

Management of soil cover and its influence on phytosociology, physiology and fig production

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Abstract

The fig stands out as an important source of food for the human diet, especially minerals and fibers. Weeds are a major concern in the conduct of fig orchards. Therefore, the objective of this study was to evaluate the effect of management of vegetable cover of soil (CVS) on weed phytosociology, physiological characteristics and fig production. The experimental design was a randomized complete block design with four replications. The treatments consisted of six CVS managements: cover maintenance, weeding, lodging, mowing, application of herbicides diquat and glyphosate. For the constitution of the vegetal cover a consortium of three winter forage species, vetch and black oats sowed and the ryegrass remaining in the area of previous years were used. Thus, we evaluated the phytosociology of weeds present in the area, at two different times, assigning parameters related to frequency, density and abundance, which establish the species importance value index (IVI), besides the dry mass of the aerial part of the weeds. Physiological parameters and total fruit yield were evaluated at the end of the crop cycle. The different CVS management methods influenced the weed community, mainly in the diversity, density and dry mass of the aerial part. There is no interference in the physiological variables of the fig plants and in the total production of fig fruits. We highlight the maintenance of coverage and lodging as the most promising for the management of weeds found fig orchards.

Keywords: *Ficus carica*, herbicide, physiological parameters

Introduction

The culture of the fig tree was one of the first fruit trees domesticated by man, especially for the excellent quality of the fruit that sparked commercial interest around the world. In Brazil around 1910, the fig cultivation started in São Paulo, later expanding to other states (Leonel, 2008). The main fig producing countries are Turkey and Egypt, Brazil stands out as the eighth largest producer, with an annual production of 25,883 tons, approximately 9,990 kg ha⁻¹ (FAO, 2019).

The fruit stands out for being a source of minerals and fiber for the human diet (Sedaghat & Rahemi, 2018). Like all agricultural crops, fig plants can suffer from pest attack. In this scenario, the weeds showed great importance to this culture.

Weeds in addition to competing for resources such as water, light and nutrients can release allelopathic compounds (Forte et al., 2018b) and even be host pests, especially gall nematodes in the fig tree (Costa et al., 2015). There are several ways to control weeds in fruit growing, wherein the use of the largest possible number

of methods points to a control with higher efficiency, less environmental contamination and the possibility of reducing cases of herbicide resistant species (Hanson et al., 2017; Westwood et al., 2018) or even for production focused on environmental sustainability.

Weed management is commonly employed through the use of crop control (Radicetti et al., 2013; Forte et al., 2018b; Alonso-Ayuso et al., 2018), mechanical control such as scarification (Schermer et al., 2016) and especially the chemical with the use of herbicides in different crops of agronomic interest, including fruit (Koning et al., 2019). The care that should be taken in orchards is the indiscriminate use of herbicides, which can cause drift and consequently irreversible injuries on fruit crops (Giacobbo et al., 2018).

Among the forms of weed control most commonly used in fruit growing is the use of mulch (CVS), mainly the use of green mass producing species that recycle soil nutrients. Given these factors it is possible to obtain greater productivity in the production of grains or fruits. (Wang et al., 2015; Forte et al., 2018a). To understand the

dynamics of weed species, weeds of a particular crop, adopting different control methods has an important tool the phytosociological (Concenço et al., 2013).

The different effects of soil management systems for planting crops or even the action of herbicides on weeds can alter the botanical composition of the community (Jakelaitis et al., 2003). The floristic evolution of the community occurs according to the intensity, regularity and time of use of a given system and, depending on the intensity of these changes, may affect the management, control and competition exerted by this community with the culture (Favero et al., 2001).

The hypothesis tested in this study was that cultural managements provide lower incidence of weeds combined with a higher fruit production. The objective of the study was to evaluate the effect of soil cover management on weed phytosociology, physiological characteristics and fig production.

Material and Methods

Study site characteristics

The present work was implemented in the field in 2012 and conducted for two consecutive harvests, 2012/13 and 2013/14, in a fig orchard (*Ficus carica* L.), cv. Roxo de Valinhos, municipality of São Domingos-SC, latitude 26°33'29 "South, longitude 52°31'54" West, at an altitude of 635 m and the soil classified as Dark Red

Latosol (EMBRAPA, 2013). The orchard was implanted on 08/01/2010, with the open pits with a tractor-powered drill at a depth of 0.6 m, 2 kg of tanned cattle manure, 1.5 kg of poultry manure, 300 g dolomitic limestone and 300 g N-P-K formula 08-20-20 fertilizer were added to the pit preparation. After the orchard implantation the only form of fertilization performed was the application of 0.5 kg per plant, in the canopy projection, formulation 08-20-20 in the middle of August of each year. The orchard has always been conducted with drastic pruning system with a limit of 22 branches.

The climate in the region corresponds to Cfa according to the Köppen classification. On March 29, 2014, the effect of the managements adopted on the variables related to fig plants was evaluated.

Experimental design and treatments

The experimental design was completely randomized blocks with four repetitions, six treatments, with two plants per repetition. The fig plants used were planted in 4.0 x 3.3 m spacing in 2010 and conducted without irrigation, ie the test received only rainwater that happened in the region (Figure 1). The orchard is arranged in 6 lines, where the 4 central lines were used for the implementation of the experiment, leaving both ends as borders, in order to reduce possible errors related to edge effects.

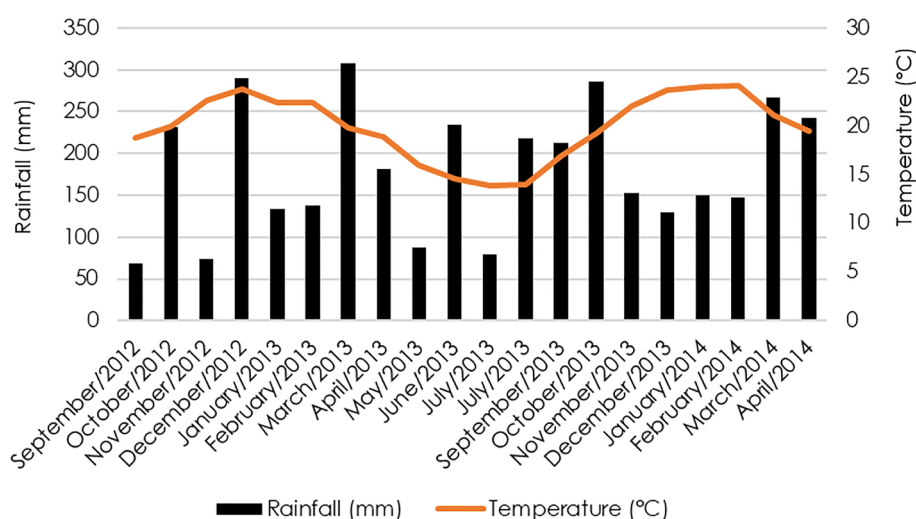


Figure 1. Climatic conditions of precipitation (mm) and temperature (°C) observed during the period of the experiment, from 2012 to 2014, in São Domingos, Santa Catarina, Brazil.

For the constitution of the vegetal cover a consortium of three winter forage species, vetch (*Vicia sativa*) and black oats (*Avena strigosa*) sowed and the ryegrass (*Lolium multiflorum*) remaining in the area of previous years were used. The black oat was implemented only in the second year in order to optimize

the control of weed ryegrass. Both vetches and black oats were sown in April 2012. Before the implementation of the experiment, a chemical analysis of the soil was performed. Fertilization for the planting of fig seedlings was carried out according to soil analysis and following the technical recommendations for fig tree cultivation

(ROLAS, 2004). The chemical and physical characteristics of the soil were: pH in water of 6.3; MO = 4.2%; P = 3.4 mg dm⁻³; K = 188.0 mg dm⁻³; Al³⁺ = 0.0 cmolc dm⁻³; Ca²⁺ = 6.9 cmolc dm⁻³; Mg²⁺ = 4.2 cmolc dm⁻³; CTC (t) = 11.58 cmolc dm⁻³; CTC (TpH = 7.0) = 14.36 cmolc dm⁻³; H + Al = 2.79 cmolc dm⁻³; SB = 11.58 cmolc dm⁻³; V = 80.64% and Clay = 43%.

The treatments tested for the management of vegetation cover were: cover maintenance, weeding, lodging, mowing, application of the herbicides of diquat (400 g a.i ha⁻¹) and glyphosate (1,440 g a.i ha⁻¹). The weeding was carried out normally, with the help of manual hoe. The herbicides were applied by spraying pressurized CO₂ precision, equipped with a series of spraying XR 110.02, spraying one spray volume of 150 L ha⁻¹. For lodging treatment, the action of the knife roll was simulated, with the kneading of the vegetable material and cutting with cutting material. For the mowing treatment, the plants were cut with the aid of costal mower on average 5 cm. The treatments were applied when the oat plants were in the milky grain phase. Two fig plants comprised each experimental unit, and the treatments were applied in an area of 4 m² around each plant.

Evaluated variables

The variables evaluated were the incidence of weeds (dry matter of the aerial part of the species), physiological parameters of fig plants, mature fruit productivity fig (for *in natura* consumption), green fruit productivity (for storage) and cumulative productivity.

The incidence of weeds was determined with the aid of a hollow square with a known area (0.25 m²), randomly casting it in two of the quadrants of one of the plants of each experimental unit (Concenço et al., 2013). Plants contained within the perimeter of the square were quantified, identified and subsequently dried in a forced air circulation oven at 60 ± 5 °C to constant dry mass (DM).

The variables related to the physiology of fig plants were evaluated on 28, 29, 30 and 31 March 2014, as follows: internal CO₂ concentration (C_i - μmol mol⁻¹), transpiration rate (E - mol H₂O m⁻² s⁻¹), stomatal conductance of water vapors (G_s - mol m⁻¹ s⁻¹), and photosynthetic efficiency (A - μmol m⁻² s⁻¹), water-use-efficiency (WUE - mol CO₂ mol H₂O⁻¹) carboxylation efficiency (CE - mol CO₂ m⁻² s⁻¹) measured in the middle third of the first fully expanded leaf of the plants. Carboxylation efficiency (CE - mol CO₂ m⁻² s⁻¹) and water-use-efficiency (WUE - mol CO₂ mol H₂O⁻¹) were calculated from the ratio of variables A / C_i and A / E, respectively. For this purpose, an ADC-branded infrared gas analyzer (IRGA), model LCA PRO (Analytical

Development Co. Ltd, Hoddesdon, UK) was used; Each block was evaluated under natural light on one day, between 8:00 AM and 10:00 AM, under clear skies, so as to maintain homogeneous environmental conditions during the analyzes.

The productivity variable was determined by counting and weighing the fruits on a precision scale. Once reaching physiological maturity, the fruits were collected separately from two randomly selected branches in one of the plants of each experimental unit at the beginning of fruiting (Giacobbo et al., 2007). Fruits that did not reach physiological maturity due to climate changes at the end of the cycle were also counted and weighed in a single day, measuring the total length of the selected branch in order to obtain the number of fruits per meter of branch.

Competitive indices and statistical analysis

With the data obtained, the phytosociological indices were calculated: relative density (RDe), relative frequency (Rf) and relative abundance (Rab), which are used to calculate the Importance Value Index (IVI), according to the methodology proposed by Müller-Dombois & Elleberg (1974), in which:

- Frequency = Number of squares in which the species was found / total number of square
- Density = Total number of individuals of the species / total number of squares
- Abundance = Total number of individuals of the species / Total number of squares where the species was found
- Relative density (RDe) = (species density / total species density) x 100
- Relative frequency (Rf) = (species frequency / total species frequency) x 100
- Relative abundance (Rab) = (species abundance / total species abundance) x 100
- IVI = RDe + Rf + Rab

For physiological characteristics and the final fruit production, all data were evaluated for normal distribution and homoscedasticity were later submitted to analysis of variance, with the same significance were compared by Tukey test at p ≤ 0.05.

Results and Discussion

Phytosociological parameters

During the evaluation period of the experiment, it was possible to observe the presence of 14 families and 23 species of weeds (Table 1). The families with the highest number of species present in the area were Asteraceae

and Poaceae, both represented by four species.

The predominance of these families in the conducting region of the study is common. In works realized by the author Santi et al. (2014) in soybean crop

and Forte et al. (2018b) in annual crops in southern Brazil, report the predominance of these weed families in their phytosociological studies.

Table 1. Distribution of weeds by family, species and popular name collected in fig orchard under different management methods. São Domingos, Santa Catarina, Brazil.

Family	Scientific name of species	Popular species name
Amaranthaceae	<i>Amaranthus hybridus</i>	Caruru
	<i>Dysphania ambrosioides</i>	Erva-de-santa-maria
	<i>Bidens pilosa</i>	Picão-preto
Asteraceae	<i>Conyza bonariensis.</i>	Buva
	<i>Sonchus oleraceus</i>	Serralha
	<i>Taraxacum officinalis</i>	Dente-de-leão
Brassicaceae	<i>Raphanus sativus.</i>	Nabo
Convolvulaceae	<i>Ipomoea purpurea</i>	Corda-de-viola
Euphorbiaceae	<i>Chamaesyce hirta</i>	Erva-de-santa-luzia
	<i>Euphorbia heterophylla</i>	Leiteiro
Fabaceae	<i>Trifolium repens.</i>	Trevo-branco
Lamiaceae	<i>Leonurus japonicas</i>	Rubim
	<i>Stachys arvensis</i>	Rabo-de-raposa
Malvaceae	<i>Sida rhombifolia</i>	Guanxuma
Plantaginaceae	<i>Plantago lanceolata.</i>	Tansagem
	<i>Eleusine indica</i>	Capim-pé-de-galinha
Poaceae	<i>Digitaria horizontalis</i>	Milhã/capim-colchão
	<i>Panicum maximum</i>	Capim-colonião
	<i>Urochloa plantaginea</i>	Papuã/capim-marmelada
	<i>Rumex obtusifolius</i>	Lingua-de-vaca
Portulacaceae	<i>Portulaca oleracea</i>	Beldroega
Rubiaceae	<i>Richardia brasiliensis</i>	Poaia-branca
Solanaceae	<i>Solanum americanum</i>	Maria-pretinha

First evaluation

According to the results found for the phytosociological parameters it is possible to verify, in the first evaluation, that the species *Euphorbia heterophylla* presented the highest importance value index (IVI) and the largest number of plants m⁻², except for the weed management (Figure 2 and Table 1). Possibly, the higher seed covering with soil in weeding management may have provided the largest germination, since the highest IVI was found for *Euphorbia heterophylla*. Smith et al. (1992) observed the occurrence of emergency *Sida rhombifolia* maximum when the depth was from 0.5 to 2 cm, which corroborates in part with the present study. Relative density was the parameter that most contributed to increase IVI, regardless of the cover management method adopted (Figure 2).

Euphorbia heterophylla presented higher frequency and relative abundance in the treatments where the cover management methods used were: chemist with the application of Diquat herbicide and glyphosate and scuffed, highlighting how these methods may contribute significantly to the appearance of the species, both due to their low efficiency, due to their

stage of development and resistance to herbicides, growing continuously.

Among the methods of soil cover management, mowing showed the highest density and dry mass of weeds, the increase was 207, 116, 199, 144 and 121 plants m⁻² and 15, 131, 92, 127 and 136 g m⁻² compared to the maintenance of mowing, lodging, diquat and glyphosate coverings, respectively (Table 2). The mowing of *Avena strigosa* of vegetation provides changes in soil temperature, light input and consequently decreased microbial activity (Zibilske & Makus, 2009), these results can contribute to the emergence of species of positive photoblastic weeds or in need of temperature alternation.

The glyphosate herbicide provided the lowest species diversity (Figure 2) and the lowest dry mass of weeds (Table 2). The smallest number of plants has already been observed in the maintenance of soil cover, with 26 m⁻² of plants. Koning et al. (2019) show the favoring of some species over others due to the weed management method, root and rhizome propagation species and weeds without seasonality were favored by glyphosate application.

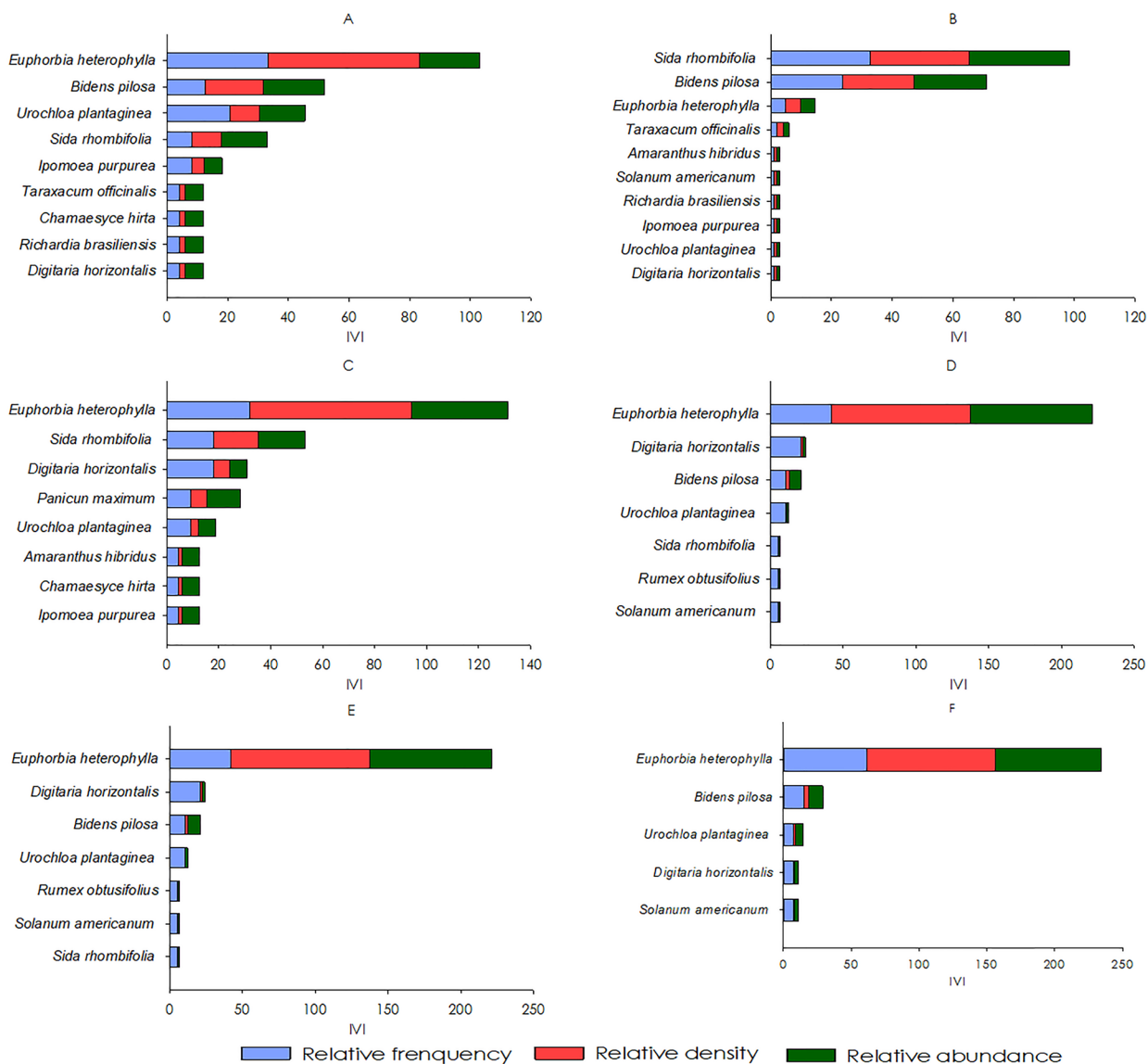


Figure 2. Importance value index (IVI) of weeds in fig under the influence of different managements (A) cover maintenance, (B) weeding, (C) lodging, (D) mowing, (E) herbicide diquat and (F) glyphosate herbicide in weed control. São Domingos, Santa Catarina, Brazil.

Table 2. Number of plants (NP) by species (m⁻²) and shoot dry mass (DM) (g m⁻²) in the different weed control methods in fig. São Domingos, Santa Catarina, Brazil.

Species	Cover maintenance		Weeding		Lodging		Mowing		Diquat		Glyphosate	
	NP	DM	NP	DM	NP	DM	NP	DM	NP	DM	NP	DM
<i>Sida rhombifolia</i>	3	22	66	6	6	3	1	1	1	0	0	0
<i>Digitaria horizontalis</i>	1	58	1	0	2	34	3	53	2	9	1	2
<i>Urochloa plantaginea</i>	3	51	1	11	1	9	1	109	4	1	1	2
<i>Euphorbia heterophylla</i>	13	7	7	3	20	15	220	13	79	39	105	36
<i>Ipomoea purpurea</i>	1	1	1	1	1	0*	0	0	0	0	0	0
<i>Bidens pilosa</i>	5	19	36	28	0	0	6	10	3	9	4	7
<i>Richardia brasiliensis</i>	1	10	1	3	0	0	0	0	0	0	0	0
<i>Chamaesyce hirta</i>	1	1	0	0	1	0*	0	0	0	0	0	0
<i>Taraxacum officinalis</i>	1	1	2	2	0	0	0	0	0	0	0	0
<i>Amaranthus hybridus</i>	0	0	1	0*	1	4	0	0	0	0	0	0
<i>Panicum maximum</i>	0	0	0	0	2	28	0	0	0	0	0	0
<i>Solanum americanum</i>	0	0	1	0*	0	0	1	0*	0	0	1	0*
<i>Rumex obtusifolius</i>	0	0	0	0	0	0	1	0*	0	0	0	0
Total	26	170	117	54	34	93	233	185	89	58	112	49

* Did not total 1 g dry mass.

Second evaluation

In the second phytosociological survey, carried out in December (20 months after the application of the treatments), it was possible to observe that there was a predominance of the family Poaceae, except for the management with the herbicide glyphosate in which

the highest IVI was found for the species *Raphanus sativus* (Figure 3). In general, the relative density and abundance of species in the area were the parameters that most contributed to the IVI of the different managements.

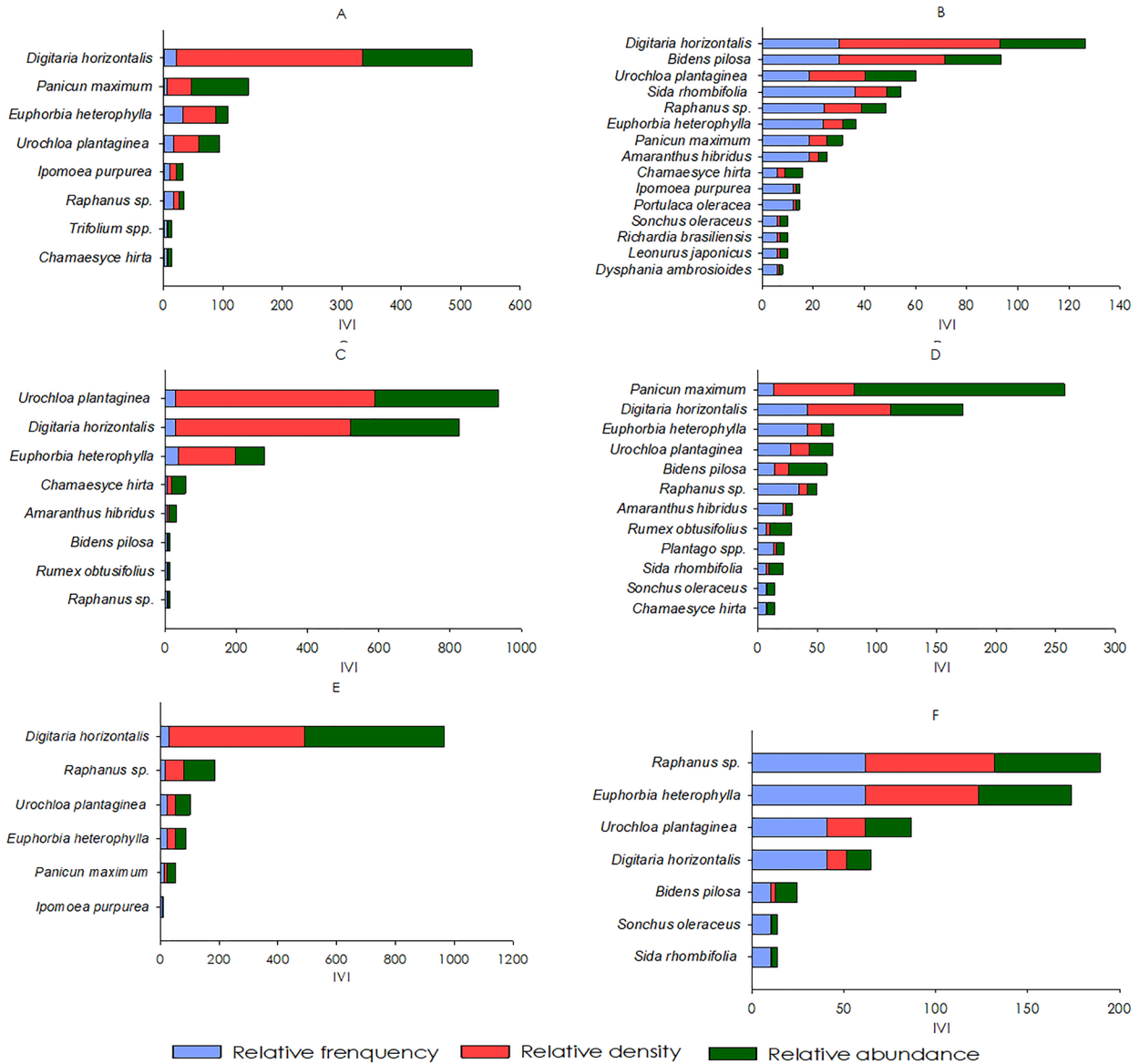


Figure 3. Importance value index (IVI) of weeds in fig under the influence of different managements (A) cover maintenance, (B) weeding, (C) lodging, (D) mowing, (E) herbicide diquat and (F) glyphosate herbicide in weed control. São Domingos, Santa Catarina, Brazil.

Weed management presented 15 weed species in the second evaluation, in the first evaluation in this same treatment 10 species were found (Figures 2 and 3). In both evaluations, it was the treatment with greatest species diversity. In places with environmental disturbance, such as soil revolving, some species are favored by this practice and thus begin the process of germination and establishment (De Rossi et al., 2007; Scherner et al., 2016).

The two herbicide managements to control the

vegetation cover soil were the ones that showed the lowest diversity of weed species, but the herbicide diquat presented the highest density and relative abundance in the study area (Figure 3 and Table 3).

The maintenance of soil cover in both evaluations showed the lowest weed density, a total of 26 and 125 plants m⁻², in the first and second evaluations, respectively. Radicetti et al. (2013) in soil cover work in pepper crop with *Avena sativa* found that it suppresses

weeds, regardless of their management, mainly related to species density and diversity. Factors such as luminosity, thermal amplitude and competitiveness may be related to this weed suppression imposed by soil cover (Zibilske & Makus, 2009; Forte et al., 2018b). De Rossi et al. (2007), in management work of black oat vegetation cover in the pear culture, observed that in the treatments where the black oat was kept on the surface, the daily temperature variation was lower. In treatments where black oats were kept on the surface, it was observed that the thermal protection of the soil was maintained for a longer period, while in the treatment with oat incorporation the thermal protection was no longer efficient, probably due to rapid decomposition of the remaining straw in the soil, exposing

it completely, making it similar to control (weeding). As a consequence, incorporated mulching and weeding presented higher species diversity and lower weed suppression, respectively.

The oat cover was the most effective for weed suppression (on average - 93% of weed above-ground biomass compared to other cover crops). Research has shown the potential of black oats as excellent soil cover both in improving soil physics, chemistry and biology characteristics, as well as in favoring pest control (diseases, insects and weeds) primarily by releasing allelopathic substances or even by physical barrier (De Rossi et al., 2007; Zibilske & Makus, 2009; Forte et al., 2018a; Forte et al., 2018b).

Table 3. Number of plants (NP) and shoot dry mass (DM - g) per weed species as a function of the method of management of soil cover. São Domingos, Santa Catarina, Brazil.

Species	Cover maintenance		Weeding		Lodging		Mowing		Diquat		Glyphosate	
	NP	DM	NP	DM	NP	DM	NP	DM	NP	DM	NP	DM
<i>Sida rhombifolia</i>	0	0	15	3	0	0	5	0	0	0	1	0
<i>Digitaria horizontalis</i>	81	20	77	63	157	54	160	58	406	89	12	3
<i>Urochloa plantaginea</i>	11	5	27	3	179	61	35	6	25	9	23	40
<i>Euphorbia heterophylla</i>	14	5	9	30	51	80	27	34	24	58	68	208
<i>Ipomoea purpurea</i>	3	1	1	2	0	0	0	0	1	0	0	0
<i>Bidens pilosa</i>	0	0	51	36	1	0*	28	61	0	0	3	1
<i>Richardia brasiliensis</i>	0	0	1	8	0	0	0	0	0	0	0	0
<i>Chamaesyce hirta</i>	1	0	1	3	4	0*	3	0	0	0	0	0
<i>Amaranthus hybridus</i>	0	0	5	4	2	13	7	6	0	0	0	0
<i>Panicum maximum</i>	11	59	9	44	0	0	155	207	10	140	0	0
<i>Rumex obtusifolius</i>	0	0	0	0	1	4	8	18	0	0	0	0
<i>Sonchus oleraceus</i>	0	0*	1	3	0	0	3	0	0	0	1	2
<i>Raphanus sp.</i>	3	1	18	28	1	0	17	94	55	81	77	155
<i>Leonurus japonicus</i>	0	0	1	1	0	0	0	0	0	0	0	0
<i>Plantago spp.</i>	0	0	0	0	0	0	5	7	0	0	0	0
<i>Trifolium spp.</i>	1	0*	0	0	0	0	0	0	0	0	0	0
<i>Portulaca oleracea</i>	0	0	3	0*	0	0	0	0	0	0	0	0
<i>Dysphania ambrosioides</i>	0	0	1	1	0	0	0	0	0	0	0	0
Total	125	89	220	228	396	213	453	491	521	376	186	408

* Did not total shoot dry mass of 1 g.

De Rossi et al. (2007), when working with different management of black oats in *Pyrus communis* orchard, observed that weed infestation in the control without soil cover was superior to the other treatments (incorporation of oats in the soil, herbicide desiccation and knife roll lodging; 5 cm) and that species diversity was higher when the soil was turned. Ferreira & Aquila (2000) observed that, among several species of plant cover studied, black oats and rapeseed provided almost total control of the herbs due to their allelopathic effect. According to Forte et al. (2018b) non-tillage and mulching favor weed control in agricultural environment. It is worth mentioning that there are few works related to weed management methods in fig trees, for this reason in the present study we sought

literature data from other crops.

Physiological variables of fig tree

According to the results obtained in the evaluation made on March 29, 2016, it was possible to verify that the type of cover management for weed control did not influence the main variables related to the physiology of the fig crop (Table 4). Most likely, the vegetation cover soil provided improvement in soil moisture and consequently on water use efficiency over a long period, including at the time of evaluation. In peach cultivation, the vegetation cover soil demonstrated in a semi-arid site of China, increases in fruit productivity of 22% due to increased water use efficiency with wheat mulch

(Wang et al., 2015). Weed density, culture age, planting arrangement, irrigation systems can all influence weed control methods and consequently established orchards (Hanson et al., 2017).

Weed competition can prejudice crop

development, therefore, regardless of the method used for weed control, it is important that it does not harm the installed crop and preserve its useful life, especially when it comes to herbicides.

Table 4. Variables related to the physiology of fig plants submitted to different weed management methods. São Domingos, Santa Catarina, Brazil.

Treatments	Ci	E	Gs	A	WUE	CE
Cover maintenance	339,50 ^{ns}	4,50 ^{ns}	0,27 ^{ns}	7,60 ^{ns}	1,72 ^{ns}	0,02 ^{ns}
Weeding	337,75	4,86	0,30	6,64	1,70	0,02
lodging	330,25	5,86	0,28	8,30	1,73	0,02
Mowing	334,75	4,98	0,33	7,65	1,83	0,02
Diquat	340,50	4,90	0,33	8,67	1,67	0,02
Glyphosate	325,25	5,23	0,32	9,05	2,02	0,03
C.V. (%)	6,50	13,83	19,65	29,73	24,95	28,22

Internal CO₂ concentration (Ci - $\mu\text{mol}\cdot\text{mol}^{-1}$), transpiration rate (E - $\text{mol H}_2\text{O m}^{-2} \text{s}^{-1}$), stomatal conductance of water vapors (Gs - $\text{mol m}^{-1} \text{s}^{-1}$), photosynthetic efficiency (A - $\mu\text{mol m}^{-2} \text{s}^{-1}$), water-use-efficiency (WUE - $\text{mol CO}_2 \text{ mol H}_2\text{O}^{-1}$) carboxylation efficiency (CE - $\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$), ^{ns} not significant the probability of error of 0,05, C.V.= coefficient of variation.

Fig fruit production

For being slow, the establishment of weeds in managed area with vegetation cover soil in the winter period, the competition imposed by these species did not influence the production of fig performance (Figure 4). Mechanical, cultural or chemical methods provided an average production of 8,811 kg ha⁻¹ of fig. This fig production average is far below those obtained in countries such as Spain, which production can exceed

20 t ha⁻¹ (Pereira et al., 2015). However, very close to the Brazilian productivity, which is 9,990 kg ha⁻¹ (FAO, 2019). This low production is explained by the fact that the orchard was only established three years ago, considered a plant still young and that its production tends to be higher from the sixth year. Factors such as climate, soil conditions, cultivars and production technology may also be contributing to this difference.

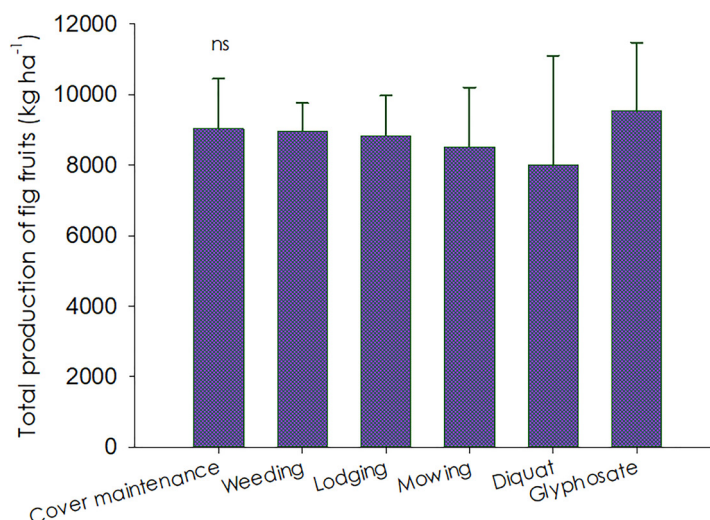


Figure 4. Total production of fig fruits (kg ha⁻¹) in the 2012/13 crop, in function of soil cover management in the winter period. Data are presented as the means and standard deviation of four independent biological repetitions. ^{ns}not significant the probability of error of 5%. São Domingos, Santa Catarina, Brazil.

As it does not change the total fig production, it is advisable to choose methods that reduce environmental and herbicide drift risks to fig plants (cover maintenance, weeding, lodging or mowing) or areas with susceptible crops located near the application. It is also recommended to use fig weed control methods that

reduce the impact of rainfall and maintain mulch over a longer period of time, including reducing weed growth (cover maintenance, lodging, herbicides - diquat or glyphosate) and with lower cost to the producer (cover maintenance and lodging). Given these factors, we highlight the maintenance of coverage and lodging as

the most promising for the management of weeds found in fig orchards.

Conclusions

A wide diversity of weeds was found in the study area, highlighting species of the family Asteraceae and Poaceae. Herbicides provided the lowest species diversity, but not the lowest importance value index.

The methods of soil cover management do not interfere with variables related to the physiology of fig plants and the total yield of fig fruits.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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