Brazilian Journal of Biology
ISSN 1519-6984 (Print)
ISSN 1678-4375 (Online)

https://doi.org/10.1590/1519-6984.176665
Original Article

Preference of red mite *Tetranychus ludeni* Zacher (Acari: Tetranychidae) to sweet potato genotypes

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Received: March 06, 2017 – Accepted: October 30, 2017 – Distributed: May 31, 2019

Abstract

Tetranychus ludeni damages the sweet potato. Pest development can vary between plant genotypes. The objective was to identify the preference of *Tetranychus ludeni* for *Ipomoea batatas* genotypes, from the germplasm bank at the Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM). Natural infestations of this mite were observed on 54 sweet potato genotypes in potted, in a greenhouse. Three mite-infested leafs of each genotype were collected and analyzed. The red mite showed different population density rate in genotypes. The BD 29 genotype was found to be highly susceptible, the BD 08, BD 57, BD 17 and Espanhola genotypes were moderately susceptible, and the others forty-nine genotypes showed low susceptibility to the mite.

Keywords: antibiosis, antixenosis, *Ipomoea batatas*, resistance.

Preferência do ácaro vermelho *Tetranychus ludeni* Zacher (Acari: Tetranychidae) por genótipos de batata-doce

Resumo

Tetranychus ludeni danifica plantas de batata-doce. O desenvolvimento de pragas pode variar entre genótipos de plantas. O objetivo foi identificar a preferência de *T. ludeni* para genótipos de *Ipomoea batatas* do banco de germoplasma da Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM). Infestações naturais deste ácaro foram observadas em 54 genótipos de batata doce plantados em vasos e mantidos em estufa. Três folhas infestadas por ácaros, de cada genótipo, foram coletadas e analisadas. *Tetranychus ludeni* mostrou diferentes taxas de crescimento populacional entres os genótipos. O genótipo BD 29 foi altamente suscetível, os BD 08, BD 57, BD 17 e Espanhola foram moderadamente suscetíveis e os outros 49 genótipos mostraram baixa suscetibilidade ao ácaro.

Palavras-chave: antibiose, antixenose, *Ipomoea batatas*, resistência.

1. Introduction

Mites herbivores are common pest in agriculture (Ghazy and Suzuki, 2014; Navia et al., 2009), ornamental plants (Silva et al., 2009) and forests (Pereira et al., 2012; Deus et al., 2012) infesting a wide range of plant hosts (Mendonça et al., 2011) and are among the most important pests across the world. *Tetranychus ludeni* Zacher (Acari: Tetranychidae) commonly found in the tropics (Zhang, 2002), occurs worldwide and infests more than 250 plant species (Gotoh et al., 2015), especially eggplant (*Solanum melongena*) and okra (*Abelmoschus esculentus*) (Reddy, 2001). This mite has potential to cause severe damage and death to sweet potato plants (Soares et al., 2012).

Tetranychus ludeni is better adapted to hot weather than *T. urticae* and has a high potential to become serious pest in other cultures (Gotoh et al., 2015).

Ipomoea batatas (L.) Lam. (Convolvulaceae) is an important crop with social significance (family agriculture) in northeastern Brazil (Albuquerque et al., 2012; Wang et al., 2013) and in the Vale do Jequitinhonha, northeast Minas Gerais State, Brazil (Andrade et al., 2009).

Acaricides are the main control strategy employed to deal with these pests in vegetable crops (Kousik et al., 2007); however, they may prove to be disadvantageous over the long-term (Razmjou et al., 2009) due to pest resistance (Maniania et al., 2008), interfering in the biological control (Moscardini et al., 2014; Castro et al., 2013, 2015) and increasing pest-related problems (Atakan, 2006; Leite et al., 2006). Therefore, intensive acaricide use should be minimized in pest control (Leite et al., 2003).

Pest development varies with the plant genotypes (Hochwender et al., 2005), such as the decreased development of *T. urticae* on the rose cultivar Virginia than on Emma, Gala and Luna ones (Landeros Flores et al., 2013). The development period was longer and the survival and reproduction lower for *T. urticae* on the strawberry (*Fragaria x ananassa*) cultivars than on the Camarosa, Diamond and Seascape ones (Monteiro et al., 2014). Sweet potato genotypes show resistance to pests like *Diabrotica* spp. (Jackson and Bohac, 2007), *Chaetocnema confinis* Crotch (Abney and Kennedy, 2011) (Coleoptera: Chrysomelidae), and the root borer, *Euscepes postfasciatus* (Coleoptera: Curculionidae) (Okada et al., 2014).

The objective was to identify the preference of *Tetranychus ludeni* for *Ipomoea batatas* genotypes, from the germplasm bank at the Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM).

2. Material and Methods

The sweet potato germplasm bank of the Vegetable Crop Sector of the Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) has 54 genotypes (BD-29, BD-08, BD-57, BD-17, Espanhola, BD-55, BD-54, BD-13, Tomba Carro 2, BD-24, BD-47, BD-18, BD-07, BD-48, Brazlândia Rosada, Palmas, BD-67, Licuri, Princesa, BD-39, BD-111TO, BD-46, BD-44, BD-42, BD-35, BD-22, BD-02, BD-69, BD-27, BD-25, BD-26, BD-113TO, Brazlândia Roxa, BD-23, BD-43, Tomba Carro 1, BD-12, BD-65, Batata mandioca, BD-70, BD-50, BD-05, BD-38, BD-56, Arruba, BD-53, Cambraia, BD-62, BD-04, BD-03, BD-31TO, Brazlândia Branca, Marmel and BD-33). Natural infestations of mites were observed, in greenhouse, on these genotypes in August 2011 (Soares et al., 2012). Specimens of this mite were sent to Dr. Gilberto José de Moraes of "Escola Superior de Agricultura Luiz de Queiroz" (ESALQ-USP), who identified them as *Tetranychus ludeni* Zacher (Acari: Tetranychidae).

The sweet potato genotypes were planted in 10-liter pots in a greenhouse and watered daily. Three sweet potato branches were transplanted per pot with soil, fertilized and limed as recommended for the crop. The experimental design was completely randomized with 54 treatments (genotypes), three replications and three plants per pot to represent each experimental unit.

A natural *T. ludeni* outbreak was observed 90 days post transplantation of the sweet potato branches. Three infested leafs were collected per genotype. They were taken for analysis to the laboratory of Entomology (UFVJM). An area of 3.8 cm^2 covering the midrib of the abaxial surface of leafs (the most frequent point of mite occurrence), was photographed using a camera coupled with an optical microscope. The *T. ludeni* adults were counted on the leaf area with computer assistance.

Data were subjected to the analysis of variance and the means were grouped using the Scott-Knott test at 5% probability, employing the statistical analysis program SAEG.

3. Results and Discussion

Tetranychus ludeni showed lower population density rate on different *I. batatas* genotypes ($F= 3.55$; $df= 53, 108$; $P< 0.0001$). The genotypes were categorized under three groups: high, moderate or low susceptibility to this mite, indicating the resistance mechanisms in these plants.

The BD 29 genotype (72.33 ± 29.19) was the most infested and was therefore classified as highly susceptible (Table 1). Density, distribution, and damage by pests vary with genotype (Hochwender et al., 2005), being plant resistance correlated with their genetic characteristics (Leimu and Koricheva, 2006). Plant preferences can be based on chemical (Kos et al., 2014) and/or morphological mechanisms such as leaf toughness, trichomes, density, stomata size, and epicuticular wax content (Nair et al., 2012). The research and selection of resistant genotypes may contribute to integrated pest management (IPM) aimed at safely, economically, and ecologically methods to eliminate pests (Ehler, 2006), in a more sustainable manner over the long term (Soares et al., 2007; Soares et al., 2009).

The BD 08, BD 57, BD 17 and the Espanhola were moderately susceptible and the others showed low susceptibility to *T. ludeni*. The development of the mites may vary between the genotypes of the same species (Modarres Najafabadi et al., 2014) as reported for *Amphitetranychus viennensis* Zacher and *Tetranychus urticae* Koch (Acari: Tetranychidae) on apples (Kasap, 2003) and *T. urticae* on strawberry (Wold and Hutchison, 2003), cucumber (Park and Lee, 2007) and tomato (Keskin and Kumral, 2015). The total height, number of leafs, flowers and fruits and fruit weight were found to be lower on the eggplant (*Solanum melongena* L. Solanaceae) cultivar Panruti than on the other varieties of this plant (Reddy and Baskaran, 2006). The resistance of the *Phaseolus vulgaris* L. cultivars to *T. urticae* also varied. The Akhtar and GS11867 varieties are susceptible, while the KS41128 and Naz are resistant (Tahmasebi et al., 2014). Resistant cultivars can reduce pest population density and is a

Table 1. Number of individuals of the red mite *Tetranychus ludeni* Zacher (Acari: Tetranychidae) (average ± standard deviation) on leafs of sweet potato genotypes (*Ipomoea batatas*).

Genotype with high susceptibility			
BD -29	72.33 ± 29.19[A]		
Genotypes with moderate susceptibility			
BD-08	51.00 ± 16.82[B]	BD-17	37.67 ± 32.62[B]
BD-57	42.67 ± 27.06[B]	Espanhola	36.33 ± 14.84[B]
Genotypes with low susceptibility			
BD-55	26.33 ± 15.34[C]	BD-26	11.67 ± 7.09[C]
BD-54	26.33 ± 4.72[C]	BD-113TO	11.33 ± 6.65[C]
BD-13	26.00 ± 5.19[C]	Brazlândia Roxa	11.00 ± 10.14[C]
Tomba Carro 2	25.00 ± 13.31[C]	BD-23	10.67 ± 4.72[C]
BD-24	23.00 ± 10.58[C]	BD-43	10.33 ± 4.50 [C]
BD-47	21.00 ± 19.97[C]	Tomba Carro 1	9.33 ± 2.51[C]
BD-18	21.00 ± 6.55[C]	BD-12	8.67 ± 5.69[C]
BD-07	20.67 ± 2.30[C]	BD-65	8.67 ± 1.52[C]
BD-48	19.00 ± 13.52[C]	Batata Mandioca	8.00 ± 7.81[C]
Brazlândia Rosada	18.67 ± 10.59[C]	BD-70	7.67 ± 4.70[C]
Palmas	18.33 ± 14.22[C]	BD-50	7.00 ± 5.56[C]
BD-67	18.00 ± 15.62[C]	BD-05	6.67 ± 2.08[C]
Licuri	18.00 ± 10.06[C]	BD-38	6.67 ± 4.04[C]
Princesa	18.00 ± 11.13[C]	BD-56	5.67 ± 1.52[C]
BD-39	17.67 ± 4.61[C]	Arruba	5.67 ± 1.52[C]
BD-111TO	17.67 ± 9.07[C]	BD-53	4.33 ± 1.52[C]
BD-46	17.67 ± 13.20[C]	Cambraia	4.33 ± 1.15[C]
BD-44	17.00 ± 4.00[C]	BD-62	4.00 ± 1.73[C]
BD-42	16.67 ± 8.32[C]	BD-04	3.67 ± 2.51[C]
BD-35	15.67 ± 1.01[C]	BD-03	3.00 ± 1.00[C]
BD-22	14.00 ± 6.00 [C]	BD-31TO	2.33 ± 0.57[C]
BD-02	13.00 ± 2.16[C]	Brazlândia Branca	1.67 ± 1.52[C]
BD-69	12.67 ± 8.68[C]	Marmel	1.67 ± 0.57[C]
BD-27	12.67 ± 7.23[C]	BD-33	1.00 ± 1.00[C]
BD-25	12.00 ± 1.35[C]		

Means followed by the same letter were grouped using the Scott-Knott test at 5% probability.

method compatible with other management tactics, such as biological control (Castro et al., 2014), an important aspect of IPM (Razmjou et al., 2009; Landeros Flores et al., 2013) and furthermore minimizes the application of chemicals (Zehnder et al., 2007) and consequently, the production costs.

4. Conclusions

The population density rate of *T. ludeni* was different in each of the sweet potato genotypes. The BD 29 was found to be highly susceptible, the BD 08, BD 57, BD 17 and Espanhola genotypes were moderately susceptible, while the others showed low susceptibility to *T. ludeni*.

Acknowledgements

To Dr. Gilberto José de Moraes (ESALQ-USP) for the identification of the mite. To Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação de Amparo a Pesquisa do Estado de Minas Gerais (FAPEMIG) and Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA) for financial support. Global Edico Services corrected and rewrote the English of this manuscript.

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