Minireview Article

Cupuaçu (Theobroma grandiflorum) culture: main pests of economic damage

ABSTRACT

Introduction: The cupuaçu tree (Theobroma grandiflorum) is one of the most important native fruit trees in the Amazon region, standing out as an economic alternative for small and medium producers.

Aims: The objective of this work is to make a brief literature review about the main pests that act in the cupuaçu culture.

Literature Review: The cupuaçu fruit borer (Conotrachelus humeropictus) has been the worst pest of the crop. The larva of this insect develops inside the fruit and then goes to the ground, where the pupa period passes, and then the adults emerge. Farmers who are dedicated to the cultivation of cupuassu trees recognize the importance of new technologies that can help control pests as a way to avoid significant losses of crops. However, they usually face a lack of information or efficient control methods for the fruit borer.

Keywords: Cupuaçu, selection, genetics, diseases, witches broom.

1. INTRODUCTION

The cupuassu tree (Theobroma grandiflorum (Willd. ex Spreng.) Schum) is characterized as a perennial species native to the Amazon region. The first commercial planting of the crop only began in the late 1970s, in the municipality of Tomé-Açu. Until then, all production was extractive or came from backyards, and consumption was strictly regional [1].

The State of Pará is the largest cupuaçu producer in the country. According to SEDAP/PA (Secretary of Agricultural Development and Fisheries of Pará) [2], the crop has an area of 11.204 ha planted, of which it is estimated that 9,738 ha is the area in production, whose fruit production corresponds at 29,558 t, with an average productivity of 3,111 kg ha-1 [2] and Amazonas with 5,775 ha-1 [3] of the planted area. The tendency of the cupuassu tree crop is for expansion, with the use of more productive cultivars and with resistance to the witches broom disease. During the last three decades, the cupuaçu culture stands out as an important economic alternative for small and medium rural producers in the Amazon [3].

According to [4], until the 1970s, all cupuaçu production came from extractivism. Currently, it basically comes from commercial plantations, estimated at more than 20,000 ha, distributed in Pará, Amazonas, Rondônia and Acre. In Amazonas, cupuaçu ranks fourth in planted area of permanent crops (5,536 ha), 85% of this area is in production (4,657 ha) and in permanent crops, it is among the ten with the best average price to the producer. It makes

up the list of products whose production is relevant at the regional level, along with açaí (Euterpe oleracea), peach palm (Bactris gasipaes) and soursop (Annona muricata) [3].
Among the strategies to resolve the obstacles in the cupuazu tree production chain is the control of the fruit borer (Conotrachelus humeropictus), a pest with the highest occurrence 18 in cupuazu trees in Amazonian cultivation areas and which causes serious economic damage to plantations in cases of intense attack [5, 6].

Although the population of insects present in the cupuazu tree is numerous, few species are considered as pests, causing economic damage, and there are also beneficial species such as predators and pollinators [7, 8].

Among the pests mentioned in the cupuaçeiro culture, the fruit borer, an insect belonging to the genus Conotrachelus (Coleoptera, Curculionidae), is the most important nowadays, due to the damage caused by the larvae, which feed on the seeds and build galleries in the interior of the fruits, and because it is widespread in some States of the North region, mainly in Rondonia and Amazonas, and in Pará and Acre the insect is not so frequent [9].

From this, the objective of this work is to carry out a literature review on the main pests of the cupuaçu culture.

2. LITERARY REVIEW

2.1 Cupuaçu crop pests

Studies that prove the presence of insect populations considered as pests in the cupuacuzeiro crop in the Brazilian Amazon are still unsatisfactory [10]. It is known that this presence is high but does not always cause economic damage [11]. This small brown-colored beetle that lays its eggs in the pods of the still-developing fruit has caused a lot of damage to cupuaçu plantations. The larvae that hatch penetrates the fruit and contaminate the pulp; after its exit, it is possible to identify open holes, which allows the identification of the attacked fruit [12].

In addition to Broca dos Frutas, many works highlight other pests that directly and indirectly affect the cupuassu tree culture, such as Broca dos ramos, Broca do brota and Leaf lace caterpillar.

2.1.1 Cupuaçu Branch Drill

Among the Lepidoptera considered to be pests of the cupuassu tree, the Magulacra nigripennata Dognin (Lepidoptera: Cossidae), popularly known as terminal branch drill, flamenguist caterpillar or branch drill, is one of the relevant species economic.

In commercial plantations, signs of pest attack are visible to the naked eye, being dry or broken branches, yellowing and/or dead leaves. There is usually the presence of feces, close to the caterpillars entry hole. In high infestations, the branchborer causes significant damage and a marked decrease in production [13, 14].

To check the level of infestation, it is suggested to carry out monthly monitoring in the planting, with walking and inspection of 100 plants per hectare. Plants that present branches with perforations, dry and with the presence of yellowish or completely dry leaves must be counted. To confirm the causal agent (caterpillar), some branches of the plants must be removed and opened with the aid of a machete (patchwork), cut in the longitudinal direction. Usually, there is only one caterpillar per branch attacked.

The caterpillar has a length of 4 cm to 5 cm and has transverse dark brown bands interspersed with yellowish-white bands. The head, ventral and last abdominal segments are reddish [13].

During their feeding, the caterpillars perforate and open galleries (Fig 1.A and Fig 1.B) inside the branches and trunks of the plants, causing ringing (Fig1.C) and hindering the passage of water, nutrients, and sap. Near the final stage of development, the caterpillars open a gallery transversal to the branches and puff up near the exit hole [14]. The attack of this insect leads to drying and death of branches, causing considerable damage to production.

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Ants are opportunistic predators and act as natural enemies of M. nigripennata in cupuaçu plantations in the Amazon [15]. However, after detecting the pest at planting, the most recommended method is the removal and burning of the infested branches [13]. Experimentally, spraying with insecticide based on Bacillus thuringiensis Berlinier was carried out to control the borer, with good results [16,13]

An infestation level of 36% was observed in commercial cupuaçu plantations in the district of Nova California, RO [17]. Although not measured, economic losses reached 20% of production in the infested area, according to the producers report.

Considering the socioeconomic expression of cupuaçu for the Amazon population and the harmful potential of this insect to production, studies on prospecting for natural enemies, bioecology, damage level and control methods are strongly recommended, in order to mitigate the economic damage caused by the attack of M. nigripennata in cupuaçu plantations in the Amazon region.

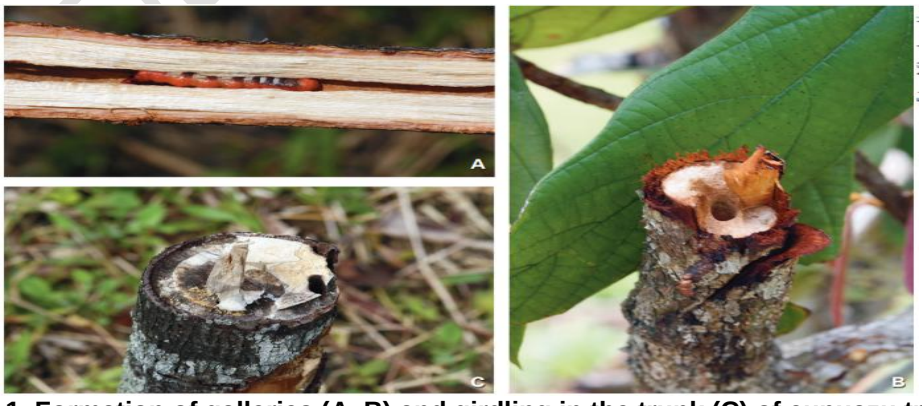

Fig 1. Formation of galleries (A, B) and girdling in the trunk (C) of cupuazu tree caused by the cupuazu tree branch borer.
Photo taken from the technical article of [14]

2.1.2 Fruit drill

The cupuaçu fruit borer (Conotrachelus humeropictus) (Coleoptera: Curculionidae) has been the worst pest of the crop. The larva of this insect develops inside the fruit and then goes to the ground, where the pupa period passes, and then the adults emerge [18].

Also according to [18], during the production period, the female spawns on new fruits and starts another cycle. Thus, the pest population quickly multiplies in the planting area, causing losses in production and, consequently, damage to the cupuaçu producer. Knowing the pest and adopting management measures can significantly reduce the incidence of this pest.

Second [19] when the fruit matures and falls, the borer larva makes a hole in the bark and leaves the fruit and goes into the soil, building a shelter at a depth that varies between 5 to 15 cm. It stays in this place for approximately 3 months at rest and without feeding in a stage called pupae (Fig 2). Therefore, the harvest carried out every day prevents the larva from leaving the fruit and going to the ground, later becoming an adult, reproducing inside the planting and generating a large number of new borers. Plantations that do not have borers attack or that have a low number of infested fruits must collect the fruits every day. This practice is necessary so that there are no losses with loss in production.

The cupuaçu fruit borer belongs to the order Coleoptera, the family Curculionidae, tribe Conotrachelini, subfamily Molytinae, genus Conotrachelus. Literature registers the genus as typical of the American continent [20]. Certain species are neotropical, distributed from Central America to South America [21, 22].

The economic damage caused by insects of the Conotrachelus genus is reported for the most diverse cultures. The fruit borer is, from the phytosanitary point of view, the most important pest of the cupuazu tree, due to the damage caused by the larvae to the fruits [4, 10]. In the last two decades, studies have found a gradual increase in the levels of infestations of C. humeropictus larvae in cupuaçu crops in Amazonas [4].

Farmers who are dedicated to the cultivation of cupuassu trees recognize the importance of new technologies that can help control pests as a way to avoid significant losses of crops. However, they usually face a lack of information or efficient control methods for the fruit borer. No isolated control technique for this pest is available, which may lead some producers to resort to the use of pesticides. This practice has already been tested in cupuaçu and cocoa without satisfactory results, in addition to being uneconomical and having a high environmental impact [9].

Despite advances in research on the biology and behavior of the borer, there is still no efficient control method for this insect. No isolated control technique for this pest is available. There is no registered insecticide for the crop, specific to the fruit borer [23, 24, 15]. In general, well-conducted plantations, in terms of cleaning, fertilization, formation and maintenance pruning and phytosanitary treatments, present fewer problems with pests and diseases. The drill control methods currently found in the literature are: monitoring, cultural methods, biological method and chemical method [15].

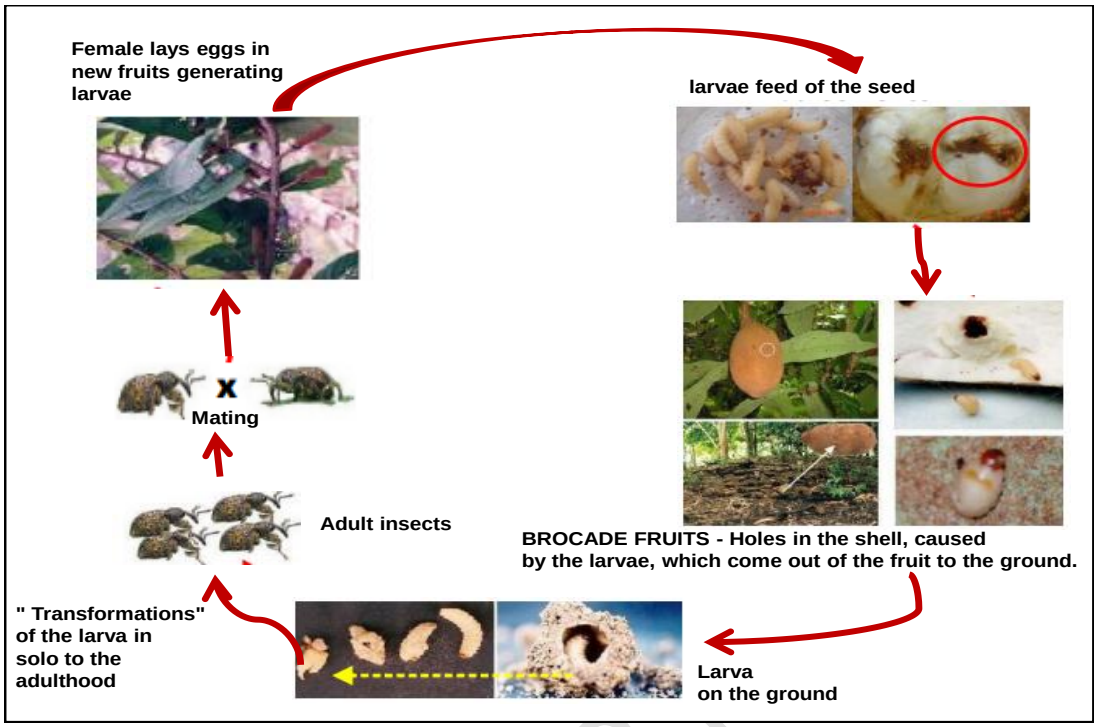

Fig 2. Life cycle of the cupuaçu fruit borer.
Figure adapted from [19]

2.1.3 Sprout drill

Important nursery pest, with the rate of seedlings, attacked varying, on average, between 15% and 20%, and reaching 60%. It is a small beetle whose larvae attack the seedling shoots(Fig 3). With the death of the shoot, the seedling emits new lateral shoots, which are also attacked, causing abnormal development of the seedlings.

As prevention, do not leave old seedlings inside the nursery, as they are usually hosting these insects. Periodically inspect and manually collect the attacked (dry) buds, which contain the larvae of this insect inside. This procedure helps to reduce the level of infestation [19].

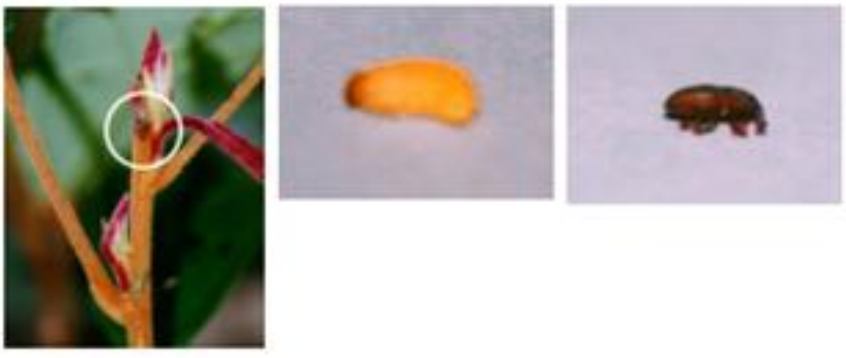

Fig 3. Attacked seedling, larva, and the sprout borer.

2.1.4 Leaf lace caterpillar

A butterfly whose caterpillar stage has the habit of feeding the consumption of young leaves. Manual control is done by collecting the caterpillars when the plants are little attacked [19].

As good agricultural practices [19], it is suggested to check during the harvest if there are bore fruits in the planting or fruits with symptoms of attack by some pest; collect all the fruits daily; bury more than 70 centimeters, or burn the brocade fruits, in a place outside the planting, breaking its cycle and reducing the multiplication of the drill; do not leave fruit abandoned in the planting area; do not take or bring fruits from places where the borer occurs to areas without borer infestation and apply fertilization.

3. CONCLUSION

It is a consensus that new studies and technologies be developed within the scope of integrated pest management to mitigate the damage caused by the cupuaçu borer and also by other crop pests. In particular, that promotes the development of culture in an agro-sustainable vision.

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