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PEST MANAGEMENT

Development, Reproduction, Survival, and Demographic Patterns of *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) on Different Commercial Tomato Cultivars

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Abstract

The increase in the production of tomato, *Solanum lycopersicon* Mill. (Solanaceae), has favored the proliferation of pests, especially *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae). In this study, the development, reproduction, survival, and demographic parameters of *T. absoluta* reared on six commercial tomato cultivars (Cherry, Cordilheira, Giuliana, Nemoneta, Paron, and Santa Clara) were evaluated. *Tuta absoluta* completed its development in all tomato cultivars. Development from newly hatched caterpillar to newly emerged adult varied between 24.8 and 28.2 days. Female fecundity ranged from 126.3 to 166.9 eggs, with fertility from 54.2 to 84.1%. Mortality during egg-adult development varied between 21.4 and 46.4% for insects reared on cultivars Cherry and Giuliana, respectively. The cultivars Cordilheira, Giuliana, and Santa Clara are promising options to tomato producers in order to decrease the attack and proliferation of *T. absoluta*. However, the development and population growth of *T. absoluta* is faster on the tomato cultivar Cherry.

Introduction

The tomato leafminer, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae), is an olyphagous microlepidopteran pest that attacks species of the family Solanaceae, especially tomatoes. Larvae penetrate the leaves and feed on the mesophyll, affecting the photosynthetic capacity of the plant (Fernandez & Montagne 1990, Uchôa-Fernandes *et al* 1995, Pereyra & Sánchez 2006). In addition, injury caused directly to fruits can result in severe yield losses (Colomo & Berta 1995).

Tuta absoluta is a major pest of tomato in South America (Torres *et al* 2001) and worldwide (Desneux *et al* 2011). More recently, it has been reported in Spain and several other countries of Europe and the Middle East (Viggiani *et al* 2009, Desneux *et al* 2010, Kiliç 2010). An estimated 27.2% of tomatoes produced in the world are infested by *T. absoluta* (Desneux *et al* 2011).

Insect growth and reproduction depend on the quality and quantity of food resources available (Hagen *et al* 1984). To assess the effect of a host on the population growth of an insect, population parameters can be used, such as intrinsic rate of increase (R_m), net reproductive rate (R_o), and generation time (T) based on survival, fertility, development time, and sex ratio (Sauvion *et al* 2005). Also, interactions with plants are important factors in the development of herbivorous insects (Jaenike 1978, Pizzamiglio 1991), while the susceptibility of plants to insects depends on their chemical and morphological characteristics, as well as their ecological environment and protective compounds (Han *et al* 2014, 2015, Larbat *et al* 2016). This information on resistance and susceptibility of cultivars (Maluf *et al* 1997, Ecole *et al* 2000, 2001, Medeiros *et al* 2006) and biological data on pest populations reared on different commercial cultivars can then be used in the development of pest management strategies. In this study, the development, reproduction, and survival of *T. absoluta* were evaluated on six commercial tomato cultivars. In addition, fertility tables were constructed to compare demographic parameters of this species reared on these genotypes.

Material and Methods

Insect rearing

Tuta absoluta rearing started in March 2010 with caterpillars and pupae collected in an organic commercial field of Cherry tomatoes in the municipality of Colombo, metropolitan area of Curitiba, state of Paraná (25°17′31″S, 49°13′26″W), Brazil (Krechemer & Foerster 2015). The insects were reared for 2 years on the tomato cultivar Santa Clara, and field-collected larvae were continuously added to the laboratory stock population.

In order to standardize the tests, insects were reared on the cultivar Carmen for three generations before the experiments were conducted. The rearing procedures followed Krechemer & Foerster (2015).

Development and survival of Tuta absoluta on different tomato cultivars

The development and survival of immature stages of *T. absoluta* were evaluated on six tomato cultivars (Cherry, Cordilheira, Giuliana, Nemoneta, Paron, and Santa Clara) under controlled climatic conditions (20 ± 2°C, 70 ± 10% RH, and 12 h photophase). One hundred forty newly hatched caterpillars for each tomato cultivar were individualized in polyethylene containers (7 × 4 cm). Each individual received one tomato foliole washed in 1% (*v*/*v*) sodium hypochlorite with its petiole wrapped in cotton moistened in water to keep leaves turgid.

Tomato leaves were replaced when caterpillars consumed approximately 70% of its area or when the leaves began to wither to allow larvae to move into them. Pupae were removed from leaves, sexed, and maintained in polyethylene containers until emergence of adults. Adults were randomly separated into couples based on emergence date (next section).

After adults died, the right posterior tibia and wing were removed, and their lengths measured with a Wild Heerbrugg M3 stereo microscope fitted with an eyepiece reticle. Measurements were later calculated using conversion tables. Egg incubation time was recorded for adults reared for each tomato cultivar. The number of eggs produced per couple was considered a sample, with a total of 2147 (Cherry), 2061 (Cordilheira), 2892 (Giuliana), 2059 (Nemoneta), 2837 (Paron), and 2209 (Santa Clara) eggs. Following incubation, the duration of larval and pupal stages was determined.

Reproduction and longevity of Tuta absoluta on different tomato cultivars

Fecundity, fertility, and longevity of *T. absoluta* adults obtained from caterpillars reared on each cultivar were determined with 20 replications per cultivar. Each couple was formed based on emergence date and placed in 10 cm tall by 10 cm in diameter cages. A tomato leaf was used as stimulus for oviposition in each cage (Krechemer & Foerster 2015). *Tuta absoluta* adults received 10% (*w*/*v*) honey solution as food in moistened cotton placed in the plastic containers. Food and leaves for oviposition were replaced daily, when pre-oviposition, oviposition, fecundity, fertility, and longevity were evaluated.

Fertility life table

Fertility life tables for *T. absoluta* were constructed for the six cultivars. The life history data for *T. absoluta* were analyzed based on the age-stage, two-sex life table according to Chi & Liu (1985) and Chi (1988). The reproductive parameters (net reproductive rate (R_o), mean duration of one generation (T), intrinsic rate of increase (R_m), and finite rate of increase (λ)) were calculated and compared using the TWOSEX-MSChart procedure (Chi 2009). The means, variances, and standard errors of the life table parameters were estimated using 10,000 bootstrap samples (Efron & Tibshirani 1993). The parameters were compared between treatments using paired bootstrap test.

Data analysis

All tests were conducted using a completely randomized design. The effects of tomato cultivars on the development and measurements of wing and tibia of *T. absoluta* were tested for homogeneity and normality with the Levene and Shapiro-Wilk

Table 1 Means (±SE) of duration of egg, larvae, pupae, and egg-to-adult periods (days) of *Tuta absoluta* (Lepidoptera: Gelechiidae) on six tomato cultivars.

Cultivars	Egg	Larvae	Pupae	Egg-adult
Cherry	5.8 ± 0.02b	14.9 ± 0.2d	9.9 ± 0.21a	24.8 ± 0.34c
Cordilheira	5.9 ± 0.03b	18.3 ± 0.2a	9.8 ± 0.25a	28.2 ± 0.35a
Giuliana	6.9 ± 0.04a	16.8 ± 0.1c	10.3 ± 0.14a	26.8 ± 0.28b
Nemoneta	5.9 ± 0.04b	17.3 ± 0.4bc	9.9 ± 0.21a	27.2 ± 0.52ab
Paron	6.9 ± 0.03a	16.7 ± 0.1c	10.3 ± 0.11a	27.2 ± 0.19ab
Santa Clara	6.9 ± 0.07a	17.8 ± 0.2ab	10.2 ± 0.15a	27.8 ± 0.21ab
Statistical results	$F_{(5,95)}$ = 170.3; p < 0.001	$F_{(5,466)}$ = 30.1; p < 0.001	$F_{(5,375)}$ = 2.01; p < 0.001	$F_{(5,379)}$ = 13.89; p < 0.001

Means followed by different letters in columns indicate significant differences among treatments (Tukey's test, p < 0.05).

tests, respectively. Only the datasets that did not conform to a normal distribution were transformed with the formulas log $(x+1)$ and $(x+0.5)^{1/2}$ and compared with an analysis of variance (ANOVA). Significant differences among treatments were compared with the Tukey test ($p < 0.05$). Mortality during larval and pupal stages and egg-to-adult development were analyzed with a chi-square test at 1% significance level. Survival curves were constructed with the Kaplan-Meier method ($p < 0.05$) (Kaplan & Meier 1958). All statistical analyses were performed using the software Statistica v. 7 (Statsoft 2004).

Results

Development and survival of Tuta absoluta on six tomato cultivars

Tuta absoluta completed its development on all tomato cultivars, but the genotype consumed during the larval stage affected the development period from egg to adult ($F_{(5,379)} = 13.89$; $p < 0.001$). Insect development was shorter on the cultivar Santa Clara and longer on Cordilheira (28.2 days), which was similar to the values obtained for Nemoneta, Paron, and Santa Clara (Table 1). Egg incubation period was shorter on Cherry, Cordilheira, and Nemoneta ($F_{(5,95)} = 170.3$; $p < 0.001$), and larval development was shortest on Cherry (14.9 days) ($F_{(5,466)} = 30.1$; $p < 0.001$). The duration of the pupal stage duration was similar among treatments ($F_{(5,375)} = 2.01$; $p = 0.07$) (Table 1).

Tomato cultivars also affected the size of *T. absoluta* adults. The tibia length of females fed the tomato cultivar Paron was longer than those fed Cordilheira ($F_{(5,102)} = 3.71$; $p < 0.001$), but female wingspan was similar among treatments ($F_{(5,107)} = 0.46$; $p = 0.80$) (Table 2). Tibia length of males was not significantly different ($F_{(5,86)} = 1.66$; $p = 1.53$), but wingspan of insects raised on Santa Clara was longer than those fed Cherry, Cordilheira, and Giuliana ($F_{(5,87)} = 4.42$; $p < 0.001$) (Table 2).

Table 3 Mortality of *Tuta absoluta* (Lepidoptera: Gelechiidae) during development stages ($N = 140$ for each cultivar).

Cultivars	Mortality (%)		
	Larvae	Pupae	Total
Cherry	10	11.4	21.4
Cordilheira	38.6	5.7	44.3
Giuliana	31.4	15.0	46.4
Nemoneta	27.2	8.6	35.7
Paron	20.7	10	30.7
Santa Clara	22.9	17.9	40.8
Statistical results ($\chi^2_{(5)}$)	0.975; $p < 0.001$	7.849; $p < 0.001$	1.508; $p < 0.001$

Survival during the life cycle of Tuta absoluta

Survival curves revealed the effect of tomato cultivars on *T. absoluta* ($\chi^2_{(5)} = 21.91$; $p < 0.001$) (Fig 2). Larval mortality rate was lower than expected for insects fed the cultivar Cherry (Table 3), and it was 38.6, 31.4, and 10% when reared on Cordilheira, Giuliana, and Cherry, respectively. Pupal mortality was 5.7, 17.9, and 15% for insects reared on cultivars Cordilheira, Santa Clara, and Giuliana, respectively. Egg-adult mortality rate was lowest for insects reared on Cherry and highest on Giuliana (Table 3). Insects fed leaves of the latter that reached the adult stage had a longer lifespan of approximately 110 days, more than twice longer than those reared on Cordilheira, with less than 50 days (Fig 1).

Reproduction and longevity of Tuta absoluta reared on six commercial tomato cultivars

The tomato cultivars affected the pre-oviposition ($F_{(5,94)} = 4.08$; $p < 0.001$), oviposition ($F_{(5,94)} = 4.09$; $p < 0.001$), and fertility ($F_{(5,94)} = 9.66$; $p < 0.001$) of *T. absoluta*. However, female fecundity ($F_{(5,94)} = 1.37$;

Table 2 Length (millimeters) of the right posterior tibia and wing (±SE) of *Tuta absoluta* (Lepidoptera: Gelechiidae) reared on six commercial tomato cultivars.

Cultivars	Tibia		Wing	
	Female	Male	Female	Male
Cherry	3.9 ± 0.0ab	3.8 ± 0.0a	9.8 ± 0.1a	9.6 ± 0.1b
Cordilheira	3.6 ± 0.1b	3.9 ± 0.1a	9.5 ± 0.2a	9.5 ± 0.2b
Giuliana	3.8 ± 0.1ab	3.7 ± 0.1a	9.8 ± 0.2a	9.5 ± 0.2b
Nemoneta	3.8 ± 0.1ab	3.8 ± 0.1a	9.8 ± 0.2a	9.8 ± 0.2ab
Paron	3.9 ± 0.1a	3.8 ± 0.1a	9.8 ± 0.1a	9.9 ± 0.2ab
Santa Clara	3.7 ± 0.0ab	3.9 ± 0.1a	9.8 ± 0.2a	10.4 ± 0.2a
Statistical results	$F_{(5,102)} = 3.71$; $p < 0.001$	$F_{(5,86)} = 1.66$; $p = 1.53$	$F_{(5,107)} = 0.46$; $p = 0.80$	$F_{(5,87)} = 4.42$; $p < 0.001$

Means followed by different letters in columns indicate significant differences among treatments (Tukey's test, $p < 0.05$).

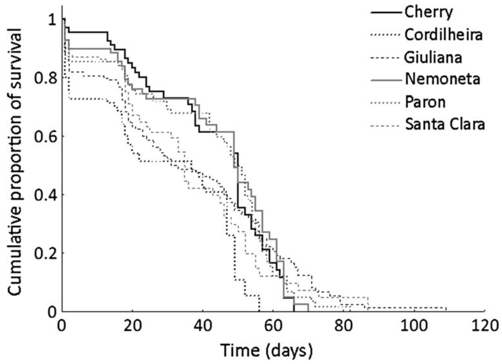

Fig. 1 Survival curves of the life cycle of males and females of *Tuta absoluta* (Lepidoptera: Gelechiidae) reared on six commercial tomato cultivars.

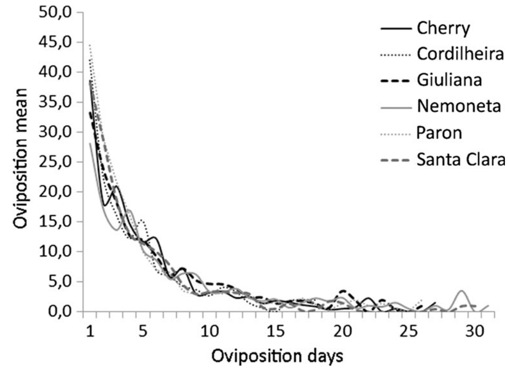

Fig. 2 Mean number of eggs laid throughout the lifespan of *Tuta absoluta* (Lepidoptera: Gelechiidae) reared on six commercial tomato cultivars.

$p = 0.24$) was similar among treatments. The shortest pre-oviposition period was observed for insects fed the cultivar Cordilheira (1.3 days), being similar only to those fed Santa Clara (Table 4). Oviposition peaks were recorded until the third day for all cultivars (Fig 2). Females fed Nemoneta oviposited for 19.8 days, longer than that obtained for those reared on Cordilheira, with 11.3 days. The mean fecundity of *T. absoluta* ranged between 134.8 eggs for insects fed Santa Clara and 166.9 eggs for those reared on Paron, without differences among treatments (Table 4). The highest percentage of fertility was observed for eggs laid by females fed the Cordilheira, Cherry, and Nemoneta cultivars. The lowest fertility rates were observed for insects reared on Giuliana and Paron followed by Santa Clara (Table 4).

Longevity differed among *T. absoluta* females and males fed the six tomato cultivars ($F_{(5,111)} = 4.38$, $p < 0.001$; $F_{(5,111)} = 2.18$, $p = 0.03$). Females reared on Cherry, Giuliana, and Nemoneta had longer lifespans than those fed Cordilheira. Also, females had longer lifespans than males reared on Cherry, Cordilheira, and Nemoneta ($F_{(1,34)} = 4.97$, $p = 0.03$; $F_{(1,28)} = 5.1$, $p = 0.03$; $F_{(1,30)} = 6.05$, $p = 0.02$, respectively). Longevity of females and males was similar for insects reared on Giuliana ($F_{(1,42)} = 0.61$; $p = 0.44$), Paron ($F_{(1,48)} = 0.29$; $p = 0.59$), and Santa Clara ($F_{(1,40)} = 1.24$; $p = 0.27$).

Fertility table

The net reproductive rate (R_o) and finite rate of increase (λ) of *T. absoluta* were higher in insects reared on the cultivars Cherry and Nemoneta, but it differed only from Santa Clara. The longest generation time (T) was observed in insects reared on Santa Clara (40.3 days), while the shortest generation time was recorded on Cherry with 37 days. No differences were found between genotypes regarding the intrinsic rate of increase (R_m) (Table 5).

Discussion

Currently, the control of *T. absoluta* is entirely conducted with broad-spectrum insecticides (Guedes & Siqueira 2012, Campos *et al* 2015). A high number of applications are required throughout the tomato growing season in Brazil

Table 4 Means (±SE) of pre-oviposition and oviposition periods, eggs per female, egg viability and longevity of females and males of *Tuta absoluta* (Lepidoptera: Gelechiidae) reared on six tomato cultivars.

Cultivars	Preov. (days)	Ovip. (days)	Eggs	Egg viab. (%)	Fem. long. (days)[a]	Male long. (days)[a]
Cherry	2.2 ± 0.2a	17.2 ± 1.3a	126.3 ± 13.1a	77.8 ± 2.9ab	31.7 ± 2.5aA	24.8 ± 2.2abB
Cordilheira	1.3 ± 0.2b	11.3 ± 1.2b	128.8 ± 15.2a	84.1 ± 1.4a	19.9 ± 1.1bA	15.9 ± 1.4bB
Giuliana	2.2 ± 0.3a	16.9 ± 1.2a	157.8 ± 10.9a	54.2 ± 5.0c	30.5 ± 2.2aA	27.5 ± 3.2aA
Nemoneta	2.5 ± 0.3a	19.8 ± 1.7a	137.3 ± 14.7a	75.2 ± 5.8ab	29.6 ± 1.7aA	22.8 ± 2.1abB
Paron	2.4 ± 0.3a	16.4 ± 1.1ab	166.9 ± 17.2a	58.3 ± 3.6c	25.2 ± 1.5abA	26.6 ± 1.9abA
Santa Clara	2.0 ± 0.2ab	15.4 ± 1.4ab	134.8 ± 13.3a	67.2 ± 2.4bc	26.6 ± 2.1abA	23.7 ± 3.5abA
Statistical results	$F_{(5,94)} = 4.08$; $p < 0.001$	$F_{(5,94)} = 4.09$; $p < 0.001$	$F_{(5,94)} = 1.37$; $p = 0.24$	$F_{(5,94)} = 9.60$; $p < 0.001$	$F_{(5,111)} = 4.38$; $p < 0.001$	$F_{(5,111)} = 2.18$; $p = 0.03$

Means followed by different letters in columns indicate significant differences among treatments (Tukey's test, $p < 0.05$)

Preov. pre-oviposition, *Ovip.* oviposition, *Eggs* eggs per female, *Egg viab.* egg viability, *Fem. long.* longevity of females, *Male long.* longevity of males

[a] Result of the comparison between cultivars.

Table 5 Means (±SE) of net reproductive rate (R_o), finite rate of increase (λ), mean generation time (T), and intrinsic rate of increase (R_m) of *Tuta absoluta* (Lepidoptera: Gelechiidae) reared on six tomato cultivars estimated by bootstrap samples (10,000 replicates).

Cultivars	R_o	λ	T	R_m
Cherry	61.34 ± 12.37a	1.12 ± 0,01a	37.03 ± 0.24d	0.11 ± 0.01a
Cordilheira	53.84 ± 11.19ab	1.11 ± 0.01ab	37.93 ± 0.19c	0.11 ± 0.01a
Giuliana	47.03 ± 9.77ab	1.10 ± 0.01ab	39.39 ± 0.19b	0.10 ± 0.01a
Nemoneta	61.56 ± 13.68a	1.11 ± 0.01ab	38.83 ± 0.27b	0.11 ± 0.01a
Paron	48.74 ± 9.81ab	1.10 ± 0.01ab	39.19 ± 0.23b	0.10 ± 0.01a
Santa Clara	39.62 ± 7.60b	1.09 ± 0.01b	40.25 ± 0.25a	0.09 ± 0.01a
Statistical results	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p = 0.48$

Means followed by different letters in columns indicate significant differences among treatments (paired boostrap test, $p < 0.05$).

(Guedes & Siqueira 2012), which have led to a steady increase in reports of insecticide resistance in *T. absoluta*. In South America, *T. absoluta* has been reported to be resistant to pyrethroids, organophosphates, abamectin, cartap, and chitin synthesis inhibitors (Siqueira *et al* 2000a, 2000b, Salazar & Araya 2001, Siqueira *et al* 2001, Lietti *et al* 2005, Silva *et al* 2011). Recent studies have also shown resistance of *T. absoluta* to insecticides containing spinosyns and diamide (Campos *et al* 2015, Roditakis *et al* 2013, 2015). In light of this context, alternative control methods to reduce insecticide applications need to be incorporated into the pest management of tomato crops. The first important aspect in pest management is the choice of a suitable tomato cultivar, which was examined in our study.

The development, survival, and reproduction of *T. absoluta* were affected by the tomato cultivars tested. Indices to assess the digestibility of plant nutrients and biomass conversion efficiency are difficult to measure in leafminers (Koricheva & Haukioja 1992). Thus, biological parameters of insects reared on different hosts are an important tool to compare the suitability of different hosts. A host that provides the conditions for a faster development time allows the occurrence of more generations of the pest in the field. Our results showed that the cultivar Cherry promoted the shortest development time for *T. absoluta*, indicating that population growth will be faster when larvae feed on this cultivar. On the other hand, the development of *T. absoluta* on Cordilheira was the longest among the evaluated cultivars. Mortality of immature stages was also higher, while the oviposition period was reduced as well as the longevity of adults. Longer development time and lower fecundity suggest that this host does not provide adequate nutrition for *T. absoluta* (Waters & Barfield 1989, Awmack & Leather 2002). Therefore, Cordilheira was the least susceptible cultivar to *T. absoluta*. Our findings regarding development time are in agreement with those reported previously on the biology of the tomato leafminer (Coelho & França 1987, Imenes *et al* 1990, Borgoni & Carvalho 2006), although some differences were observed. These studies do not mention the cultivars on which larvae were reared, but some of these variations may be associated to differences in temperature.

Wing and tibia length are parameters commonly used to measure the size of adult insects (Awmack & Leather 2002). Despite the differences found in the development, reproduction, and demographic parameters of *T. absoluta* reared on different cultivars, wing and tibia length of adults did not differ significantly. Thus, the latter are not suitable parameters to detect differences in the development of the tomato leafminer feeding on different hosts. Instead, pupal weight may be more appropriate to detect differences in the development.

The realized fecundity of *T. absoluta* females was not significantly different, but the fertility of insects reared on the cultivars Giuliana and Santa Clara was the lowest compared to those reared on the other genotypes. Fecundity is the total number of eggs produced by females, while fertility is the number of viable eggs produced. The potential fecundity is a measure of the reproductive capacity of an insect, defined by the number of eggs in the reproductive tract (Kazimirova 1996, Sequiera & Dixon 1996, Rossi *et al* 1999, Awmack & Leather 2002), whereas realized fecundity refers to the number of offspring produced during the insect's life (Leather 1995). In many herbivorous species, especially among Lepidoptera, all eggs are present in the ovarioles before the adult molt (Leather 1994, Boggs & Ross 1993, Awmack & Leather 2002). Although these eggs may not be at the same stage of development, the quality of the host plant during larval development is the determining factor of the potential fecundity and fertility (Awmack & Leather 2002). The number of viable eggs obtained for insects reared on the cultivars Cherry, Cordilheira, and Nemoneta was similar to the higher values reported by Krechemer & Foerster (2015) at temperatures of 15 and 25°C, while the lowest fertility rates were observed for insects reared on the cultivars Giuliana, Paron, and Santa Clara. Nevertheless, the development time until adult stage differed only for insects reared on Cherry and Cordilheira. Thus, these hosts do not seem to strongly affect the development time of *T. absoluta*, but some negatively influence the viability of eggs, contributing to a lower population increase in the following generations. Moreover, our findings on the lifespan of males and females were similar to those of previous studies reporting that females live longer than males (Coelho & França 1987, Angel 1988, Haji *et al* 1988, Imenes *et al* 1990, Erdogan & Babaroglu 2014).

Demographic parameters of insects reared on different host plants under laboratory conditions are useful to assess their biotic potential when evaluating a new food source and the quality of the host plant (Sánchez & Pereyra 1995, Pereyra & Sánchez 2006). When R_o is above 1 and R_m positive, the population is growing on all cultivars (Carey 1993, Krebs 1994). In our study, highest intrinsic rate of increase (R_m) and the second highest net reproductive rate (R_o) were observed for *T. absoluta* reared on the cultivar Cherry. These parameters are frequently used to measure species performance (Giske *et al* 1993), since they provide information on survival, development, and reproduction of a population (Chi & Yang 2003). The intrinsic rate of increase showed a stable age distribution, and this is considered an essential demographic parameter to predict and compare potential population growth (Andrewartha & Birch 1954, Varley & Gradwell 1970, Hulting *et al* 1990). Thus, the combined values of life table parameters indicate a high growth potential of the population of *T. absoluta* when reared on Cherry cultivar, since for each generation, the value of these parameters tend to increase. Furthermore, the mortality during the life cycle of *T. absoluta* reared on Cherry cultivar was lowest, while fertility rate was similar to those obtained for other cultivars. Therefore, these results indicate that Cherry is the most suitable cultivar for the development of *T. absoluta* and, consequently, the most susceptible.

The tomato cultivar Cherry, one of the most cultivated tomato genotype worldwide, is the most predisposed to the attack of *T. absoluta*, while Cordilheira, Giuliana, and Santa Clara were the least suitable ones for its development and reproduction. Therefore, these cultivars are the most recommended for commercial tomato crops to reduce the damage caused by the tomato leafminer.

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