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Aqueous extracts and oil of neem combined with neonicotinoid insecticides against *Bemisia tabaci* biotype B in melon

Extratos aquosos e óleo de nim associados com inseticidas neonicotinóides sobre *Bemisia tabaci* biótipo B em meloeiro

Maria Santana de Araújo Trindade[I] Adalberto Hipólito de Sousa[II] Patrício Borges Maracajá[I]* Rui Sales Júnior[I] Wilson Galdino de Andrade[I]

-NOTA-

ABSTRACT

*This research was aimed at evaluating nymph population density of whitefly (**Bemisia tabaci** biotype B) in melon plants after treatment with neem-dry-leaf aqueous extracts and neem-oil (**Azadirachta indica** A. Juss.) applied alternately with neonicotinoid insecticides under field conditions. The experimental design was a randomized block, with 6 treatments and 4 replications. The treatments were control (only water); neem-dry-leaf extract at 5% (neem-dry-leaf powder 50g L^{-1} of water); neem oil (5.0mL L^{-1} water); chemicals insecticides imidacloprid (30g $25L^{-1}$ of water) and acetamiprid (5g $20L^{-1}$ of water); neem-dry-leaf extract at 5% weekly alternated with imidacloprid (30g $25L^{-1}$ of water) and acetamiprid (5g $20L^{-1}$ of water); neem oil (5.0mL L^{-1} of water) weekly alternated with imidacloprid (30g $25L^{-1}$ of water) and acetamiprid (5g20 L^{-1} of water). The efficiency of treatments was compared through of the number of nymphs recorded in leaves of melon with 35, and 50 days after planting. The less number of nymphs was registered when the neem oil was applied alternatively with the chemical treatment with efficiency of 28.58 and 7.85% in the first and second evaluations, respectively. However, the nymphs incidence was higher when the neem oil and the chemical treatment were applied separately.*

Key words: *Insecta, whitefly, insecticidal plant.*

RESUMO

*O objetivo deste trabalho foi avaliar a densidade populacional de ninfas de mosca-branca (**Bemisia tabaci** biótipo B) em plantas de melão após o tratamento com extratos aquosos de folhas secas de nim e de óleo de nim (**Azadiracta indica** A. Juss.), aplicados alternadamente com inseticidas neonitotinóides, sob condições de campo. O delineamento utilizado foi o de blocos casualizados, com 6 tratamentos e 4 repetições. Foram utilizados os seguintes tratamentos: controle (apenas água); extrato aquoso de folhas secas de nim a 5% (pó de folhas secas de nim, 50 g L^{-1} de água); óleo de nim (5mL L^{-1} de água); inseticidas químicos imidacloprid (30g $25L^{-1}$ de água) e acetamiprid (5g $20L^{-1}$ de água); extrato de folhas secas de nim a 5% alternado semanalmente com imidacloprid (30g $25L^{-1}$ de água) e acetamiprid (5g $20L^{-1}$ de água); e óleo de nim (5mL L^{-1} de água) alternado semanalmente com imidacloprid (30g $25L^{-1}$ de água) e acetamiprid (5g $20L^{-1}$ de água). A eficiência dos tratamentos foi comparada através do número de ninfas registrado nas folhas de melão aos 35 e 50 dias após o plantio. O menor número de ninfas foi registrado quando o óleo de nim foi aplicado alternadamente com o tratamento químico, com eficiência de 28,58 e 7,85% na primeira e segunda avaliações, respectivamente. No entanto, a incidência de ninfas foi maior quando o óleo e o tratamento químico foram aplicados separadamente.*

Palavras-chave: *Insecta, mosca branca, planta inseticida.*

Melon stands out in the Brazilian northeast region for being one of the main export agricultural products. However, the production has been facing serious pest problems such as severe attacks of whitefly ***Bemisia tabaci*** biotype B (Homoptera: Aleyrodidae) that is only controlled with chemical insecticides. Until the end of the 80s, more than 50 conventional pesticides were known for being efficient on regulating populations of ***B. tabaci*** biotype B (Homoptera: Aleyrodidae). Because of the fast development of resistance of this pest to pesticides

[I]Departamento de Ciências Vegetais, Setor de Fitossanidade, Universidade Federal Rural do Semi-Árido (UFERSA), 59625-900, Mossoró, RN, Brasil. E-mail: patricio@ufersa.edu.br. *Autor para correspondência.
[II]Departamento de Biologia Animal, Setor de Entomologia, Universidade Federal de Viçosa (UFV), 36570-000, Viçosa, MG, Brasil.

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and the resulting environmental problems by the use of such products, methods of alternative control have been studied, including control by using plant-derived extracts.

The search for new pesticides constitutes a wide investigation field. The great variety of substances present in the flora is still of great interest for insect control, specially considering that just a small number of plants have been investigated for this purpose (LOVATTO et al., 2004). Neem, ***Azadirachta indica*** A. Juss., is known for being resistant to attacks of a number of insects, acting as feeding deterrent, growth regulator and sterilizer (SILVA et al., 2003). Its pesticide power allows up to 90% of success in pest control of agroecological management, having the advantage of preserving natural enemies (ABREU JÚNIOR, 1998).

In view of the alternatives for reducing the use of conventional pesticides, the objective of this study was to evaluate the efficiency of aqueous extracts of dry leaves and oil of neem (***A. indica***) applied alternately with conventional insecticides on nymphs of ***B. tabaci*** in melon under field conditions.

The field experiment was carried out in melon plantations at W. G. Fruticultura LTDA, in the municipality of Baraúna-RN. The hybrid AF-646, yellow melon of "Valenciano" type, with 99.9% of purity and 90% of germination was used.

Hydrosoluble compounds of neem leaves were extracted as described by SOUSA (2004). Green leaves were dried in the shade and crushed to obtain the powder after 72 hours. In the extract preparation, the powder was mixed to distilled water in the proportion of 5g per 100mL. The suspensions were maintained in flasks for 24 hours and filtered to produce the 5% aqueous extract (mass/volume).

The experimental design was a randomized block, with 6 treatments and 4 replications. Each plot consisted of a 7.0-m row, with 0.3-m intra-row spacing and 2.0-m inter-row spacing, given an area of 14.0m^2. Ten plants of the central row were chosen for evaluation. The treatments were as follows: control (only water); neem-dry-leaf extract at 5% (neem-dry-leaf powder 50g L^{-1} of water); neem oil (Trilogy, active ingredient=70% of clarified hydrophobic extract of neem oil) (5.0mL L^{-1} water); chemicals insecticides imidacloprid (30 g 25 L^{-1} of water) and acetamiprid (5g 20 L^{-1} of water); neem-dry-leaf extract at 5% weekly alternated with imidacloprid (30g 25 L^{-1} of water) and acetamiprid (5g 20L^{-1} of water); neem oil (5.0mL L^{-1} of water) weekly alternated with imidacloprid (30g 25 L^{-1} of water) and acetamiprid (5g 20 L^{-1} of water). The first applications were 20 days after planting (DAP) and were carried out weekly, except for the chemical treatment, where the applications were carried out at 15-day intervals, beginning 20 DAP.

Ten leaves were randomly collected per plant and the total number of ***B. tabaci*** nymphs determined in a 2.8cm^2 area on the right or left lobe near the stem. Samples were immediately placed in plastic bags and packaged in polystyrene box with ice until counting procedure. Three evaluations (20, 35, and 50 days after planting) were realized. The first sampling was made to verify if the experimental area presented uniformity in relation to initial nymphs population in the blocks and plots. This evaluation allowed to conclude that the distribution of nymphs was uniform. The second and third samplings were realized to verify the efficiency of the treatments.

Data were transformed and analyzed through analysis of variance (ANOVA) and the Scott-Knott's test was carried out at 5% significance level. The efficiency of treatments was compared to control according to ABBOTT (1925).

In the second sampling, the application of neem oil alternated with pesticides was more efficient in controlling nymphs (46.25%), with efficiency significantly greater than when used separately. Fresh-leaf extracts and neem oil had low efficiency in controlling nymphs, with 7.58% and 7.43% efficiency respectively, and significantly different from the control (Table 1). Fifty days after planting, in the third sampling, treatments were inefficient because the great number of whiteflies (Table 1) that migrated from adjacent areas. In general, there was smaller number of nymphs in areas sprayed with oil alternated with insecticides when compared to the other treatments. These results are similar with what we had in the second evaluation.

It might be possible that the application of neem oil combined with insecticide has produced a repellent effect on whitefly, causing a decrease in the incidence of nymphs during the second and third samplings. The reduction in the nymph number caused by neem oil alternated with insecticide was similar to results obtained by the mixture of neem-fruit extracts with Thiamethoxam (SOUSA, 2004), and with commercial formulations of neem seeds (PRABHAKER et al., 1999). SOUSA (2004) reported the control of whitefly nymphs with neem-seed aqueous extracts combined with thiamethoxam was more efficient than the control. PRABHAKER et al. (1999) reported egg and nymph mortality using a commercial formulation of seeds, from which the oil is extracted.

Application of neem oil combined with insecticide reduced nymph population density of ***B. tabaci***. However, the efficiency was significantly

Table 1 - Population density of whitefly nymphs in melon treated with neem aqueous extracts combined with pesticides.

Treatments	2ª sampling		3ª sampling	
	Nymphs/leaf[1]	Efficiency (%)	Nymphs/leaf[1]	Efficiency (%)
Control	8.78 a	---	8.42 a	---
Leaf	7.57 b	13.78	7.74 a	8.08
Oil	7.36 b	16.17	7.90 a	6.18
Insecticide	6.62 c	24.60	8.04 a	4.51
Leaf + insecticide	6.27 c	28.58	7.85 a	6.77
Oil + insecticide	4.73 d	46.12	6.95 a	17.46

[1] Within columns, means followed by the same letter are not significantly different according to Scott-Knott´s test (P<0,05). Data transformed by $\sqrt{X+0,5}$.

reduced when applied separately. More studies in greenhouse are recommended to verify the effect on adults of ***B. tabaci***.

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