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Effects of herbicide underdoses on the vegetative development of *Panicum maximum* cultivars

Efeitos da subdosagem de herbicidas no desenvolvimento vegetativo de cultivares de *Panicum maximum*

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Abstract

The advance of intercropping has generated the need for studies that evaluate methods of suppression of forage grasses in order to not harm the development of the commercial culture. The aim of this study is to evaluate the sensitivity of forage grasses to post-emergence herbicide application. To this end, an experiment was carried out in a greenhouse using a randomized complete block design in a 4 x 9 factorial scheme with four replicates. The first factor consisted of the forage grasses *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Tamani, *P. maximum* cv. BRS Quênia, and *P. maximum* cv. BRS Zuri. The second factor consisted of the combination of eight herbicide treatments applied at post-emergence in association with atrazine (1200 g a.i. ha⁻¹), besides a control treatment, without application. *P. maximum* cv. BRS Quênia was the least sensitive to post-emergence herbicide application. Tembotrione (42 and 84 g a.i. ha⁻¹) and mesotrione (48 and 96 g a.i. ha⁻¹) have potential for suppression of *U. ruziziensis*. Tembotrione (84 g a.i. ha⁻¹), glyphosate (200 g a.i. ha⁻¹), and nicosulfuron (7.8 g a.i. ha⁻¹) have potential for suppression of the cv. BRS Quênia, and tembotrione (42 g a.i. ha⁻¹) and mesotrione (96 g a.i. ha⁻¹) have potential for the suppression of BRS Tamani. The *P. maximum* cv. BRS Zuri presented a higher plant height, shoot dry matter, and root dry matter than the other forages evaluated. For this forage, the use of nicosulfuron herbicides at post-emergence, regardless of the dose, reduced the shoot dry matter by 70%.

Additional keywords: *Brachiaria ruziziensis*; chemical control; phytointoxication; post-emergence.

Resumo

O avanço no cultivo de culturas consorciadas tem gerado a necessidade de estudos que avaliam métodos de supressão das gramíneas forrageiras de forma a não prejudicarem o desenvolvimento da cultura comercial. Objetivou-se, avaliar a sensibilidade de gramíneas forrageiras aos herbicidas quando aplicados em pós-emergência das plantas. Para isso, foi realizado experimento em casa-de-vegetação utilizando delineamento inteiramente ao acaso em esquema fatorial 4x9 com quatro repetições. O primeiro fator foi constituído das gramíneas forrageiras *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Tamani, *P. maximum* cv. BRS Quênia e *P. maximum* cv. BRS Zuri, e o segundo fator da combinação de oito tratamentos herbicidas aplicados em pós-emergência das plantas em associação com atrazina (1200 g i. a. ha⁻¹), além da testemunha sem aplicação. *P. maximum* cv. BRS Quênia foi menos sensível a aplicação dos herbicidas em pós emergência. Tembotriona (42 e 84 g i. a. ha⁻¹) e mesotriona (48 e 96 g i. a. ha⁻¹) apresenta potencial para utilização na supressão de *U. ruziziensis*. Tembotriona (84 g i. a. ha⁻¹), glifosato (200 g i. a. ha⁻¹) e nicossulfuron (7,8 g i. a. ha⁻¹) apresentam potencial para supressão da forrageira Quênia, acrescido de tembotriona (42 g i. a. ha⁻¹) e mesotriona (96 g i. a. ha⁻¹) para BRS Tamani. *P. maximum* cv. BRS Zuri apresentou maior altura de plantas, massa seca da parte aérea e de raiz que as demais forrageiras avaliadas. Para essa forrageira, a utilização de herbicidas em pós-emergência nicossulfuron independente da dose reduziu cerca de 70% a massa seca da parte aérea.

Palavras-chave adicionais: *Brachiaria ruziziensis*; controle químico; fitointoxicação; pós-emergência.

Introduction

The use of forage grasses in intercropping systems of annual crops is considered an advantageous alternative for the sustainability of agricultural production systems (Borghi et al., 2013). The advantages are provided by the high ratio of carbon and nitrogen (C/N) of forages, increasing the straw

persistence on the soil surface, which is especially desirable in warm environments with rapid decomposition of dry matter, such as in the Cerrado (Silva et al., 2019). This results in protection against insolation and raindrop impact and in the reduction of soil water evaporation and erosion. In addition, the biomass of these plants provides high contents of organic matter in the soil, contributing to nutrient cycling,

especially in the replacement of nitrogen and carbon and in the improvement of soil properties (Ryschawy et al., 2017), besides reducing weed occurrence (Lima et al., 2014).

To ensure the success of the intercropping system, forage grasses must be well managed, so that the main crop is not harmed by plant competition. Several factors can influence grain production, including the species of grass used in the system, sowing density, location, and distribution of plants in the crop, soil fertility, sowing time, and especially the use of underdoses of herbicides for the suppression of grass growth (Almeida et al., 2017).

The genus *Panicum* has been gaining prominence for use as a cover crop or for forage production in integrated systems (Dias et al., 2020) mainly due to the release for commercialization of new cultivars of *P. maximum* BRS Tamani, BRS Quênia, and Zuri, which have shown positive results when used in integrated systems (Valote, 2018). Despite this, little is known regarding the suppression of growth of these cultivars when used in intercropping systems.

Generally, cultivars of *P. maximum* have a greater productive potential compared to *Urochloa* spp., as they have a more vigorous and deeper root system with high tolerance to water deficit and high nutrient absorption capacity at deeper soil layers (Correia et al., 2011). In addition, *P. maximum* has the characteristic of presenting its most vigorous regrowth at the beginning of the rainy season and high productive potential, combined with its erect and caespitose habit (Almeida et al., 2017). Such properties require the suppression of this grass to be assertive, so that competition between it and the main crop does not occur.

There are several results in the literature on the use of herbicide underdoses to suppress the growth of species of the genus *Urochloa*, in particular *U. ruziziensis* (R. Gem. & C.M. Evrad) (Richetti et al., 2018). However, studies with grasses of the genus *Panicum* have been incipient or not very conclusive. The most used herbicides to suppress the growth of forage grasses and control narrow-leaved invasive plants intercropped with maize are mesotrione and nicosulfuron, where mesotrione has a quick action, allowing the resumption of grass growth, while nicosulfuron has a longer action, significantly reducing grass growth (Cecon et al., 2015). However, the best dose for the suppression of the different forages used, specially for the cultivars of *P. maximum*, needs to be better studied for recommendation in intercropping systems.

Therefore, the objective of this study is to evaluate the sensitivity of species of the genus *Panicum* to herbicides when applied at post-emergence and tested at the recommended doses and underdoses, as well as to evaluate their efficiency in inhibiting plant growth and producing biomass for land cover.

Material and methods

The experiment was conducted in a greenhouse located at the GAPES Innovation and Technology Center, 17° 48' 58" south latitude, 51° 03' 24" longitude, and 752 m altitude, in the municipality of Rio Verde, Goiás, Brazil.

For the establishment of the experiment, a randomized complete block design (RCBD) in a factorial scheme (4x9) with four replicates was used. The first factor consisted of four species of forage grasses, namely: *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Tamani, *Panicum maximum* cv. BRS Quênia, and *Panicum maximum* cv. Zuri. The second factor consisted of eight concentrations of four herbicides applied at post-emergence, besides the treatment without application (control). All herbicide treatments received 1200 g a.i. ha⁻¹ of atrazine. Treatments with the herbicides glyphosate, mesotrione, nicosulfuron, and tembotrione and their respective evaluated doses are listed in Table 1.

The planting of the species was carried out on February 20, 2020 in experimental units consisting of black-colored pots with volumetric capacity of 3.00 dm³ containing a mixture of soils in the ratio of two parts of fine sand and one part of clayey soil (45% clay). After planting, the plots were thinned in order to standardize treatments and conditions of interference between plants, with a total of five plants per pot remaining at 25 days after planting.

At 40 days after sowing (DAS), the post-emergence herbicide application was conducted using a CO₂ backpack sprayer equipped with a 3.0 m boom and XR 110 015 spray nozzles spaced 0.5 m apart, with an application rate of 150 L ha⁻¹.

The percentage of phytotoxicity was evaluated at 7, 21, and 35 days after application (DAA) of the herbicide treatments. For this, a visual score in percentage in which 0 represents absence of symptoms and 100% represents plant death was assigned (SBCPD, 1995). Plant height was evaluated before the application of treatments (41 days after sowing) and 7 days after application (DAA) of herbicide treatments. For this, the five plants of each pot were measured from the neck to the end of the panicle using a graduated ruler.

At 35 DAA, the plants were cut close to the ground to determine shoot dry matter and the roots were washed to determine root dry matter. These samples were placed in paper bags and maintained in a forced air circulation oven for a period of 72 hours at a temperature of 65 °C, being subsequently weighed using a precision scale.

Data were subjected to analysis of variance using the software ASSISTAT (Silva & Azevedo, 2016). When significant effects were found, the treatment means were compared by Tukey test for the first factor (species) and by the Scott-Knott test for the second factor (herbicides), both at a 5% significance level.

Table 1 - List of herbicides applied at post-emergence of forage grass species.

Herbicides*	Dose	
	g or L c. p. ha ⁻¹	g a. i. ha ⁻¹
Control	-	-
Tembotrione	0.1	42
Tembotrione	0.2	84
Glyphosate	0.2	100
Glyphosate	0.4	200
Mesotrione	0.1	48
Mesotrione	0.2	96
Nicosulfuron	0.1	7.8
Nicosulfuron	0.2	15.6

* In all treatments containing herbicides, atrazine was added (dose of 3.0 L c. p. ha⁻¹ or 1200 g a.i. ha⁻¹).

Results and discussion

Table 2 presents the summary of the analysis of variance for the characteristics evaluated as a function of the different forage grasses and herbicides applied at post-emergence. In the evaluation of plant height before application, as expected, significant effect

was only observed for the factor species. The other variables (phytotoxicity, plant height after application, shoot dry matter, and root dry matter) presented significant effect on the interaction species versus herbicide. These results demonstrate the importance of evaluating the influence of each forage species after herbicide application separately.

Table 2 - Summary of the analysis of variance (calculated F values) for the variables phytotoxicity, plant height before and after application (PHB and PHA, respectively), shoot dry matter (SDM), and root dry matter (RDM) as a function of different forage grass species and herbicides.

Source of variation	DF	F values						
		Phytotoxication			PHB	PH	SDM	RDM
		7 DAA	21 DAA	35 DAA				
Species (S)	3	33.9**	59.6**	133.5**	3.4*	126.9**	44.4**	20.0**
Herbicide (H)	2	39.8**	155.1**	332.3**	2.3 ^{ns}	12.9**	34.1**	16.3**
S x H	4	3.8**	9.8**	35.1**	1.2 ^{ns}	2.9**	2.2**	4.2**
Residue	48	-	-	-	-	-	-	-
CV (%)	-	30.9	22.1	16.3	13.5	25.9	31.9	53.5

DAA = days after application; ns, *, **: not significant and significant at 5 and 1% probability level by the F test, respectively.

Before application, the forage *P. maximum* cv. BRS Zuri presented the highest plant height (up to 53% higher than the others), followed by *P. maximum* cv. BRS Quênia and finally the species *P. maximum* cv. BRS Tamani and *U. ruziziensis* (Table 3). Understanding the early development of the forage plant is essential for making management recommendations. Fast growing cultivars such as BRS Zuri must be well managed, so that competition with the commercial species does not occur. On the positive

side, the larger size is directly related to the dry matter content that the plant will provide, to nutrient cycling, increased organic matter, and decreased soil evaporation, possibly also providing a higher stocking rate for animals and higher yields for subsequent crops (Borges et al., 2014; Costa & Queiroz, 2017). On the other hand, the smaller size of *U. ruziziensis* and *P. maximum* cv. BRS Quênia may indicate greater ease of management in the intercropping system.

Table 3 – Plant height before application of *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Tamani, *P. maximum* cv. BRS Quênia, and *P. maximum* cv. BRS Zuri.

Species	Plant height before application (cm)
<i>U. ruziziensis</i>	13.88 c
<i>P. maximum</i> cv. BRS Quênia	25.86 b
<i>P. maximum</i> cv. BRS Tamani	15.79 c
<i>P. maximum</i> cv. BRS Zuri	38.96 a

Means followed by different lowercase letters differ significantly by the Tukey test ($p < 0.05$).

Table 4 shows the results of phytotoxicity of different forage grasses after post-emergence herbicide applications. In the first phytotoxicity evaluation, carried out 7 days after application (DAA), in general, the forage *P. maximum* cv. BRS Quênia was less sensitive to post-emergence herbicide application. For *U. ruziziensis*, the use of glyphosate and nicosulfuron at the recommended doses (200 and 15.6 g a.i. ha⁻¹, respectively) provided a phytotoxicity greater than 90%, demonstrating that they are not interesting alternatives

for use in intercropping systems to suppress this forage. The high sensitivity of *U. ruziziensis* plants to a higher dose of glyphosate is related to the rapid translocation of the herbicide to the site of action, which may be greater in a situation of plant stress. Thus, lower doses than those recommended should be indicated to avoid plant death (Matias et al., 2019). The herbicides that presented an intermediate level of phytotoxicity against *U. ruziziensis* were tembotrione (42 and 84 g a.i. ha⁻¹) and nicosulfuron at a dose of 7.8 g a.i. ha⁻¹.

Table 4 – Phytotoxicity of *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Quênia, *P. maximum* cv. BRS Tamani, and *P. maximum* cv. BRS Zuri as a function of post-emergence herbicide application.

Phytotoxicity	Herbicide	Dose (g a. i. ha ⁻¹)	<i>U. ruziziensis</i>	BRS Quênia	BRS Tamani	BRS Zuri
7 DAA	Control	-	0.0 aD	0.0 aB	0.0 aD	0.0 aB
	Tembotrione	42	70.0 aB	15.0 bB	62.5 aB	57.5 aA
	Tembotrione	84	75.0 abB	50.0 bA	83.7 aA	61.2 abA
	Glyphosate	100	33.2 abC	11.2 bB	46.2 aC	48.7 aA
	Glyphosate	200	95.0 aA	55.0 bA	92.5 aA	52.5 bA
	Mesotrione	48	20.0 bC	17.5 bcB	43.7 abC	58.7 aA
	Mesotrione	96	25.0 bcC	20.0 cB	63.7 aB	52.5 abA
	Nicosulfuron	7,8	65.0 aB	52.5 aA	72.5 aB	46.2 aA
	Nicosulfuron	15,6	93.7 aA	32.5 cA	97.5 aA	61.2 Ba
21 DAA	Control	-	0.0 aD	0.0 aC	0.0 aD	0.0 aD
	Tembotrione	42	38.7 aC	26.2 aB	27.5 aC	40.0 aB
	Tembotrione	84	50.0 aB	45.0 abA	32.5 bC	42.5 abB
	Glyphosate	100	57.5 aB	27.5 bB	17.5 bC	30.0 bC
	Glyphosate	200	100.0 aA	42.5 cA	75.0 bB	60.0 bA
	Mesotrione	48	5.0 bD	1.2 bC	1.2 bD	25.0 AC
	Mesotrione	96	40.0 aC	7.5 cC	25.0 abC	21.2 bcC
	Nicosulfuron	7,8	97.5 aA	45.0 cA	70.0 bB	55.0 bcA
	Nicosulfuron	15,6	100.0 aA	55.0 bA	97.5 aA	47.5 bB
35 DAA	Control	-	0.0 aE	0.0 aF	0.0 aF	0.0 aF
	Tembotrione	42	16.2 bD	17.5 bE	31.2 aC	37.5 aB
	Tembotrione	84	41.2 aC	36.2 abC	37.5 abB	30.0 bB
	Glyphosate	100	65.0 aB	26.2 bD	15.0 cE	26.2 bC
	Glyphosate	200	100.0 aA	41.2 bB	42.5 bB	43.7 bA
	Mesotrione	48	3.7 abE	1.2 bF	1.2 bF	13.7 aD
	Mesotrione	96	16.2 abD	6.2 bF	22.5 aD	20.0 aD
	Nicosulfuron	7.8	100.0 aA	42.5 bcB	36.2 cB	50.0 bA
	Nicosulfuron	15.6	100.0 aA	53.7 bA	95.0 aA	46.2 bA

DAA = days after application; Means followed by different lowercase letters in the rows differ significantly by the Tukey test ($p < 0.05$). Means followed by different uppercase letters in the columns differ by the Scott-Knott test ($p < 0.05$).

For the forage grass cultivars BRS Quênia and BRS Tamani, the herbicides tembotrione (84 g a.i. ha⁻¹), glyphosate at a dose of 200 g a.i. ha⁻¹, and nicosulfuron at a dose of 15.6 g a.i. ha⁻¹ provided the highest levels of

phytotoxicity at 7 DAA, besides nicosulfuron at a dose of 7.8 g a.i. ha⁻¹ for the cultivar BRS Quênia. Although these two cultivars belong to the same species and presented similar behavior in relation to herbicides, it is important to highlight that the level of phytotoxicity observed for the cultivar BRS Tamani was very high for the aforementioned herbicides (above 80%), not being interesting alternatives for the suppression of this forage. This result may be related to the characteristic of the cv. BRS Tamani of presenting narrower and longer leaves than BRS Quênia, which may contribute to a greater ease of control (Tesk et al., 2020). On the other hand, for the forage cultivar BRS Zuri, all the herbicides used promoted a similar phytotoxicity (46.2 to 61.2%), being superior to the control without application.

In the subsequent phytotoxicity evaluations at 21 and 35 DAA, there was a decrease in herbicide phytotoxicity except for nicosulfuron, especially at the dose of 15.6 g a.i. ha⁻¹. In this sense, this herbicide should be used with caution, as nicosulfuron has a longer action that significantly reduces grass growth (Cecon et al., 2015).

The herbicides glyphosate (200 g a.i. ha⁻¹) and nicosulfuron (7.8 and 15.6 g a.i. ha⁻¹) promoted the death of *U. ruziziensis* plants, demonstrating their high sensitivity to these herbicides. Thus, their use is not interesting for the suppression of this species in intercropping. In this case, the herbicides tembotrione at the doses of 42 and 84 g a.i. ha⁻¹, besides glyphosate at a dose of 100 g a.i. ha⁻¹ and mesotrione at a dose of 96 g a.i. ha⁻¹, promoted intermediate levels of phytotoxicity (between 38.7 to 57.5%) at 21 DAA, proving to be interesting alternatives for the suppression of *U. ruziziensis*. The suppression of plants by the use of the herbicide combined with the shading provided by the commercial crop used in the intercropping may be able to mitigate the effects of competition between the forage and the crop, maximizing the benefit of intercropping (Cecon et al., 2015).

For the cultivar BRS Quênia at 21 DAA, the herbicides that promoted the greatest phytotoxicity were also tembotrione (84 g a.i. ha⁻¹), glyphosate (200 g a.i. ha⁻¹), and nicosulfuron (7.8 and 15.6 g a.i. ha⁻¹), with phytotoxicity values between 42.5 to 55%. The phytotoxicity values decreased in the evaluation at 35 DAA, demonstrating the recovery power of this cultivar, which has the characteristic of presenting high tillering and a large amount of leaves (Jank et al., 2017). The other herbicides used, regardless of the evaluation, were not able to satisfactorily suppress this forage grass, with phytotoxicity values below 27% for all evaluations.

The phytotoxicity values decreased considerably in the evaluation at 21 DAA for the cultivar BRS Tamani (except for nicosulfuron). The herbicides that promoted intermediate phytotoxicity for this cultivar and that have the potential to be used in suppression were tembotrione (84 g a.i. ha⁻¹), glyphosate (100 g a.i.

ha⁻¹), and mesotrione (96 g a.i. ha⁻¹). Matthias et al. (2019) also observed that intermediate doses of glyphosate (from 58 to 116 g a.i. ha⁻¹) have the potential to be used in the suppression of BRS Tamani. Regarding the forage cultivar BRS Zuri, all herbicides applied at post-emergence presented potential to be used in the suppression of this cultivar, with levels of phytotoxicity lower than 60% in the evaluation at 21 DAA and lower than 50% in the evaluation at 35 DAA.

For all herbicides used, the cultivar Zuri had the highest plant height, shoot dry matter, and root dry matter (Table 5). This result should be carefully observed, since the higher height and dry matter of this cultivar can provide greater competition with the species of commercial interest in an intercropping system. Furthermore, the herbicides were not able to suppress the height of this forage when compared to the control, regardless of the herbicide used. The cultivar BRS Zuri has the characteristic of fast growth and recovery even under adverse conditions, a fact that contributed to the lack of difference in herbicide treatments in relation to the control (Silva et al., 2020). However, the use of the herbicide nicosulfuron at post-emergence (7.8 and 15.6 g a.i. ha⁻¹) was able to promote a reduction of up to 70% in shoot dry matter content, while glyphosate and mesotrione at the doses of 100 and 48 g a.i. ha⁻¹, respectively, promoted a reduction of approximately 30%.

For *U. ruziziensis*, the use of tembotrione (42 and 84 g a.i. ha⁻¹) and mesotrione (48 and 96 g a.i. ha⁻¹) were able to reduce the shoot dry matter of the forage from 30 to 54%. However, they did not influence the root dry matter and can be used in intercropping systems for the suppression of this forage. The other herbicides reduced the shoot dry matter from 75 to 100% and considerably reduced the root dry matter, indicating a high sensitivity of the species. Thus, its use to suppress the growth of *U. ruziziensis* is not recommended. These results corroborate those observed by Adegas et al. (2011), who concluded that tembotrione and mesotrione promote weed control in the intercropping system of maize with *U. ruziziensis*, besides producing phytotoxic effects on forage.

The use of tembotrione (84 g a.i. ha⁻¹), glyphosate (200 g a.i. ha⁻¹), and nicosulfuron (7.8 g a.i. ha⁻¹) reduced the plant height and root dry matter of cultivar BRS Quênia, besides reducing its shoot dry matter by approximately 50%. In addition to the herbicides aforementioned, tembotrione and mesotrione at doses of 42 and 96 g a.i. ha⁻¹, respectively, were also efficient in suppressing the growth of cultivar BRS Tamani, demonstrating a greater sensitivity of this cultivar. These results will contribute to the search for viable alternatives to suppress the growth of *P. maximum* cultivars in the intercropping system, attenuating the effect of forage competition, which will contribute to the maximum exploitation of the commercial crop.

Table 5 – Plant height, shoot dry matter, and root dry matter of the species *Urochloa ruziziensis*, *Panicum maximum* cv. BRS Tamani, *P. maximum* cv. BRS Quênia, and *P. maximum* cv. BRS Zuri as a function of post-emergence herbicide application.

	Herbicide	Dose (g a. i. ha ⁻¹)	<i>U. ruziziensis</i>	BRS Quênia	BRS Tamani	BRS Zuri
Height (cm)	Control	-	27.9 bA	32.4 bA	28.5 bA	47.4 aA
	Tembotrione	42	13.1 bB	32.1 aA	16.4 bA	39.1 aA
	Tembotrione	84	7.7 cB	21.3 bB	9.3 cB	36.1 aA
	Glyphosate	100	21.7 bA	25.4 bB	20.7 bA	42.5 aA
	Glyphosate	200	2.8 cB	23.9 bB	7.7 cB	39.6 aA
	Mesotrione	48	21.8 bA	28.7 abA	23.5 abA	33.4 aA
	Mesotrione	96	18.1 bA	20.3 bB	17.0 bA	33.1 aA
	Nicosulfuron	7.8	2.8 cB	28.8 bA	19.6 bA	41.7 aA
	Nicosulfuron	15.6	8.6 bcB	19.9 bB	0.0 cB	37.7 aA
Shoot dry matter (g)	Control	-	6.9 bA	5.8 bA	4.8 bA	10.1 aA
	Tembotrione	42	3.7 abB	3.9 abB	2.5 bB	5.5 aC
	Tembotrione	84	3.2 aB	2.9 aC	2.4 aB	4.5 aC
	Glyphosate	100	1.7 cC	4.0 bB	4.4 bA	7.1 aB
	Glyphosate	200	0.1 bC	2.6 aC	2.6 aB	4.7 aC
	Mesotrione	48	4.8 abB	5.7 abA	4.1 bA	6.5 aB
	Mesotrione	96	3.6 abB	4.2 abB	3.1 bB	5.4 aC
	Nicosulfuron	7.8	0.2 bC	2.8 aC	1.7 abB	3.5 aD
	Nicosulfuron	15.6	0.2 bC	1.4 abC	0.4 bC	2.9 aD
Root dry matter (g)	Control	-	10.1 bA	15.6 bA	12.1 bA	43.9 aA
	Tembotrione	42	5.9 aA	12.7 aA	7.9 aA	11.7 aB
	Tembotrione	84	5.8 aA	7.7 aB	7.3 aA	9.7 aB
	Glyphosate	100	3.8 aB	12.1 aA	10.3 aA	11.0 aB
	Glyphosate	200	1.0 aB	5.5 aB	6.9 aA	8.4 aB
	Mesotrione	48	9.8 aA	13.7 aA	10.7 aA	13.2 aB
	Mesotrione	96	6.2 aA	10.1 aA	8.9 aA	9.1 aB
	Nicosulfuron	7.8	1.2 bB	10.7 aA	3.5 abB	7.7 abB
	Nicosulfuron	15.6	1.0 aB	5.8 aB	1.1 aB	6.2 aB

Means followed by different lowercase letters in the rows differ significantly by the Tukey test ($p < 0.05$). Means followed by different uppercase letters in the columns differ by the Scott-Knott test ($p < 0.05$).

Conclusions

The forage *P. maximum* cv. BRS Quênia was less sensitive to post-emergence herbicide application.

The use of tembotrione (42 and 84 g a.i. ha⁻¹) and mesotrione (48 and 96 g a.i. ha⁻¹) has potential for use in the suppression of *U. ruziziensis*.

The herbicides that presented potential for suppression of the cultivars BRS Quênia and BRS Tamani were tembotrione (84 g a.i. ha⁻¹), glyphosate (200 g a.i. ha⁻¹), and nicosulfuron (7.8 g a.i. ha⁻¹), besides tembotrione and mesotrione at the doses of 42 and 96 g a.i. ha⁻¹, respectively, for BRS Tamani.

Regardless of the herbicide treatment, the *P. maximum* cv. BRS Zuri presented the highest plant height, shoot dry matter, and root dry matter. For this forage, the use of nicosulfuron herbicides (7.8 and 15.6 g a.i. ha⁻¹) at post-emergence reduced the shoot dry matter by up to 70%.

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