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Phytosociology of weeds in soybean cultivation CZ37B39

Phytosociology of weeds in soybean cultivation CZ37B39

Pablo Henrique Santa de Oliveira1 ;
Richardson Silva Teodoro1 ;
Reinaldo Silva Oliveira Canuto2

Abstract: Competition from weeds for water, nutrients, space, and light hinders the development of cultivated plants. Additionally, they can host insect pests and phytopathogens that cause phytosanitary problems in agricultural crops, thus contributing to a reduction in the productive potential of soybean cultivars. Knowing the interference of weeds in agricultural production systems, agronomic management must be defined considering the particularities of each property. One of these specificities is the weed community present in the cultivated area. To understand it, a quantitative and qualitative survey of weed species is fundamental for any planning of strategies for preventing or controlling weed infestation in soybean crops. Therefore, this work aimed to conduct a phytosociological survey of weeds in an area cultivated with CZ37B39I2X soybeans at the Sobradinho Farm, IFTM Campus Uberlândia, in Uberlândia-MG. Weed sampling was performed using the quadrat method (0.5 m x 0.5 m) randomly placed at 12 points in the soybean area at the V4 phenological stage. At each point, weeds were identified and quantified for subsequent analysis of floristic composition and phytosociology. The characteristics evaluated were: frequency, density, and abundance (absolute and relative) and importance value index. The family with the greatest representation in the area was Amaranthaceae, with 2 identified species *(Alternanthera tenella* and *Amaranthus spinosus).* However, the species that presented the highest phytosociological indices was *Urochloa decumbens,* with an importance value index (IVI) of 132.28%, followed by *A. tenella,* with 112.19%. Therefore, the phytosociological survey carried out indicates that the agronomic management of weeds should focus on controlling the two species with the highest IVIs (Index of Violence Against Weeds), paying special attention to the need for rotation of active ingredients with different mechanisms of action to prevent the selection of resistant weed biotypes in the agricultural production systems of Fazenda Sobradinho, in Uberlândia, MG.

Keywords: Phytosociology. Weed science. Weeds. *Glycine max.*

Abstract: Weed competition for water, nutrients, space, and light impairs the development of cultivated plants. Additionally, they can host insect pests and phytopathogens that cause phytosanitary problems in agricultural crops, thus contributing to the reduction of the productive potential of soybean cultivars. Knowing the interference of weeds in agricultural production systems, agronomic management must be defined considering the particularities of each property. One of these specificities is the weed community present in the cultivation area. To know it, the quantitative and qualitative survey of weed species is essential for any planning of strategies to prevent or control the infestation of soybean crops by weeds. Therefore, the present study aimed to survey phytosociological

1 Undergraduate student in Agronomic Engineering at the Federal Institute of Education, Science and Technology of the Triângulo Mineiro, Uberlândia Campus, MG. Student - Agronomy - IFTM Uberlândia Campus.

2 Professor - Agronomy - IFTM Campus Uberlândia.2 PhD in Agronomy (Phytotechnics) and professor at the Federal Institute of Education, Science and Technology of the Triângulo Mineiro, Uberlândia Campus, MG. Email: reinaldo@iftm.edu.br

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weeds in an area cultivated with CZ37B39I2X soybean at Fazenda Sobradinho, IFTM Campus Uberlândia, in Uberlândia-MG, 2024/2025 harvest. Weed sampling was performed using the square inventory method (0.5 mx 0.5 m) randomly placed at 12 points in the area with soybeans at phenological stage V4. At each point, weeds were identified and quantified for subsequent analysis of floristic composition and phytosociology. The characteristics were evaluated: frequency, density and abundance (absolute and relative) and importance value index. The family with the greatest representation at the site was Amaranthaceae, with 2 species identified *(Alternanthera tenella* and *Amaranthus spinosus).* However, the species that presented the highest phytosociological indices was *Urochloa decumbens,* with an importance value index (IVI) equal to 132.28%, followed by *A. tenella,* with 112.19%. Therefore, the phytosociological survey carried out indicates that the agronomic management of weeds should be carried out with a focus on controlling the two species with the highest IVIs, with special attention to the need for rotation of active ingredients with different mechanisms of action to prevent the selection of resistant weed biotypes in the agricultural production systems of the Sobradinho Farm, in Uberlândia-MG.

Keywords: Phytosociology. Weed Science. *Glycine max.*

INTRODUCTION

The 2024/25 soybean crop reached record numbers, considering a planted area of 47.6
millions of hectares, which represented an increase of 3.2% compared to the previous harvest.
Productivity also increased, reaching 3,536 kg/ha, a value that represented an increase.
10.5%. Production reached 168.3 million tons, meaning there was an increase of 14.0%.
In Minas Gerais, São Paulo, Goiás, Mato Grosso, Bahia, Rondônia, and Tocantins, the productivity...
The results achieved were record highs (CONAB, 2025).

The risk of losses in soybean production represents a significant challenge, impacting both the
Productivity and profitability of the crop. These losses can occur at different stages.
From planting to storage, and are caused by various factors, such as conditions.
Unfavorable weather conditions, diseases, pests, inadequate weed management, and regulation.
Incorrect use of the equipment.

Generally, weeds have a greater competitive ability compared to plants.
cultivated, generating losses that can be greater than those caused by other problems.
phytosanitary factors such as pests and diseases (VASCONCELOS; SILVA; LIMA, 2012).
Therefore, weed control in crops is essential to promote yields.
Crop yields, since these invasive species can significantly harm the...
Agricultural production is driven by competition for water, nutrients, light, and space with the crop of interest.
agronomic, in addition to favoring the survival of pests and diseases. Therefore, understanding the dynamics
The population size of weeds and the floristic composition profile of a production area is
important for decision-making and choosing management practices in order to promote productivity.
(PITELLI, 1985, 1987).

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The population survey of weeds, also called a survey
Phytosociological analysis, or floristic composition analysis, allows us to identify the most important species.
to be managed in any agricultural production system (SILVA *et al.,* 2017; FORTE *et al.,*
(2018). Integrated weed management can only be carried out satisfactorily if
having detailed knowledge of the infesting community will make it possible to define the best [strategies/strategies].
strategies for each agricultural situation, contributing to the reduction in production costs and impact.
to the environment (COSTA *et* al., 2019).
Understanding the importance of floristic composition surveys for decision-making.
With the aim of protecting crops, this study aimed to conduct a survey.
Phytosociological analysis of weeds in CZ37B39I2X soybean cultivation at the Farm
Sobradinho, from IFTM Campus Uberlândia, in Uberlândia, Minas Gerais, specifically during the harvest season.
2024/2025.

MATERIALS AND METHODS

A survey of weed species for the analysis of floristic composition and distribution.
Spatial weed survey was conducted in a CZ37B39I2X soybean crop at Fazenda Sobradinho.
of the Federal Institute of the Triângulo Mineiro Campus Uberlândia, whose area is located in
geographic coordinates of 18°46'22" South latitude and 48°17'27" West longitude, with an altitude
of 703 m, climate classification Aw, according to Köppen-Geiger (PEEL; FINLAYSON;
(MCMAHON, 2007). The site where the phytosociological survey was conducted had 10,000 m2 cultivated
with soybeans.
The soil was classified as eutrophic Red Latosol and had been fallow since March 2023.
The soybeans were sown on November 12, 2024, with prior desiccation performed using 2,4-D +
glyphosate, two weeks before the seed drill/fertilizer applicator enters for sowing.
direct. At the time of weed sampling, the crop was at the V4 phenological stage.
The weed species survey was conducted using a quadrat inventory.
(0.5m x 0.5m), constructed with PVC pipes. Twelve throws of the square were performed.
Inventory at random points in the sampled area.
In addition to quantifying the species and the total number of individuals per sampled area, further data was also collected.
The phytosociological parameters proposed by Mueller-Dombois and Ellenberg (1974) were calculated:

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Frequency (repetition index of species in the squares):

$$F = \frac{Número\ de\ parcelas\ que\ contém\ a\ espécie}{Total\ de\ parcelas\ utilizadas}$$

Density (index of the number of individuals of the same species in all squares):

$$D = \frac{Total\ de\ indivíduos\ por\ espécie}{Área\ total\ coletada}$$

Abundance (grouping of species at different points in the total area):

$$A = \frac{Total\ de\ indivíduos\ por\ espécie}{Total\ de\ parcelas\ contendo\ a\ espécie}$$

Relative frequency:

$$Fr = \frac{Frequência\ da\ espécie\ X\ 100}{Frequência\ total\ de\ todas\ as\ espécies}$$

Relative density:

$$Dr = \frac{Densidade\ da\ espécie\ X\ 100}{Densidade\ total\ de\ todas\ as\ espécies}$$

Relative abundance (relates a species to all other species found in the area):

$$Air = \frac{Abundância\ da\ espécie\ X\ 100}{Abundância\ total\ de\ todas\ as\ espécies}$$

Importance value index:

IVI = + +

All the results obtained were presented in tables and graphs for analysis.
descriptive profile of the weed community present in soybean cultivation.

RESULTS AND DISCUSSION

The weed community in the area consisted of 9 species of weeds, belonging to the 8th
Families. In quantitative terms, the Amaranthaceae family had the largest number of species.
recorded (Table 1).

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Table 1. Weed species, grouped by family, based on the survey conducted.
in soybean cultivation CZ37B39I2X at the Sobradinho Farm, of IFTM Campus Uberlândia, in Uberlândia, Minas Gerais.

Harvest season 2024/2025.

Family	Common Name	Scientific name
Amaranthaceae	fire extinguisher	*Alternanthera tenella*
	spiny amaranth	*Amaranthus spinosus*
Poaceae	brachiaria	*Urochloa decumbens*
Fabaceae	perennial soybean	*Neonotonia wigthii*
Convolvulaceae	guitar string	*Ipomoea triloba*
Euphorbiaceae	castor bean	*Ricinus communis*
Malvaceae	white guanxuma	*Sida glaziovii*
Asteraceae	mentrasto	*Ageratum conyzoides*
Commelinaceae	spiderwort	*Commelina benghalensis*

The two weed species that showed the highest frequencies, densities, and
The abundances (absolute and relative) in the experimental area of the Sobradinho Farm were *Urochloa. decumbens* and *Alternanthera tenella* (Table 2).

Table 2. Number of individuals present in squares (NQ), number of individuals (NI), frequency (F), density (D), abundance (A), relative frequency (Fr), relative density (Dr), relative abundance (Ar) and importance value index (IVI) of weed species in soybean cultivation CZ37B39I2X at Fazenda Sobradinho, IFTM Campus Uberlândia, in Uberlândia, Minas Gerais.

Harvest season 2024/2025.

Species	NI	NQ	FD		THE	Fr	Dr	Air
Urochloa decumbens	399	12	1.00	39.90	33.25	33.33	53.56	45.39
Alternanthera tenella	318	12	1.00	31.80	26.50	33.33	42.68	36.18
Amaranthus spinosus	12	4	0.33	1.20	3.00	11.11	1.61	4.10
Neonotonia wigthii	10	2	0.17	1.00	5.00	5.56	1.34	6.83

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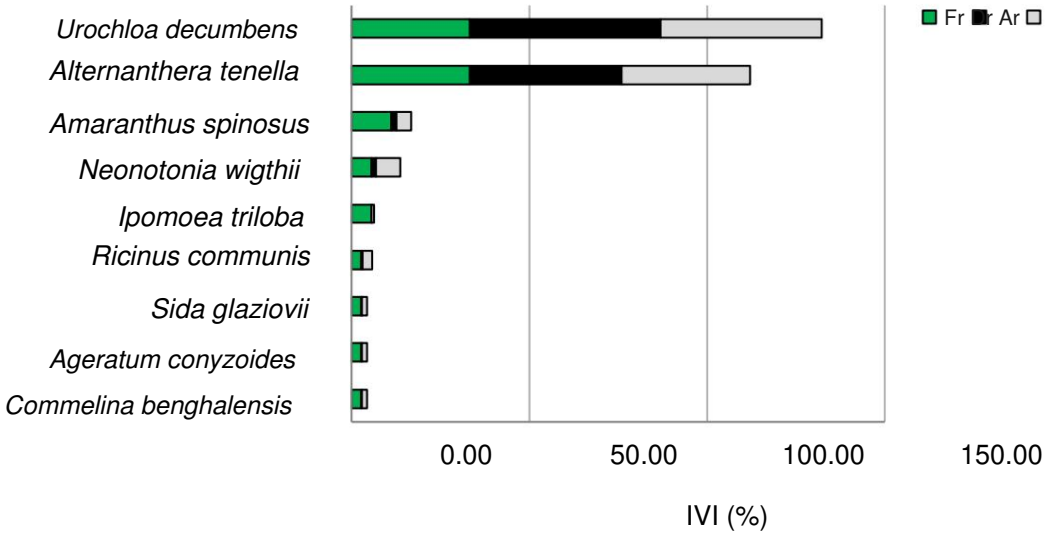
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Species	NI	NQ	FD		THE	Fr	Dr	Air
Ipomoea triloba	1	2	0.17	0.10	0.50	5.56	0.13	0.68
Ricinus communis	2	1	0.08	0.20	2.00	2.78	0.27	2.73
Sida glaziovii	1	1	0.08	0.10	1.00	2.78	0.13	1.37
Ageratum conyzoides	1	1	0.08	0.10	1.00	2.78	0.13	1.37
Commelina benghalensis	1	1	0.08	0.10	1.00	2.78	0.13	1.37
Total	745	12	3.00	74.50	73.25	100.00	100.00	100.00

Although broadleaf weeds represented the majority of the weed community, with nearly 88.9% of the total identified species, the planning of actions to carry out the control of For weed control, consider applying herbicides that also have an effect on *U.S. decumbens,* mainly because it was the weed with the highest IVI, that is, 132.28% (Figure 1).

Figure 1. Phytosociological survey of weeds in CZ37B39I2X soybean cultivation in Sobradinho Farm, belonging to IFTM Campus Uberlândia, in Uberlândia, Minas Gerais. 2024/2025 harvest. Fr: relative frequency (%); Dr: relative density (%); Ar: relative abundance (%); IVI: index of importance value (%).



Since most commercially grown soybean cultivars in Brazil have embedded technology. In genotypes for herbicide tolerance, especially glyphosate tolerance, care must be taken. to be larger in order to prevent an increase in infestation by *U. decumbens* and *A. tenella,* considering that This EPSPS inhibitor, frequently used at Fazenda Sobradinho, can create a pressure of

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Selection of resistant weed biotypes over time. Therefore, the problem requires
that the agronomist uses herbicides with other mechanisms of action throughout the production cycles.
agricultural use to mitigate the selection of weed biotypes with alleles for resistance to
glyphosate.

As reported by GAZZIERO *et* al., 2014, the increase in populations tolerant to the inhibitor of
The EPSPS enzyme has become more common after the introduction of several cultivars to the agricultural market.
glyphosate-tolerant soybeans. As observed by Lamego *et al.* (2024), when detecting populations
Regarding glyphosate-resistant weeds, it is necessary to investigate the type of resistance present.
that the most appropriate management strategy be defined for each situation.

Rodrigues and Almeida (2018) endorse the idea that preserving biotechnological technologies requires the
mandatory adoption of alternative active ingredients, combining ALS, ACCase, Protox inhibitors,
among others, associated with cultural practices, aimed at preventing the development cycle of plants
control weeds, reduce the amount of seeds deposited in the soil and, consequently, decrease the...
number of weed biotypes that may therefore carry some allele for resistance.
to herbicides frequently used in soybean cultivation, especially glyphosate, whose molecule
It has been used extensively over the last few decades.

CONCLUSION

Based on the phytosociological survey of weeds in the CZ37B39I2X soybean crop at the Farm
In Sobradinho at the IFTM Campus Uberlândia, it was possible to observe the species of weeds.
The predominant species were *U. decumbens* and *A. tenella.* Based on the survey conducted at the stadium.
By observing the V4 phenological stage of the crop, the agronomist can make the most informed decision regarding species management.
with the highest importance value indices, in addition to planning herbicide rotation with others
Mechanisms of action to be employed throughout the agricultural year.

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