

# OPTIMIZATION OF SOMATIC EMBRYOGENESIS EXPRESSION OF HIGH-VALUE COCOA CLONES IN THE REGION OF SAN MARTIN – PERU

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## Introduction

The most common and practiced way of propagating cacao is through the use of botanical seeds, mainly due to the low costs that represents to the producer and the availability of plant material, a situation that represents a high variability or segregation of genes, obtaining highly heterogeneous plants and possibly susceptible to the attack of monilia pod (*Moniliophthora roverei*) and the fruit borer “mazoreguero” (*Carmenaea sp.*), in addition to getting cacao populations with low quality and yields. Given this scenario, Somatic Embryogenesis (SE) becomes a key and important tool for multiplication of select, outstanding and promising material, and above all the bridge between a conventional production system for an innovative one, which allows maintaining the conditions of desirable genetics in the new individuals, in addition to their adaptability and conduction in the field. In order to evaluate the response to SE, two types of floral explants were studied, in 5 cacao genotypes.

## Methodology

Two types of explants (petals and staminoïds) were evaluated in 5 cacao genotypes: BJG, BT, CCN-51, TSH-565 and CJO-1, which were induced to form embryogenic calli, using two sequences of culture media, for the processes of induction, expression, and maturation of somatic embryos, having Sequence 1 (Li et al., 1998) and the Sequence 2 (Fontanel et al., 2002). The flower buds were collected and superficially sterilized with 1% sodium hypochlorite + Tween 80, for 15 minutes, and rinsed with sterile distilled water. The buttons were dissected to extract the floral explants, the same ones that were put in contact with the culture media according to the respective sequence, having subcultures every 20 days.

## Results

The results showed that the culture media of Sequence 2 were more efficient in the expression of primary somatic embryos for the genotypes BJG (30 embryos) and CCN-51 (12 embryos), at 51 days of culture. With respect to the culture media of Sequence 1, they showed to be more efficient for the genotypes BT (20 embryos) and TSH-565 (18 embryos), expressing embryos at 78 days of culture. In relation to the type of explant studied, all the embryos formed were from staminoïds. The CJO-1 genotype did not form somatic embryos.

Figure 1. Number of somatic embryos in relation to the cacao genotypes studied.

Figure 2. Number of somatic embryos in relation to the sequence studied.

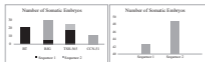


Table 1. Number of somatic embryos in relation to the type of explant used.

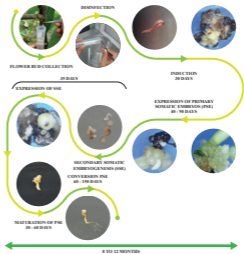
Explant	Number of Somatic Embryos	Mean Rank
Petal	0.0	0.0 a
Staminoïd	92.0	2.3 b

Mean Rank with different letters within the same column, differ significantly ( $p > 0.05$ ), according to Kruskal Wallis.

Figure 3. Cacao somatic embryos from BJG genotype



Figure 4. Embryogenic process timeline



## Conclusions and recommendations

It was established that Sequence 1 was better for cacao genotypes BT and TSH-565, while for Sequence 2, the genotypes that best behaved were BJG and CCN-51. The process of obtaining primary somatic embryos of cacao is in the phase of optimization and validation for the genotypes studied, a situation that represents an alternative for the mass production of cacao clones of high genetic value, the same as after agronomic validation process in the field, could be available to the main actors in the value chain, and thus meet the demand for seed with promising characteristics in the San Martín region, and other regions where the crop is developed. Thus, we recommend continuing to deepen scientific research in somatic embryogenesis, since it could become the infallible route to redesign current production systems, seeking greater efficiency in production and shortening the phenological cycle of cacao cultivation.