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CORRELATION AMONG DAMAGES CAUSED BY YELLOW BEETLE, CLIMATOLOGICAL ELEMENTS AND PRODUCTION OF GUAVA ACCESSES GROWN IN ORGANIC SYSTEM

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ABSTRACT - The objective of this research was evaluate the damage caused by the yellow beetle on 85 guava accessions and correlations of the damage with the climatological elements and the production of fruit in an orchard of guava conducted in organic system. Ten leaves by access were analyzed containing the injury of insect attack. Each leaf had its foliar area measured by leaf area meter and, after obtaining the total area, the leaf was covered with duct tape, and measure again. The averages were compared by Scott-Knott test at 5% probability. The 15 accessions with highest average damage had the data submitted to the correlation with the minimum and maximum temperature, precipitation and relative humidity. The production was obtained by the number of fruits/plant. The damages are negatively correlated with the mean relative humidity of 7:00h (local time) in the period of 14 days prior to the assessments, and negatively affect production. The accessions Saito, L4P16, Monte Alto Comum 1 and L5P19 are promising in organic agriculture, for presenting good production and minor damage to insect attack, when compared to others.
Index terms: *Psidium guajava*, *Costalimaita ferruginea,* temperature, precipitation, relative humidity.

CORRELAÇÃO ENTRE DANOS OCASIONADOS PELO BESOURO AMARELO, ELEMENTOS CLIMATOLÓGICOS E PRODUÇÃO DE ACESSOS DE GOIABEIRA CULTIVADOS EM SISTEMA ORGÂNICO

RESUMO - O objetivo deste trabalho foi avaliar os danos ocasionados pelo besouro amarelo em 85 acessos de goiabeira e as correlações dos mesmos com os elementos climatológicos e a produção, em um pomar de goiaba conduzido em sistema orgânico. Foram analisadas 10 folhas por acesso contendo a injúria do ataque do inseto. Cada folha foi medida com medidor de área foliar e, após a obtenção da área total, a folha foi coberta com fita adesiva, e medida novamente. As médias foram comparadas pelo teste de Scott-Knott, a 5% de probabilidade. Os 15 acessos com maior média de danos tiveram os dados submetidos à correlação com a temperatura mínima e máxima, a precipitação e a umidade relativa. A produção foi obtida pelo número de frutos/planta. Os danos mostraram-se correlacionados negativamente com a média da umidade relativa das 7 h no período de 14 dias que antecedem as avaliações, afetando negativamente a produção de frutos. Os acessos Saito, L4P16, Monte Alto Comum 1 e L5P19 são promissores na agricultura orgânica, por apresentarem boa produção e menor dano ao ataque do inseto, quando comparados aos demais.
Termos de indexação: *Psidium guajava*, *Costalimaita ferruginea*, temperatura, precipitação, umidade relativa.

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INTRODUCTION

The guava tree (*Psidium guajava* L.) (Myrtaceae), native from the American tropics is an important fruit in tropical and subtropical regions of the world (SINGH e PAL, 2008). In Brazil, is grown on a commercial scale in almost all regions (PEREIRA e RYOSUKE, 2011). The guava is one of many cultivated species that has high genetic diversity. However, there are few varieties used commercially both for industry and for natural consumption.

The differences between conventional and organic production systems presented strong influence on diversity of arthropod communities (ZEHNDER et al., 2007; MIÑARRO et al., 2009). Thus, the yellow beetle *Costalimaita ferruginea* (Fabr., 1801) (Coleoptera: Chrysomelidae) which is considered on important defoliation pest on Myrtacea, with eminence of the attacks on *Eucalyptus* (PINTO et al., 2004), also composes the insect fauna of guava trees whose adults feed on the leaves, leaving then with tracery aspect. Their larvae present in the soil feed the roots compromising mainly the installation of new orchards (SOUZA FILHO e COSTA, 2009).

Adults of *C. ferruginea* have approximately elliptical shape measuring between five and 6.5 mm length and with yellowish-cream color. The beetle attacks preferentially young leaves of guava, punching them due to his masticate habit. The insect also attacks the buds and when the attack occurs in flowers the fruit can be deformed (OLIVEIRA et al., 2012).

Is technical and scientific knowledge that the development of Integrated Pest Management (IPM) programs depends highly of basic studies of population dynamics and estimation of the relative importance of factors that regulate the population growth. Thus, it becomes necessary to develop research to meet what are the factors and how they affect the intensity of pest attack for the guava crop. The improvement of the knowledge of guava agro-ecosystem as a complex ecological unit enables the development of IPM programs which are important regionally (CALORE et al., 2013).

Seasonal changes in the weather have direct or indirect effects upon insects, by act directly on mortality and on the performance of pests through changes in oviposition, feeding, growth and migration (HOPKINS e MEMMOT, 2003). Seasonal temperatures and rainfall patterns constitute the major factors that determine the distribution of agricultural pests in space (WALLNER, 1987).

The objectives of this study were to evaluate the damage caused by *C. ferruginea* in accesses of guava cultivated in organic system and study the possible correlations among the insect and the meteorological factors: temperature, precipitation and relative humidity, besides fruit yield.

MATERIAL AND METHODS

The experimental work was developed in APTA - Agência Paulista de Tecnologia dos Agronegócios, Regional Centre North Pole, in Pindorama-SP, 21 13 ‘ South latitude and 48 55 ‘ longitude West, 527 m altitude, with yearly average temperature of 22.8° C, annual average rainfall of 1,390.3 mm and average annual relative humidity of 71.6%. According to the Köppen classification, the climate is Aw type, defined as tropical humid, with rainy season in summer and dry in winter.

Were used plants from Germplasm Bank of guava, containing 85 accessions, with 15 years old, with three plants/access, cultivated in the last ten years in organic system, 6 X 5 meter spacing. Through the analysis of soil, it was done an application on surface of 1.5 ton/ha of dolomitic limestone in total area and 20 L of filter cake, around the trunk, in each plant. The control of spontaneous plants was accomplished by cutter motor and manual weeding.

In July 2012, the plants have suffered a drastic pruning, and the main trunk presented a final height of 1.20 meters from the ground. Thus, plants were with new shoots in the evaluation period. Supplemental irrigation was not used in the trial.

For the study with *C. ferruginea*, on each access were evaluated at random 10 leaves containing the yellow beetle attack symptom (perforated leaves, with tracery aspect). The leaves were collected manually, stored in paper bags duly identified and brought to the laboratory. Each one had your leaf area measurement with the aid of leaf area meter CID Bio-science, model CI-202. After obtaining the total area in cm^2, the leaf was covered with duct tape to cover the holes left by the insect, and passed again by the appliance. The leaf area consumed by the insect, in cm^2, was obtained by differences in the readings (GALLI et al., 2013). To standardize data, they were transformed into percentage of leaf area consumed. The evaluations were conducted in 12/11/2012, 26/11/2012, 14/01/2013, 28/01/2013 and 18/02/2013. The damage of each access in each assessment was compared by Scott-Knott test, at 5% probability. For statistics analysis the data were transformed in $\sqrt{x}$ and in Table 2 was found the original values.

The average data relating to damage of *C. ferruginea* on 15 accesses more attacked by the insect have been recorded in each collection and submitted to correlation (Pearson), with the minimum temperature (°C), the maximum temperature (°C), relative humidity (obtained at 7:00 and 13:00 hours) and precipitation (mm), according to methodology used by various authors (DALBERTO et al., 2004; COLOMBI; GALLI, 2009; AUAD et al., DUARTE et al., 2012; CALORE et al., 2013). The data were obtained from the meteorological station of the Regional Center North Pole, located about 300 m from the experiment. In correlations, data of damages caused by insect were correlated with the meteorological elements recorded the day before, with the average registered in periods of seven and 14 days prior to the assessments, in order to determine which length of time that must be used in the correlations. For precipitation, was used the value of the day before, and the accumulated values at seven and 14 days prior to assessments.

For the yield evaluation, was computed the number of fruits per plant of each access (85 in total), accounting the fruits in the canopy and lying on the ground. The means were compared by Scott-Knott test, at 5% probability. For statistics analysis the data were transformed in $\sqrt{x}$ and in Table 3 was found the original values.

RESULTS AND DISCUSSION

The higher damages of *C. ferruginea* were observed in the evaluations carried out in November, with posterior drop in percentage of leaf area consumed by the insect, both to the overall average of all accesses and the average of the 15 accesses more attacked, according to Figure 1.

The increased severity of insect attack observed in the second evaluation (Figure 1) is due to the greater number of new shoots observed at that time, since the yellow beetle, during its food, starts the damage on the young leaves (GALLO et al., 2002). The fall in the percentage of leaf area consumed in the subsequent evaluations is due to the decrease of young leaves on area. Anjos and Majer (2003) reported, for eucalyptus, that yellow beetle prefers to attack the apical and tender parts, as pointers, young leaves, shoots and, in some cases, the bark of the branches. In young leaves, can cause continuous injuries and of large size, while in mature leaves only the main nervure are remaining after intense outbreaks of the pest.

Duarte et al. (2012) verified the population dynamics of *C. ferruginea* and its correlation with population of their natural enemies in organic and conventional orchard of guava, respectively located in Fernando Prestes-SP and Vista Alegre do Alto-SP, and reported that the damages caused by the insect in organic orchard represented average with note 2 (damage between 26-50%), in November 2010, with the top population resulting in high perforating of the newly mature leaves. Then, in February 2011, the authors reported that the average damage was represented by note 1 (damage between 0 – 25%), mainly by the absence of branches with young leaves during this period. In the present work also was noted the greater damage caused by *C. ferruginea* on evaluation held in November, regular season of its normal population increase in the region.

The damage caused by *C. ferruginea* presented significant and negative correlation only with the relative humidity recorded the 7:00 hs when taken the average 14 days prior evaluations, showing that there is an increase in the damage caused by the insect with the decrease in relative humidity (Table 1 and Figure 2).

Contrary to these results, Colombi (2007) found that the damage, through measurement scale of notes of *C. ferruginea* showed significant positive correlation with relative humidity, in other words, there has been an increase in the damage with increasing relative humidity. The other meteorological elements, temperature (minimum, medium and maximum) and precipitation showed no significant correlation with the yellow beetle damage, also observed in the present study.

In this experiment, we evaluated damages to several accesses of guava tree, grown in organic system, which suffered a drastic pruning, and the damages assessments were made with leaf area meter, increasing the precision in obtaining data. Colombi (2007) assessed the insect damage in an area with one variety, Paluma, in conventional system, with an application of insecticide (parathion methyl), and the damage assessments were obtained from visual form, with a scale of notes. In addition, the author conducted the evaluations for a year, covering all the seasons. Already the work here presented covered from November to February, traditionally higher rainfall and relative humidity. Therefore, differences to the correlations between the insect damage and the relative humidity should be expected.

Despite the influence of climatic elements on the behavior of agricultural pests, other factors, such as varieties, geographic location, time of sampling, stage of development, etc. cannot be neglected and should be taken into account in the process of assessing the damages and/or insect pest populations.

Significant differences were observed in the percentage of leaf area consumed by *C. ferruginea* in all evaluations (Table 2). The average of the five evaluations allowed the separation of accesses in six groups, with 24.3 percentage points difference between the most and least attacked by the insect. It was noted that the accesses FAO EEFT C.A.B.A. and RS EEFT. C.A. B.A. were the most attacked, with average percentage of 27.34 and 24.93%, respectively. Among the least attacked, was observed a group of 50 accesses, which did not differ significantly among themselves, some grown commercially, as Rica, Supreme, Saito, Paluma, Ogawa1, Indiana, Webber Supreme, IAC 4 (of the materials obtained in Jaboticabal-SP and Monte Alto-SP), Kumagai branca and Patillo.

The average production of guava fruit, registered as fruits per plant, of 85 accesses of guava trees can be found in Table 3. The Scott Knott test allowed separate statistically the accesses in eight groups, where the cultivar Saito presented the biggest yield of the experiment (average of 373 fruits per plant), not differing from other twelve accesses. Five accesses did not producing fruits, including cultivar Paluma, with widespread commercial use. Generally speaking, the production of all accesses were lower than the obtained in literature for commercial orchards, which can be attributed to the fact that the plants belong to a germplasm bank and therefore had not received the appropriate cultural practices as in commercial crops.

The accesses Saito, L4P16, Monte Alto Comum 1 and L5P19, respectively with average production of 373.0, 362.7, 357.7 and 340.7 fruits per plant (Table 3), showed percentages of leaf area consumed by beetle of 4.67, 5.47, 3.38 and 5.02, respectively (Table 2) being therefore best indicated to organic farming, when it is taken into account the attack of *C. ferruginea*. Gallo et al. (2002) considered significant the losses caused by *C. ferruginea*, which depredate the leaves, leaving them fully laced, and causing reduction in the photosynthetic capacity of the plant, reducing its production.

It is necessary to recognize that, in the last 50 years, all the research efforts have been directed towards developing high-yielding cultivars, heavily dependent on large financial inputs and technologies, mainly oriented to maximizing productivity, without concerns about the ecological aspects. Therefore, it is expected that a long way is to be taken, in order to develop productive cultivars suitable for organic farming (NEVES et al., 2000).

Studies of damages assessment of *C. ferruginea* in guava orchards have been carried out by visual scale of notes for each sampled leaf (COLOMBI, 2007; DUARTE et al., 2012). However, this is the first study to compare accesses of guava to the attack of the pest with accurate results, obtained by the use of leaf area meter. Obtaining results that allows us to distinguish materials least attacked by the insect is an important tool for future planting choices and/or materials for possible genetic improvement. The use of resistant varieties is considered the ideal method for management being apply to large areas and have low environmental impact.

TABLE 1- Coefficient of correlation between damages caused by *C. ferruginea* and climatic elements minimum temperature (TMIN), maximum temperature (TMAX), precipitation (PREC) and relative humidity to the 7:00 and the 13:00 (RH) recorded on the eve of the assessments, the 7 and 14 days prior evaluations.

Costalimaita ferruginea	Correlation coefficient (Pearson)				
	TMIN (^{O}C)	TMAX (^{O}C)	PREC (mm)	RH 7hs	RH 13 hs
	-------------------------- Registered the day before -------------------				
Damages	0.2969^{NS}	0.3273^{NS}	- 0.1769^{NS}	- 0.4111^{NS}	- 0.5512 ^{NS}
	------------------------- Average 7 days prior --------------------				
	- 0.5420 ^{NS}	0.3552^{NS}	- 0.6365^{NS}	0.1888 ^{NS}	- 0.6662 ^{NS}
	------------------------ Average 14 days prior --------------------				
	- 0.8525 ^{NS}	0.5682^{NS}	- 0.8213 ^{NS}	- 0.8831 *	0.0587 ^{NS}

* Significantly, at 5% probability; ^{NS} Not Significantly.

TABLE 2- Percentage of foliar area of guava trees consumed by the yellow beetle (*C. ferruginea*) in 85 accesses and evaluation times.

Accesses	Origin	Evaluation times 12/11/2012	26/11/2012	14/01/2013	28/01/2013	18/02/2013	Averages of 5 evaluations
		---------- % ----------					
FAO EEFT C.A. B.A.	Jundiaí	27.47[1]a	35.08a	21.52b	27.28a	25.36a	27.34 a
R.S. EE.FT C.A. B.A.	Jundiaí	27.97a	27.29b	32.29a	17.56c	19.52b	24.93 a
IAC – 4	Jundiaí	20.25b	23.16c	22.59b	23.78b	21.78a	22.31 b
Guanabara	Jundiaí	17.59c	20.12c	18.50c	18.56c	22.18a	19.39 c
Australiana Vermelha	Jundiaí	22.05b	21.48c	16.96c	13.79d	19.09b	18.67 c
Indiana	Jundiaí	14.44d	24.76b	14.47c	15.72c	15.89c	17.06 c
Webber Supreme	Jundiaí	16.96c	15.37d	14.26c	20.43b	14.32c	16.27 c
Rubi Supreme	Jundiaí	15.68c	17.39d	12.00c	16.78c	18.19b	16.01 c
Supreme BA.	Jundiaí	22.10b	18.13d	14.31c	14.93c	8.08d	15.51 d
Monte Alto	Jundiaí	13.70d	19.65c	13.09c	16.17c	12.89c	15.10 d
V. Redonda (Shimoda)	Valinhos	17.73c	22.43c	12.52c	13.02d	9.45d	15.03 d
Torrão de Ouro	Jundiaí	7.29e	25.89b	13.14c	11.41d	11.90c	13.93 d
L3P8	Campinas	20.23b	17.70d	12.71c	7.23e	10.69d	13.71 d
V. Comprida (Shimoda)	Valinhos	18.17c	17.64d	6.43d	8.50e	8.85d	11.92 d
Campos	Jundiaí	12.16d	18.28d	8.76d	12.70d	7.47d	11.87 d
L7P28	Campinas	14.68d	9.46e	9.12d	11.41d	6.01d	10.14 e
L6P24	Campinas	10.82e	8.18e	4.99e	8.74e	16.98c	9.94 e
Red Selection	Monte Alto	12.91d	10.88e	12.77c	6.09e	5.57d	9.65 e
Tetraplóide	Jundiaí	8.84e	13.69e	8.93d	7.35e	7.16d	9.19 e
Mirtácea (Campinas)	Campinas	9.08e	9.31e	8.65d	7.57e	6.63d	8.25 e
Ogawa 3	M. das Cruzes	7.21e	11.04e	7.12d	8.94e	6.11d	8.08 e
L2P6	Campinas	8.59e	5.77f	10.44d	7.94e	7.07d	7.96 e
L8P31	Campinas	9.27e	10.44e	7.21d	3.87f	7.01d	7.56 e
L6P22	Campinas	9.45e	11.62e	7.14d	4.03f	5.30d	7.51 e
L1P2	Campinas	7.63e	6.95e	3.33e	6.14e	12.74c	7.36 e
L5P21	Campinas	6.24e	10.09e	9.77d	4.82f	5.56d	7.29 e
FAO – UNESP	Jaboticabal	5.42f	8.43e	8.57d	10.43e	2.97d	7.17 e
L6P25	Campinas	9.23e	7.45e	6.18d	6.38e	6.41d	7.13 e
L3P7	Campinas	11.44e	7.72e	7.45d	3.53f	3.74d	6.78 e
L8P30	Campinas	9.15e	9.54e	4.43e	2.16f	8.38d	6.73 e
L2P5	Campinas	9.54e	3.17f	6.83d	7.28e	6.59d	6.68 e
L5P18	Campinas	8.25e	7.41e	6.08d	6.10e	5.53d	6.67 e

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Vermelha perfumada	Jundiaí	14.11d	6.49f	2.96e	6.16e	3.36d	6.62 e
L6P23	Campinas	5.96f	10.14e	6.35d	5.99e	4.04d	6.50 e
L3P11	Campinas	9.22e	8.57e	5.11e	4.89f	3.85d	6.33 e
L1P3	Campinas	8.82e	7.33e	4.17e	5.54f	4.43d	6.06 f
G. vermelha (Cingapura)	Linhares-ES	4.79f	7.97e	4.79e	6.64e	5.46d	5.93 f
Supreme Branca	Jundiaí	5.64f	5.99f	7.54d	6.73e	3.46d	5.87 f
propr. de Tadao Ogawa	M. das Cruzes	4.53f	5.15f	6.46d	7.29e	5.82d	5.85 f
L7P26	Campinas	8.18e	3.93f	7.52d	4.82f	4.03d	5.70 f
EEFT 3	Monte Alto	5.98f	3.92f	4.78e	9.46e	3.85d	5.60 f
L4P16	Campinas	3.40f	3.28f	14.46c	2.54f	3.68d	5.47 f
EEFT – CA - BA	Jundiaí	7.98e	8.35e	4.48e	3.47f	2.97d	5.45 f
EEFT 2 (C. das Almas)	Monte Alto	4.76f	5.26f	9.07d	5.13f	3.01d	5.45 f
L4P14	Campinas	7.43e	7.32e	3.79e	4.31f	4.29d	5.43 f
L4P17	Campinas	8.31e	6.17f	4.46e	3.60f	3.84d	5.27 f
L3P9	Campinas	7.04e	4.62f	4.47e	5.62f	4.29d	5.21 f
Rica – J – 2	Jaboticabal	6.16e	6.65f	4.47e	5.25f	3.19d	5.14 f
Supreme	Monte Alto	6.55e	6.60f	4.96e	2.23f	5.15d	5.10 f
Ruby Supreme 3	Monte Alto	2.95f	6.27f	6.94d	4.26f	5.03d	5.09 f
L3P12	Campinas	8.25e	4.90f	4.64e	3.71f	3.69d	5.04 f
L5P19	Campinas	7.11e	7.18e	4.06e	4.67f	2.07d	5.02 f
EEFT 1 (C. das Almas)	Monte Alto	6.41e	4.94f	5.94d	4.74f	2.77d	4.96 f
EEF – 3	Jaboticabal	5.73f	3.65f	5.55e	5.57f	4.20d	4.94 f
Australiana Branca	Jundiaí	5.34f	3.85f	5.71e	5.18f	4.30d	4.88 f
L5P20	Campinas	7.73e	4.77f	4.69e	3.81f	2.92d	4.78 f
L2P4	Campinas	8.31e	4.63f	2.67e	4.03f	3.87d	4.70 f
Saito	Valinhos	3.27f	5.02f	4.00e	6.42e	4.65d	4.67 f
L4P13	Campinas	7.68e	4.78f	3.54e	4.31f	2.80d	4.62 f
Paluma	Jaboticabal	3.14f	8.01e	3.97e	5.15f	2.82d	4.62 f
Ogawa 1	M. das Cruzes	5.13f	5.06f	3.84e	4.68f	4.32d	4.61 f
Kioshi 3	Monte Alto	3.51f	4.27f	6.82d	4.23f	3.85d	4.54 f
L3P10	Campinas	7.23e	5.06f	4.03e	3.21f	3.05d	4.52 f
Ruby Supreme 1	Monte Alto	3.87f	3.25f	7.19d	4.27f	3.69d	4.45 f
Creme Arredondada	Jaboticabal	4.06f	4.50f	5.57e	3.61f	4.50d	4.45 f
Indiana - UNESP	Jaboticabal	3.39f	4.69f	5.21e	4.31f	4.58d	4.44 f
Webber – Supreme	Jaboticabal	3.12f	5.82f	4.71e	3.53f	4.95d	4.42 f
Ogawa x Kumagai	Promissão	4.03f	6.69f	4.23e	3.28f	3.83d	4.41 f

continue...

Ruby Supreme 2	Monte Alto	3.85f	4.44f	4.38e	4.95f	4.38d	4.40 f
EEFT 4	Monte Alto	3.69f	4.17f	4.76e	4.70f	4.30d	4.32 f
Kioshi 1	Monte Alto	2.73f	5.72f	6.15d	3.08f	3.35d	4.21 f
IAC – 4 - UNESP	Jaboticabal	3.70f	4.94f	3.18e	4.50f	4.55d	4.17 f
Taquaritinga comum	Monte Alto	4.06f	5.47f	3.03e	5.17f	3.05d	4.16 f
Patillo – Ba.	Jundiaí	3.26f	3.64f	5.60e	4.03f	3.39d	3.98 f
IAC – 4 – Cica	Monte Alto	3.42f	5.51f	4.33e	2.43f	4.19d	3.98 f
Kumagai Branca	Valinhos	3.94f	3.62f	2.75e	4.40f	5.00d	3.94 f
Goiaba Branca	Desconhecida	4.44f	3.04f	5.36e	3.84f	2.89d	3.91 f
Patillo	Jaboticabal	1.69f	4.45f	4.30e	4.60f	4.09d	3.82 f
Monte Alto - Branca	Valinhos	3.20f	3.88f	3.00e	6.21e	2.74d	3.81 f
L8P32B	Campinas	4.12f	5.25f	3.41e	3.77f	2.34d	3.78 f
Goiaba polpa amarela	Limeira	3.51f	3.18f	2.87e	4.83f	4.46d	3.77 f
M. Alto – Comum 1	Monte Alto	2.30f	4.60f	2.32e	3.63f	4.06d	3.38 f
L4P15	Campinas	5.31f	2.20f	3.78e	2.83f	2.22d	3.27 f
Kioshi 2	Monte Alto	3.23f	2.20f	4.97e	2.69f	2.64d	3.15 f
L8P32A	Campinas	2.56f	2.64f	2.44 e	4.42f	3.12d	3.04 f
F (Blocos)		0.3546 ^{NS}	0.9873 ^{NS}	1.0738 ^{NS}	1.2463 ^{NS}	2.1530 *	14.2537 **
F (Tratamentos)		19.2476 **	19.8593 **	9.6526 **	12.0371 **	11.1480 **	18.7615 **
CV (%)		24.44	25.53	32.24	29.84	33.20	15.47

[1]Means followed by the same letter in the column do not differ. by Scott-Knott test. at 5% probability.
Data transformed in $\sqrt{x}$.
**Significantly. at 1% probability; * Significantly. at 5% probability; ^{NS} Not Significantly.

TABLE 3-Average production of guava fruit (fruits per plant) of 85 accesses of *Psidium guajava.*

Acesses	Production	Acesses	Production
Saito	373.0 a	Kumagai Branca	82.0 e
L4P16	362.7 a	FAO – UNESP	79.3 e
Monte Alto – Comum 1	357.7 a	vermelha perfumada	72.7 e
L5P19	340.7 a	L5P21	70.0 e
L3P10	300.7 a	L3P8	67.3 e
propr. deTadaoOgawa	289.3 a	Webber Supreme	64.3 e
L3P12	266.7 a	Torrão de Ouro	58.0 e
L3P9	260.3 a	Supreme	55.7 e
L4P14	249.7 a	Creme Arredondada (UNESP)	53.0 e
L4P15	249.0 a	L8P32B	51.7 e
Ogawa x Kumagai	239.7 a	L8P31	51.0 e
L3P7	218.3 a	L3P11	50.0 e
L8P32A	217.7 a	Patillo	49.3 e
Campos	192.0 b	Australiana Branca	48.3 e
Ogawa3	178.7 b	RedSelection	45.7 e
Taquaritinga comum	173.7 b	EEFT 3	45.7 e
L5P20	152.3 b	L6P24	44.3 e

continue...

RubySupreme1	135.7	b	EEFT 4	44.3	e
L6P23	135.3	c	Webber – Supreme	41.3	e
L4P13	135.3	c	IAC – 4 - UNESP	34.7	f
Kioshi1	135.3	c	EEFT – CA - BA	33.7	f
L6P22	133.0	c	L6P25	32.7	f
L2P6	127.3	c	RubySupreme2	31.7	f
L1P2	126.7	c	RubySupreme3	31.0	f
Supreme Branca	120.7	c	Guanabara	30.0	f
L4P17	117.3	c	Monte Alto	26.7	f
Kioshi3	116.7	c	EEF – 3	26.0	f
L2P4	116.3	c	IAC – 4	23.7	f
L1P3	114.3	c	Australiana Vermelha	20.3	f
Goiaba polpa amarela	112.0	c	Vermelha Redonda (Shimoda)	19.7	f
Monte Alto - Branca	107.7	c	Tetraplóide	19.3	f
Indiana	105.0	d	L8P30	18.0	f
Kioshi2	104.7	d	Mirtácea (Campinas)	16.3	f
L5P18	103.3	d	EEFT 1 (Cruz das Almas)	14.7	f
Rica – J – 2	102.3	d	Supreme BA.	11.0	g
L7P26	97.3	d	FAOEEFT C.A. B.A.	6.0	g
Patillo – Ba.	92.0	d	Vermelha Comprida (Shimoda)	4.0	g
EEFT 2 (Cruz das Almas)	91.7	d	R.S. E.E.F.T. C.A. B.A.	0.0	h
L2P5	88.7	d	L7P28	0.0	h
Ogawa1	88.7	d	Paluma	0.0	h
IAC – 4 – Cica	88.0	d	Goiaba Branca	0.0	h
Rubi Supreme	84.3	e	Goiaba vermelha (Cingapura)	0.0	h
Indiana - UNESP	82.0	e			
F (Acesses)			35.7968 **		
F (Blocks)			1.0092 NS		
CV (%)			15.07		

[1] Means followed by the same letter in the column do not differ. by Scott-Knott test. at 5% probability.
**Significantly. at 1% probability; NS Not Significantly.

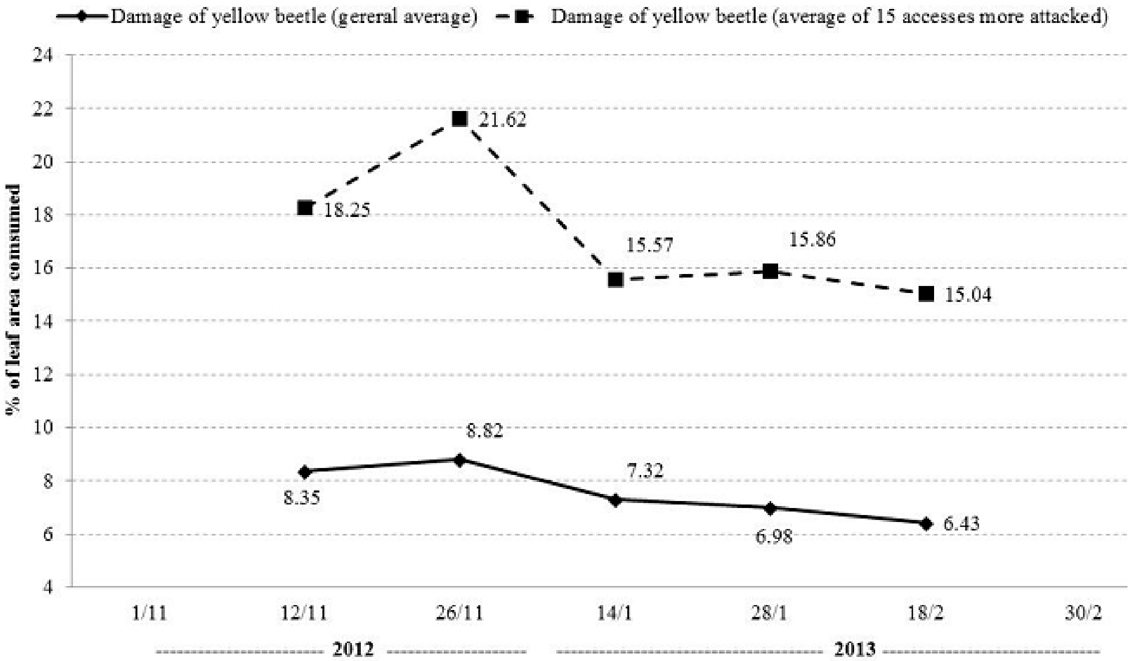

FIGURE 1- Average percentage of leaf area consumed by the yellow beetle *C. ferruginea* in 85 accesses of guava and in the 15 accesses more attacked.

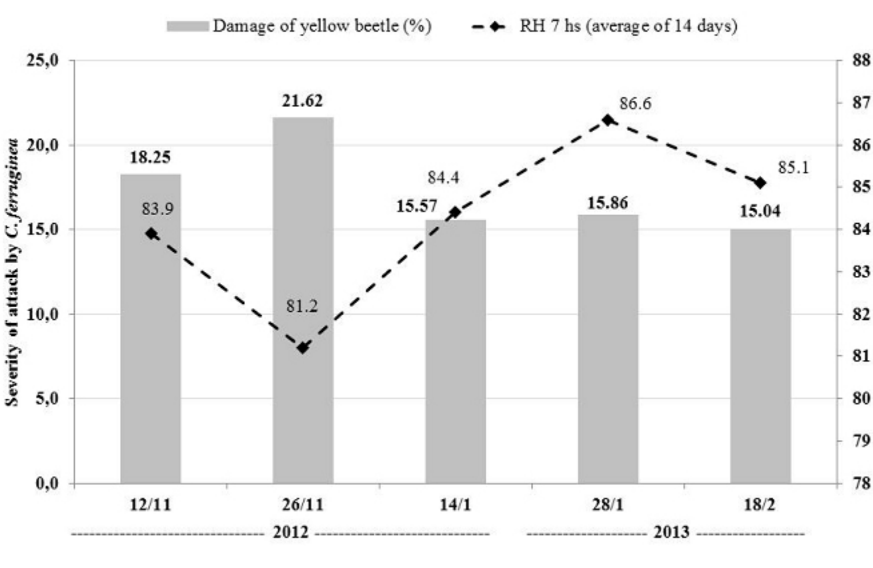

FIGURE 2 - Average percentage of leaf area consumed by the yellow beetle *C. ferruginea* on 15 accesses more attacked by the insect and relative humidity recorded in the period.

CONCLUSIONS

The damage caused by *Costalimaita ferruginea* in leaves of guava were negatively correlated with the average relative humidity of 7:00 in the period of 14 days prior to the assessments, adversely affected the production of fruits.

The accesses Saito, L4P16, Monte Alto Comum 1 and L5P19 are promising in organic agriculture, for presenting good production and suffer little damage to the yellow beetle attack, when compared to the other materials tested.

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