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INFLUENCE OF IRRIGATION AND SOIL TEXTURE IN THE GROWTH OF PEACH TREE BRANCHES AND FRUITS OF cv. ESMERALDA[1]

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1 ABSTRACT

The objective of this work was to the evaluate the effect of irrigation and soil texture on the growth of branches and fruits of peach tree cv. Esmeralda. The study was developed in a commercial peach orchard, cv. Esmeralda, in Morro Redondo – Rio Grande do Sul state. Irrigated and non-irrigated plants were evaluated in two textural class (Sandy Loam and Sandy Clay Loam) in a total of four rows of peach. The irrigation management was based on the replacement of the potential crop evapotranspiration. The parameters of growth evaluated were: fruit growth and fruit growth rate, branch growth and branch growth rate. The results led to the conclusion that irrigation increases the diameter of the fruits of the peach crop by 5% in the Sandy Loam textural class and by 18% in the Sandy Clay Loam textural class; irrigation provides an increase in the size of the peach tree branches, especially after fruit harvesting, by 6% in the Sandy Loam textural class and 16% in the Sandy Clay Loam textural class; more clayey soils show the influence of irrigation more pronounced than in soils with higher sand contents as the soil of the present study, increasing fruit and branch growth.

Keywords: *Prunus persica (L.)*, irrigation management, peach orchard.

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INFLUÊNCIA DA IRRIGAÇÃO E DA TEXTURA DO SOLO NO CRESCIMENTO DE RAMOS E FRUTOS DE PESSEGUEIRO DA cv. ESMERALDA

2 RESUMO

O objetivo do trabalho foi avaliar o efeito da irrigação e da textura do solo no crescimento de ramos e frutos de pessegueiro cv. Esmeralda. O estudo foi conduzido em um pomar comercial

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de pessegueiro, cv. Esmeralda, no município de Morro Redondo - Rio Grande do Sul. Foram avaliadas plantas irrigadas e não irrigadas em duas classes texturais (Franco Arenosa e Franco Argilo Arenosa) num total de quatro linhas de pessegueiro. A irrigação foi manejada baseada na reposição da evapotranspiração potencial da cultura. Foram avaliadas as seguintes variáveis:crescimento e taxa de crescimento de frutos, e; crescimento e taxa de crescimento de ramos. A irrigação aumenta o diâmetro dos frutos da cultura do pessegueiro em 5% na classe textural Franco Arenosa e em 18% na classe textural Franco Argilo Arenosa; a irrigação proporciona aumento no tamanho dos ramos da cultura do pessegueiro, principalmente após a colheita dos frutos, em 6% na classe textural Franco Arenosa e em 16% na classe textural Franco Argilo Arenosa; solos de textura mais argilosa mostram a influência da irrigação mais pronunciadamente do que em solos com teores de areia mais elevados como o solo do presente estudo, incrementando o crescimento de frutos e ramos.

Palavras-chave: *Prunus persica (L.)*, manejo da irrigação, persicultura.

3 INTRODUCTION

Brazilian peach orchards present different characteristics according to each region (FACHINELLO et al., 2011). The state of Rio Grande of Sul stands out as the largest national fruit producer and in the period 2009-2011 reached an average of 134.278 Mg year^{-1}, corresponding to 60% of the country's production (RIO GRANDE DO SUL, 2014).

The southern half of the state, which includes the municipalities of Pelotas, Morro Redondo, Capão do Leão, Canguçu, Arroio do Padre, Arroio Grande, Candiota and Jaguarão, accounts for 90% of the peach production in the state, almost all of the industrialized fruit in Brazil (TIMM et al., 2007).

The success of the production of this species depends mainly on the management conditions, the environment surrounding the orchard as well the climatic conditions (NAVA, MARODIN e SANTOS, 2009). Growing stone fruit such as the peach in the south region of Brazil presents some difficulties, the fruit trees most very frequently face problems due to water stress, either lack or excess, in periods that are critical for the crop such as the stage that precedes the maturation of fruits and in the flowering stage (MARTINAZZO et al., 2013). These problems can also be observed in the southern half of Rio Grande Sul state.

Among cultural practices, irrigation is one in which the producer can intervene during the crop cycle, which can affect the productivity and quality of the fruits (VERA et al., 2013). Aeration and the availability of water to the plants are affected by the characteristics of the physical environment where the plant develops. The texture of the soil is closely related to the aeration and the retention and availability of water to the plants, thus influencing the development of the root system and, consequently, its growth and development (REISSER JÚNIOR, TIMM e TAVARES, 2008). For the peach crop, soils with medium texture are considered ideal, with clay contents around 30 to 35% (HERTER, SACHS e FLORES, 1998).

Irrigated agriculture is the primary water user worldwide. This, added to the competition for water between agriculture, industry and population, creates an urgent need to increase irrigation water efficiency of use and to develop and provide new tools and water conservation methods (MIRÁS-AVALOS et al., 2017). Several authors have sought to develop techniques to reduce water consumption through irrigation, maintaining fruit yield (VERA et al., 2013). One of the approaches that has been studied in several countries is the deficit irrigation in fruit trees (DE LA ROSA et al., 2015; EGEA et al., 2010; GELLY et al., 2003; LEVIN et al., 2018; LÓPEZ-LÓPEZ et al., 2018; MERCIER et al., 2009; NAOR et al., 2001; VERA et al., 2013). The deficit or deficit irrigation is an irrigation management technique based on the reduction of the volume applied during the stage of plant development that is the least sensitive to water stress (MARSAL et al., 2016).

Irrigation has been used in peach orchards to minimize the effects of water stress on fruit growth, yield and quality. However, research that seeks to evaluate the effect of irrigation on these variables associated with peach crop productivity in the southern half of the country is scarce. The objective of this study was to evaluate irrigation and soil texture effects on the growth of peach tree branches and fruits of the cv. Esmeralda, in an 8-year-old commercial orchard.

4 MATERIAL AND METHODS

The study was conducted during the months of October to December 2014 in a commercial peach orchard in Morro Redondo-RS, - 31º 31 ‘55.30’ S and 52º 35 ‘37.87 “W and 243 m a.s.l. The climate of the region is of the Cfa type, according to Köppen classification, being temperate humid with hot summers (ALVARES et al., 2013). The peach orchard, of the Esmeralda cultivar was planted in an area of 1.8 ha, consisting of 18 peach rows with trees spaced by 1.5 m along the row and 6.0 m between rows. The cultural practices were carried out by the producer (fertilization, weeding, pruning, thinning and phytosanitary management).

By applying the Regionalized Variables Theory (Geostatistics), elaborated by Terra (2012), spatial distribution maps of the soil textural fractions in the orchard (sand, silt, and clay contents) and homogeneous areas were delimited. Two homogeneous areas were delimited presenting Sandy Loam (clay 129 g kg^{-1}, sandy 679 g kg^{-1}, silt 192 g kg^{-1}, bulk density 1.39 g cm^{-3}, total porosity 0.48 m^3 m^{-3}, macroporosity 0.26 m^3 m^{-3}, microporosity 0.22 m^3 m^{-3}, field capacity 0.19 m^3 m^{-3}, permanent wilting point 0.08 m^3 m^{-3}) and Sandy Clay Loam (clay 290 g kg^{-1}, sandy 437 g kg^{-1}, silt 273 g kg^{-1}, bulk density 1.32 g cm^{-3}, total porosity 0.48 m^3 m^{-3}, macroporosity 0.22 m^3 m^{-3}, microporosity 0.26 m^3 m^{-3}, field capacity 0.23 m^3 m^{-3}, permanent wilting point 0.10 m^3 m^{-3}) as predominant textural classes.

The irrigation method used was that of localized irrigation with a drip system, using self-compensating drippers with a flow rate of 2.47 L h^{-1} spaced 0.75 m apart, with a Christiansen coefficient of uniformity of 96.18%. The drip tapes were distributed along the rows of plants in the orchard and positioned 0.10 m away from the trunk of the peach trees. Irrigated by drip irrigation and non-irrigated plants were evaluated in a total of four rows of peach, separated by three rows, one from the other. The irrigation management in the experimental area was based on crop evapotranspiration, with water replenishment twice a week, on Mondays and Thursdays. Reference evapotranspiration data were obtained through an automatic meteorological station (EMA) installed near the peach orchard. The crop coefficient used was 1.0 based on the average values of the peach crop coefficient (ranging from 0.85 to 1.15) the same used by Allen et al. (1998). During the conduction of the experiment the potential evapotranspiration was of 234.17 mm, the rain of 156.75 mm and the irrigation of 108.50 mm.

The growth and growth rate of branches and fruits were evaluated during the period mentioned above. The growth and the growth rate of branches were evaluated in 24 plants previously selected by trunk diameter in combination with the irrigation factor (either with or without irrigation) and soil textural class factor (Sandy Loam and Sandy Clay Loam) resulting in six plants in each combination. Each of the selected plants had five branches of the year randomly marked in the different quadrants of the median region, after the thinning of the fruits, determining the average length of the branches of each plant (cm) weekly with the help of a tape measure. Subsequently, the average daily rate of vegetative growth of the five branches selected in each plant was calculated.

Growth and fruit growth rate were evaluated in the same six plants where the growth and the growth rate of branches were evaluated. After the thinning in October 2014, five fruits per plant were randomly selected, which were tagged and numbered with labels. With the aid of a pachymeter, the diameter of each selected fruit was determined weekly, calculating the average fruit growth as the average of the diameters of the fruits in each plant. From this, the daily growth rate of the five fruits in each plant was calculated and later the average daily rate of fruit growth in each plant.

The data of fruit diameter and maximum fruit growth rate, length of branches, growth of branches and branch maximum rate of growth were submitted to analysis of variance according to two-factorial mathematical model in the completely randomized design given by:

$$Y_{ijk} = \mu + a_i + d_j + (ad)_{ij} + \varepsilon_{ijk} \qquad (1)$$

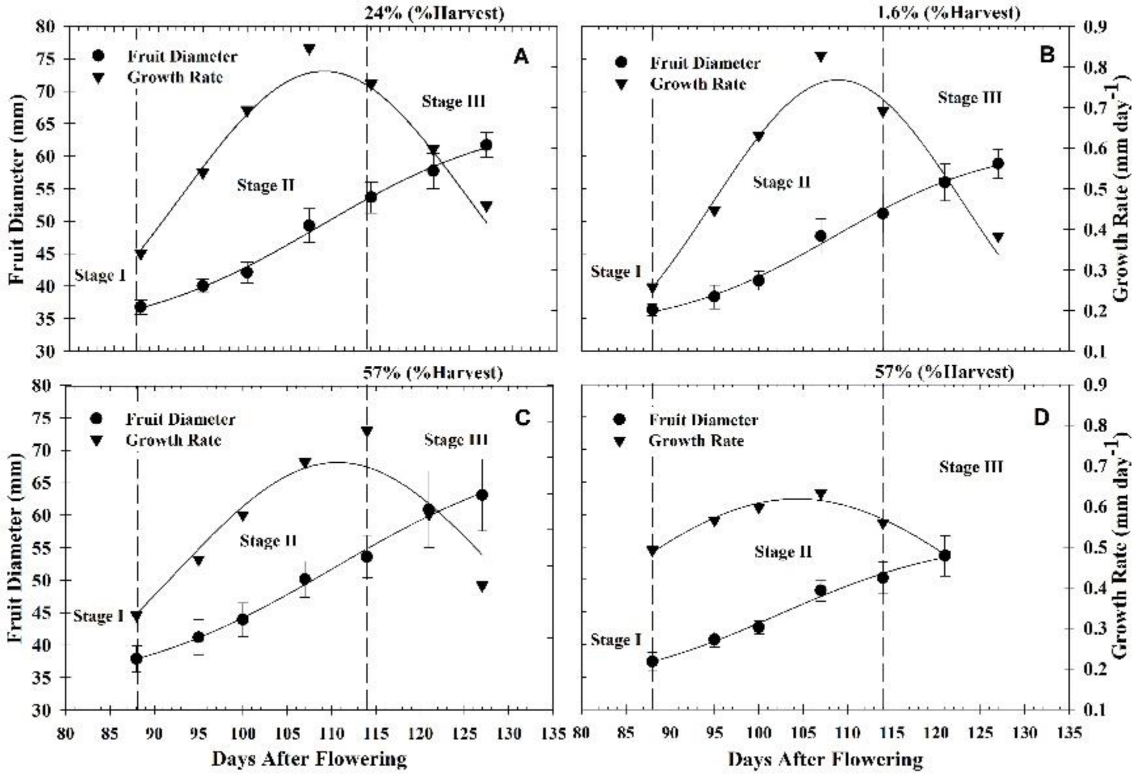
Where: Y_{ijk} is the observed mean value of the response variable in the ijk plot, μ is the overall mean, a_i is the fixed effect of level i of the irrigation factor (with irrigation and without irrigation), d_j is the fixed effect of level j of the soil textural class factor (Sandy Loam and Sandy Clay Loam), $(ad)_{ij}$ is the effect of the interaction of level i of the irrigation factor with the level j of the soil textural class fator and ε_{ijk} is the effect of the assumed normal and independently distributed experimental error with mean 0 and common variance σ^2 (STORCK et al., 2016).

The experimental coefficient of variation was calculated and the means were compared using the Tukey test at 5% probability. Statistical analyses were performed whith the help of the Office Excel® software and SISVAR software (FERREIRA, 2011).

5 RESULTS AND DISCUSSION

Figure 1 shows that the final growth of the sutural diameter of the fruits followed the trend of a sigmoid curve behavior, with three distinct periods (stage I, II and III) of growth, characteristic of stone fruits as already highlighted per Pérez-Pastor, Ruiz-Sánchez e Domingo (2014). The duration of Stage II was 26 days, on average, from full bloom and from 7 to 13 days for Stage III (Figure 1) for all textural class-irrigation combinations evaluated. These durations of the peach fruit growth phases corroborate the stage observed by Pérez-Pastor, Ruiz-Sánchez e Domingo (2014). Those authors showed that in Stage I the beginning of the development of the fruit occurs, predominating the division and cellular multiplication; Stage II comprises the slow growth of the fruit, the hardening of the endocarp, the hardening of the stone and the growth of the endosperm; and in Stage III the fruit continues to increase its size until it reaches maturation, when the growth decreases (GIRARDI e ROMBALDI, 2003).

Figure 1. Growth rates and growth curves of peach fruits as a function of the number of days after flowering in a peach orchard - Morro Redondo - RS, 2014. (A - Sandy Loam textural class with irrigation; B - Sandy Loam textural class without irrigation; C - Sandy Clay Loam textural class with irrigation; D - Sandy Clay Loam textural class without irrigation). Stage I - beginning of fruit development; Stage II - slow fruit growth, endocarp hardening, stone hardening and endosperm growth; Stage III - increase in size until maturation.



Irrigation tended to increase fruit diameter regardless of the textural class (Figures 1A and 1C), corroborating the effect of irrigation on fruit diameter observed by Naor et al. (1999). This increase could be observed throughout the evaluations (Table 1); however, no significant effects ($p \leq 0.05$) were identified for the interaction between the irrigation factor and the soil textural class in any evaluation. The coefficient of variation was low in all evaluations of fruit diameter ($3.91\% \leq CV \leq 6.81\%$) according to the classification of Pimentel-Gomes (2009) indicating high precision in the evaluation of this variable.

Table 1. Summary of variance analysis with sources of variation, degrees of freedom (DF) and mean squares (MS) for irrigation effects, soil type, interaction and residue, coefficient of variation (CV) and general mean for diameter of fruits on seven evaluation dates in days after flowering in a peach orchard - Morro Redondo - RS, 2014.

Source of Variation	**DF**	**MS – Diameter of fruits in days after flowering**						
		88	**95**	**100**	**107**	**114**	**121**	**127**
Irrigation	1	1.21^{ns}	6.50^{ns}	9.58^{ns}	17.74^{ns}	51.38*	120.73*	107.43*
Soil	1	6.32^{ns}	18.92*	19.30*	3.13^{ns}	1.67^{ns}	1.07^{ns}	0.00^{ns}
Interaction	1	0.01^{ns}	2.13^{ns}	0.01^{ns}	0.13^{ns}	1.21^{ns}	45.24^{ns}	11.76^{ns}
Residue	20	2.10	3.32	3.10	6.01	7.60	15.09	12.32
CV (%)		3.91	4.54	4.16	5.02	5.28	6.81	5.82
Average (mm)		37.10	40.07	42.36	48.87	52.16	57.05	60.27

* Significant effect by F test at 5% probability. ^{ns} not significant. **Source:** Authors (2019).

In the evaluations at 95 and 100 days after flowering, significant differences were observed in the diameter of the fruits in the textural classes of soil, with larger diameter of fruits from the Sandy Clay Loam textural class soil (Table 2). In the last three evaluations (114, 121 and 127 DAF), significant differences were verified between irrigated and non-irrigated areas, with irrigation resulting in larger fruit production (Tables 1 and 2).

The effect of irrigation within each fruit growth stage can be observed (Figure 1). Higher fruit development could be observed in the three stages of irrigated plants in the two textural classes evaluated (Figure 1A and 1C) when compared to plants without irrigation (Figure 1B and 1D). This difference in fruit growth is more evident in plants managed in the Sandy Loam textural class (Figure 1A and 1B). Stage III was the most affected by the absence of irrigation, in both textural classes (Figure 1B and 1D). This fact was confirmed in the last three evaluations (Table 2).

Table 2. Comparison of means for two-factorial experiment with irrigation effects and soil type on the fruit diameter variable (mm) on seven evaluation dates in days after flowering (DAF) for a peach orchard - Morro Redondo - RS, 2014.

Treatments	**88 DAF[1]**			**95 DAF**			**100 DAF**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	36.78	37.86	37.32a	40.00	41.18	40.59a	42.07	43.91	42.99a
Without irrigation	36.38	37.36	36.87a	38.36	40.73	39.55a	40.85	42.60	41.73a
General	36.58A	37.61A	37.10	39.18B	40.96A	40.07	41.46B	43.26A	42.36

Treatments	**107 DAF**			**114 DAF**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	49.29	50.16	49.73a	53.66	53.58	53.62a
Without irrigation	47.72	48.30	48.01a	51.18	50.21	50.69b
General	48.50A	49.23A	48.87	52.42A	51.89A	52.16

Treatments	**121 DAF**			**127 DAF**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	57.71	60.88	59.30a	61.70	63.08	62.39a
Without irrigation	55.97	53.65	54.81b	58.87	57.45	58.16b
General	56.84A	57.27A	57.05	60.28A	60.26A	60.27

[1] Means not followed by the same small letter in the column or capital letter in the line differed in the Tukey test at 5% probability.

Mercier et al. (2009) studying different irrigation regimes during the rapid growth stage of fruits showed that when a moderate deficit irrigation was performed during stages I and II of fruit growth, there was no reduction in fruit growth when compared to plants with supplementation of water.

This fact was also observed in stage III of fruit growth, where this difference between the growth of the fruits of irrigated plants and the growth of the fruits of the plants without irrigation was more evident (Figure 1 and Table 2). Naor et al. (2001) and Gelly et al. (2003) studying different levels of irrigation observed a decrease in fruit diameter when water restriction was applied during stage III of fruit growth. Mercier et al. (2009) emphasized that irrigation should be maintained regularly during stage III of fruit growth so that there is no decrease in productivity or even an invasion of pathogens in plants and fruits that are in irregular water regimes. Within this context, deficit irrigation at certain periods of crop growth could be carried out without affecting the final crop production. Mercier et al. (2009) reported that 20% reduction in evapotranspiration (80% replacement of evapotranspiration water) throughout the fruit growth period did not affect the final diameter of the fruits. However, reductions above 20% caused decreases of up to 18% in fruit diameter in relation to the 100% replenishment level of the evapotranspiration.

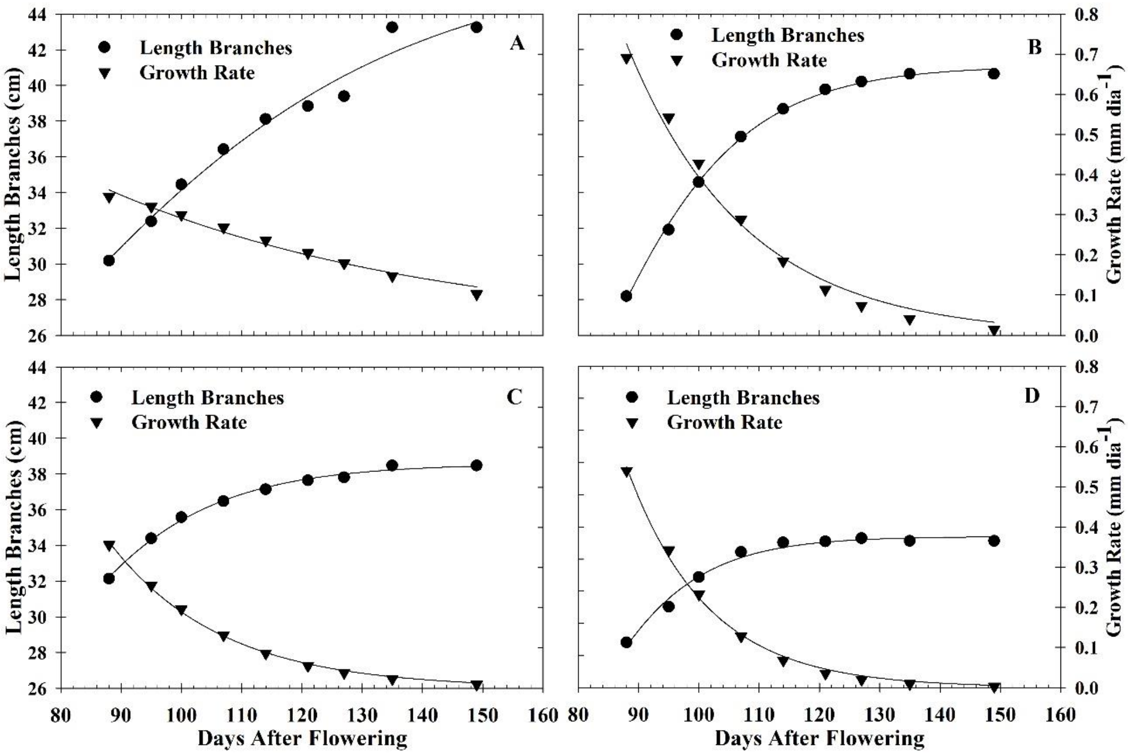
Regarding fruit growth rates, all conditions evaluated (Figure 1) were described approximately by a Gaussian model. The behavior of fruit growth rates was also observed to be similar within each textural class, either with or without irrigation. The rates within each textural class show that irrigation (Figures 1A and 1C) provided maximum rates of growth of larger fruits when compared to the maximum rates of the same textural classes without irrigation

(Figures 1B and 1D). For the plants monitored in the Sandy Loam textural class with irrigation (Figure 1A) and without irrigation (Figure 1B), maximum growth rates were obtained at 107 DAF, corresponding to rates of 0.85 and 0.83 mm day^{-1}, respectively, that is, the irrigated plants showed a 0.02 mm day^{-1} increase in the growth rate.

For the Sandy Clay Loam textural class with irrigation (Figure 1C) and without irrigation (Figure 1D) the maximum growth rates were obtained at 114 DAF and 107 DAF, respectively, corresponding to rates of 0.87 and 0.63 mm day-¹, respectively. A higher irrigation effect on the fruit growth rate in the Sandy Clay Loam textural class can be observed when compared to the Sandy Loam textural class since a difference of 0.24 mm day^{-1} was detected. This fact is possibly related to the greater soil water retention capacity, presented by this textural class.

In relation to the curve length of branches, a sigmoid was fitted and for the growth rate of branches it was exponential (Figure 2). The tree length curves showed different patterns between the textural class and also between the irrigation treatments evaluated (Figure 2). A similar trend can be observed in the behavior of the branch growth curve in the Sandy Loam textural class with and without irrigation (Figure 2A and 2B). In the Sandy Loam textural class with irrigation (Figure 2A) there was a tendency of increase in the growth after fruit harvest, in the east, where there was no competition for photoassimilates between fruits and branches.

Figure 2. Growth and growth rate of the branches as a function of the number of days after flowering in a peach orchard - Morro Redondo - RS, 2014. (A - Sandy Loam textural class with irrigation; B - Sandy Loam textural class without irrigation; C - Sandy Clay Loam textural class with irrigation; D - Sandy Clay Loam textural class without irrigation).



Analyzing the plants of the two textural classes of soil with irrigation (Figures 2A and 2C), the absolute values of the sizes of their branches were observed to start higher (Sandy Loam textural class - 30 cm and Sandy Clay Loam textural class - 32 cm) being higher than the sizes obtained in these soil texture classes without irrigation (Sandy Loam textured class - 28 cm and Sandy Clay Loam textured class - 27 cm). This difference is more evident in the Sandy Clay Loam textural class (Figures 3C and 3D). This fact shows that even with the larger water storage presented by the Sandy Clay Loam textural class, it is not totally available to the plants, since even with the increase in water content in this textural class, through irrigation, the plants did not obtain the same vegetative development when compared to the plants in the Sandy Loam textural class.

However, the variable length of branches showed growth along the eight evaluations (Table 3). Regarding fruit diameter, no significant effects ($p \leq 0.05$) were identified for the interaction between the irrigation factor and the textural class of soil in any evaluation. This indicates that modifying one factor level does not significantly change the behavior of the other factor levels. The evaluation of the main effects of the irrigation factor and the textural class factor did not indicate significant differences either. In this sense, it can be concluded that, on a certain evaluation date, there was no effect of the interaction or main effect of the textural class and the irrigation factor on the length of branches, a fact highlighted in the mean comparison test (Table 4).

Table 3. Summary of variance analysis with sources of variation, degrees of freedom (DF) and mean squares (MS) for irrigation effects, soil type, interaction and residue, coefficient of variation (CV) and general mean for length of branches on nine evaluation dates in days after flowering in a peach orchard - Morro Redondo - RS, 2014.

Source of Variation	**DF**	**MS – Length of branches in days after flowering**							
		88	**95**	**100**	**107**	**114**	**121**	**127**	**135**
Irrigation	1	80.67^{ns}	51.33^{ns}	31.51^{ns}	16.67^{ns}	19.08^{ns}	19.62^{ns}	20.54^{ns}	95.20^{ns}
Soil	1	0.48^{ns}	1.17^{ns}	10.01^{ns}	32.20^{ns}	66.00^{ns}	93.22^{ns}	108.38^{ns}	226.94^{ns}
Interaction	1	16.67^{ns}	35.77^{ns}	34.80^{ns}	33.61^{ns}	32.67^{ns}	45.10^{ns}	42.67^{ns}	11.21^{ns}
Residue	20	39.63	56.47	73.58	97.03	111.41	125.35	130.48	146.44
CV (%)		21.47	23.54	25.33	27.66	28.73	29.99	30.33	31.14
Average (cm)		29.33	31.92	33.86	35.61	36.73	37.33	37.67	38.87

* Significant effect by F test at 5% probability. ^{ns} not significant.

Table 4. Comparison of means for two-factorial experiment with irrigation effects and soil type on the variable length of branches (in cm) on nine evaluation dates in days after flowering (DAF) for a peach orchard - Morro Redondo - RS, 2014.

Treatments	**88 DAF[1]**			**95 DAF**			**100 DAF**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	30.18	32.13	31.16a	32.38	34.38	33.38a	34.45	35.57	35.01a
Without irrigation	28.18	26.80	27.49a	31.90	29.02	30.46a	34.57	30.87	32.72a
General	29.18A	29.47A	29.33	32.14A	31.70A	31.92	34.51A	33.22A	33.86
Treatments	**107 DAF**			**114 DAF**			**121 DAF**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	36.42	36.47	36.44a	38.12	37.13	37.63a	38.83	37.63	38.23a
Without irrigation	37.12	32.43	34.78a	38.67	33.02	35.84a	39.77	33.08	36.43a
General	36.77A	34.45A	35.61	38.39A	35.08A	36.73	39.30A	35.36A	37.33
Treatments	**127 DAF**			**135 DAF**					
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**			
Irrigation	39.38	37.80	38.59a	43.25	38.47	40.86a			
Without irrigation	40.20	33.28	36.74a	40.63	33.12	36.88a			
General	39.79A	35.54A	37.67	41.94A	35.79A	38.87			

[1] Averages not followed by the same small letter in the column or capital letter in the line differed in the Tukey test at 5% probability.

In relation to the growth rate of branches, it followed the same trend of behavior in the evaluated plants in both textural classes studied (Figure 2A to 2D). With the results obtained in Figures 1 and 2, the irrigation was observed to have influenced more fruit growth (Figure 1) than the size of the branches (Figure 2), mainly in the Sandy Loam textural class. For the Sandy Clay Loam textural class, irrigation had a positive effect on the growth rates of fruits and branches (Table 5). This fact is possibly related to the increase in available water from the elevation of water content retained in this textural class.

Table 5. Summary of variance analysis with sources of variation, degrees of freedom (DF) and average squares for irrigation effects, soil type, interaction and residue, coefficient of variation (CV) and general mean for the growth of branches (GB - cm), maximum growth rate of branches (MGRB - mm day^{-1}), fruit diameter (FD, in mm), maximum fruit growth rate (MFGR - mm day^{-1}) orchard of peach tree - Morro Redondo - RS, 2014.

Source of Variation	DF	Mean Squares			
		GB	MGRB	FD	MFGR
Irrigation	1	0.96 ^{ns}	0.01 ^{ns}	107.40*	0.11*
Soil	1	222.04 ^{ns}	0.03 ^{ns}	0.00 ^{ns}	0.05 ^{ns}
Interaction	1	2.28 ^{ns}	0.54 ^{ns}	11.75 ^{ns}	0.07 ^{ns}
Residue	20	62.79	0.14	12.31	0.03
CV (%)		79.90	51.34	5.82	19.99
Average		9.92	0.72	60.27	0.80

* Significant effect by F test at 5% probability. ^{ns} not significant.

The variables growth of branches and maximum rate of growth of branches did not present statistical significance in the interaction or in the main effects of irrigation and soil textural class (Tables 5 and 6). The variables growth of branches and maximum rate of growth of branches did not present statistical significance in the interaction or in the main effects of irrigation and soil textural class (Tables 5 and 6).

This increase in the diameter of the fruits promoted by irrigation can influence the classification and consequently the aggregation of value to these fruits if they are commercialized with the industry and even for *in natura* consumption. In relation to the growth of branches, neither significant effect of irrigation was observed nor of textural class (Table 6). However, it is possible to infer that irrigation provided a higher growth of branches in both textural classes evaluated and that there was no significant effect due to the variability of the results obtained for this variable. This increase in the size of the branches provided by the irrigation might influence positively the productivity of the peach tree in the next harvests.

Table 6. Comparison of averages in a two-factorial experiment with irrigation effects and soil type on the growth variables (cm), maximum growth rate of branches (mm day^{-1}), fruit diameter (mm) and maximum fruit growth rate (mm dia^{-1}) in a peach orchard - Morro Redondo - RS, Brazil, 2014.

Treatments [(1)]	Growing Branches			Maximum Branches Growth Rate		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	13.47	6.77	10.12a	0.56	0.93	0.75a
Without irrigation	12.45	6.98	9.72a	0.82	0.58	0.70a
General	12.96A	6.88A	9.92	0.69A	0.76A	0.72
Treatments	**Diameter Fruits**			**Maximum Fruit Growth Rate**		
	Sandy	**Clay**	**General**	**Sandy**	**Clay**	**General**
Irrigation	61.70	63.08	62.39a	0.85	0.87	0.86a
Without irrigation	58.87	57.45	58.16b	0.83	0.63	0.73b
General	60.28A	60.26A	60.27	0.84A	0.75A	0.80

[(1)] Averages not followed by the same small letter in the column or capital letter in the line differed in the Tukey test at 5% probability.

6 CONCLUSIONS

Irrigation increases the diameter of the fruits of the peach crop by 5% in the Sandy Loam textural class and by 18% in the Sandy Clay Loam textural class.

Irrigation provides an increase in the size of the peach tree branches, especially after fruit harvesting, by 6% in the Sandy Loam textural class and 16% in the Sandy Clay Loam textural class.

More clayey soils show the influence of irrigation more pronounced than in soils with higher sand contents as the soil of the present study, increasing fruit and branch growth.

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