Production of Plants of *Coffea canephora cv. conilon* with Conventional Fertilizer (Chemical) and Bokashi plus Effective Microorganisms

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Abstract

The work was developed from March to December 1996, with cultivar conilon 181 (*Coffea canephora*) with 50 % reduction of light. The objective was to evaluate the effect of Bokashi plus EM (Effective Microorganisms) and chemical fertilizer on the vegetative propagation of *Coffea canephora*. The EM results showed plants more vigorous and resistant to Cercospora leaf spot. The statistical analysis, by Tukey test ($p \leq 0.01$) detected significant differences relating to number of leaves (47.0 and 40.4), pairs of leaves (4.70 and 4.04), plant height (39.33cm and 28.44cm) and incidence of Cercospora coffeicola (0.21 % and 5.94 %) between treatments. Plants with Bokashi fertilizer plus EM weighed 18 g, while the others weighed an average of 13 g per plant.

Introduction

Seed propagation of *Coffea canephora cv. conilon* induces high genetic variability in relation to height, size of leaves, branch insertion, stem flexibility, shape and size of fruits, disease and insect susceptibility as well as productivity. Vegetative propagation is the usual mean to eliminate genetic variability, improving productivity and beverage quality. (Paulino, et al 1995)

The greatest impulse in the selection of conilon cultivar was initiated 1986, when the Capixaba Agribusiness Company selected matrix plants showing resistance to rust *(Hamilea vastatrix*), coffee berry disease (*Colletotrichum cofeanum*) and pests, such as the leaf miner (*Perileucoptera coffeella*) as well as a distinct maturation period and higher productivity. Among the clones, Encapa 8111, Encapa 8121 and Encapa 8131, of early, intermediate and late maturation period, respectively were outstanding and bring an average increase in productivity of 29 percent, 33 percent and 33 percent respectively (Braganca et al 1995). Espirito Santo State is the Brazilian largest coffee conilon producer, having about 480 million plants, the equivalent of 60 percent of the coffee plantation.

Verdebras – a private nursery institution selected and produced Conilon cultivars 181, 183, 302, 321, 328 and 399 responsible for 90 percent of cuttings produced in the area (Periodic Verdebras).

Since vegetative plant propagation is the key point of success of the crop, the objective of this research was to find an adequate substrate and a production system of environmentally healthy sets, which is also economical and superior to that traditionally used by growers and nurseries.

Materials and Methods

The present work was carried out from March to December 1996, in Verdebras nurseries, under 50 percent shade and adequate moisture.

Conilon 181 cuttings were induced to root in vermiculite, divided into two parts, and transplanted to polyethylene sacks able to hold one kilogram of soil. In the conventional treatment, the sacks were filled with the usual soil mixture of the nursery. In the Bokashi + EM treatment the sacks were filled with conventional soil plus Bokashi 2 percent w/w and EM 0.5 percent v/v (Higa and Wididana, 1991, Higa and Parr, 1994).

During the growth period under shade, the plants of the control treatment were fertilized with macro and micro nutrients every other week in the proportions used by the company nurseries (proportion not reported) and sprayed weekly with benomyl 0.1 per cent a.i.

In the Bokashi + EM treatment, the plants were fertilized weekly with one gram of Bokashi and sprayed with EM at 0.5 per cent v/v and both treatments were irrigated daily.

The experimental design used was a completely randomized block with 2 treatments, 10 replications and 5 plants per plot. The statistical analysis was carried out using the SANEST program Zonta and Machado (1992). The comparisons were carried out according to the Tukey test.

Four months after transplanting the pairs of leaves were counted, leaf spots per plant and average weight and height of fifteen plants were evaluated simultaneously.

Results and Discussion

The average of pair of leaves and plant height are shown in Table 1. They show that the pairs of leaves and the height of plants in the Bokashi + EM Treatment showed a better development compared to the control. Significant statistical differences were detected in pairs of leaves and height of plants by the variance analaysis and Tukey tests ($p \leq 0.01$).

The Bokashi + EM fertilization was superior to control, in average of 38 percent in height and 16 percent in pairs of leaves.

Table 1. Results of Conventional Fertilization and Bokashi + EM System in the Growth of Coffea canephora cv. conilon 181, Under Shading.

Blocks	Pairs of Leaves		Plant Height	
	Bokashi + EM	Control	Bokashi +EM	Control
1	4.60	4.60	40.00	28.90
2	4.80	4.00	38.00	29.50
3	5.40	4.00	42.50	29.00
4	4.60	4.20	38.80	28.20
5	5.40	4.00	40.60	27.20
6	5.40	4.00	42.10	31.20
7	3.80	3.40	37.50	27.50
8	4.60	4.20	34.30	28.60
9	4.20	3.80	38.70	28.40
10	4.20	4.20	40.70	25.90
Average	4.70 [a]	4.04 [b]	39.33 [a]	28.44 [b]
Increase	16 %	0	38.3 %	0

Data followed by different letters differ statistically by Tukey test ($p \leq 0.01$);
Each figure represents an average of 5 plants

According to Table 2, the average number of leaves and disease incidence in the Bokashi + EM treatment was statistically superior in leaf number and disease incidence ($p \leq 0.01$). The EM treatment produced 16 percent more pairs of leaves and 2.16 percent diseased leaves against 59.40 percent in the control.

The increase of 2,802 percent in incidence of cercosporiose in the control treatment was due to the lower vigor and higher susceptibility to disease.

Conclusions

From the results and statistical analysis we concluded that :

- The coffee plant propagation can be substantially improved replacing the chemical fertilizer by the Bokashi + EM;
- The Bokashi + EM treatment was superior in the control of leaf spot (*Cercospora coffeicola*), eliminating the fungicides in plant production;
- The total replacement of chemical fertilizers and pesticides in Conilon coffee plant production opens a possibility of using this technology in organic coffee production within a sustainable agricultural system;
- It is advisable to continue studying the Bokashi plus EM in other stages of the Conilon coffee production.

Table 2. Results of Control Fertilization and Bokashi + EM System in the Cercosporiose Control in *Coffea canephora cv. conilon* 181, under Shading.

	Treatments			
	Bokashi + EM		Control	
Blocks	Number of Leaves	Diseased Leaves	Number of Leaves	Diseased Leaves
1	46	0	46	4
2	48	0	40	3
3	54	0	40	4
4	46	0	42	3
5	54	1	40	5
6	54	0	40	0
7	38	0	34	0
8	46	0	42	1
9	42	0	38	2
10	42	0	42	2
Average	47.0[a]	1[a]	40.4[b]	24[b]
Percent	16	2.16	0	59.40
Increase	16 %	0	0	2,802 %

Data followed by different letters differ statistically by Tukey test ($p \leq 0.01$);
Each figure represents an average of 5 plants

Acknowledgements
The authors wish to thank the Verdebras enterprise and the technician for their help provided during the research, Special thanks to the Mokiti Okada Foundation for the economic support and products.

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