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Effect of bio-organic products on the control of coffee leaf rust and coffee berry borer in Villa Rica, Pasco, Peru

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INTRODUCTION

Coffee leaf rust (*Hemilia vastatrix*) and coffee berry borer (*Hypothenemus hampei*) are the main health problems affecting coffee crops worldwide and also in Peru. Coffee rust is a disease that significantly reduces yields. For example, in 2013, during the so-called "rust crisis," losses amounted to approximately 60% of the harvest, equivalent to about $290 million. The coffee berry borer is a pest that attacks the fruit or cherry. The female insect pierces the fruit and lays eggs in the endosperm. These eggs, when hatched, allow the larvae to emerge, which feed on the fruit and cause significant economic losses. In Peru, we estimate that with an 11.6% infestation rate, we would be losing approximately 30% of green coffee. These problems become even more serious when we consider that most of the cultivars used by coffee growers are susceptible to these pests. This suggests the need for a constant search for control methods, which should be implemented with environmentally friendly products that pose a low risk to humans. Bio-organic products that are associated with more sustainable production have recently been introduced to the Peruvian market.

General Objective

- ✓ This study aimed to understand the effect of bio-organic products on the control of coffee leaf rust and coffee berry borer in Villa Rica, Pasco, Peru.

Specific Objectives

- ✓ To evaluate the effect of bio-organic products on the incidence of coffee leaf rust (*Hemileia vastatrix*) in Bourbon Rojo variety in Villa Rica, Pasco, Peru.
- ✓ To evaluate the effect of bio-organic products on the infestation of coffee berry borer (*Hypothenemus hampei*) in Bourbon Rojo variety in Villa Rica, Pasco, Peru.
- ✓ To evaluate the effect of bio-organic products in yield and quality in Bourbon Rojo variety in Villa Rica, Pasco, Peru.

MATERIALS/METHODS

The study was conducted in the town of Villa Rica, Pasco, in the central Peruvian jungle, on commercial coffee plots at the “Cinco Corazones” farm. The trial was established in september 2021 on plot cultivated with the Bourbon Rojo variety and located at an altitude of 1,580 m. Four products were studied: **iQForte**, a natural extract of oligopeptides and free amino acids with fertilizing and biostimulant action; **Royano**, a microbiological consortium of *Bacillus subtilis, Lecanicillium lecanii,* and *Trichoderma harzianum*; **Metaveria Plus**, a broad-spectrum microbiological insecticide formulated from the microbial consortium of *Metarhizium anisopliae, Beauveria bassiana, Lecanicillium lecanii, Paenibacillus popilliae,* and *Bacillus thuringiensis*; and **Organikelp**, a biostimulant based on *Macrocystis pyrifera*. These products were compared with a chemical fungicide (**Opera** = Pyraclostrobin + Epoxiconazole) and an absolute control (Table 1) in a trial conducted on a Bourbon Rojo coffee plot at 1,580 meters above sea level using a completely randomized block design (6 treatments x 3 replicates). The incidence of coffee leaf rust, the level of coffee berry borer infestation, yield, and coffee quality were evaluated.

Table 1. Treatments studied in a trial with Bourbon Rojo variety at 1580 m altitude, Villa Rica, Peru.

Treatments	Description	Numbers Aplications
T1	Without sanitary treatment (Absolute witness)	0
T2	Regular nutritional management + health treatment Opera (2‰) + Opera (2‰) + Opera (2‰)	3
T3	iQForte (2.0 L/ha) + Royano (5.0 ml/L) + Metaveria Plus (3.5 ml/L in the 1st and 2nd application) + Metaveria Plus (5.0 ml/L in the 3rd, 4th, and 5th application)	5
T4	iQForte (2.0 L/ha) + 50% Regular Fertilization	5
T5	Organikelp (20 ml/L).	5
T6	iQForte (2.0 L/ ha) + Organikelp (20 ml/L)	5

RESULTADS/DISCUSSION

The results showed that the incidence of *H. vastatrix* varied throughout the study period. Initial incidence levels were high, but decreased in December 2021. Beginning in the fifth month of evaluation, an increasing trend in the disease was observed, and the incidence increased until the end of the study. In this plot, the behavior pattern of rust in treatments with biological products (T3, T4, T5, and T6) is also very similar to the control (T1). Meanwhile, the disease curve graphed for treatment with a chemical fungicide (T2) is very different from the others and shows that the product's effectiveness is lost over time. Three applications of the fungicide, even with systemic action, are insufficient and do not protect the plant until the end of the campaign. At the end of the trial, after harvest, the incidence decreased in all treatments (Table 2).

Table 2. Incidence monthly (%) of *H. vastatrix*

Treatments	09/2021	10/2021	11/2021	12/2021	01/2002	02/2022	03/2022	04/2022	05/2022	06/2002	07/2022	08/2002
T1	62.2 a	61.2 a	49.7 a	41.0 a	69.3 a	71.8 a	81.0 a	72.7 a	71.8 a	66.2 a	67.8 b	39.3 ab
T2	72.5 a	55.5 a	31.4 a	14.1 b	14.4 c	17.4 b	15.6 b	23.2 b	49.3 a	63.4 a	73.6 b	54.4 a
T3	57.7 a	51.4 a	41.5 a	38.4 a	38.3 b	53.2 ab	64.4 a	63.6 a	59.8 a	70.9 a	68.2 b	36.7 ab
T4	72.2 a	58.0 a	47.1 a	40.5 a	60.5 ab	53.4 ab	61.4 a	70.9 a	64.3 a	65.9 a	73.7 b	23.1 b
T5	65.1 a	62.4 a	40.2 a	23.8 ab	37.8 bc	47.9 ab	62.6 a	62.6 a	57.0 a	70.6 a	68.4 b	29.3 ab
T6	63.6 a	51.4 a	38.0 a	32.4 ab	54.8 ab	50.4 ab	68.8 a	64.8 a	71.5 a	76.1 a	83.9 a	42.5 ab

When evaluating the effect of treatments on *H. hampei*, no statistically significant differences were reported in any of the evaluations. In may/2022, the highest infestation level corresponded to T3 and the lowest to T5, but all treatments were statistically similar. In the first evaluation in June/2022, the highest infestation level was in T6 and the lowest in the control; all treatments were statistically similar. In the second evaluation in June/2022, the highest infestation level again corresponded to T3 and the lowest to T4, but the differences between treatments were not statistically significant (Table 3). The highest value for cherry coffee corresponded to the control, followed by T5, but no statistically significant differences were found between treatments for this variable. In the case of dry parchment coffee, the results had the same trend, that is, the highest value corresponded to the control, followed by T5, but no statistically significant differences were found between treatments for this variable (Table 4). Physical quality (export yield), did not vary much between treatments. Its highest value was in T4, which was statistically similar to most treatments, with the exception of T1. The latter had the lowest value and was statistically similar to T2. Cup quality (organoleptic quality), also did not vary much between treatments. Its highest value was at T1 = T2 and its lowest at T4, but all treatments were statistically similar (Table 4).

Table 3. Infestation (%) of *H. hampei*

Treatments	I (%) 19. may/2022	I (%) 03. june/2022	I (%) 21. june/2022
T1	2.0 a	0.0 a	0.7 a
T2	1.7 a	2.0 a	1.0 a
T3	6.0 a	2.3 a	2.0 a
T4	2.3 a	0.7 a	0.0 a
T5	0.3 a	1.0 a	0.3 a
T6	2.7 a	4.0 a	1.7 a

Table 4. Yield and quality of Bourbon Rojo

Treatments	Cherry Coffee (Kg/pl)	Parchment Coffee (Kg/pl)	Physical Quality (%)	Cup Quality (Score)
T1	3.8 a	0.78 a	75.8 b	83.2 a
T2	2.9 a	0.59 a	77.7 ab	83.2 a
T3	2.6 a	0.54 a	78.1 a	83.1 a
T4	2.6 a	0.54 a	79.4 a	82.8 a
T5	3.0 a	0.61 a	78.9 a	82.9 a
T6	2.5 a	0.51 a	78.3 a	82.9 a

CONCLUSION

- ✓ The treatments reduced the incidence of rust compared to the control; however, this decrease was not statistically significant. Regarding the berry borer, they did not reduce the level of infestation, and the values obtained were not statistically different from the control. The treatments did not have a positive effect on the yield of cherry and parchment coffee. Physical quality improved slightly, but this was not statistically significant. There was no positive effect on the organoleptic quality of the coffee.

REFERENCES

- ✓ Hernández, Ch. et al., 2021. BioTecnología 25 (1): 21-30.
- ✓ Rivillas, A. 2015. Manejo agroecológico de la roya del café. FAO. 96 pp.