Plant Growth Retardant in Fig

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Abstract

In this study two experiments were conducted in order to study the effect of the plant, trinexapac-ethyl, in growth and yield of fig (Ficus carica L.) plant. Experiment 1 was carried out from August 27, 2011 to March 3, 2012 and experiment 2, August 27, 2012 to March 3, 2013. Both experiments were deployed in a commercial orchard cultivation of fig cv. Roxo de Valinhos - four years of age, conducted in rainfed (no irrigation), being added regularly, sugar cane bagasse in the lines of plants as mulching and allocating the production of green fruit industry in the Caldas city-MG. The experimental design was a randomized block, considering a control (no application) and one or two applications of Trinexapac-ethyl in five concentrations in solution form: 0; 62.5; 62.5 + 62.5; 125; 125 + 125; 250; 250 + 250 and 500 mg L^{-1} of active ingredient, distributed in four blocks. The plot consisted of four plants and a plant border on each side of the plot. In experiment 1 and 2, the first spray was in new branches (shoots) standardized to 50 cm in length and containing 12 internodes (around 12 axillary buds). The second spraying was performed in the same lines, 45 days after the first application. The use of trinexapac-ethyl, both in one as in two applications of 250 mg L^{-1} did not affect the plant growth, but increased plant height, number of internodes, length of the branch and the first insertion height fruit until the 1st harvest of fruits of fig cv. Roxo de Valinhos. However, since this concentration there was negative effect on growth and impaired production.

Keywords: Ficus carica L., gibberellin, plant growth inhibitors, ‘Roxo de Valinhos’

Introduction

The fig tree is a subtropical fruit plant introduced in Brazil, a country of continental conditions and with great diversity of climate. However, most of the national territory is located in tropical climate region, which covers the latitude 5 ° N to 33 ° S. Therefore, most part of the efforts to adapt the frutis to warmer climates have been noted, especially in figs, peaches, grapes, citrus, apples, persimmons, pears and other species, not as common as acerola, guava, custard apples (soursop, custard apple, atemóia, cherimoya) and passion fruit (POMMER; BARBOSA, 2009). There is therefore sufficient reason to believe that the plant in warmer regions (tropical climate), like Brazil, can promote vegetative growth at the expense of production. There is therefore sufficient reason to believe that the plant in warmer regions (tropical climate), like Brazil, can promote vegetative growth at the expense of production. The growth and development of temperate and subtropical climate plants can be affected by climate change, especially global warming. However, knowing phenological events can provide valuable data for planning, execution and organization of agricultural activities (Ruml; Vulic, 2005), mitigating adverse effects. Chmielewski et al. (2004) revealed that climate change, especially the increase of air temperature since the late 1980s, led to profound changes in phenology and hence in the yield in several locations around the world.

In natural growth, plants acquire medium to large size, with variable height from three to seven meters. The growth of aerial parts of the fig tree is abundant, and pruning must be held annually, removing branches that fruited the previous year by drastic pruning. The amount of material removed is too high, this can mean wasting of dry matter produced by plant, which could be used for production of fruit in greater quantity and quality, especially with regard to size.

An alternative would be to use vegetable retardant to promote shortening of internodes and reduced growth of the vegetative part, allowing the translocation and utilization of assimilates to significantly increase production of fig. Retardants vegetables are synthetic compounds used to reduce the undesirable longitudinal growth of the aerial parts of the plant, without reducing productivity (RADEMACHER, 2000). The main vegetables retardants act by inhibiting the biosynthesis of gibberellins, plant hormone that, among other things, promote cell elongation (Davies, 2010). An inhibitor of gibberellin synthesis promising in diverse cultures is the ethyl-trinexapac especially in suppressing vegetative growth and promote the accumulation of sucrose in cane sugar (MILK et al., 2009), influence the height and diameter of stem of soybean and the development and yield of rice. Therefore, the objective of this work was to verify the effects of ethyl-trinexapac on growth and yield of the fig (Ficus carica L.).

Material and Methods

Experiment 1 was carried out from August 27, 2011 to March 3, 2012, and experimente 2 from August 27, 2012 to March 3 2013. Experiment 2 was a repetition of experimente 1. The two experiments were conducted in a commercial orchard of fig (*Ficus carica* L.) cv. Roxo de Valinhos, in spacing of 3 m between rows and 2 m between plants, plants with four years old and in open cup (Figure 6) system, keeping about 15 branches (shoots) of the year to produce increased number of fruits for green figs processing industry, conducted without irrigation, being added regularly, bagasse in lines of plants wich seved as mulching. Four months after winter pruning the first harvest was made and six months after winter pruning the second harvest of green fruits destinated to industry was performed. The property is located in Caldas city (MG), Tóca farm, located on the road Caldas-São Pedro de Caldas, km 10, owned by Mr. João Evangelista Franco. Caldas city is located at 21º55 'South latitude and 40 West longitude and altitude of 1.150 meters above sea level, with soil type predominantly lithosol Argisol. The annual average temperature is 19 ° C, average minimum temperatures of 13 ° C and maximum of 26 ° C, with an average relative humidity of 75%, total annual rainfall of 1.500 mm, and annual sunshine of 1,816 hours. In Figures 1 and 2 are shown the average, maximum and minimun temperatures, and precipitation during the experiments in 2011/2012 and 2012/2013 cycle respectively. It is noteworthy that on September 2, 3, 4, 5, 2011 a weak frost occured and on July 14, 15, 19, 20, 21, 2012 moderate frost in the region.

Fertilization in 2011/2012 and 2012/2013 cycle was based on soil physical and chemical analysis, according to techniques for culture. Also adopted as auxiliary parameter the chemical analysis of the leaves. Phytosanitary treatments were carried out taking into account the formation of favorable environment to pest and disease attack, besides visual symptoms in the leaves, stems and fruits. For pathogens control, technical recommendations regularly adopted by farmers were used.

The experimental design used was the randomized block (RBD), considering a control (no application) and one or two applications of ethyl trinexapac in five concentrations, in solution form: 0 mg L^{-1} active ingredient (a.i.); 62.5 mg L^{-1} a.i.; 62.5 + 62.5 mg L^{-1} a.i.; 125 mg L^{-1} a.i.; 125 + 125 mg L^{-1} a.i.; 250 mg L^{-1} a.i.; 250 + 250 mg L^{-1} a.i.; 500 mg L^{-1} a.i. Treatments were divided into four blocks (replications). The plot consisted of four plants, one plant from each side of the plot was considered as border, in spacing of 3 m between rows and 2 m between plants, totalizing 128 plants. The plant growth regulator used was ethyl trinexapac, comercial producto Moddus®, containing 25% w/v (250 g L^{-1}) of ethyl trinexapac (chemical name: ethyl ester of 4-(cyclepropyl-hydroxy-α methylene) -3,5-carboxylic dioxycyclehexan) Syngenta Crop Protection. After drastic pruning performed in winter (August 27, 2011 and 2012), the product was sprayed on November 22, 2011 and 2012 with a pressurized backpack sprayer with CO_2 and constant pressure adjustment (pressure gauge) at 2,812 kgf cm^{-2} and tip of X_3 cone type, according to the previous test performed on randomly selected plants in the area, and volume of solution of 500 mL for each plant. The first spray was performed on new branches (shoots) standardized to 50.0 cm in length and containing 12 internodes (around 12 axillary buds). The second spraying was carried out on the same branches, 45 days after the first application.

After 100 days of treatments application the following evaluations were performed:

Plant height (PH): considered as the distance from ground level (neck of the plant) to the tip of the apical bud (highest point of the plant); performed using a ruler attached to a mesuring tape, in centimeters (2.0 m in height).

Canopy area (m^2): measurement taken from the perpendicular and parallel axis to the row (length and width) that were transformed into square meters (m^2).

Canopy diameter (length): measured with a ruler attached to a mesuring tape, in centimeter (2.0 m height). The canopy diameter was considered as the measure, within the line of cultivation of the fig tree, starting from the outermost edge of the leave on one side of the canopy to the edge of the outermost leaf on the other side of the canopy.

Plant diameter (width): measured with a ruler (2.0 m in height) attached to a measuring tape. Plant diameter (width) was considered as the measure, between rows, starting from the outermost edge of the leave on one side of the canopy to the edge of the outermost leaf on the other side of the canopy.

Length of the branch (LB): determined with a measuring tape in centimeters, considering the base of the branch to the tip of the apical bud of the same branch selected and marked with colored narrow ribbon.

Number of internodes (NI): determined by counting the number of internodes of the selected branch, starting at the base of the branch to its apex.

First fruit insertion height (FFI1 and FFI2): measured with the a ruler (2.0 m in height) attached to a measuring tape, in centimeters. It was considered the height of insertion of the first fruit as the height from the ground level until the first fruit formed in the labeled branch from frist harvest (20/12/2012 and 20/12/2013) to second harvest (27/02/2012 and 02/27/2013). This measure indicates the height in which manual harvesting of the fruits wil be performed, which can be a facilitating factor or not of the harvesting process.

Percentage of branches with fruit (% BF): number of labeled branches with fruit set and calculation of the percentage of branches with fruit, as follows: number of branches with fruits x 100 / total branches =% BF

Total number of fruits per plant (NF/P): counting of the total number of fruits per plant at harvest.

Weight of fruits per plant (WF): weighing the total green fruits per plant (g) at harvest.

Average weight of the fruit (AWF): harvest of all fruits per plot, which were counted and weighed with the a scale. The harvesting point was defined when the fruits reach approximately 17 g, mass considered standard for the begining of harvest of immature fruit.

Fruit mass (FM): ratio of total fruit mass per plant (FM) with the total number of fruits per plant (NF). This data served as reference for the approximate size of the fruit of the fig tree: FM (g) / NF = AMF (g).

The results obtained in all evaluation were submitted to analysis of variance (F test), observing the homogeneity of variances by Cochran tes, besides the uniformity of treatments being confirmed by the Shapiro-Wilk test. As required, the respective data analyzed were transformed into square root. Furthermore, regression analysis was applied to the concentrations used. Subsequently, the homogeneity of variances of each cycle by bilateral F test with a significance level of a = 0.05 test was performed. Also performed the combined analysis of data from 2011/12 and 2012/13 cycles to determine whether there was interference of the year factor in the variables analyzed using the SAS statistical analysis program.

Results and Discussion

The regression analysis of Experiment 1 (2011/2012 cycle, Table 1) confirms the differences for NF/P and FM/P in one or two applications of ethyl trinexapac, besides the frist fruit insertion height until the second harvest (FFI2). Hawerroth et al. (2012) studying the effect of prohexadione-Ca, a substance similar to ethyl trinexapac, found that a dosage of 550 g ha^{-1} resulted in a higher number and weight of pear fruits. Figure 3 shows the significant effect of one or two applications of the plant growth inhibitor. It is observed that there was a linear increase in FFI1 and FFI2 (Figure 3 C and D) with one application of ethyl trinexapac, which could be a factor to be considered in the efficience of harvest. Plant height (PH) increased up to 250 mg L^{-1} (125 mg L^{-1} in two applications) later, there was a reduced plant height, demonstrating the inhibitory effect of growth by ethyl trinexapac from this concentration (Figure 3A). However, increasing the concentration of ethyl trinexapac reduced NF/P, FM/P and FM (Figure 3 E, F, B respectively) affecting production and yield of fig possibly due to inhibition of active gibberellins synthesis. The level of active gibberellin plays an important role in the retention of large numbers of fruits on plants and on growth of these fruits. Anderini and Bartolini (2008) found that nectarine treated with gibberellin showed large number of fruits per branch.

At higher concentrations of ethyl trinexapac (250 mg L^{-1} in two applications) the effect on the reduction in plant height (PH) and the reduction in NF/P, FM/P and FM (Figure 3 A, E, F and B, respectively) may be desirable, since more compact and smaller plants can be densified and thus increased productivity per area of cultivation, or higher yield. The regression analysis of experiment 2 (2011/2012 cycle, Table 2) shows significant differences to NI and FFI2 in single application of ethyl trinexapac, in addition to the PH, LB and NI in treatments receiving two applications. Hawerroth et al. (2012) observed in the pear that prohexadine Ca (compound of acylcicle hexanodionas group) decreased the number, average branch length and mass of the branches pruned, with incremente of the dosage. However, the average length of internodes and the number of buds per plant were not significantly influenced by this inhibitor of gibberellin synthesis. The plant hormone, gibberellic acid (GA), is an endogenous compound related to the promotion of growth of various plant organs, especially the internodes. Based on such information becomes primordial the knowledge of hormonal regulation, particularly of gibberellins, providing favorable conditions for the control of plant growth. The knowledge of hormone metabolites and transport routes will bring new opportunities to manipulate hormone levels and regulate plant growth (SANTNER et al., 2009). The PH, NI and LB (Figure 4A, B and D, respectively) increased up to 250 mg L^{-1} (two applications of 125 +125 mg L^{-1}), then reduction occurred; the same occurred to NI (Figure 4B).

The analysis of the two cycles (2011/2012 and 2012/2013) in experiments conducted in Caldas-MG (Table 3) shows no influence of the cycle for PH and CA, however, all other characteristics showed differences in the cultivation cycle. According to the results obtained it appears that the response to chemical treatments may be mediated by numerous endogenous (physiological) and exogenous (environmental). However, there was a significant effect on many variables, allowing report the action of ethyl-trinexapac on growth of *F. carica*. Andreini and Bartolini (2008) studying the morphological and histochemical characteristics of nectarine 'Lavinia' treated with gibberellin in different cropping cycles (2002-2003 and 2003-2004) showed high variability of results. In addition, they reported that climatic conditions which occurred between the different years will not predict the effectiveness of chemical treatment. The precipitation was less than 50 mm (Figures 1 and 2) in August, September and November 2011 (Experiment 1) and from August to October 2012 (Experiment 2), which may have negatively affected the development of the fig tree and influenced the marked differences from one crop cycle to another, since there was no irrigation in area under cultivation, but had uniform mulch in the. In Botucatu city (SP), Silva et al. (2011) showed that the use of mulch and irrigation favored the development of fig 'Roxo de Valinhos', besides offering satisfactory water conditions to rapid establishment of. In Caldas (MG) conditions, only the mulch may not have been sufficient to supply the water demand of the crop. Souza and Leonel (2011) revealed that the annual water requirements of the fig tree are supplied with 1200 mm, since well distributed throughout the year. In addition, in brazilian southeastern droughts may occur on winter, which could cause leaf fall and stop the growth of the fig tree, with negative consequences for yield and the fruiting period. However, frequent rainfall and high atmospheric humidity are also unfavorable at the time of fruit ripening, from December to May. It is noteworthy that during the months of December 2011, January 2012 (Experiment 1) and December 2012 until May 2013 (Experiment 2), precipitation was more than 200 mm, which can be considered excessive and have a negative influence growth and development of *F. carica* fruits.

Conclusions

From the results obtained and under the conditions of this study it can be concluded that the use of ethyl trinexapac, both in one as in two applications at 250 mg L^{-1} did not affect the plant growth, increasing the number of internodes, branch length and height of insertion of the first fruits up to the first harvest of the fig fruits (*Ficus carica* L.) cv. Roxo de Valinhos. However, from this concentration there was a negative effect on growth and yield.

Acknowledgment

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References

ANDREINI, L.; BARTOLINI, S. Morphological changes in the apex of Prunus persica L. during floral transition and effects of gibberellin on flower bud differentiation. Journal of Applied Horticulture, Indiranagar, v. 10, n. 2, p. 93-99, 2008.

CHMIELEWSKI, F.; MULLER, A.; BRUNS, E. Climate changes and trends in phenology of fruit trees and field crops in Germany, 1961-2000. Agriculture and Forest Meteorology, Amsterdan, v. 121, p. 69-78, 2004.

DAVIES, P. J. Plant hormones: biosynthesis, signal transduction, action! / edited by Peter J. Davies. - 3.ed., rev., Dordrecht; Boston: Kluwer Academic Publishers, 2010. 802 p.

HAWERROTH, F. J. et al. Redução da poda hibernal e aumento da produção de pereiras 'Hosui' pelo uso de prohexadionacalico. Pesquisa Agropecuária Brasileira, Brasília, DF, v.47, n.7, p.939-947, 2012.

LEITE, G. H. P.; CRUSCIOL, C. A. C.; SILVA, M. A.; VENTURINI FILHO, W. G.; Maturadores e qualidade tecnológica da cana-de-açúcar variedade RB855453 em início de safra. Bragantia, Campinas, v.68, n.3, p.781-787, 2009.

POMMER, C. V.; BARBOSA, W. The impacto f breeding on fruit production in warm climates of Brazil. Revista Brasileira de Fruticultura, Jaboticabal - SP, v. 31, n. 2, p. 612-634, 2009.

RADEMACHER, W. Growth retardants: effects on gibberellin biosíntesis and other metabolic pathways. Annual Review Plant Physiology and Plant Molecular Biology, Palo Alto,v. 51, p. 501-531, 2000.

RUML, M.; VULIC, T. Importance of phonological observations and predictions in agriculture. Journal of Agricultural Sciences, v.50, n. 2, p. 217-225, 2005.

SILVA, A. C. et al. Crescimento de figueira sob diferentes condições de cultivo. Pesquisa Agropecuária Tropical, Goiânia, v. 41, n. 4, p. 539-551, 2011.

SOUZA, A. P.; LEONEL, S. Uso da irrigação suplementar em figueira. In: LEONEL, S.; SAMPAIO, A. C. (Coord.) A figueira. São Paulo: Editora Unesp, 2011.p. 177-194.

Table 1: Regression study for plant height (PH, in cm), canopy area (CA, in m^2), average length of the branch (ALB, in cm), average number of internodes (ANI), first fruit insertion height form 1st to 2nd harvest (FFI1 and FFI2 in cm), total number of fruits per plant (NF/P), weight of fruits per plant (WF/P, in g) and fruit mass (FM, g) of fig (*Ficus carica* L. cv. Roxo de Valinhos) treated with different concentrations of ethyl-trinexapac, Caldas, 2011/2012[(1)].

	1 application								
REGRESSION	PH	CA	ALB	ANI	FFI1	FFI2	NF/P	WF/P	FM
Linear	0,56ns	0,02ns	0,34ns	0,06ns	8,13*	9,22*	40,82**	32,13**	9,87**
Quadratic	2,75ns	0,70ns	0,04ns	3,46ns	4,00ns	3,41ns	0,88ns	0,45ns	0,00*
Cubic	0,15ns	1,12ns	0,55ns	1,15ns	0,15ns	0,39ns	0,27ns	1,85ns	8,49*
4th degree	0,63ns	0,60ns	0,22ns	0,04ns	0,01ns	0,30ns	24,68**	14,99**	1,92ns
F	1,03	0,61	0,29	1,18	3,07	3,33	16,66	12,35	5,07
VC(%)	21,21	38,18	25,25	13,12	24,30	22,99	17,75	25,83	13,51
	2 applications								
Linear	0,00ns	1,79ns	0,03ns	1,48ns	1,48ns	5,11ns	90,21**	47,27**	4,72ns
Quadratic	8,75*	3,81ns	2,29ns	0,16ns	0,00ns	0,13ns	2,57ns	0,01ns	0,53ns
F	3,36	1,87	3,74	4,84	0,66	1,97	42,62	21,52	2,26
VC(%)	16,80	26,55	21,02	9,81	21,85	16,96	12,92	21,72	13,28

[(1)] Linear, Square, Cubic and 4th degree regression: value of F test, showing statistically significant differences between treatments at 1% (**) and 5% (*) of probability; ns: no significant differences between treatments; F: F value for treatments; VC= variation coefficient, in %.

Table 2: Regression analysis for plant height (PH, in cm), canopy area (CA, in m^2), average length of the branch (ALB, in cm), average number of internodes (ANI), first fruit insertion height form 1st to 2nd harvest (FFI1 and FFI2 in cm), total number of fruits per plant (NF/P), weight of fruits per plant (WF/P, in g) and fruit mass (FM in g) in fruits of fig (*Ficus carica* L. cv. Roxo de Valinhos) treated with different concentrations of ethyl-trinexapac, Caldas, 2012/2013[(1)].

	1 application								
REGRESSÃO	PH	CA	ALB	ANI	FFI1	FFI2	NF/P	WF/P	
Linear	0,4198ns	3,3531ns	1,6521ns	1,3177ns	0,4198ns	0,4225ns	3,7785ns	1,7593ns	4,4738ns
Quadratic	0,1088ns	1,0915ns	4,4428ns	5,5880*	0,1088ns	0,1765ns	0,0314ns	0,4880ns	2,8392ns
Cubc	2,9226ns	0,0372ns	1,4625ns	1,0375ns	2,9226ns	0,1499ns	0,0817ns	0,0619ns	1,5257ns
4th degree	0,9840ns	3,7055ns	0,2012ns	0,7215ns	0,4849ns	8,9496*	0,4993ns	1,7066ns	0,7065ns
F	4,3135	2,0468	1,9396	2,1662	0,9840	2,4246	1,0977	1,0039	2,3863
VC(%)	12,44	14,98	20,02	8,85	96,63	34,16	36,52	34,10	21,49
	2 applicattions								
Linear	6,1265*	0,4447ns	0,5665ns	0,5322ns	1,6752ns	0,0015ns	2,1906ns	1,7754ns	0,0145ns
Quadratic	7,0093*	3,5933ns	5,6015*	6,3054*	1,3688ns	1,9642ns	0,6846ns	0,4121ns	0,0557ns
F	5,0546	1,4333	2,1363	2,3953	1,0373	0,9196	2,9385	1,8017	0,3635
VC(%)	14,58	25,62	22,59	8,57	89,01	38,84	35,41	21,39	11,43

[(1)] Linear, Square, Cubic and 4th degree regression: value of F test, showing statistically significant differences between treatments at 1% (**) and 5% (*) of probability; ns: no significant differences between treatments; F: F value for treatments; VC= variation coefficient, in %. FFI (1application) and WF/P (2 applications): data transformed according to square root.

Table 3- Joint analysis of the two cropping cycles with p values for the F test unfolding the cycles effect within each concentration (treatment) for plant height (PH, in cm), canopy area (CA, in m^2), average number of internodes (ANI), average number of internodes (ANI) first fruit insertion height form 1st to 2nd harvest (FFI1 and FFI2 in cm), total number of fruits per plant (NF/P) , weight of fruits per plant (WF/P, in g) and fruit mass (FM, g) of fig plant (*Ficus carica* L. cv. Roxo de Valinhos) treated with different concentrations of ethyl-trinexapac, Caldas, 2011/2012 and 2012/2013[(1)] cycles.

Concentrations	PH	CA	ALB	ANI	FFI1	FFI2	NF/P	WF/P	FM
0 mg L^{-1}	0,6821	0,3874	0,4727	0,5782	0,0150*	0,9039	0,0003*	0,0006*	0,4556
62,5 mg L^{-1}	0,0842	0,3561	0,0127*	0,0001*	0,2471	0,1748	0,0519	0,0615	0,7622
62,5 + 62,5 mg L^{-1}	0,8524	0,4803	0,0751	0,0008*	0,0249*	0,8590	0,0349*	0,2582	0,3369
125 mg L^{-1}	0,6945	0,1252	0,1571	0,0018*	0,0056	0,2183	<0,0001*	<0,0001*	0,2532
125 + 125 mg L^{-1}	0,5216	0,6734	0,9965	0,1282	0,0029*	0,6995	0,1468	0,2969	0,9743
250 mg L^{-1}	0,6821	0,8561	0,3047	0,0156*	0,0005*	0,9635	0,7455	0,1616	0,0130*
250 + 250 mg L^{-1}	0,1094	0,4283	0,3595	0,0524	0,0001*	0,1255	0,8329	0,5813	0,2527
500 mg L^{-1}	0,0853	0,6015	0,4268	0,2405	0,0058	0,0043*	0,2430	0,8931	0,0006*

[(1)] P value for F test, showing significant diferences between treatments at 5% (*) of probability.

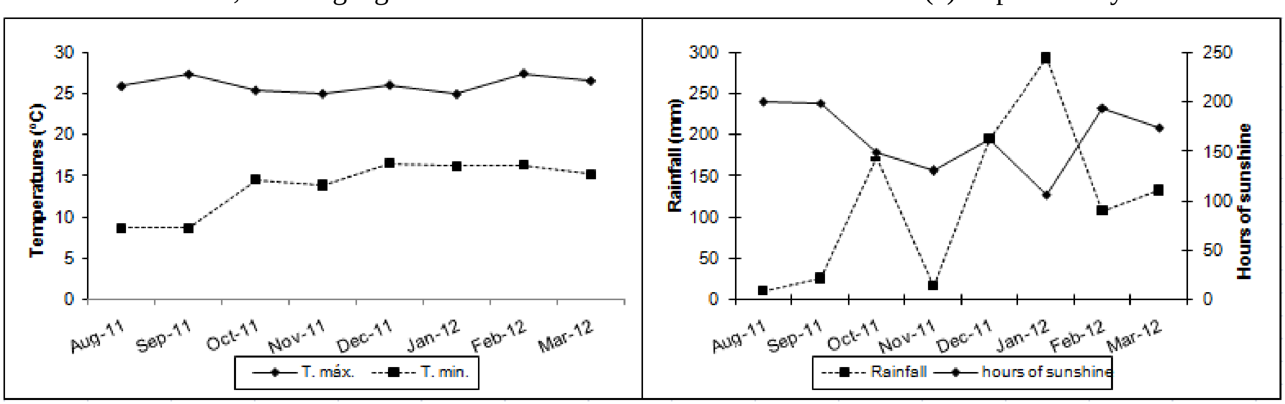

Figure 1: Maximun and Minimun Temperatures (ºC), rainfall (mm) and hours of Sunshine (insoltion) during August 2011 to March 2012. Caldas (MG)

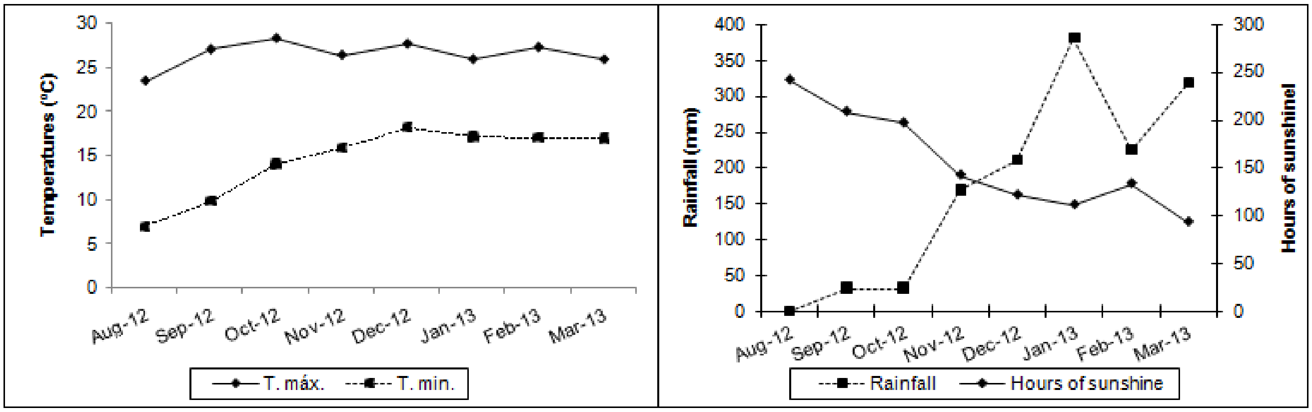

Figure 2: Maximun and Minimun Temperatures (^oC), Rainfall (mm) and Fours of Sunshine (Insolation) during August 2012 to March 2013. Caldas (MG)

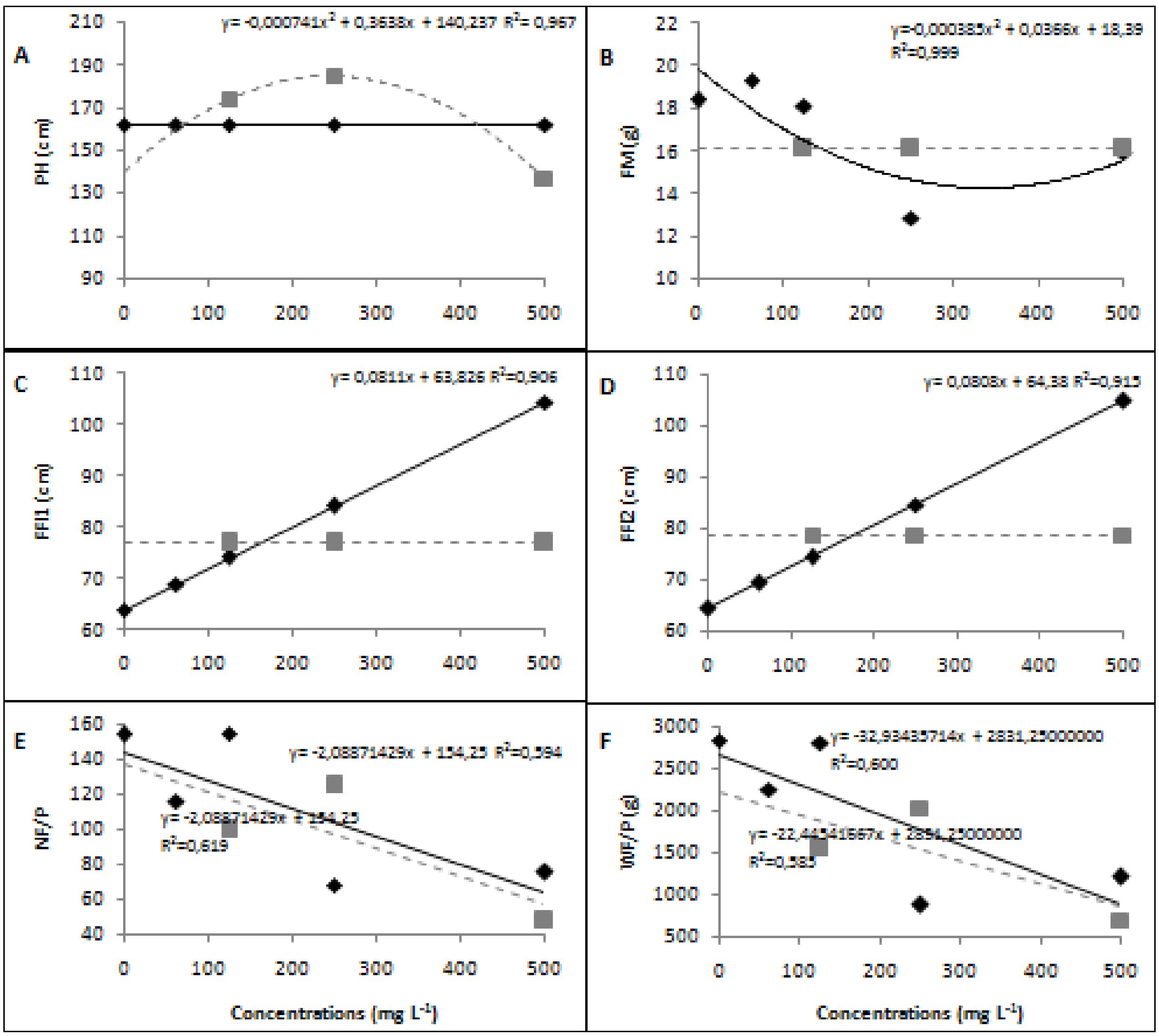

Figure 3. (A) Plant height (PH, in cm), (B) fruit mass (FM, in g), (C) first fruit insertion height until 1st harvest (FFI1, in cm), (D) first fruit insertion height until 2nd harvest (FFI2, in cm), (E) total number of fruits per plant (NF/P) and (F) weight of fruits per plant (WF/P, in g) of fig plants treated with ethyl-trinexapac, Caldas – MG, 2011-2012. 1 application 2 applications.

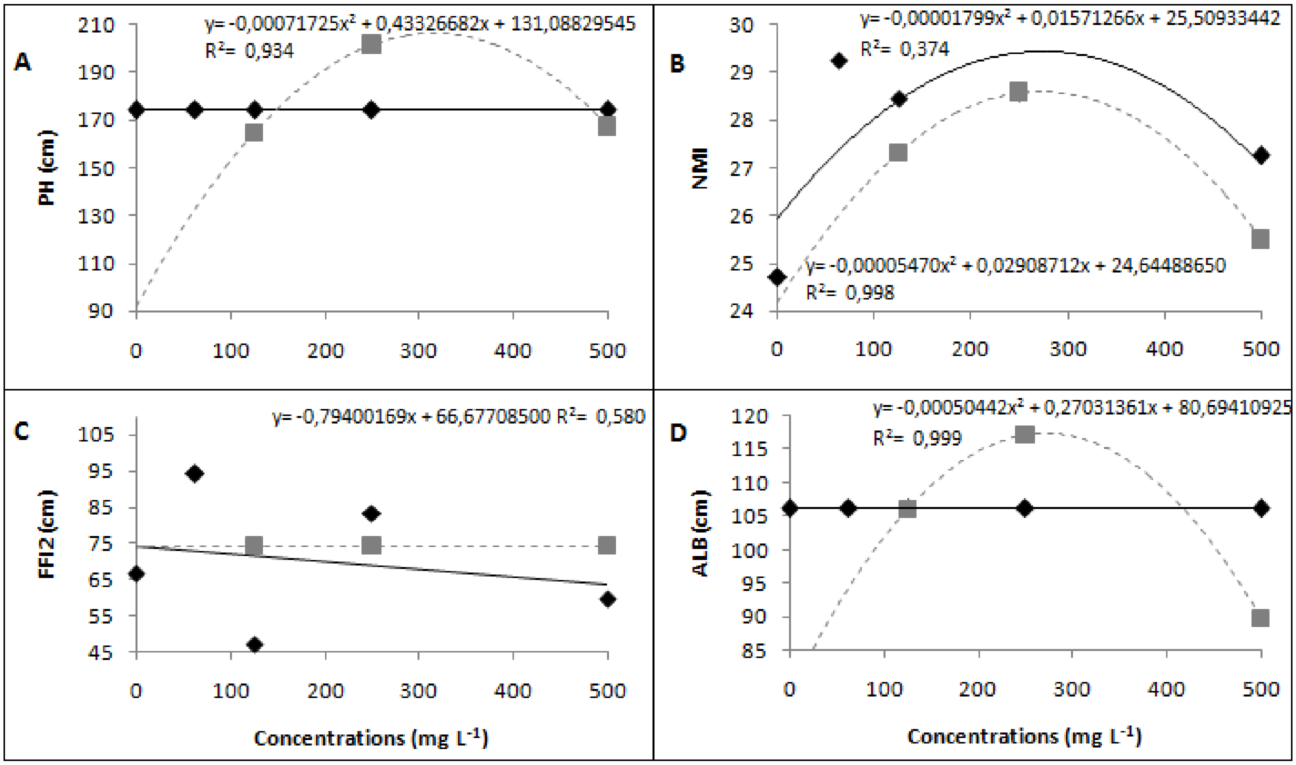

Figure 4: (A) Plant height (PH, in cm), (B) average number of internodes (ANI), (C) first fruit insertion height until 2nd harvest (FFI2, in cm) and (D) average length of the branch (ALB, in cm) of fig plants treated with ethyl-trinexapac, Caldas – MG, 2012-2013. 1 application 2 applications.