

Original Research Article

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Pruning intensity and lopping system in fig plants in the Brazilian semiarid region

Abstract

5 **Aims:** Fig plants produce fruits in branches of the year, which grow after emission of
6 buds from the leaf armpits. And the lopping system is one of the most common
7 practices among the green fig farmers to increase production. Thus, the present work
8 aimed to improve the physical, chemical and productive characteristics of fig trees in
9 the semiarid region of Brazil.

10 **Study Design:** A complete randomized block design was used in a 3x2 factorial scheme
11 (3 pruning intensities: 5, 10 and 15 cm in length; and 2 lopping system: with and
12 without lopping), constituting six treatments with 4 replicates. Each experimental plot
13 consisted of five plants, but only the three central plants were used.

14 **Place and Duration of Study:** The experiment was conducted in the didactic orchard
15 of the Federal Rural University of Semiarid (UFERSA), Mossoró-RN.

16 **Methodology:** The treatments were: 5 cm pruning without lopping; 5 cm pruning with
17 lopping; 10 cm pruning without lopping; 10 cm pruning with lopping; 15 cm pruning
18 without lopping; 15 cm pruning with lopping. The following variables were analyzed:
19 fruit weight (g), fruit length and diameter (cm), firmness (N), soluble solids (°Brix),
20 titratable acidity (%), vitamin C (mg ascorbic acid 100g⁻¹ pulp), fruit yield (number of
21 fruits plant⁻¹ and kg plant⁻¹). The data were submitted to analysis of variance by the F
22 test at 5% probability and means were grouped using the Tukey test at 5% probability.
23 Analysis was performed using R software version 3.5.2.

24 **Conclusion:** Pruning intensity of 10 cm and the use of lopping system influenced
25 physical, chemical and productive characteristics of fig plants in the Brazilian semiarid
26 region.

27 Keywords - Chemical characteristics, *Ficus carica* L., fruticulture, handling,
28 production, pruning, physical.

29 1. INTRODUCTION

30 The fig tree (*Ficus carica* L.) has great importance in the world scenario among
31 temperate fruit trees, but many management techniques need to be improved.

32 The southern and southeastern regions of Brazil, according to IBGE [13], are the
33 most producers of fig fruits, for in natura consumption and for the industry. The planted
34 area corresponds to 2,591 ha, where the South (1,766 ha) and Southeast (825 ha) are the
35 largest producers, with an average production of 7.521 and 15.274 kg ha⁻¹, respectively.

36 Although the fig tree has been cultivated in temperate regions, it has shown good
37 adaptation to tropical regions. Thus, the semiarid becomes an alternative for the
38 productive chain and exploration of new agricultural areas of fig plants.

39 Pruning intensity is a management technique used to increase production and
40 quality of fruits, but it must consider the edaphoclimatic conditions [16]. In addition,
41 the lopping system is another technique widely used by fig producers in order to extend
42 the productive period and increase fruit production [4]. Cutting off the branch apex
43 favors the emission and growth of new branches, contains the plant canopy, and
44 maintains more luminosity in the canopy interior [3]. However, the first lopping must be
45 done when shoots have eight pairs of leaves and then leaving two new branches after
46 the emission [7].

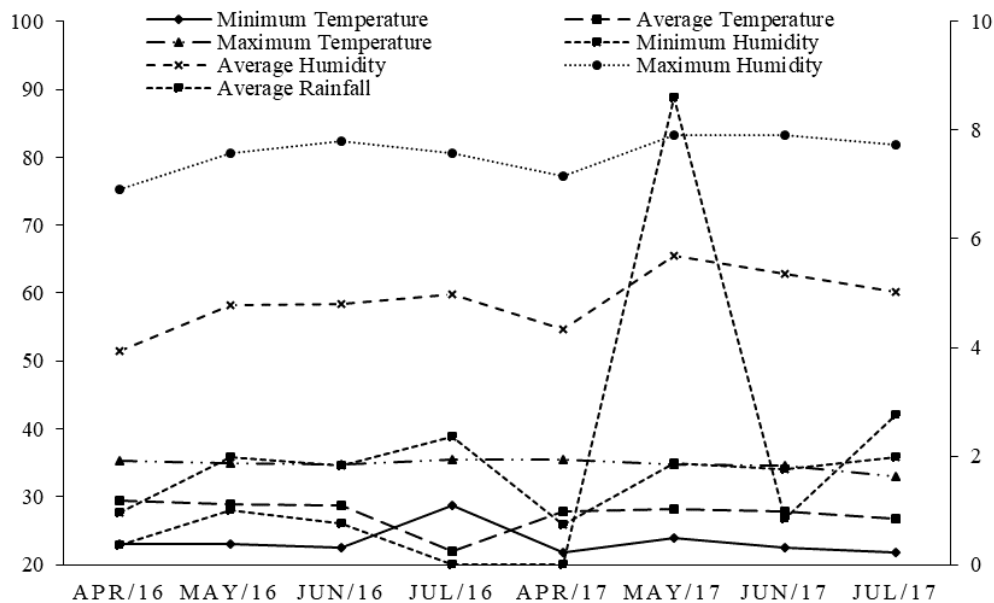
47 The fig tree is rustic and can grow, develop and produce in semiarid conditions.
48 However, knowledge about this crop management in the semiarid region is still scarce.
49 In addition, the same technologies that have been used in the South and Southeast
50 regions cannot be used in the semiarid, because this region has different conditions of
51 temperature, humidity, insolation, and rainfall. Thus, the present work aimed to evaluate
52 the use of the pruning and lopping system in fig trees in the semiarid region.

53 **MATERIAL AND METHODS**

54 **2.1 Climatic data**

55 The experiment was carried out in two production cycles, the first one from April
56 to July 2016 (Cycle 1), and the second from April to July 2017 (Cycle 2), at the didactic
57 orchard of the Federal Rural University of Semiarid (UFERSA), located in the
58 municipality of Mossoró-RN, in the semiarid potiguar region of the Brazilian Northeast,
59 at the geographical coordinates 5° 11' South latitude, 37° 20' West longitude, and 18 m
60 altitude from the sea level. The climatic conditions, characterized as hot and dry, during
61 the experimental period were: 27.50 °C mean annual temperature, 68.9% mean annual
62 relative humidity, 4.4 tenths mean annual cloudiness, and 673.9 mm mean annual
63 rainfall [10] (Figure 1). According to the soil analysis, the soil was classified as
64 Eutrophic Red-Yellow Argisol.

65



66

67 **Figure 1 - Climatic data of temperature, relative humidity, and rainfall of Cycle 1**
 68 **and Cycle 2 of fig production, conducted under different pruning intensities, and**
 69 **with or without lopping. UFERSA, Mossoró-RN, 2018.**

70 2.2 Treatments, experimental design, and plant growth conditions

71 Roxo de Valinhos was used because this cultivar has high economic value,
 72 presents rusticity, vigor and productivity characteristics, and is adapted to the drastic
 73 pruning system.

74 The experimental area was composed of 150 plants, spaced 2.0 m between rows
 75 and 1.5 m between plants. The plants were irrigated daily by a micro-sprinkler system
 76 and the weed control was performed by gas brushes.

77 A fruiting pruning was performed to start a new production cycle. The plants were
 78 conducted with three primary branches throughout the vegetative cycle, and then with
 79 two secondary branches, totaling six branches plant⁻¹. After that, when new branches
 80 emerged from the secondary branches, they were pruned at 5, 10 and 15 cm from the

81 base and when these tertiary branches presented eight pairs of leaves, they were
82 submitted to the lopping. Others tertiary branches were conducted without the lopping
83 system.

84 The experiment was carried out in a complete randomized block design in a 3x2
85 factorial scheme with 4 replications. The factors corresponded to the different pruning
86 intensity (5, 10 and 15 cm), and the lopping system use (with or without). Plots
87 corresponded to five plants per treatment, but only the three central plants were used.

88 **2.3 The physical-chemical analyzes**

89 The following plant vegetative characteristics were evaluated at the end of the
90 experiment: fruit weight (g), length and diameter of fruits (cm), and yield (number of
91 fruits plant⁻¹, and kg plant⁻¹).

92 Postharvest evaluations of the fruit were carried out at the Physiology and
93 Postharvest Laboratory of the Department of Agronomic and Forest Sciences of the
94 Federal University of Semiarid (UFERSA). The following physicochemical analyses
95 were performed: soluble solids content, pulp firmness, titratable acidity, and vitamin C
96 content, that were performed according to [2].

97 The length and diameter of the fruits, expressed in cm, were evaluated with a
98 digital caliper. And fruit weight was obtained using a semi-analytical balance (Mars
99 model AS 2000).

100 The number of fruits plant⁻¹ was determined by counting the fruit number in the
101 plant every 3 days. After harvesting, the fruits were weighed and the yield (kg plant⁻¹)
102 was calculated.

103 The pulp firmness was measured by a penetrometer (McCormick model FT 327),
104 coupled to a tip of 8 mm in diameter, and the results were expressed as Newton (N).

105 The titratable acidity was determined by titration with 0.1 M NaOH standard
106 solution, with 1.0% phenolphthalein as indicator, and the results were expressed as g
107 citric acid 100 g⁻¹ pulp (Instituto Adolfo Lutz 1985). Data were expressed as %. The
108 soluble solids content (SS) was obtained by a digital refractometer (Atago PR-101
109 Palette) and the results were expressed as °Brix (AOAC 1997).

110 The vitamin C content was obtained by titration with 2,6-
111 dichlorophenolindophenol (DFI), and data were expressed as mg ascorbic acid 100g⁻¹
112 pulp, according to AOAC (1997).

113 **2.4 Statistical analysis**

114 Data were submitted to analysis of variance by the F test at 5% probability, and
115 the means were grouped by the Tukey test at 5% probability using R software version
116 3.5.2.

117 **2. RESULTS**

118 Fruit mass, fruit length, fruit diameter, pulp firmness, soluble solids content,
119 titratable acidity, and vitamin C content were not influenced by the different pruning
120 intensity. However, except for titratable acidity and vitamin C, these physical-chemical
121 characteristics were significantly different when the lopping system was used. The
122 number of fruits plant⁻¹ and total fruit production were significantly different according
123 to pruning intensity and to lopping system in Cycle 1.

124 In Cycle 2, pulp firmness, titratable acidity, and vitamin C content were
125 significantly different when the plants were submitted to the different pruning intensity
126 or to lopping system. The other variables were not influenced by the pruning intensity
127 and lopping system.

136 Means followed by different letters in the same column differ significantly according to
137 the Tukey test at 5% probability. NS: not significant; *, **: significant at 5% or 1%
138 probability, respectively, according to the F test.

139 The fruit length and fruit diameter were not affected by the pruning intensity both
140 in Cycle 1 and in Cycle 2, and by the lopping system in Cycle 2. However, in Cycle 1,
141 when the plants were conducted without lopping, maximum values of 3.79 cm and 4.17
142 cm for fruit length and fruit diameter, respectively, were obtained.

143 In Cycle 1, the pulp firmness of the fruits was not affected when the plants were
144 submitted to the different pruning intensities. But, in Cycle 2, the plants submitted to the
145 15 cm pruning intensity produced fruits with higher firmness value (7.17 N). The use of
146 lopping system increased the pulp firmness in Cycle 1, with a maximum value of 13.91
147 N.

148 For the soluble solids content, no significant effect was observed considering the
149 pruning intensity treatments in both cycles. However, the plants conducted without
150 lopping produced fruits with SS content 19,4% higher in Cycle 1, which did not occur
151 in Cycle 2.

152 In Cycle 1, the titratable acidity and vitamin C content (Table 2) were not affected
153 when the plants were submitted to the pruning intensity or to the lopping system.
154 However, in Cycle 2, a significant interaction between the two treatments occurred
155 (Table 2).

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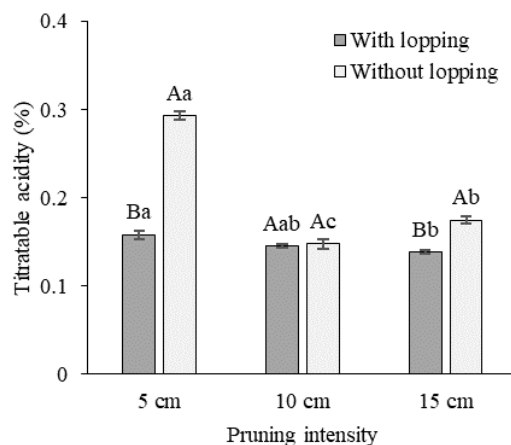
157 **Table 2 - Titratable acidity (%) and vitamin C content of fig fruits cv. Roxo de**
158 **Valinhos from plants submitted to different pruning intensities and to lopping**
159 **system in two production cycles. UFERSA, Mossoró-RN, 2018.**

	Titratable acidity		Vitamin C	
	(%)		(mg ascorbic acid 100 g ⁻¹ pulp)	
	Cycle 1	Cycle 2	Cycle 1	Cycle 2
Pruning 5 cm	0,18a	0,23	22,06a	16,83
Pruning 10 cm	0,19a	0,16	22,51a	20,58
Pruning 15 cm	0,18a	0,15	21,75a	23,88
With lopping	0,18a	0,15	22,05a	21,5
Without lopping	0,18a	0,21	22,16a	19,36
Mean	0,18	0,18	22,11	20,43
CV (%)	13,67	4,68	14,15	6,62
	Mean square			
Block	0,00018	0,000061	24,660	0,524
Pruning	0,00030	0,0154	1,143	99,612
Lopping	0,00050	0,0193	0,062	27,413
Pruning*Lopping	0,00115	0,0092	9,551	27,294
Block	NS	NS	NS	NS
Pruning	NS	**	NS	**
Lopping	NS	**	NS	**
Pruning*Lopping	NS	**	NS	**

160 Means followed by different letters in the same column differ significantly according to
 161 the Tukey test at 5% probability. NS: not significant; *, **: significant at 5% or 1%
 162 probability, respectively, according to test F.

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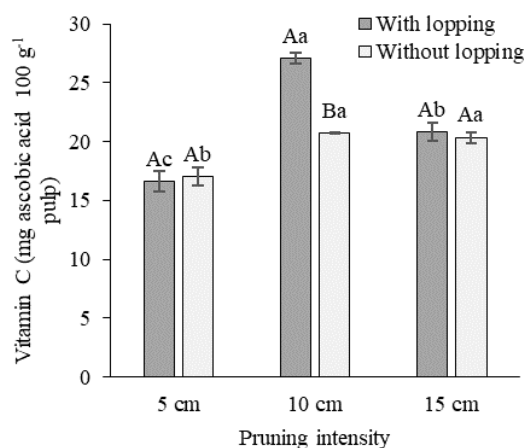
164 In Cycle 2, when the plants were submitted to 5 cm pruning intensity and not to
 165 the lopping system, the fruits presented a 44.8% increase in titratable acidity, with a
 166 maximum value of 0,30%. The other treatments did not affect the titratable acidity,
 167 which reached the mean values of 0,18% (Figure 2).



168

169 **Figure 2 - Titratable acidity in fig fruits cv. Roxo de Valinhos from plants**
 170 **submitted to different pruning intensities and to lopping system in Cycle 2 of**
 171 **production. Uppercase letters compare the lopping system and the lowercase**
 172 **letters compare the means among pruning intensity according to the Tukey test at**
 173 **5% probability UFERSA, Mossoró-RN, 2018.**

174 The vitamin C content was 30.8% higher in the fruits when the plants were
 175 submitted to 10 cm of pruning intensity and to lopping, reaching to 27.0 mg ascorbic
 176 acid 100 g⁻¹ pulp. The plant pruned at 5 cm, conducted with or without lopping,
 177 presented the lowest values of vitamin C content (16.8 mg ascorbic acid 100g⁻¹ pulp
 178 average) (Figure 3).



179

180 **Figure 3 – Vitamin C content in fig fruits cv. Roxo de Valinhos from plants**
 181 **submitted to different pruning intensities and to lopping system in Cycle 2 of**
 182 **production. Uppercase letters compare the lopping system and the lowercase**
 183 **letters compare the means among pruning intensity according to the Tukey test at**
 184 **5% probability. UFERSA, Mossoró-RN, 2018.**

185 In Cycle 1, a significant interaction between the pruning intensity and the lopping
 186 system occurred for the total number of fruits plant⁻¹ (TNF) and the total fruit
 187 production (TFP). However, no interaction was observed in Cycle 2, and the maximum
 188 number of 238.63 and 254.00 fruits plant⁻¹ was observed when the plants were pruned at
 189 15 cm and not submitted to looping, respectively, in addition to 4.61 kg plant⁻¹ average.

190 **Table 3 - Total number of fruits plant⁻¹ (TNF) and total fruit production (TFP; kg**
 191 **plant⁻¹) in fig plants cv. Roxo de Valinhos submitted to different pruning intensities**
 192 **and to lopping system in two production cycles. UFERSA, Mossoró-RN, 2018.**

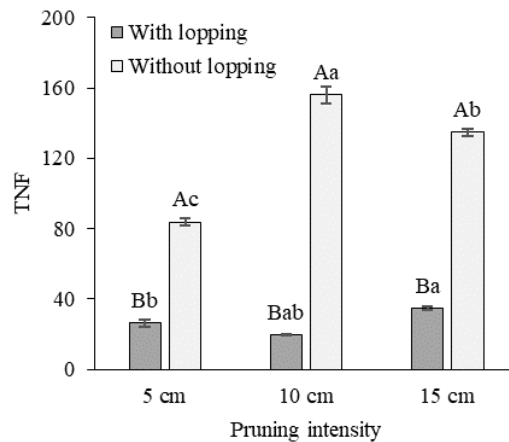
	TNF		TFP	
	Cycle I	Cycle II	Cycle I	Cycle II
Pruning 5 cm	55,13	228,75a	1,445	4,845a

Pruning 10 cm	87,75	230,63a	2,812	4,281a
Pruning 15 cm	84,75	238,63a	2,538	4,715a
With lopping	26,92	211,33a	0,814	4,150a
Without lopping	124,83	254,00a	3,715	5,077a
Mean	75,88	232,67	2,264	4,613
CV (%)	6,63	22,35	28,28	23,64
Mean square				
Block	19	6673,4	0,290	4,470
Pruning	2601	220,0	4,183	0,691
Lopping	57526	10922,7	50,480	5,162
Pruning*Lopping	3147	3101,0	4,916	1,434
Block	NS	NS	NS	*
Pruning	**	NS	**	NS
Lopping	**	NS	**	NS
Pruning*Lopping	**	NS	**	NS

193 Means followed by different letters in the same column differ significantly according to
 194 the Tukey test at 5% probability. NS: not significant; *, **: significant at 5% or 1%
 195 probability, respectively, according to the F test.

196

197 As shown in Figure 4, fig plants conducted without lopping were more
 198 productive. In addition, the plants submitted to 10 cm pruning were more productive
 199 (160 fruits plant⁻¹), followed by 15 cm (130 fruits plant⁻¹) and 5 cm pruning (80 fruits
 200 plant⁻¹).

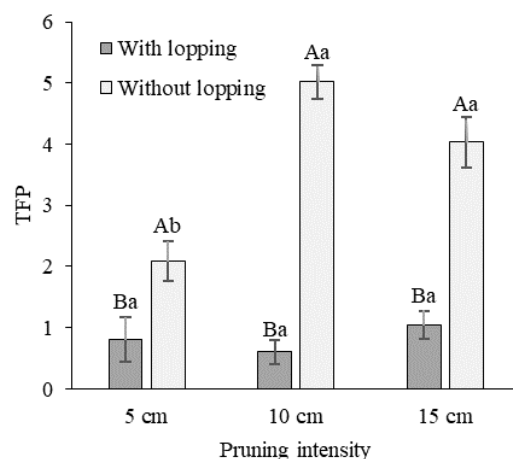


201

202 **Figure 4 – Total number of fruits plant⁻¹ (TNF) in fig plants cv. Roxo de Valinhos**
 203 **submitted to different pruning intensities and to lopping system in Cycle 1 of**
 204 **production. Uppercase letters compare the lopping system and the lowercase**
 205 **letters compare the means among pruning intensity according to the Tukey test at**
 206 **5% probability. UFERSA, Mossoró-RN, 2018.**

207

208 Similarly to the high number of fruits plant⁻¹, the fruit production was higher
 209 when the plants were conducted without lopping, and a maximum of 5.07 kg plant⁻¹ was
 210 obtained in the plants conducted with 10 cm pruning. With lopping, all plants produced
 211 less than 1.0 kg fruits plant⁻¹ (Figure 5).



212

213 **Figure 5 – Total fruit production (TFP; kg plant⁻¹) in fig plants cv. Roxo de**
 214 **Valinhos submitted to different pruning intensities and to lopping system in Cycle**
 215 **1 of production. Uppercase letters compare the lopping system and the lowercase**
 216 **letters compare the means among pruning intensity according to the Tukey test at**
 217 **5% probability. UFERSA, Mossoró-RN, 2018.**

218

219 4. DISCUSSION

220 The physical characteristics of fig fruits (fresh weight and length) were Studied by
 221 Rodrigues et al. [17], who found corresponding values of 38.56 g and 5.30 cm,
 222 respectively, when they evaluated mutant selections of fig plant cultivar Roxo de
 223 Valinhos. These values are higher than those found in the present study.

224 The values obtained for fruit length (3.63 and 3.79 cm) in the present work are
 225 similar to those found by Carvalho et al. [6] when they studied the lopping system in the
 226 production of green figs cv. Roxo de Valinhos. These researchers verified that the plants
 227 conducted without lopping produced fruits with 3.77 cm in length, and 3.81 cm in
 228 length when the lopping was used.

229 According to Carvalho et al. [6], the fruit size can be influenced by the plant's
230 appearance, that is, as the number of shoots in the plant increases, the average fruit
231 diameter also increases, due to the uniformity generated by this management system.
232 However, results reported in the present study are contrary to Carvalho et al. [6],
233 because of the use of lopping in the semiarid provided fruits with smaller diameters.

234 For firmness, we verified values high than those found by [14], who found
235 firmness values of 10.58 N.

236 For soluble solids content, [19] obtained results close to finding in the present
237 study, ranging from 17 to 18.43 °Brix. And similarly to observed in Cycle 2, [12] did
238 not find a statistical difference on soluble solids content in fruits produced by plants
239 conducted with or without lopping. Thus, the difference on soluble solids content in
240 Cycle 1 can be explained, as shown by Carvalho et al [6], by different factors, such as
241 cultivar, climatic conditions and harvesting season that may cause changes in the
242 soluble solids content.

243 The titratable acidity values are like Goncalves et al. [12], who found values
244 ranging from 0.20% to 0.23% when the plants were pruned at different times. In
245 contrast, Rodrigues et al. [17] obtained lower values (0,15%) in mutant selections of fig
246 plants cv. Roxo de Valinhos. According to [8], acidity is modified by changes in the
247 concentrations of organic acids during the fruit growth and it is different in each type of
248 fruit.

249 In fig plants cultivated under greenhouse conditions and in the field, [11] found
250 vitamin C content values of 12.12 and 10.39 mg ascorbic acid 100 g⁻¹ pulp,
251 respectively. According to the authors, fig fruits do not have high levels of vitamin C,
252 like cashew and acerola fruits. Moreover, vitamin C content can reduce during the fruit

253 maturation, due to the action of ascorbic acid oxidase enzymes (ascorbate oxidase) [1].
254 Thus, because fig fruit ripens rapidly, which make it highly perishable, the vitamin C
255 content also reduces rapidly during ripening.

256 Regarding the productive aspect, [9] obtained a number of fruits plant⁻¹ (ranging
257 from 138.16 to 184.25) higher than those in Cycle 1, but lesser than in Cycle 2.
258 Similarly to [5], who reported 189.94 fruits plant⁻¹ in green fig cv. Roxo de Valinhos.
259 In contrast, [15] obtained a high number of fruits plant⁻¹ (203) in the second cycle, when
260 the plants were pruned in August and conducted with eight branches. Such result,
261 compared to the present study, is higher than those in Cycle 1, but less than in Cycle 2.

262 Furthermore, [9] submitted fig plants to different pruning seasons (from April to
263 September) and obtained less fruit production (1.25 to 2.00 kg plant⁻¹) than those
264 obtained in the present study in both cycles. In contrast, [15] obtained similar results
265 (4.50 and 5.73 kg plant⁻¹ in May and August, respectively) with fig plants submitted to
266 different pruning times in a greenhouse condition.

267 This high difference in fruit production (number of fruit plant⁻¹ and kg plant⁻¹) in
268 semiarid conditions may be because the plants that were not submitted to lopping
269 produced more shoots and, consequently, more reproductive buds, which favored the
270 production of fruits.

271 As mentioned by [5], the plants submitted to lopping present smaller branches in
272 size and shorter internodes (as they bloom) in comparison to plants not submitted to
273 lopping. Moreover, such plants suffer stress and were not able to recover the normal
274 development due to the hardy climatic conditions, such as high temperature (above 35
275 °C, as shown in Figure 1), which is harmful to fig plants growth. Furthermore, not
276 submitting plants to lopping may result in lower labor costs for fig production [5].

277 The high rainfall occurred during Cycle 2 favored good water availability for fig
278 plants, which contributed to high yield. In addition, the low production in Cycle 1
279 avoided exaggerated expenses of photoassimilates accumulated in the plants, which also
280 favored higher production in Cycle 2. Branches that form the plant canopy are reserve
281 organs of these photoassimilates and contribute to an increase in yield, and factors such
282 as water and soil cover also contribute to this increase [18].

283 Thus, the higher yield in the number of fruits plant^{-1} and kg plant^{-1} in Cycle 2
284 compared to Cycle 1 may be because the fig plants had more adequate environmental
285 conditions, such as high relative humidity, high temperature and good water availability
286 in the soil (Figure 1). As mentioned by [20], good availability of water and nutrients in
287 the soil favors the crop growth and development, which consequently increase
288 productivity. And the variable climatic conditions also influence the growth,
289 development, and production of fig plants.

290 **5. CONCLUSIONS**

291 The pruning intensity and lopping system influenced the physical-chemical
292 characteristics of the fig fruits in the Potiguar semiarid conditions.

293 Fig plants submitted to 10 cm pruning intensity and conducted without lopping in
294 semiarid conditions are more productive in the number of fruits plant^{-1} and kg plant^{-1} .

295 The use of lopping system is inefficient for fig plant management in the Potiguar
296 semiarid region.

297 **COMPETING INTERESTS**

298 Authors have declared that no competing interests exist.

299 **REFERENCES**

- 300 1. Adriano E, Leonel S, Evangelista RM. 2011. Quality of fruit of the acerola cv.
301 Olivier in two stages of maturation. *Revista Brasileira de Fruticultura*, 541-545. DOI:
302 10.1590 / S0100-29452011000500073.
- 303 2. AOAC - Association of Official Analytical Chemists. Official methods of analysis of
304 the AOAC. 17 ed. Washington, 2002.
- 305 3. Brighenti AF, Rufato L, Kretzschmar AA, Madeira FC. Desponte of the branches of
306 the vine and its effect on the quality of the fruits of 'Merlot' on rootstocks 'Paulsen
307 1103'e'Couderc 3309'. In: *Brazilian Journal of Fruit Crops*, v.32, n.1, p.19-26, 2010.
- 308 4. Campagnolo MA. Desponte system and number of branches in the production of
309 'Roxo de Valinhos' green figs in organic cultivation in subtropical conditions. Marechal
310 Cândido Rondon: State University of Western Paraná, 2008. 43p. Masters dissertation.
- 311 5. Campagnolo MA, Pio R, Dalastra IM, Chagas EA, Guimarães VF, Dalastra GM.
312 System emerges in the production of green figs 'Roxo de Valinhos'. In: *Ciência Rural*,
313 v.40, n.1, p.25-29, 2010. Doi: [dx.doi.org/10.1590/S0103-84782009005000219](https://doi.org/10.1590/S0103-84782009005000219).
- 314 6. Carvalho HA, Chitarra MIF, Chitarra AB, Carvalho HS de. Effect of modified
315 atmosphere on components of guava cell wall. In: *Science and Agrotechnology*, v. 25,
316 p. 605-615, 2001.
- 317 7. Chalfun NNJ, Araujo JL, Villa F. Profile of Figueira. In: Chalfun NNJ. (Ed.). *The fig
318 tree culture*. Lavras: Editora UFLA, p. 31-39, 2012.
- 319 8. MIF Chitarra. Harvest and quality of vegetable products. UFLA / SBEA, Poços de
320 Caldas, p.58, 1998.
- 321 9. Dalastra IM, Pio R, Campagnolo MA, Dalastra, GM, Chagas EA, Guimarães VF.
322 Pruning times in the production of 'Roxo de Valinhos' green figs in an organic system in
323 the western region of Paraná. In: *Brazilian Journal of Fruit Crops*, v.31, n.32, p.447-453,

- 324 2009. Doi:dx.doi.org/10.1590/S0100-29452009000200019.
- 325 10. Espínola Sobrinho J, Pereira VC, Oliveira AD, Santos WO, Silva NKC, Maniçoba
326 RM. Precipitation climatology in the municipality of Mossoró-RN. Period: 1900-2010.
327 In: XVII Brazilian Congress of Agrometeorology-18th. v.21, 2011.
- 328 11. Freitas RNS, Souza PA, Silva MET, Silva FL, Maracajá PB. Post-harvest
329 characterization of figs (*Ficus carica* L.) produced under different growing conditions
330 in the Chapada do Apodi-CE. Green Journal of Agroecology and Sustainable
331 Development, Pombal-PB, v.10, n.1, p.43-46, 2015.
- 332 12. Gonçalves CAA, Lima LCO, Lopes PSN, de Souza MT. Pruning and driving
333 systems in the production of green figs. In: Pesquisa Agropecuária Brasileira, v. 41, n.6,
334 p.955-961, 2006.
- 335 13. IBGE. Municipal Agricultural Production. Available at:
336 <<https://sidra.ibge.gov.br/tabela/1613#resultado>>. Accessed on: 05 Dec. 2018.
- 337 14. Lima LC, Dias MSC, Castro MVD, Martins RN, Medeiros Júnior PR, Silva ED.
338 Post-harvest conservation of green figs (*Ficus carica* L.) cv. Purple of Valinhos treated
339 with sodium hypochlorite and stored under refrigeration in a passive modified
340 atmosphere. Science and Agrotechnology, Lavras, v.29, n.4, p.810-816, 2005.
- 341 15. Nienow AA, Chaves A, Lajús CR, Calvete EO. Production of the fig tree in
342 protected environment submitted to different seasons of pruning and number of
343 branches. Revista Brasileira de Fruticultura, v.28, n.3, p.421-424, 2006.
- 344 16. Radunz, AL, Santos Acunha TD, Giovanaz MA, Herter FG, Clasen Chaves F.
345 Intensity of pruning in the production and quality of the fruits of myrtle tree. Revista
346 Brasileira de Fruticultura, Jaboticabal-SP, v.36, n.1, p.186-191, 2014.
- 347 17. Rodrigues MGF, Correa LDS, Boliani AC. Evaluation of mutant selections of fig

- 348 cv. Roxo-de-Valinhos. Revista Brasileira de Fruticultura, Jaboticabal-SP, v.31, n.3, p.
349 771-777, 2009.
- 350 18. Silva AC, Leonel S, Souza AP, Souza, ME, Tanaka AA. Fig tree growth under
351 different conditions. Journal of Tropical Agriculture, v.41, n.4, p.539-551, 2011.
- 352 19. Physicochemical attributes and fruit acceptability of figs grown in Spain. Nativa,
353 Sinop, v.2, n.3, p.138-142, 2014. DOI: 10.14583/2318-7670.v02n03a02.
- 354 20. Figueiredo AL. Agronomic performance of fig cultivars aiming at the production of
355 green figs in regions of subtropical climate. 2017. p.35. Dissertation (Agronomy / Plant
356 Science), Federal University of Lavras.
- 357
- 358