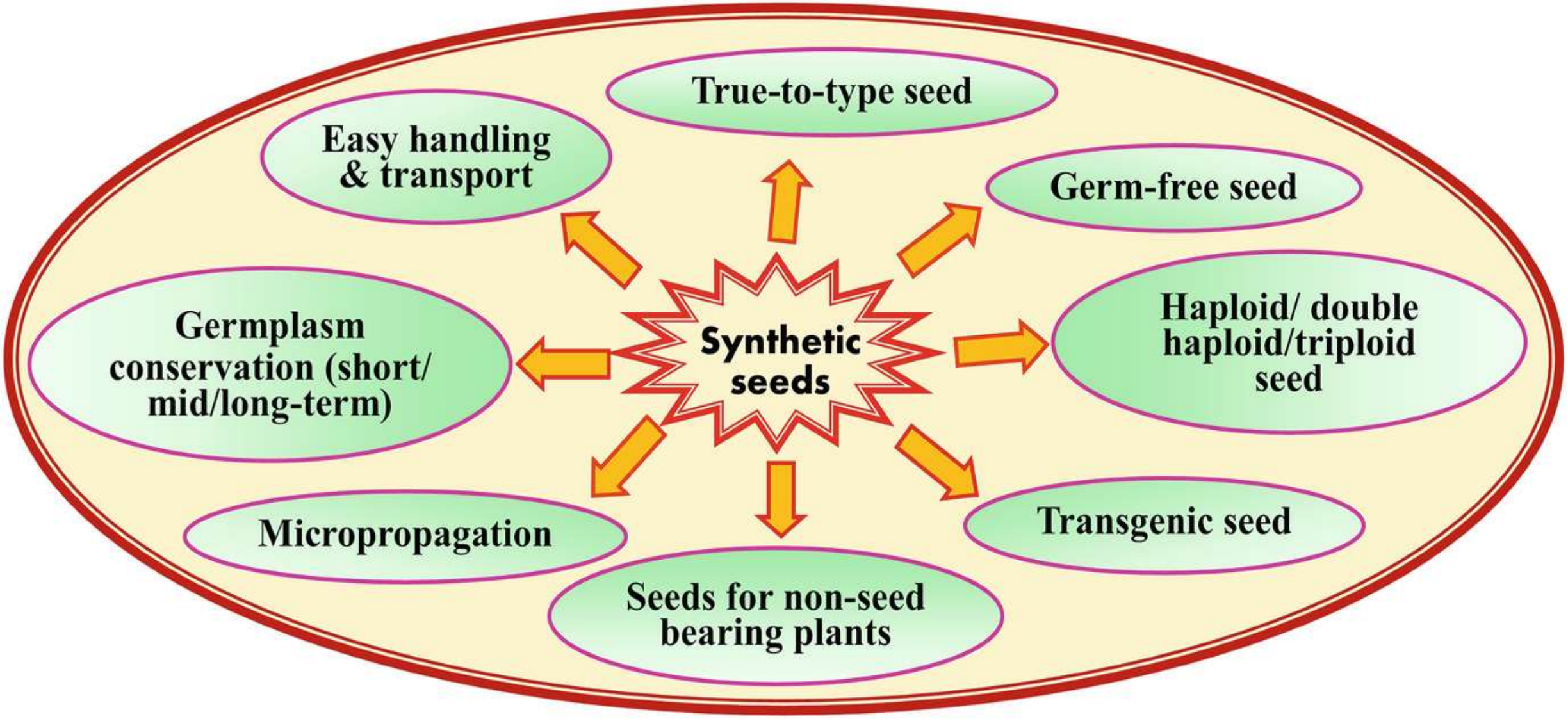


Methods for encapsulation of somatic embryos

Gel Complexation Via a Dropping Procedure	Automated Encapsulation Procedure
Moist useful encapsulation system Drip 2-3% sodium alginate drops from at the tip of the funnel and the somatic embryos are inserted Keep the encapsulated embryos complex in calcium salt for 20 minutes. Rinsed the capsules in water and the stored in air tight container	Quick method of artificial seed production Here, alginate solution with embryo is feed from supply tank Alginate capsules were planted in speeding trays using a vacuum seeder. The capsules are planted in the field using a stan hay planter A hydrophobic coating is required for mechanical handling for the rapid drying and thickness of the alginate capsule

Pros of synthetic seeds



Cons of synthetic seeds

Low production of viable mature somatic embryos

Poor proper acclimatization into field because of their tenderness due o absence of lignifications and low cuticle formation

Lack of dormancy

Lack of synchrony in somatic embryo development

Improper maturation

Slow conversion into plantlets

Difficulties of sowing artificial seeds directly in soil or under nonsterile conditions

Differences between natural and synthetic seeds

Natural seeds	Synthetic seeds
Produced from sexual reproduction	Produced from asexual process
Involve the fusion of male and female gametes	Doesn’t involve the fusion of gametes
Produced from germ cells	Produced from the vegetative cells
Contains genetics constitution form both parents	Contains genetic constituent from single parent
Genetic recombination takes place	Genetic recombination does not takes
Contains embryo, endosperm and seed coat	Contains only embryo and endosperm and seed coat are absent

Conclusion

Requirement for the practical application of the artificial seed technology is the large scale production of high quality micropropagule, which is at present a major imitating factor

the synthetic seed technology offers tremendous potential in micro propagation and germplasm conservation; however future research need to perfect the technology so that it can be used on commercial scale


Thank
You