

## grafted on 5 different rootstocks

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### INTRODUCTION

*Coffea arabica* var. Laurina, also called Bourbon pointu, differs from other Arabica varieties by the shape of the plant, leaf size, bean dimension, lower caffeine content and its sensory qualities. illycaffè's Laurina (internally called as Bourbon Low Caffeine – aka BLC) is a result of a long selection process started in the nineties of the last century. The caffeine content of this selection is aprox. 0,6-0,8%. Despite the excellent cup quality, over the years this selection has proved neither to be very productive nor very resistant to pests and diseases (especially Coffee Leaf Rust). Promising coffee species and varieties that can be used as rootstock for Arabica, typically have more vigorous root development, even in the presence of plant-parasitic nematodes. In order to improve yields and performance of BLC, we grafted BLC on 5 different rootstocks. In this report, the first vegetative and productive results of this trial are presented.



### METHODS

The experimental trial was carried out in Finca Rabanales, located in Fraijanes, Guatemala. On April 2017, BLC scions were hypocotyl grafted – onto 5 different rootstocks varieties (see Tab.1) for a total of 60 plants per each grafted rootstock variety. The grafting was realized when the rootstock was in butterfly stage (50 to 60 days) and the BLC scion in soldier stage (60 to 70 days). In September 2017, the grafted plants were transplanted in the field, spaced 100 cm x 150 cm, in a randomized complete block design with four replications and 15 trees per replication (60 trees per treatment). The entire plot was treated uniformly for fertilization, pest control and other crop management activities. Plant growth data were collected monthly since the planting. Circumference of the trunk, overall tree height, mean number of nodes on primary plagiotropic branches (plus its secondary branches), horizontal primary branches length were measured for each plant. The yield per tree of ripe, palpable berries was collected during the first two harvest seasons (2019–20 and 2019–20). Cherries were harvested, numbered and weighed for each tree, also evaluating the percentage of empty fruits and cherry average weight.

Tab. 1 – Varieties selected as rootstock for the experimental trial

ANACAFE 14	It is supposed to have originated from a natural cross between a Catimor variety with Pacamara, around 1980, in Guatemala. After several cycles of selection, it was released by the National Coffee Association of Guatemala (ANACAFÉ), as a commercial variety in 2014.
OBATA	A cross between Timor Hybrid and Villa Sarchi. Pedigree selection made by the Instituto Agronomico (IAC) of São Paulo State, Brazil. Released in Brazil in 2000 and brought to Costa Rica for commercial release in 2014 by the Costa Rican Coffee Institute (ICAFE). A high yielding, rust-resistant variety, with a delicate but distinct acidity profile.
MUNDO NOVO	A vigorous and productive plant, discovered in 1943, with good quality cup but susceptible to major diseases, is the result of a natural cross between the Bourbon and Typica varieties found in Minceros do Tiete, São Paulo, Brazil. High commercial importance in Brazil and other South American countries, but little used in Central America.
NEMAYA	A Robusta variety used for rootstock grafting because of its high resistance to nematodes. Arabica plants can be grafted onto Nemaya rootstock to make the plant more resistant to nematodes. Grafting Arabica onto Robusta rootstock has no negative effect on cup quality. Propagation by seeds produced in authorized fields.
TYPICA	One of the most culturally and genetically important <i>C. arabica</i> coffees in the world with high susceptibility to coffee leaf rust, well-adapted to the coldest conditions and with good cup quality. It is supposed to have originated in southwestern Ethiopia. Typica is both low yielding and highly susceptible to major coffee diseases.

### RESULTS

For the vegetative and productive results, we tested differences between thesis groups with an analysis of variance (ANOVA, with Tuckey Test, 0.05 significance).

**GROWTH DATA** (We collected data monthly, but here we reported results that arose after 4 years from grafting)

**Trunk circumference:** after 4 years from grafting, BLC grafted on Anacafé 14 shows (See Tab. 2) significantly higher trunk circumference (4,2 cm), whilst the lower circumference was performed unexpectedly by BLC grafted on Nemaya rootstock (3,5 cm). The first differences between the two rootstocks were already evident 2 years after grafting. **Average number of nodes on primary plagiotropic branch (plus its secondary branches):** BLC plants grafted on Anacafé 14 again present statistically significant results with a higher number of nodes (42,9) if compared to Nemaya rootstock (24,7). Moreover, some mortality (around 20%), occurred after grafting and in the first months after planting, especially on BLC plants on Nemaya; this could reveal some incompatibility between BLC and Nemaya. **Plant height, horizontal primary branch length and number of trunk internodes** don't show any significant difference between the thesis in all 4 years of the trial.

**YIELD DATA** (as sum of the first 2 yields - 2019-20 and 2020-21)

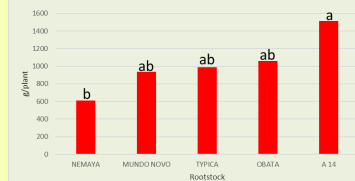
BLC plants grafted on Anacafé 14 ( 1513,4 g/tree) produced on average (see Fig.2) higher amount of coffee cherry than BLC grafted on Nemaya rootstock (608,7 g/tree). Nemaya rootstock, which could be considered as a control in this trial, being the most commonly used rootstock, performs the lower average production. The other thesis seems to have a statistically intermediate behavior between BLC grafted onto Anacafé 14 and BLC grafted onto Nemaya. **Average weight of the coffee cherry and number of empty fruits (%)** was not influenced by the rootstock variety.

Tab.2. - Average of some growth parameters of BLC variety on 5 different rootstocks, 4 years after grafting

Rootstock	Trunk circumference (cm)	Plant height (cm)	N° nodes on primary plus its secondary plagiotropic branches	Horizontal primary branches length (cm)
Anacafé 14	4,2 a	156,5 a	42,9 a	49,7 a
Nemaya	3,5 b	144,8 a	24,7 b	45,5 a
Mundo Novo	3,8 ab	151,5 a	29,8 ab	45,3 a
Obata	3,8 ab	146,6 a	33,1 ab	45,7 a
Typica	3,9 ab	138,3 a	30,6 ab	45,2 a

Means with the same letter are not significantly different from each other (P<0.05 ANOVA followed by Tuckey test)

Fig. 1 - X 2 years BLC yields average (g/plants) according to the different rootstock



### CONCLUSIONS & PERSPECTIVES

The vegetative growth results obtained 4 years after grafting are very promising, especially if we compare BLC grafted plants with BLC not grafted plants (data not reported here). The growth of the plants grafted on A14, from 2 years after grafting, have showed better performance than Nemaya thesis, especially in terms of average number of nodes on primary - plus its secondary - plagiotropic branches, and trunk circumference. The results obtained from the two first harvests, also show how BLC grafted on A14 could overcome the low productivity of this Bourbon pointu selection, especially if compared to plants grafted on Nemaya. In fact, unexpectedly, after 4 years from grafting, the BLC plants grafted on Nemaya probably have not demonstrated their potential yet or this variety does not adapt well to this rootstock (this could be the reason of some mortality after grafting). Further investigation, especially about yields, green coffee quality and cup testing are required in the next years. In the meantime, we are carrying out various agronomic trials to improve the performance of BLC, in order to make it possible to increase productivity and confirm its excellent cup quality.

### REFERENCE:

<https://www.worldagroforestrycentre.org/>  
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