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Evaluation of the use of alternative control methods of coffee tree diseases in the tropical Amazon

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Abstract

The present study aimed to evaluate the effect of alternative products on the control of coffee brown-eye spot and coffee rust. The experiment was carried out in two conilon coffee plantations, in the following agroforestry system models: a) continuous system (SM-1) and b) mixed system (SC-2). The following treatments were used: i) aqueous plant extract of *Himatanthus sucuuba* (2%) - SUC, ii) Bordeaux mixture (2%) - CB and iii) control (water). Four monthly samplings of the temporal progress of the diseases were carried out, during the period from October/2019 to January/2020, evaluating the symptoms in three leaves per plant, one from each of the upper, middle and lower thirds of the plant. Incidence percentages were determined according to the number of leaves with symptoms in relation to the total number of leaves sampled. In order to estimate severity, diagrammatic scales were used for each disease evaluated. The obtained data were submitted to routine statistical analysis in R programming with a significance of 5%. Interaction effects were not significant according to the ANOVA test. Significant differences were observed among the treatments studied for the two diseases with the following results: percent reduction of rust incidence: (SUC - 50%, CB - 80% and TEST - 95%) and percent reduction of brown-eye spot: (SUC - 30%, CB - 60 % and TEST - 80%). SUC treatment was more effective in reducing disease severity with the following results: (SUC - 0.26%, CB - 0.40% and TEST - 0.83%) and (SUC - 0.35%, CB - 0.41% and TEST - 0.99%) for rust and brown-eye spot diseases, respectively. The treatment (SUC) proved to be a promising alternative product for the management of brown-eye spot and rust diseases.

Keywords: Amazon, *Cercospora coffeicola*, *Coffea canephora, Hemileia vastatrix*.
Abbreviations: SM-1_Continuous Agroforestry System; SC-2_Mixed Agroforestry System; SUC_Aqueous plant extract of *Himatanthus sucuuba*; CB_Bordeaux mixture; TEST_control (water).

Introduction

The adoption of new agricultural practices in the Amazon region is essential for the establishment of improved agrarian models for the environment (Arvor et al., 2017). In the state of Amazonas, Brazil, especially in its southern region, many of the coffee crops are concentrated in agroforestry systems, consisting predominantly of the species *Coffea canephora* Pierre ex. A. Froehner. In recent years, this species has spread throughout the region, due to the influence exerted by the neighboring state of Rondônia, which accounts for 97% of the total coffee production in the northern region, which currently corresponds to 14% of the national production of Robusta coffee (Conab, 2020).
Southern Amazonas is located in a geographic area known in Brazil as the “arc of deforestation” which includes a variety of land uses (Silva et al., 2021). In this region, due to deforestation associated with agricultural activity, there are fragmented areas with native vegetation that are also associated with agroforestry systems; these areas include exotic agricultural species, such as coffee, alongside endemic plants used for food (Botelho et al., 2021). In this context, coffee is an exotic species that is highly adaptable to the conditions of the Amazon environment, enabling the reconciliation of agricultural and environmental objectives (Piato et al., 2021). As a shrub species that is native to African forests, coffee is a suitable plant for agroforestry systems in the Amazon. Normally, these crop systems are made up of essential ecosystem services that reconcile agricultural production, maintenance of forest areas and soil conservation, factors that converge to generate environmental, socioeconomic and cultural sustainability (Botelho et al, 2021; Macdicken and Vergara 1990).
Currently, the coffee-growing scenario in the Brazilian Amazon is dependent on one of three realities: *i*) technical improvements, through agroecological management practices; *ii*) evaluations of genetically improved varieties and *iii*) abandonment of orchards, which consequently

results in low productivity; this is due, in part, to the high rates of disease in unregulated crops (Conab, 2020). Many of these diseases have shown enough destructive potential to make coffee production and productivity unfeasible, including in the State of Amazonas, where the environment differs significantly from other coffee-producing regions throughout the country (Júnior and Fernandes, 2015).
According to Júnior and Fernandes (2015), among the main diseases that affect coffee plantations in the Amazon, rust (*Hemileia vastatrix* Berk et Br.) and brown-eye spot (*Cercospora coffeicola* Berk. & Cooke) stand out. Carvalho et al., 2002, assert that some fungicides containing active compounds such as Mancozeb, Chlorothalonil, and Tebuconazole are recommended for the control of these diseases. These products are classified as moderately or highly toxic making it necessary to evaluate the possibility of using alternative products for phytosanitary control purposes with a lesser negative impact on the environment. This is especially relevant to the Amazon region, whose tropical forests contain the greatest biodiversity on the planet. This biological diversity provides interesting ecological services for agroecological management, including native plant species with great antimicrobial potential (Suffredini et al., 2006).
Recently, new discussions have arisen regarding the use of alternative methods to control plant diseases, mainly promoting the search for new protection measures. In this context, the use of alternative products for biological control has emerged with promising potential for the management of plant diseases, contributing to reducing the excessive use of synthetic fungicides, as well as favoring ecological interactions and socio-environmental adaptations. The efficacy of using alternative methods to control phytopathogens has been observed in several experimental studies (Costa et al., 2007; Pereira, 2008; Reis et al., 2007; Santos et al., 2013).
In this sense, this study seeks to contribute to biotechnological advances aimed at the creation of alternative phytosanitary management programs for coffee plantations in the Amazon, considering the socio-environmental characteristics present in the region. Thus, this study sought to evaluate the effect of a variety of alternative products on disease control in productive plantations of Robusta *C. canephora* coffee, under two different agroforestry production systems in the Brazilian Amazon.

Results and discussion

No significant interactions were found by Fisher's test for any of the data (Table 2). However, significant differences were detected between treatments by month. This may have occurred due to the non-normality of the model residuals (Shapiro-test; p-value < 0.01).
There was no significant difference in the incidence and severity percentages of *C. coffeicola* and *H. vastatrix* among coffee crops grown in different agroforestry production systems, namely SM-1: Continuous Agroforestry System and SC-2: Mixed Agroforestry System (Table 3). It should be noted that although there was no significant difference in disease intensity between the two different environments studied, there was an elevated mean percentage of disease incidence and severity (Table 3). *C. coffeicola* presented a maximum incidence level of 95% and a minimum incidence level of 82.5% in SC-2 and SM-1 crops, respectively. Similar maximum and minimum incidence levels of *H. vastatrix* rust (87.5%) were observed in both types of coffee crops (Table 3).
The high incidence and severity percentages of *C. coffeicola* and *H. vastatrix* in both SM-1 and SC-2 coffee crops are linked to the climatological conditions present in the Amazon region and, above all, are due to the absence of appropriate management practices (phytosanitary, nutritional, and cultural) in the evaluated coffee plantations (Table 3). According to Júnior and Fernandes (2015), the climatic conditions present in the Amazon region are, for most of the year, extremely favorable to the incidence, dissemination, and survival of pathogens, generally resulting in high levels of incidence and severity of these respective diseases (Tables 4, 5, 6 and 7) (Figures 2 and 3).
The climatic conditions in the study region showed large amounts of rainfall, with an average monthly value of (199 mm). Consequently, monthly values of relative air humidity were observed as varying between 80.26% and 83.48%. Linked to this climatological factor, monthly minimum and maximum temperature rates varied between 26.35 C° and 26.71 C° during the evaluation period (Figures 2 and 3). According to Júnior and Fernandes (2015), brown-eye spot is mainly favored by high humidity and temperatures between 25ºC and 30ºC. On the other hand, climatic conditions with average temperatures ranging between 21.6°C and 23.6°C with leaf wetness associated with high relative humidity (> 80%) favor the temporal progress of *H. vastatrix* (Zambolim, 2015). These conditions corroborate the climatological data presented in (Figures 2 and 3).
Regarding the incidence of *H. vastatrix* rust, a significant difference was observed between the treatments: a) aqueous vegetable extract of sucuuba, SUC (*H. sucuuba*) and b) Bordeaux mixture – CB. This difference was noticeable at the beginning of the evaluation, soon after the foliar spraying procedure (1st sampling/October (p-value < 0.01). The treatment (SUC) considerably reduced incidence percentages in relation to the other treatments studied, with the following values observed among treatment groups: SUC=50%, CB=80% and TEST= 95% (Table 4). The treatment (SUC) produced a similar reduction in the incidence percentage of *C. coffeicola* brown-eye spot. For this disease, application of the alternative product produced a significant difference compared to the other treatments, observing the following values among treatment groups: SUC= 30%, CB= 60% and TEST= 80% (Table 5).
It is interesting to note the effectiveness of the treatment (SUC) on rust and brown-eye spot, with a clear reduction in incidence levels in the initial assessments: 1st assessment/October and 2nd assessment/November, being significantly lower in relation to other treatments (CB) and (TEST) (Tables 4 and 5). However, beginning with the third (3rd evaluation/December), disease incidence in the treatment group (SUC) progressively increased again. It is likely that successive applications of the alternative product will be necessary in order to maintain low percentages of pathogenic incidence and severity in coffee plantations.
It was observed that the treatment (SUC) provided the lowest severity percentage of *H. vastatrix* and *C. coffeicola* when correlated with the control (TEST) (p-value < 0.01). Specifically, for the severity of rust, lower mean values were found in the SUC treatment = 0.26% than in both the CB and TEST treatments at 0.40%, 0.83%, respectively (Table 6).

Table 1. Characterization of the different agroforestry systems studied: continuous (SM-1) and mixed (SC-2), located in Vicinal do Alto Crato, in the municipality of Humaitá, Amazonas.

SAF	System Type	Topography	Primary production	Tree planting design	Age (years)
SM-1	Continuous agroforestry system	Flat	Coffee	Regular to scattered	7
SC-2	Mixed agroforestry system	Undulated and flat	Coffee, açaí and cupuaçu	Scattered	15

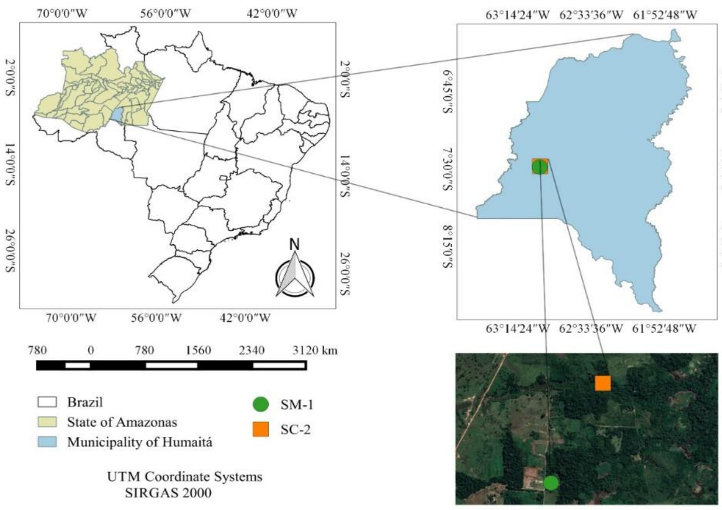

Fig 1. Location of the two coffee farms studied: Continuous agroforestry system (SM-1) and Mixed agroforestry system (SC-2), located in Vicinal do Alto Crato, in the municipality of Humaitá, Amazonas.

Table 2. Interaction effect p-values from Fisher's Three-way ANOVA test for incidence and severity of Brown-eye spot and Coffee leaf rust.

	Incidence of Brown-eye spot	Incidence of coffe leaf rust	Severity of Brown-eye spot	Severity of coffe leaf rust
Treatment (T)	< 0.01	< 0.01	< 0.01	< 0.01
Month (M)	0.04	0.49	0.61	0.35
System (S)	0.09	1.00	0.11	0.69
T x M	0.95	0.74	0.81	0.28
T x S	0.98	0.57	0.83	0.52
M x S	0.08	0.47	0.35	0.87
T x M x S	0.99	0.43	0.50	0.99

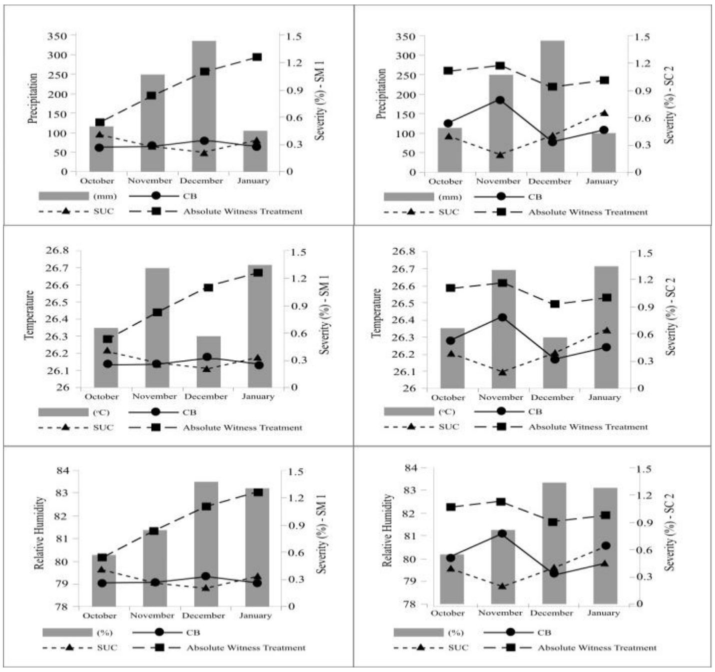

Fig 2. Effect of foliar spraying of alternative products (CB= Bordeaux Mixture, SUC= Aqueous plant extract of sucuuba and control) on the severity of brown-eye spot (*C. coffeicola*) in Robusta coffee plantations under different agroforestry systems: A - (Plantation 1) continuous agroforestry system – SM 1 and B - (Plantation 2) mixed agroforestry system – SC 2, in the municipality of Humaitá/AM, Brazil. Climatological variables: (mm) precipitation, (°C) temperature and (%) relative humidity.

Table 3. Incidence and severity of Brown-eye spot and Coffee leaf rust in different agroforestry production systems **A** - (Plantation 1) continuous agroforestry system SM-1 and **B** - (Plantation 2) mixed agroforestry system SC-2, in the municipality of Humaitá/AM, Brazil.

	Incidence (%)			Severity (%)		
	SM-1	SC-2	p-value	SM-1	SC-2	p-value
Brown-eye spot	82.5	95	0.09	0.93	1.05	0.11
Coffee leaf rust	87.5	87.5	1.00	0.83	0.82	0.69

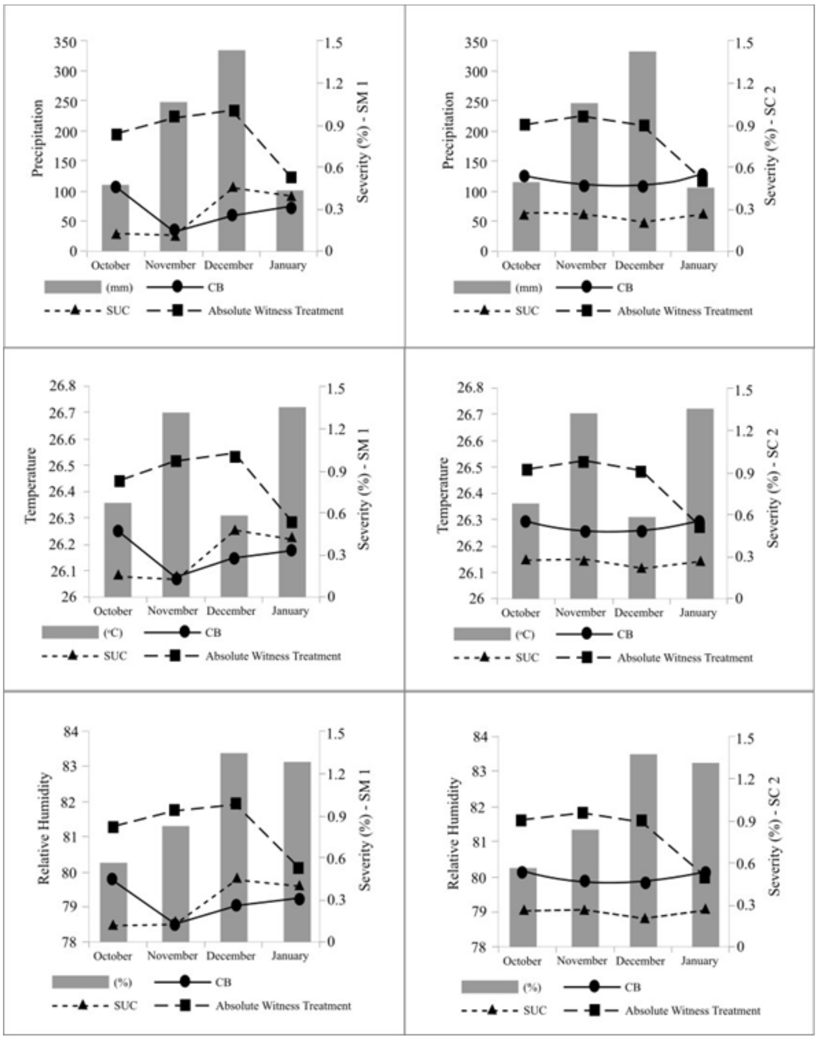

Fig 3. Effects of spraying alternative products (CB= Bordeaux Mixture, SUC= Aqueous plant extract of sucuuba and control) on the severity of rust (*H. vastatrix*) in Robusta coffee plantations in different agroforestry systems: A - (Plantation 1) continuous agroforestry system – SM 1 and B - (Plantation 2) mixed agroforestry system – SC 2, in the municipality of Humaitá/AM, Brazil. Climatological variables: (mm) precipitation, (°C) temperature and (%) relative humidity.

Table 4. Effect of foliar-sprayed products (CB = Bordeaux Mixture, SUC = Aqueous plant extract of sucuuba and control) in the alternative control of the incidence of *H. vastatrix* rust in Robusta coffee (*C. canephora*) crops conducted in agroforestry systems, in the municipality of Humaitá/AM, Brazil.

	SUC (%)	CB (%)	Control (%)	p-value
1st sampling October/2019	50 b*	80 a	95 a	0.01
2nd sampling November/2019	50	60	85	0.11
3rd sampling December/2019	80	70	90	0.41
4th sampling January/2020	60	70	80	0.52
p-value	0.50	0.83	0.53	

*Means followed by the same letter in the row do not differ based on the Scott-Knott test (5%).

Table 5. Effect of foliar-sprayed products (CB = Bordeaux Mixture, SUC = Aqueous plant extract of sucuuba and control) in the alternative control of the incidence of brown-eye spot *C. coffeicola* in Robusta (*C. canephora*) coffee plantations in agroforestry systems, in the municipality of Humaitá/AM, Brazil.

	SUC (%)	CB (%)	Control (%)	p-value
1st sampling October/2019	50	50	80	0.15
2nd sampling November/2019	30 b*	60 a	80 a	0.02
3rd sampling December/2019	60 b	70 b	95 a	0.05
4th sampling January/2020	60 b	80 b	100 a	0.01
p-value	0.52	0.56	0.09	

*Means followed by the same letter in the row do not differ based on the Scott-Knott test (5%).

Table 6. Effect of foliar-sprayed products (CB = Bordeaux Mixture, SUC = Aqueous plant extract of sucuuba and control) on the alternative control of the severity of *H. vastatrix* rust in Robusta (*C. canephora*) coffee crops conducted in agroforestry systems, in the municipality of Humaitá/AM, Brazil.

	SUC (%)	CB (%)	Control (%)	p-value
1st sampling October/2019	0.20 b*	0.50 b	0.87 a	0.01
2nd sampling November/2019	0.20 b	0.30 b	0.97 a	< 0.01
3rd sampling December/2019	0.33 b	0.37 b	0.95 a	0.01
4th sampling January/2020	0.33	0.43	0.52	0.53
p-value	0.60	0.71	0.10	

*Means followed by the same letter in the row do not differ based on the Scott-Knott test (5%).

Table 7. Effect of foliar-sprayed products (CB = Bordeaux Mixture, SUC = Aqueous plant extract of sucuuba and control) in the alternative control of the severity of brown-eye spot *C. coffeicola* in Robusta coffee (*C. canephora*) crops conducted in agroforestry systems, in the municipality of Humaitá/AM, Brazil.

	SUC (%)	CB (%)	Control (%)	p-value
1st sampling October/2019	0.40	0.40	0.82	0.08
2nd sampling November/2019	0.23 b*	0.53 b	1.00 a	0.01
3rd sampling December/2019	0.30 b	0.33 b	1.02 a	< 0.01
4th sampling January/2020	0.50 b	0.37 b	1.13 a	< 0.01
p-value	0.47	0.78	0.57	

*Means followed by the same letter in the row do not differ based on the Scott-Knott test (5%).

Similar results were observed for the alternative control of *C. coffeicola* using the SUC treatment. Plants treated (sprayed) with SUC exhibited lower mean percentages of severity, equivalent to 0.35%. For the other treatments CB and TEST, the percentage values were 0.41% and 0.99%, respectively (Table 7). The results presented demonstrate, in an unprecedented way, the antifungal effect of the aqueous plant extract of sucuuba, SUC (*H. sucuuba*), on the phytopathogens *H. vastatrix* and *C. Coffeicola*.
The efficacy of the aqueous plant extract of sucuuba (*H. sucuuba*), SUC, is related to a diversity of secondary metabolites present predominantly in the soluble fraction of the species (*H. sucuuba*), which can act as chemical signals, inducing the defense responses of plants against phytopathogens and other external agents (Luz et al., 2014; Rebouças et al., 2012; Ricardo, 2011, Sprenger et al., 2016). According to Rebouças et al., 2012, several phenolic substances are found in the chemical composition of the species (*H. sucuuba*) such as gallic acid, catechol, quercitrin and myricetrin. According to studies carried out by Pascholati and Leite (1994), the presence of phenolic compounds in soluble fractions can be constituted as defense components against external factors, such as harmful phytopathogens.
The presence of secondary metabolites has been commonly observed in phytochemical studies with plants of the genus *Himatanthus* sp., usually presenting metabolites such as: alkaloids, phenols, triterpenes, tannins, steroids, flavonoids, iridoids fulvoplumerin, plumericin and isoplumericin in their composition (De Miranda et al., 2000; Sequeira et al., 2009; Sprenger et al., 2016; Wood et al., 2001). Many of these metabolites are associated with plant defense, presenting antifungal potential, and their efficacy has been proven in several studies (Elizabetsky and Castilhos, 1990; Fakhrudin et al., 2014; Ricardo, 2011; Silva et al., 2007; Sprenger et al., 2016). This information corroborates the results presented in this study, showing the positive effect of the aqueous plant extract of sucuuba (*H. sucuuba*), SUC, in reducing the progress of the respective diseases in coffee crops (Tables 4, 5, 6 and 7).
Many of the secondary metabolites found in the soluble fraction of specimens of the genus *Himatanthus* and of the

species *H. sucuuba*, such as phenols and flavonoids, have antipathogenic activity and are commonly associated with plant defense against external factors (Ricardo, 2011). All these characteristics confirm and prove the antifungal effect of the aqueous plant extract of *H. sucuuba* on the development of the phytopathogens *H. vastatrix* and *C. Coffeicola* under field conditions in coffee plantations, as shown in (Tables 4, 5, 6 and 7). Thus, considering the diversity of secondary metabolites and the aforementioned inhibitory effects of these compounds on the soluble fraction of (*H. sucuuba*), the unprecedented and promising results obtained regarding the fight against coffee diseases are evidenced (Tables 3, 4, 5, 6 and 7).

Material and methods

Characterization of the experimental area

The experiment was conducted during the 2019/2020 agricultural year in two plantations of conilon *C. canephora* coffee in different agroforestry production systems with the following characteristics: no irrigation, arranged in 3.0 x 4.0 m spacing, approximately 7 years old, located in the Alto Crato district in the municipality of Humaitá-AM. This municipality is located on the left bank of the Madeira River, a tributary of the right bank of the Amazon River, about 200 km from Porto Velho, Rondônia and 675 km from Manaus, Amazonas, as measured along the BR-319 highway. The coffee crops are located at the following geographic coordinates: plantation 1: Continuous Agroforestry System - **(SM-1)** 07°28'40.62" S and 63º02'28.30" W and plantation 2: Mixed Agroforestry System - **(SC-2)** 07°28'14.70"S and 63°02'15.40"W (Figure 1).

The climate in this region is of the "AM" type, according to Köppen, and the annual rainfall varies between 2250 and 2750 mm. The rainy period occurs from October through March and the dry period between June and August; the remaining months are considered a transition period (Vidotto et al., 2007). The average annual temperature varies between 24°C and 26°C, the relative humidity is quite high, ranging from 85 to 90%, and the average altitude is 90 meters above sea level.

Typology of agroforestry systems

The agroforestry systems studied were of the Silviagricultural type, with two types of systems used: continuous and mixed. This typology is based on the spatial arrangements of the plants, considering the way they are arranged in the area (Senar, 2017). Both systems are located in the Crato River basin, a tributary of the Madeira River. In general, this is an environment characterized by different types of land use and occupation, such as forest fragments - areas identified with dense native tree vegetation (Dense Ombrophilous Forest), grasses - areas occupied by dense or sparse herbaceous vegetation (pasture or natural field), rivers, dams and wetlands (Santos et al., 2020).

The two SAFs differ in their compositions (Table 1). The Continuous Agroforestry System - (SM-1) consists of the cultivation of conilon coffee (C*. canephora*), as the main species of production, in 4x3m spacing, and secondary species such as peach palm (*Bactris gasipaes* Kunth, Palmae), tucumã (*Astrocaryum aculeatum* Meyer), ingá - vine (*Inga edulis* Martius), annatto (*Bixa orellana* L.), cassava (*Manihot esculenta* Crantz) and bananas (*Musa* spp.), randomly distributed throughout the area. The topography of the SM-1 system is characterized by a flat relief with few undulations.

The Mixed Agroforestry System - (SC-2) consists of a mixture of components, without cultivation of a main species, and is planted with no spacing pattern (Table 1). The area includes planting of conilon coffee (*C. canephora*), açaí (*Euterpe oleracea* Mart.) and cupuaçu (*Theobroma grandiflorum* Schum.), with maximum use of the horizontal and vertical space of the area and purposeful densification to explore the different plant species cultivated therein. The topography of the SC-2 system is characterized by a relief that varies from undulated to flat, ending in a valley of variable width with the presence of a stream.

Description of treatments

The treatments used were **1.** an aqueous plant extract of *Himatanthus sucuuba* (Spruce ex Mull. Arg.) Woodson, Apocynaceae, at a concentration of 2% – (SUC), **2.** Bordeaux mixture, at a concentration of 2% – (CB) and **3.** control (water) - (TEST). In order to produce the Bordeaux mixture, a plastic bucket was used with (10) liters of water; 200 grams of copper sulfate were dissolved in a cloth bag and immersed in the bucket for 24 hours. In another 20-liter bucket, 200 grams of quicklime were slowly added to the water and then stirred for 30 minutes until a thin paste formed. Then, 10 liters of copper sulfate solution were poured into the container with the quicklime solution; the mixture was subsequently stirred for 15 minutes with a wooden spoon. An acidity test performed with pH indicator tape showed a pH of 7, which is considered an ideal value for use.

In order to obtain an aqueous plant extract of *H. sucuuba*, 400 grams of dry powdered *H. sucuuba* leaves and stem bark were prepared with 20,000 ml of distilled water, in a 4-step procedure: ***i)*** 400 grams of dry matter (powder) of *H. sucuuba* previously ground in a blender; ***ii)*** mixed into 20,000 ml of distilled water, infused in a water bath (60 °C) for 72 hours that was properly sealed and protected from light; ***iii)*** after this period, it was removed from the water bath, and the material was maintained in a properly sealed infusion at room temperature for another 48 hours; ***iv)*** finally, the material was filtered and deposited into plastic buckets.

Pulverization methods

Leaf spraying was carried out on (02) two experimental coffee crops in September/2019. The sprays were applied to (40) plants for each of the treatments, considering boundaries and an average distance of 15m between plants to avoid product drift and interference between treatments. Applications were carried out in the early morning (8:00 AM), obtaining full leaf wetness; this same methodology was used for all treatments. A 20-liter agricultural coastal sprayer with a cone-type nozzle (Carneiro) was used to apply the alternative products. Between sprays, water containing neutral detergent was used to clean the sprayer, for a total of three successive washes.

Data collection

After 15 days of applying the alternative products with *H. sucuuba* – (SUC) and Bordeaux mixture – (CB) to the two experimental coffee crops, (04) four samplings were carried out during the period between October/2019 and January/2020. A completely randomized design was used, with a lottery drawing of (10) coffee plants monthly from each treatment group from which to obtain data on the incidence and severity of the diseases. Analysis of the severity of rust and brown-eye spot diseases was performed by sampling the plagiotropic branches, collecting three leaves per coffee plant in the following respective areas: upper third, middle third and lower third, in order to carry out comparative studies of the effect of the applied alternative products.

Severity levels of *H. vastatrix* rust and *C. coffeicola* brown-eye spot were determined with the aid of diagrammatic scales specific for each disease. The incidence percentage was determined according to the number of leaves with symptoms in relation to the total number of collected leaves. The diagrammatic scale proposed by (Oliveira et al., 2001) was used to assess the severity of the brown-eye spot disease *C. coffeicola*, and the diagrammatic scale proposed by (Cunha et al., 2001) was used to estimate the severity of the rust disease *H. vastatrix*.

Source of climatological

The climatological information used was obtained from the meteorological station for automatic surface observation of the National Institute of Meteorology - INMET, located at the Federal Institute of Amazonas - IFAM (7.55° S, 63.07° W, 54 m) in the municipality of Humaitá, Amazonas. Data from the following climatological variables were used: temperature (°C), precipitation (mm) and relative air humidity (%).

Statistical analysis

Initially, in order to evaluate the interactive effects of treatment x month x system, these variables were assessed using Fisher's Three-Way Analysis of Variance and the Scott-Knott post-hoc test to calculate the differences among averages. The p-value was set at 0.05. Since Fisher's test detected no interaction, we chose to perform comparisons among the treatments by month and among treatments by system. Normal distribution of all data was verified using the Shapiro-Wilk test. Statistical analysis was performed using R Studio software v.3.6.0 (R Core Team, 2019).

Conclusion

In conclusion, the use of the aqueous plant extract of sucuuba (*H. sucuuba*) stands out as a less aggressive alternative for the environment, and a promising one for the management of coffee diseases. In this context, it can be considered, from an alternative and sustainable point of view, as having inhibitory antifungal potential against the development of the phytopathogens *C. coffeicola* and *H. vastatrix*, under field conditions, especially in the Amazonian agroforestry system. In this scenario, the implementation and development of the use of the aqueous plant extract of sucuuba (*H. sucuuba*) represents a promising alternative mainly due to the low amounts of toxicity exhibited by its phytochemical composition, low cost of implementation and the fact that it is readily available in this part of the country. Investigations aimed at discovering sustainable alternatives to synthetic fungicides against coffee diseases in the Amazon region are highly desirable, considering that the Brazilian Amazon has some of the greatest plant biodiversity in the world.

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