PROPAGATION MATERIAL

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About its Role in Nature:

Life phenomenon has chosen the successive series of birth-death, prior reproduction, as perpetuation strategy. With this strategy, it is able to find a frequent and iterative stage in reproduction, where intervention implies deployment of mechanisms with gradual adaptation to such varied and variable environmental conditions and means. This adaptation may imply both maintaining and modifying, at a given stage, the characteristics of a specific organism, in response to the interpretation of the environmental conditions involved. Such election will be performed through a lower or higher alteration of genetic and epigenetic information transmitted to progeny. Consequently, nature offers a wide variety of reproductive mechanisms and structures that carry out propagation, enabling different levels of genetic modification, which may range from clonal-type propagation with low genetic alterations, to sexual-type propagation involving a higher level of this modification. While the first largely guarantees conservation of information in progeny, enabling determination and fixation of the information that seems adaptive in this situation, the second enables the acceleration of adaptation, introducing variables that will be challenged and assessed with time and by discarding deleterious variants in the most efficient manner. *Thus, the mechanism and structure of reproduction are functional to the genetic variability at stake*.

Supplementary, phenotypic variability of an individual also carries an epigenetic component. Epigenetics involves the whole process of regulation of genes not implying changes to DNA sequence, and includes DNA chemical modifications and histones which, by modifying the structure and condensation of chromatin, affect the genetic expression and the phenotype in a heritable manner. The variability obtained from this contribution is more relatively relevant in clonal propagations, where the genetic component of variability is relatively lower. *Therefore, the mechanism and structure of propagation will condition the level and type of phenotypic variability even when there are no quantitatively important genotypical variants.*

About handling:

The aforementioned knowledge has enabled the creation of a large portfolio of technical tools of intervention that may be used for genetic improvement of organisms. Apart from employing the natural mechanisms of reproduction, *artificial conditions have been developed to propagate organisms in accordance with scientific, technological and productive objectives pursued*. Thus, even though a species does not undertake, for instance, a clonal reproduction under natural conditions, the technologist may recover the potentiality for such purpose, and, through an adequate physical-chemical intervention, successfully develop and multiply a complete higher organism from a fragment of another.

About its use:

In the agricultural field, there are handling protocols enabling propagation of several vegetable species from non-reproductive tissues and it may be assumed that any vegetable material may offer this possibility, according to the compliance of physical-chemical conditions of *in vitro* culture required by that species. The same applies even to isolated cells of that kind of tissue. Moreover, this type of clonal propagation is also possible from isolated sexual cells, generating a complete specimen with half of genetic makeup (haploid). It is worth mentioning that whenever somatic (non-sexual) cells are induced to a totipotent state to acquire propagation capacity, a genetic and epigenetic variation phenomenon known as somaclonal variation may occur, whereby the material obtained differs as much from the source material as from any other clone produced therefrom. *Thus, the use of several forms of propagation is affected by biological characteristics providing specificity upon its technological use.*

If we descend in the hierarchical level of the organization, it may be noted that the market now offers the possibility of propagating a complete organism from a single cell nucleus, and it may possibly be applied to the agriculture industry, where it may be achieved with the use of deoxyribonucleic acid stored in that organelle.

Finally, if the part of the plant considered was not its anatomy but another form of definition, the mere genetic and epigenetic information might be sufficient to propagate a living organism, as a result of the new DNA design and synthesis tools provided by synthetic biology.

The aforementioned possibilities and other current and future possibilities describe the heterogeneity of the collective called Propagation Material, involving both structural and functional aspects. Moreover, those differences may cause absence or feasibility of an effective productive use and, when this is possible, several means of use given the different limitations involved and different characteristics of the progeny deriving from them. Therefore, the latter would add another variable, whereby the use of material improves the definition of the group.

About its insertion in the regulatory framework:

The aforementioned heterogeneities included in this group of materials prove the difficulty of a collective treatment to be considered in a regulatory framework. Different aspects defining different propagation materials may call for a different treatment under regulatory selection related to their treatment. Thus, biological considerations may be complemented with utilization practices in order to combine capacities and effective uses for the definition of propagation materials.

With the aim to collaborate with the discussion of a definition of Plant Propagation Material, structural, functional and usage variables were here reviewed.
