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Original Article

Bioactivity of aqueous extract of *Jacaranda* spp. (Bignoniaceae) on *Plutella xylostella* L. 1758 (Lepidoptera: Plutellidae)

Bioatividade do extrato aquoso de *Jacaranda* spp. (Bignoniaceae) em *Plutella xylostella* L. 1758 (Lepidoptera: Plutellidae)

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Abstract

The high consumption rate of vegetables stimulates the cultivation and increases the demand regarding the adequacy of the production processes. The attack of the pest *Plutella xylostella* causes high losses by reducing product quality, typifying a phytosanitary problem. This study aimed to verify the bioactivity of aqueous extracts of leaves of *Jacaranda decurrens* and *Jacaranda mimosifolia* at concentrations of 5, 10, and 15% on the insect. The choice test was carried out at the laboratory to determine the food effect of plant extracts and evaluate changes in the life cycle of insects exposed to active compounds through the analysis of biological parameters. Plant extracts of *J. decurrens* and *J. mimosifolia* presented with phagodeterrent classification in the choice experiments. The three *J. decurrens* extract concentrations promoted a prolongation of larval and pupal duration, while the duration of individuals treated with *J. mimosifolia* at 10% was significantly reduced. Occurred reduction in larval survival of individuals treated with aqueous extracts of *J. decurrens* and *J. mimosifolia*. Eggs from treatments with aqueous extract of *J. decurrens* and *J. mimosifolia* had reduced survival. Pupal survival of individuals treated with extract at 15% showed a significant reduction compared to the treatments at 5% and 10%. Pupae from the treatment with aqueous extract of *Jacaranda mimosifolia* showed a reduction in biomass in the treatment at 15% differing from the control e 5%. Thus, the aqueous extracts of the species *J. decurrens* and *J. mimosifolia* show insecticidal potential in the tests performed on *P. xylostella*.

Keywords: diamondback moth, insecticide plants, *Jacaranda decurrens*, *Jacaranda mimosifolia*.

Resumo

O alto índice de consumo de hortaliças estimula o cultivo e aumenta a demanda quanto à adequação dos processos produtivos. O ataque da praga *Plutella xylostella* causa grandes perdas por reduzir a qualidade do produto, caracterizando um problema fitossanitário. Este trabalho teve como objetivo verificar a bioatividade de extratos aquosos de folhas de *Jacaranda decurrens* e *Jacaranda mimosifolia* nas concentrações de 5, 10 e 15% sobre o inseto. O teste de escolha foi realizado em laboratório para determinar o efeito alimentar de extratos vegetais e avaliar alterações no ciclo de vida de insetos expostos a compostos ativos por meio da análise de parâmetros biológicos. Os extratos vegetais de *J. decurrens* e *J. mimosifolia* apresentaram classificação fagodeterrente nos experimentos de escolha. As três concentrações de extrato de *J. decurrens* promoveram um prolongamento da duração larval e pupal, enquanto a duração dos indivíduos tratados com *J. mimosifolia* a 10% foi significativamente reduzida. Ocorreu redução na sobrevivência larval de indivíduos tratados com extratos aquosos de *J. decurrens* e *J. mimosifolia*. Ovos dos tratamentos com extrato aquoso de *J. decurrens* e *J. mimosifolia* tiveram sobrevivência reduzida. A sobrevivência pupal dos indivíduos tratados com extrato a 15% apresentou redução significativa em relação aos tratamentos a 5% e 10%. Pupas do tratamento com extrato aquoso de *J. mimosifolia* apresentaram redução de biomassa no tratamento a 15% diferindo do controle e 5%. Assim, os extratos aquosos das espécies *J. decurrens* e J. *mimosifolia* apresentam potencial inseticida nos testes realizados em *P. xylostella*.

Palavras-chave: traça-das-crucíferas, plantas inseticidas, *Jacaranda decurrens*, *Jacaranda mimosifolia*.

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1. Introduction

Insect pests affect agriculture and, consequently, the economic structure (Sousa et al., 2014). The attacks of these agricultural pests limit crop production, as they cause high losses or reduce product quality, typifying a phytosanitary problem (Ghini and Bettiol, 2000).

The group comprising the largest number of insect species that attack the brassica crop is the Lepidoptera, that attack brassicas, available at all times of the year, provides abundant availability of hosts to insect pests (Zago et al., 2010). In this scenario, *Plutella xylostella* (L., 1758) (Lepidoptera: Plutellidae), popularly known as diamondback moth (Gallo et al., 2002), stands out as a voracious pest insect (Chagas Filho et al., 2010) due to several factors that contribute to its success, as a short generation time, high fecundity (Lima Neto and Siqueira, 2017), and rapid migration capacity (Gomes et al., 2016), attacking cultivars at any stage of its larval development (Czepak et al., 2005), commonly known to rapidly evolve resistance against various types of insecticides (Castelo Branco et al., 1997; Gomes et al., 2016; Xu et al., 2017).

In recent decades, the genera of the family Bignoniaceae have been extensively studied from a phytochemical point of view (Cipriani et al., 2012), and their botanical species are characterized by the presence of terpenoids, quinones, alkaloids, flavonoids, and non-nitrogen derivatives (Silva et al., 2012).

Jacaranda decurrens Cham. subsp. *symmetrifoliolata* Farias & Proença (Bignoniaceae) popularly known as carobinha-do-campo (Gonçalves et al., 2010) is an endemic plant of the Cerrado, found in the state of Mato Grosso do Sul, MS, Brazil (Carvalho et al., 2009). Antimicrobial (Zatta et al., 2009), antioxidant (Casagrande et al., 2014), and anti-inflammatory activities (Santos et al., 2012) have been described for the species. *Jacaranda mimosifolia* D. Don, popularly known as jacarandá-mimoso D. Don (Gentry, 1992), is native to northern Argentina, but with wide occurrence in Brazil (Terra et al., 2007; Socolowski and Takaki, 2004). It has antimicrobial (Sidjui et al., 2016; Naz et al., 2014; Rojas et al., 2006), antibacterial (Sidjui et al., 2016), and antioxidant potentials (Rana et al., 2013).

For insecticidal activity we found no reports in the literature, especially in *P. xylostella. Jacaranda decurrens* has ursolic acid as a secondary metabolite (Santos et al., 2012; Antunes et al., 2016), isolated by Varanda et al. (1992), who observed the reproductive rate, survival, and population growth rate of *Schizaphis graminum* (Hemiptera: Aphididae) (wheat aphid), one of the main pests of wheat (Gomes et al., 2004), which decreased at direct proportion with the ursolic acid content used in the diet. Terpenes, also described for *J. decurrens* and *J. mimosifolia* (Sidjui et al., 2016), have current ecological importance as plant protection agents (Viegas Júnior, 2003).

Studies involving other forms of control, using insecticidal plants aqueous extracts, are important in the *P. xylostella* control with promising results, including aqueous extracts of *Tradescantia pallida* var. Hunt. (Rocha et al., 2022), *Ludwigia tomentosa* (Cambess.) H. Hara, from *Ludwigia longifolia* (DC.) H. Hara, from *Ludwigia sericea* (Cambess.) H. Hara and from *Ludwigia nervosa* (Poir.) H. Hara (Ferreira et al., 2020, 2022), *Alibertia edulis* (Rich.) A. Rich., *Alibertia intermedia* (Mart.), and *Alibertia sessilis* (Vell.) K. Schum. (Peres et al., 2017; da Silva et al., 2020), *Campomanesia adamantium* (Cambess.) O. Berg, *Campomanesia guazumifolia* (Cambess.) O. Berg, and *Campomanesia xanthocarpa* O. Berg (Souza et al., 2019), *Schinus terebinthifolius* Raddi, *Annona coriacea* Mart., *Annona crassiflora* Mart. and *Serjania marjinata* Casar (Couto et al., 2016, 2019).

Considering the lack of research aimed at evaluating the insecticidal activity in the species *J. decurrens* and *J. mimosifolia*, aqueous extracts of plant species were tested at different concentrations to evaluate their effect on the feeding and biology of *P. xylostella*.

2. Materials and Methods

2.1. Botanical material

Healthy leaves of *J. decurrens* and *J. mimosifolia* were collected in the forest of the Federal University of Grande Dourados (UFGD), located in the city of Dourados, MS, Brazil (22°11′43.7″S, 54°56′08.5″W, and altitude of 430 m), from 7:00 am to 9:00, during the month of August, flowering season.

Authorization to collect botanical material was granted by the Brazilian National Research Council for Scientific and Technological Development (CNPq)/Genetic Heritage Management Council (CGEN/MMA), under No. 010220/2015-1. The plant species were identified by a specialist at the Laboratory of Applied Botany, and exsiccatae were deposited at the UFGD Herbarium in Mato Grosso do Sul, Brazil, with the registration numbers *J. decurrens* (DDMS 6497) and *J. mimosifolia* (DDMS 6498).

2.2. Plant extracts

Leaves collected and previously washed were submitted to the drying process in a forced-air circulation oven for 72 hours at a temperature of 40 °C (±1 °C). The dried plant material was ground in a Willey knife mill to obtain plant powder.

The concentration of aqueous extracts (AE) at 5, 10, and 15% was obtained by the mass to volume ratio (m/v) of the plant powder, using distilled water as solvent. The set was left to rest for 24 hours after homogenization and then filtered, with the liquid fraction being reserved and the solid fraction discarded.

2.3. Obtaining and maintaining the Plutella xylostella rearing

Adults of *P. xylostella* collected in a brassica plantation located in the municipality of Dourados, MS, Brazil, were sexed and kept in an entomological cage, which consists of a plastic container (9×19×19 cm) sterilized with 70% alcohol, containing an opening side covered with perforated plastic film for airflow. Two 8-cm diameter discs, one made of organic cabbage (*Brassica oleracea* L. var. *acephala*) and another of filter paper, were placed inside for oviposition.

The moths were fed through an upper opening of the cage, through a cotton plug moistened with a 10% honey solution, renewed every two days.

The discs with eggs were transferred to larvae cages (30×15×12 cm) made of material equivalent to the previous one, containing a sheet of paper towel and two leaves of organic cabbage superimposed on it with the abaxial surface facing each other, previously washed with 2% sodium hypochlorite, and then running water.

The maintenance of cages occurred on alternate days, with unhealthy lower kale leaves being discarded and upper leaves, as well as the larvae, transferred to a clean cage; a new kale leaf has been added over them. This procedure occurred during the four larval instars of *P. xylostella.*

The formed pupae were transferred with forceps from the larvae cage to a storage container in an environment refrigerated at 8 ± 1 °C. Approximately 50 of these pupae were transferred to adult cages, where they remained until the moths emerged, with the life cycle of the next generations being started similarly.

The rearing of *P. xylostella* was carried out according to the method by Barros et al. (2012), with adaptations and the experiments conducted under constant conditions of temperature (25 ± 2 °C), relative humidity (60 ± 5%), and photoperiod (12 h) at the Laboratory of Insect-Plant Interaction (LIIP).

2.4. Effect of aqueous extracts of Jacaranda decurrens and Jacaranda mimosifolia at 10% on Plutella xylostella feeding

Organic cabbage disks were immersed in the control treatment (distilled water) and aqueous extracts of *J. decurrens* and *J. mimosifolia* at 10% for 30 seconds and placed on filter paper to dry at room temperature. Choice tests were performed.

The choice experiment was performed in Petri dishes containing a leaf disc treated with water (control) and another disc treated with the plant extract (*J. mimosifolia* and *J. decurrens*). The effect produced by the plant extract in the choice experiment was determined after 24 h, they were observed, recorded and subjected to analysis of food preference (Boiça Júnior et al., 2013; Ferreira et al., 2022). The effect produced by the plant extract was evaluated using the food preference index (Kogan and Goeden, 1970), and they were classified as phagostimulant if the index was greater than 1, neutral if equal to 1, and phagodeterrant if less than 1, using the formula: AE = 2A / (M + A), where: A = area consumed of treated discs; M = consumed areas in untreated discs.

The consumed leaf area was evaluated using the software ImageJ. The leaf consumption was obtained by the difference between the initial area of the leaf and the area that remained after larval feeding.

2.5. Experiments of aqueous extracts of Jacaranda decurrens and Jacaranda mimosifolia at 5, 10, and 15% on the P. xylostella biology

Organic cabbage disks were immersed in the control treatment (distilled water) and aqueous extracts of *J. decurrens* and *J. mimosifolia* at 5, 10, and 15% for 30 seconds and then placed on a filter paper to dry at room temperature. These discs were replaced daily.

A first-instar larva was released at the center of sterilized and identified Petri dishes (60×15 mm) with a 4-cm diameter filter paper disc moistened with 0.5 mL distilled water, on which a leaf disc of equal size was placed. The dishes were covered with perforated plastic film to ensure airflow. Larvae were monitored until pupa formation.

The insect at the pupal stage was retained in experimental tubes (12×100 mm) until the adult emerged, being later sexed to form couples. Each couple was kept in individual cages with filter paper and leaf discs for oviposition and fed a 10% honey solution through an upper opening in the cage containing cotton until its death.

The oviposited discs were transferred to Petri dishes (100 x15 mm) duly identified with a reference number and the date of disc removal from the couple's cage. Then, new leaf discs were placed in this cage.

The following biological parameters were evaluated during the experimental life cycle tests: larval duration (period in which the insect remains as a larva), larval survival (percentage of larvae that turned into a pupa), pupal duration (period in which the insect remained as pupa), pupal survival (percentage of pupae that turned into adults), sex ratio (assessed by the formula F/M+F, where F refers to the number of females and M to the number of males), number of eggs (total number of eggs laid), oviposition period (period in which the female oviposited), fecundity (number of eggs that turned into larvae), and adult longevity (period in which the insect remained alive at the adult stage).

The experiment was carried out in a completely randomized design, in a 3×3 factorial scheme (plants × concentrations), with 10 replications of five subsamples, and the means were compared by Tukey's test at a 5% probability. Data were processed through arcsine transformation, with initial values for larval and pupal survival first converted by $\sqrt{x/100}$ and initial values for larval and pupal duration, male and female longevity, and fecundity converted by $\sqrt{x+0.5}$. The results were submitted to analysis of variance and means were compared with the Tukey test.

3. Results

3.1. Evaluation of aqueous extracts of Jacaranda decurrens and Jacaranda mimosifolia at 10% on Plutella xylostella feeding

Plant extracts of *J. decurrens* and *J. mimosifolia* presented AE with phagodeterrent classification (0.81±0.22 and 0.95±0.13, respectively) in the choice experiments (Figure 1).

According to Kogan and Goeden (1970), AE < 1 means low acceptance of the insect to the plant with the test substance. Larvae from the choice tests showed a preference for the consumption of water-treated discs during the monitoring period. This behavior is in accordance with the result obtained by AE and is attributed to the food quality.

3.2. Evaluation of aqueous extracts of Jacaranda decurrens and Jacaranda mimosifolia at 5, 10, and 15% on the P. xylostella biology

A significant difference was observed for the isolated factor plant extracts for variable in the biological characteristics larval duration (F = 42.65; DF = 2; $p < 0.01$), larval survival (F = 17.90; DF = 2; $p = 0.01$) and egg survival (F = 12.22; DF = 2; $p = 0.01$) (Table 1). Individuals treated with the aqueous extract of *J. decurrens* showed a prolongation of the larval period (8.60 days) when compared to the control (7.06 days). The reduction in larval survival of individuals treated with aqueous extracts of *J. decurrens* (87%) and *J. mimosifolia* (77%) compared to the control treatment (99%) was also significant (Table 2). Larvae from the treatments with plant extracts were less agile and discolored each day until they obtained a putrefied appearance. Eggs from treatments with aqueous extract of *J. decurrens* and *J. mimosifolia* had reduced survival (53.69 and 62.29%, respectively) compared to the control (74.09%) (Table 1).

Interaction between the factors (plant extracts and concentration) was observed in the biological characteristics pupal duration (F = 4.64; DF = 4; $p = 0.02$) and pupal survival (F = 3.28; DF = 4; $p = 0.0151$), pupal weight (F = 4.40; DF = 4; $p = 0.028$) (Table 2), oviposition period (F = 0.0970; DF= 4; p= 0.983), however, for the oviposition period, no significant difference was between treatments.

The three *J. decurrens* extract concentrations promoted a prolongation of pupal duration, while the duration of individuals treated with *J. mimosifolia* at 10% (2.88 days) was significantly reduced compared to the control treatment (3.75 days) (Table 2).

A reduction in pupal survival was observed in individuals treated with *J. mimosifolia* extract a 15% compared to the control, 5% e 10%, and, for the pupal weight in the concentration of 10 and 15% (Table 2).

The pupal survival of individuals treated with extract at 15% showed a significant reduction (86.89%) compared to the treatments at 5% (94.16%) and 10% (97.50%). Pupae from the treatment with aqueous extract of *J. mimosifolia* showed a reduction in biomass in the treatment at 15% differing from the control e 5% (Table 2).

No difference was observed between treatments for sex ratio, female and male longevity, and the number of eggs laid. The significant difference for the isolated factor concentration was expressed in the parameters pupal duration (F = 4.05; DF = 2; $p = 0.021$), pupal survival (F = 7.49; DF = 2; $p = 0.0151$), and pupal weight (F = 7.45; DF = 2; $p = 0.001$).

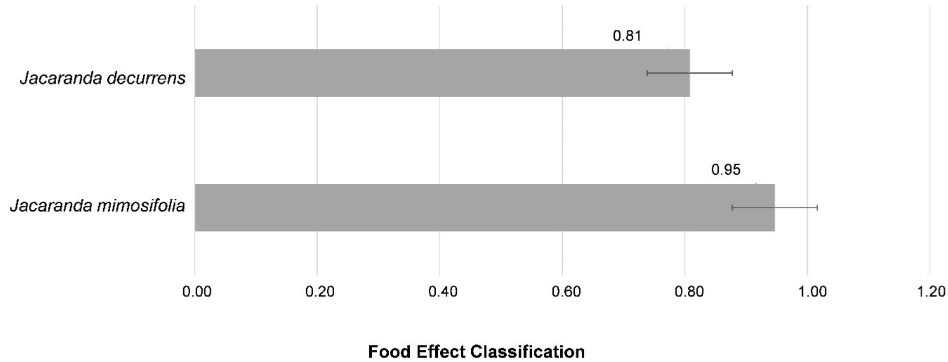

Figure 1. Food preference index effect of aqueous extracts of *Jacaranda decurrens* and *J. mimosifolia* at 10% on *P. xylostella.*

Table 1. Larval duration (days), larval survival (%) and egg survival (%) of *Plutella xylostella* fed with aqueous extract of *Jacaranda* spp.

Treatments	Larval duration (days)	Larval survival (%)	Egg survival (%)
Control	7.06 ± 0.07^{b}	99.00 ± 0.55^{a}	74.09 ± 1.01^{a}
	n= 50	n= 50	n=21
Jacaranda decurrens	8.60 ± 0.20^{a}	86.66 ± 2.77^{b}	53.69 ± 0.03^{b}
	n= 50	n= 50	n=21
Jacaranda mimosifolia	6.84 ± 0.15^{b}	77.33 ± 3.28^{c}	62.29 ± 3.97^{b}
	n= 50	n= 50	n=21
F value	F = 42.65**	F = 17.90**	F = 12.22**
	p = 0.0001	p = 0.0001	p = 0.0001
	DF = 2	DF = 2	DF =2
CV (%)	10.7	16.05	21.18

Means followed by the same letter in the column do not differ in the Tukey test. **1% significance level. n = number of individuals; DF = Degree of freedom; CV = Coefficient of variation.

Table 2. Duration (days) and survival (%) pupal stages and pupal weight (mg) of *Plutella xylostella* treated with aqueous extract of *Jacaranda* spp, at concentrations of 5%, 10% and 15%.

Treatments	Pupal Duration (Days)			Pupal Survival (%)			Pupal Weight (mg)		
	5%	10%	15%	5%	10%	15%	5%	10%	15%
Control		3.75±0.04^{bA}			97.00±1.52^{aA}			5.17±0.15aA	
		n=49			n=49			n= 50	
Jacaranda decurrens	4.56±0.10^{aA}	4.84±0.19^{aA}	4.90±0.18^{aA}	95.50±3.02^{aA}	95.50±3.02^{aA}	87.67±4.26^{aA}	5.01±0.12^{aA}	4.90±0.20^{aA}	4.66±0.24^{aA}
	n=48	n=47	n=45	n=48	n=47	n=45	n= 50	n= 50	n= 50
Jacaranda mimosifolia	3.43±0.09^{bA}	2.88±0.09^{cB}	3.62±0.11^{bA}	90.00±4.47^{aA}	100±0.00^{aA}	76.00±6.53^{bB}	4.62±0.15^{aA}	3.51±0.31^{bB}	2.98±0.29^{bB}
	n=40	n=38	n=38	n=40	n=38	n=38	n= 50	n= 50	n= 50
F value		F = 4.64**			F = 3.28*			F = 4.40**	
		p = 0.002			p = 0.0151			p =0.0028	
		DF = 4			DF = 4			DF =4	
CV (%)		9.29			11.7			14.63	

Means followed by the same lowercase in the column and uppercase in the row do not differ in the Tukey test. ** 1% significance level; * 5% significance level. n = number of individuals; DF = Degree of freedom; CV = Coefficient of variation.

4. Discussion

The choice tests showed that the aqueous extract at a concentration of 10% of *J. decurrens* presented a higher phagodeterrence index than that of *J. mimosifolia* in the 24 hour experiments, when the food effect was evaluated on *P. xylostella.*

Plant extracts with this characteristic guide the insect away from the plant even if it performs the test bite on the plant when detecting antixenotic allomones through its sensory system, paralyzing feeding and reducing the damage caused to the leaf (Vendramim and Castiglioni, 2000; Seffrin et al., 2008).

Isolated effects of extracts were also evaluated by Boiça Jr. et al., (2013), and observed that the aqueous extract of *Azadirachta indica* A. Juss. almonds at concentrations of 5 and 10% on *P. xylostella* larvae showed repellency to larvae in all evaluated periods.

Substances that reduce food consumption of the insect can be considered a phagoinhibitor, which can be a substance with a bad taste for insects, preventing feeding through a mechanism of action given in the peripheral sensilla (Isman, 2002). The phagedeterrence can be classified as primary or secondary (Mordue (Luntz) and Blackwell, 1993). The primary is characterized when feeding is interrupted by the insect direct action. The secondary phagodeterrence occurs when ingested substances by the herbivore cause sublethal effects, such as physiological changes, digestion and nutrients absorption difficulties, among others (Koul and Isman, 1991; Timmins and Reynolds, 1992; Trumm and Dorn, 2000).

The observed phagodeterrence may be due to toxicity post-ingestive or malaise in exposed insects. Considerable changes were verified in the subsequent stages of the life cycle of the insects evaluated with the aqueous extracts of *J. decurrens* and *J. mimosifolia.*

The nutritional imbalance in the *Jacaranda* treatments shows changes in the subsequent phases (Rodriguez and Vendramim, 1996). The extract of *J. decurrens* and *J. mimosifolia* is phagodeterrent and acted in two aspects. First, reduced larval survival in *J. mimosifolia*, and subsequently pupal weight, especially at the 10% and 15% concentration, in addition to low pupal survival, significant for the 15% concentration. The survival decreasing may be due to the phagodeterrent effect or the action of the secondary metabolites after ingestion (Sapindal et al. 2017). Botanical insecticides can operate in pupal stage, delaying pupae development and consequently inducing metamorphosis deleterious effects (Pratissoli et al., 2008; Rana et al., 2013; Vendramim and Castiglioni, 2000).

It is worth noting that although the larvae in *J. decurrens* presented a longer duration in this phase, it does not necessarily mean a greater feeding and food conversion. There is a lower survival rate when compared to the control, and, showing at the end of the cycle, reduced survival of eggs laid by females submitted to this treatment, i.e., less fertile females. This aspect was also observed in *J. mimosifolia.*

Small pupae result in lower mating success than adults resulting from higher-value biomass pupae, as the former generate less fecund females or small males (Matos et al., 2006). The insect body size can be determined by many factors, both internal and external (Rauschenbach et al., 2007), and we believe that the *Jacaranda* extracts phagodeterrent effect can affect pupae fertility by its weight. Studies have shown that low pupal biomass is generally related to reduced fecundity (Peres et al., 2017; Silva et al., 2019; Padial et al., 2020; Ferreira et al., 2020).

Insects exposed to food resources treated with plant extracts that have insecticidal action present cumulative effects of chemical compounds, which can cause physiological, morphological or behavioral changes in the other phases of the life cycle (Couto et al., 2016; 2019).

In this study, we observed moths with uncharacterized genital segments and body malformation, which are reported morphological deformations and do not have expressive values, but indicate that chemical compounds present in plant extracts can be toxic to the insect, causing a late bioactive effect (Scapinello et al., 2014).

These changes end up making the insect unfeasible as a sexual partner, limiting the next generation, as in the physiological changes observed for the biological parameter of egg survival (Table 1). It is a transovarial aspect of the action of the phagodeterrent extracts tested, as the quantity and quality of the food consumed can influence the number of ovarioles per ovary, reduce egg quality (Costa et al., 2004). In previous studies, it was found that azadirachtin, a secondary metabolite present in *A. indica* (Meliaceae) can compromise ovarian development and reduce the number and size of oocytes (Oulhaci et al., 2018; Zhang et al., 2018).

Aqueous plant extracts can interfere by decreasing the number of eggs laid by the parental generation, contributing to the reduction of the F1 generation. However, this type of change was not observed in our results. Females previously exposed to plant extracts at different concentrations were as fecund as those in the control treatment, what we observed was a lower egg survival. The means of egg survival in *J. decurrens* and *J. mimosifolia* treatments were lower than in the control treatment, contributing to a reduction in reproductive success.

The lack of insecticidal activity, as observed for the parameters sex ratio, fecundity, female longevity, male longevity, and oviposition period, occurs when there is no extraction of specific active compounds, which would interfere with the insect biology, causing changes in its life cycle. Sublethal effects during the insect life cycle and development are very important to integrate Pest Management (IPM), although it does not cause insect death, aqueous plant extracts can interpose drastically in the insect biology by reducing the individual numbers of insects next generation (Roel et al., 2000).

Different results were found by Roel et al. (2000), depending on the solvent used to extract the product or the extraction method applied. Thus, new tests using chemical partitions extracted from the plant powder of *J. decurrens* and *J. mimosifolia*, using a different extractive method, such as the solvent gradient elution in a chromatography column, are suggested.

The Chemical studies on the constituents of *Jacaranda* identified as triterpenes, quinones, flavonoids, fatty acids, acetosides, and, recently, a novel phenylethanoid dimmer (Gachet and Schuhly, 2009). Many of them possess insecticidal activity in addition to anticancer. Antimicrobial activity of the hexane, ethanol and water extracts of the leaves of *Jacaranda mimosifolia* against *Bacillus cereus, Escherichia coli* and *Staphylococcus aureus* (Rojas et al., 2006). The infusion and decoction of the leaves and bark of *Jacaranda decurrens* are employed as depurative and to treat cutaneous disturbances and wounds. Leaves of *Jacaranda decurrens* is used against syphilis, rheumatism, inflammation and dermatological diseases (Maroni et al., 2006). In short, the lack of studies on the insecticidal action of these plant species, added to the environmental and human health harm of the formulated products was the motivation for this research.

5. Conclusions

The aqueous extracts of the species *J. decurrens* and *J. mimosifolia* show insecticidal potential in the tests performed on *P. xylostella*. The aqueous extracts of the species *J. decurrens* and *J. mimosifolia* show insecticidal potential in the tests performed on *P. xylostella*. This research allows us to point out the following biological characteristics as the most relevant: In *J. decurrens* there was a prolongation of larval and pupal duration and for *J. mimosifolia*, at 10%, reduction of larval and pupal duration and at 15% biomass reduction. For both species, we concluded that there was a reduction in larval, pupal and egg survival.

Further investigations, including phytochemical analyses, recognition of the mechanism of action of the extracted compounds, and even more suitable extractive methods, as well as tests under semi-field and field conditions, are recommended.

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