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Article

Selectivity of herbicides in initial growth of pre-budded seedlings of sugarcane

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Abstract

With the advent of new implantation technologies of sugarcane crop, the aim of this study was to evaluate the selectivity of herbicides in pre-budded cultivars of sugarcane seedlings. With the formation of seedlings from a gem of high sanity in tubes with substrates, seedlings, with an average height of 20 cm, were transplanted to 12 L pots filled with soil. The experimental design was a completely randomized factorial arranged in a (3x8), being the cultivars, CTC 7, CTC 14 and RB966928; and the herbicides (g ha^{-1}): ametryn + trifloxysulfuron-sodium (1280 + 32.4); imazapic (150); halosulfuron (150); isoxaflutole (90); ametryn (5000); ametryn + clomazone (1500 + 1000) and amicarbazone (1500), applied 10 days after transplanting; and a control without application. The three cultivars of sugarcane visually studied responded differently to the application of herbicide treatments tested, being the herbicides ametryn + trifloxysulfuron, imazapic, halosulfuron and ametryn which caused less phytotoxicity. However, when confronting the other parameters analyzed, it was observed that ametryn + trifloxysulfuron, isoxaflutole, ametryn, ametryn + clomazone and amicarbazone for CTC7 cultivar, ametryn + clomazone and amicarbazone for CTC14 and amicarbazone for RB966928, caused loss to the initial development of the crop.

Keywords: phytotoxicity, post emergence, tolerance, cultivars

Introduction

Like any other crop of economic interest, sugarcane can present reductions in productivity when kept in the presence of weeds, especially in the early stages of its cycle. Thus, to obtain high yields, weed control becomes an indispensable activity in any growing situation (Negrisoli et al., 2004).

Among the main forms of weed management in sugarcane plantations, chemical control is the one that stands out most, mainly due to the extensive cultivation areas (Martins et al., 2010). For the success of the use of herbicides in the sugarcane crop, the selectivity of the applied treatment is fundamental, that is, the herbicide treatment must eliminate weeds without promoting significant economic reductions, both in the quantity and in the quality of the parts of interest of culture (Veline et al., 2000).

The selectivity of the plants cultivated to the herbicides can be affected differently depending on the physiological characteristics of the genotypes used (Torres et al., 2012), as well as how their tolerance can be altered when applied at different phenological stages of the crop.

With the advent of new techniques for the propagation of the sugarcane crop, the pre-budded seedling system (PSS) arose mainly to reduce the number of stalks used for the formation of new sugarcane plantations that could be

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destined to industry, besides of a improvement in the uniformity and quality of the vigor as so with the elevation of economic earnings in replanting on failure areas with plantations carried out by tolete (Landell et al., 2013).thereby, the reedimplanted with PSS had a gain time in relation with the convencional system of stems in furrows, because PSS will be in a more advanced stage of planting at the time of planting which could impart a lower phytotoxicity in the sugarcane plants when there is the application of herbicides in post-emergence and a reduction of the period for shading between the lines, which would aid in weed management.

It should be emphasized that a PSS presents very different morphological and physiological characteristics of a stem-plant that is prepared to sprout in a planting groove, since there is a seedling with a greater number of leaves and leaf area, a more developed and compact root system, as well as acclimated plants in nurseries that may modify their selectivity to the herbicides used in the conventional propagation system.

Thus, understanding the importance of herbicide selectivity and the emergence of new means of sugarcane propagation, this study aimed to evaluate the selectivity of herbicides applied in pre-budded sugarcane cultivars.

Material and Methods

For the process of pre-buds formation (PSS) yolks were selected from a nursery of the São Martinho Plant located in Pradópolis-SP, which were submitted to management and protocols of quality, disease-free, without varietal mixture and aged six to ten months. The healthy and undamaged yolks were cut in minarets of approximately 3 cm and as a protection system for fungal diseases, minirrules were immersed for three minutes in a solution at the concentration of 0.1% Azoxystrobin, according to the management proposed by Landell et al.(2013) . After these steps, the minirrules were placed in substrate tubes composed of the mixture of filter cake, soot and sugarcane bagasse in the ratio 3: 1: 1 v: v: v. During a period of 90 days, the seedlings were irrigated daily and underwent leaf pruning to stimulate root development and minimize water losses

The PSS of sugarcane were transplanted to plastic vessels, with volumetric capacity of 12 L, being filled with soil classified as Red-Yellow Latosol (Santos et al., 2013). Correction of soil fertility was performed based on the chemical analysis (Table 1).

Table 1. Chemical characterization of the soil at depth 0-20 cm used in the study.

pH	MO	P_{resses}	S	H + Al	K	Ca	Mg	SB	CTC	V
$CaCl_2$	g dm^{-3}	-- mg dm^{-3} --		---------- mmol$_c$ dm^{-3} ----------						%
4.3	28	9	17	54	1.3	13	8	22	76	29

At the moment of transplanting of the seedlings to the pots (February 2014), the varieties of PSS's were packed in tubes and had an average height of 30 cm and three completely expanded leaves.

The experimental design was completely randomized with treatments arranged in a factorial scheme (3x8) with four replicates, three cultivars of sugarcane PSS (CTC 7, RB966928 and CTC14) and seven herbicides tested, in addition to one control for each cultivar without application.

The herbicides used were (g ha^{-1}): ametryn + trifloxysulfuron-sodium (1280 + 32.4); imazapic (150); halosulfuron (150); isoxaflutole (90); ametryn (5,000); ametryn + clomazone (1,500 + 1000) and amicarbazone (1,500), being applied in post-emergence at 10 days after transplanting (DAT). For the spraying, a CO 2 pressurized spool was used, equipped with Teejet XR 11002VS flat jet tips, spaced 50 cm apart, at a constant pressure of 200 kPa, with spray consumption of 200 L ha-1 . The environmental conditions during the application were: temperature of 26.6 ° C and RH of 65%.

Visual evaluations of phytotoxicity were done through a scale of notes, in which '0%' corresponded to no injury shown by plants and '100%' to plant death (Gazziero et al., 1995). The height of the plant was also measured using a tape measure, measuring the plant from its ground base to the apex of the highest

leaf of the plant, and these two variables were evaluated at 7, 14, 21, 28 , 35 and 42 days after application (DAA). The number of tillers at 14, 28 and 42 DAA and at the end of the study (42 DAA) were evaluated, the shoots were cut close to the soil and kept in a forced air ventilation oven at 65 ° C until constant weight for the dry matter quantification.

The results were submitted to analysis of variance by the F test, and the means were compared by the Tukey test at 5% probability, in case of significant difference.

Results and Discussion

There was no significant interaction between herbicides and sugarcane cultivars regarding selectivity in all seasons of evaluation (Table 2). There was a significant effect of the cultivar and herbicide factors on the percentage of phytotoxicity in all evaluations, and only in the first evaluation, at 7 DAA, it was observed that there was no significant effect of the cultivars on the phytotoxicity symptoms.

All the herbicides used provided visual symptoms of phytotoxicity to the plants of the cultivars studied at some evaluation period, except for halosulfuron sprayed plants that did not present any injury to the three cultivars during all the evaluation periods (Table 3). The herbicides that showed the highest severity of intoxication for the three cultivars were isoxaflutole and the ametryn + clomazone mixture, which provided higher visual injuries in cultivar RB966928 at 14 DAA; it is noted that for this mixture, the plants showed a slow recovery until the end of the study, still maintaining 8.5% of injury in this cultivar.

Table 2. Analysis of variance of the percentage of phytotoxicity in different sugarcane cultivars after the application of herbicides in post-emergence

Analysis of Variance	Days after application					
	7	14	21	28	35	42
F Grow crops (C)	1.7^{ns}	9.9**	27.2**	44.2**	38.6**	7.7**
F Herbicide (H)	142.8**	61.2**	84.9**	94.8**	87.7**	22.1**
F (CxH)	4.2**	8.2**	11.8**	16.9**	17.5**	5.5**
CV (%)	44.75	47.4	37.5	37.5	46.3	106.9
D.M.S. (C)	2.9	6.4	4.5	3.0	2.2	2.4
D.M.S. (H)	3.7	8.2	5.8	3.8	2.8	3.0

^{ns} not significant ; ** Significant at 1% probability .

The cultivars CTC 7 and CTC 14 were tolerant to the herbicide mixture (ametryn + trifloxysulfuron-sodium), more than the variety RB966928 and, this effect, remained until 35 DAA, but among the herbicides studied this mixture caused the 42 DAA the lowest percentage of phytotoxicity, being similar to imazapic, halosulfuron, ametryn and amicarbazone (Table 3). With the emergence of new tillers, the symptoms of phytotoxicity that remained in the leaves that received the application of herbicide decreased with the increase of leaf area of the healthy leaves. In a study of the ametryn + trifloxysulfuron-sodium mixture in different sugarcane genotypes (SP80-1816, RB855113 and RB867515), Galon et al. (2009) studyng thecombination between (ametryn + trifloxysulfuron-sodium) found that RB855113 genotype was the highest because it reached 17% of phytotoxicity at 28 DAA. However, Maciel et al. (2008) found maximum values of toxicity caused by the ametryn + trifloxysulfuron-sodium herbicide for the variety SP80 1842 with the same volume of syrup studied, ranging from 15% to 14 DAA.

The imazapic herbicide provided almost zero visual injuries to pre-sprouted sugarcane seedlings throughout the study period (Table 3), which does not corroborate the data obtained in the field by Monquero et al., (2011) which recorded phytotoxicity greater than 30% at 30 DAA. It should be noted that the results of this study were similar to those reported by Durigan et al., 2005, Suganthi et al., 2013 and Odero et al., 2015, since they also did not observe any visual injury in the sugarcane plants treated with this herbicide.

The herbicide isoxaflutole, independent of the cultivar of sugarcane studied, caused intense insults in the aerial part of the plants (Table 3). The cultivar RB966928 showed to be the most

Table 3. Phytotoxicity of sugarcane cultivars planted by the pre-sprouting seedling system after post-emergence herbicide application

DAA[1]	Treatments	Dose (g ha^{-1})	Cultivars		
			CTC 7	CTC 14	RB966928
7	ametryn + trifloxysulf[2].	1,280 + 32.4	0.0 c A[3]	0.0 c A	0.3 c A
	imazapic	150	0.8 c A	0.0 c A	0.8 c A
	halosulfuron	150	0.0 c A	0.0 c A	0.0 c A
	isoxaflutole	90	7.3 b A	4.8 b B	5.8 b AB
	ametryn	5,000	0.0 c B	5.8 b A	3.5 bc A
	ametryn + clomazone	1,500 + 1,000	14.3 a B	15.5 a B	20.0 a A
	amicarbazone	1,500	2.0 c A	1.0 c A	0.0 c A
14	ametryn + trifloxysulf.	1,280 + 32,4	0.0 c B	0.5 c B	10.8 b A
	imazapic	150	0.0 c A	0.0 c A	1.3 c A
	halosulfuron	150	0.0 c A	0.0 c A	0.0 c A
	isoxaflutole	90	27.0 a A	9.5 b B	22.8 a A
	ametryn	5,000	2.5 c A	6.3 bc A	7.8 bc A
	ametryn + clomazone	1,500 + 1,000	12.0 b C	20.0 a B	29.0 a A
	amicarbazone	1,500	7.0 bc AB	9.0 b A	2.5 c B
21	ametryn + trifloxysulf.	1,280 + 32.4	0.0 b B	4.3 cd B	10.8 c A
	imazapic	150	0.0 b A	0.0 c A	0.0 d A
	halosulfuron	150	0.0 b A	0.0 c A	0.0 d A
	isoxaflutole	90	12.0 a B	9.5 bc B	20.8 b A
	ametryn	5,000	2.0 b B	7.3 bc A	9..0 c A
	ametryn + clomazone	1,500 + 1,000	13.7 a B	16.5 a B	27.5 a A
	amicarbazone	1,500	3.5 b B	13.0 ab A	0.0 d B
28	ametryn + trifloxysulf.	1,280 + 32.4	0.0 b B	0.0 c B	7.3 b A
	imazapic	150	0.0 b A	0.0 c A	0.0 c A
	halosulfuron	150	0.0 b A	0.0 c A	0.0 c A
	isoxaflutole	90	8.5 a B	5.0 bc C	16.3 a A
	ametryn	5,000	1.0 b B	3.8 cd AB	6.0 b A
	ametryn + clomazone	1,500 + 1,000	8.5 a B	10.8 a B	20.0 a A
	amicarbazone	1,500	1.0 b B	8.5 ab A	0.0 c B
35	ametryn + trifloxysulf.	1,280 + 32.4	0.0 b B	0.0 b B	2.8 b A
	imazapic	150	0.0 b A	0.0 b A	0.0 b A
	halosulfuron	150	0.0 b A	0.0 b A	0.0 b A
	isoxaflutole	90	5.3 a B	2.5 b C	12.3 a A
	ametryn	5,000	0.0 b B	1.5 b AB	2.5 b A
	ametryn + clomazone	1,500 + 1,000	5.5 a B	7.3 a B	14.3 a A
	amicarbazone	1,500	0.0 b B	5.8 a A	0.0 b B
42	ametryn + trifloxysulf.	1,280 + 32.4	0.0 a A	0.0 a A	0.5 b A
	imazapic	150	0.0 a A	0.0 a A	0.0 b A
	halosulfuron	150	0.0 a A	0.0 a A	0.0 b A
	isoxaflutole	90	2.8 a B	1.5 a B	6.0 a A
	ametryn	5,000	0.0 a A	0.0 a A	0.0 b A
	ametryn + clomazone	1,500 + 1,000	2.5 a B	2.8 a B	8.5 a A
	amicarbazone	1,500	0.0 a B	3.0 a A	0.0 b B

[1] Days after application; [2] trifloxysulfuron-sodium. [3] Means followed by the same lowercase letter, in the columns, within each cultivar and upper case, in the lines, among the cultivars, do not differ statistically from each other by the test Tukey (P<0,05).

sensitive to the herbicide isoxaflutole and, this fact, was observed in the majority of the epochs of evaluation while the cultivar CTC 14 was the most tolerant, but at the end of the period of evaluation was similar to CTC 7. The difference in sensitivity observed between cultivars CTC 7 and CTC 14 may have been due to leaf area existing at the time of application, since CTC 7 is an earlier cultivar than CTC 14 which is late and probably CTC 7 showed a higher index of leaf area, which may have helped in a greater interception of spray syrup in the leaf.

The application of isoxaflutole in the initial pre-emergence of the sugarcane crop presents phytointoxication of approximately 20% at 15 DAA, with subsequent reduction up to 45 DAA, but when the application is carried out in late post-emergence of the crop, this phytotoxification is 40% at 45 DAA and a reduction in yield of 19 t ha-1 (Azania et al., 2006). It is noteworthy that

in the study now led to the injuries were much smaller than those registered by the researchers in the three cultivars analyzed, which do not corroborate the results found.

For the herbicide ametryn no intense symptoms of intoxication were observed in the three cultivars studied (Table 3). In cultivars RB966928 and CTC 14 this herbicide provided small whitish spots in the leaf limb of the new leaves, probably due to foliar retention of the spray syrup. It is emphasized that the highest phytointoxication was found in cultivar RB966928 at 21 DAA. In addition, Galon et al. (2010) also observed phytotoxicity in different sugarcane genotypes when ametryn was applied in the post-emergence period, with values ranging from 9.25 to 11% at 14 DAA, being slightly higher than verified for the three cultivars studied in the present research.

The application of the ametryn + clomazone commercial mix gave the 7 DAA phytotoxic effects in all the cultivars studied, with the exception of the CTC 7 variety (Table 3). The cultivar that presented the greatest visual injury of phytotoxication was RB966928, which at 14 DAA presented 29% and that it must have been caused by the two herbicides of the mixture, with a greater probability of being bound to clomazone, because when the herbicide ametryn was applied in isolation, it presented only 7.8% phytotoxicity or a synergistic effect of the mixture. Since clomazone is mainly absorbed by the roots (Ferhatoglu & Barrett, 2006), and because there was no lack of availability of water, the upward translocation of this herbicide by the plant favored the appearance of the insults.

At 21 DAA, there was a small reduction in phytotoxicity caused by the ametryn + clomazone herbicide mixture in the cultivars cultivars RB966928 and CTC14, while for cultivar CTC 7, elevation was observed, with subsequent reduction at 28 DAA. It is noteworthy that Arantes et al. (2013), when working with physiological responses in the investigation of selectivity of clomazone + ametryn, using as a parameter the emission of chlorophyll a fluorescence, observed that there was a reduction of the electron flow and inhibition of the synthesis of carotenoids from 3 to 7 DAA of the studied cultivars, but with an increase in the quantum efficiency of photosystem II (FSII) from the 7 DAA, showing to be a less selective commercial mixture to the culture.

When the amicarbazone herbicide was applied, a slight chlorotic injury was detected at 7 DAA in cultivars CTC 7 and CTC 14, and cultivar CTC 14 was shown to be more sensitive and, consequently, showed an evolution of this injury up to 21 AAD, but similar to treatment with ametryn + clomazone, with subsequent reduction during the study (Table 3), which corroborates the results found by Souza et al. (2009).

There was no significant interaction between cultivar and herbicide on plant height at 7 DAA, and this interaction was significant from 14 DAA. For the cultivar and herbicide factors, throughout the study period, these factors were significant (Table 4).

Table 4. Analysis of variance of the mean height (cm) in sugarcane cultivars after the application of herbicides in post-emergence.

Analysis of Variance	Days after application					
	7	14	21	28	35	42
F Cultivar (C)	1.7^{ns}	9.9**	27.2**	44.2**	38.6**	7.7**
F Herbicida (H)	142.8**	61.2**	84.9**	94.8**	87.7**	22.1**
F (CxH)	4.2**	8.2**	11.8**	16.9**	17.5**	5.5**
CV (%)	44.75	47.4	37.5	37.5	46.3	106.9
D.M.S. (C)	2.9	6.4	4.5	3.0	2.2	2.4
D.M.S. (H)	3.7	8.2	5.8	3.8	2.8	3.0

^{ns} not significant; * Significant at 5% probability; ** Significant at 1% probability .

To cultivate CTC 7 it can be observed that the herbicides used in this study did not influence plant height (Table 5). However, for the cultivar RB966928 there was a negative effect of herbicides, ametryn + trifloxysulfuron-sodium, ametryn + clomazone and amicarbazone on plant growth, with a great reduction in plant height. It is noteworthy that, for the cultivar CTC 14 only decrease in the height of plants with the application of amicarbazone was registered. As this herbicide caused the greatest reductions in height, independently of the cultivar studied

(Table 5).

It should be noted that the selectivity of some herbicides is related to the cultivar studied. Galon et al. (2010) did not find any stoppage on the growth of sugarcane of the variety RB855156 when applying ametryn and the association of ametryn + trifloxysulfuron-sodium, which corroborates with that observed for cultivars CTC 7 and CTC 14.

Table 5. Effect of herbicides applied in after emergences on plant height (cm) in different cultivars of sugarcane PSS.

DAA[1]	Treatments	Dose (g ha^{-1})	Cultivars		
			CTC 7	CTC 14	RB966928
7	ametryn + trifloxysulf[2].	1,280 + 32.4	95.25a A[3]	77.38a B	71a B
	Imazapic	150	92.75a A	73.63a B	83.38a AB
	Halosulfuron	150	98.25a A	77.13a B	77.13a B
	Isoxaflutole	90	91.12a A	79.13a B	80.25a B
	Ametryn	5,000	93.75a A	78.63a B	80.38a B
	ametryn + clomazone	1,500 + 1,000	92.25a A	71.25a B	72.25a B
	Amicarbazone	1,500	93.38a A	78.88a B	81.5a B
	Control	-	100.88a A	81a B	81.13a B
14	ametryn + trifloxysulf.	1.280 + 32.4	117a A	90a B	83.5b B
	Imazapic	150	111.25a A	85.87a B	104.37a A
	Halosulfuron	150	118.25a A	92.5a B	95.25ab B
	Isoxaflutole	90	108.75a A	93a B	101.25a AB
	Ametryn	5,000	109.62a A	91a B	100.5a AB
	ametryn + clomazone	1,500 + 1,000	112.25a A	82.37a B	84b B
	Amicarbazone	1,500	111a A	82.25a C	95.25ab B
	Control	-	118.12a A	95a B	100.12a B
21	ametryn + trifloxysulf.	1,280 + 32.4	129.5a A	99.62abc B	101.62bc B
	Imazapic	150	125a A	105.12ab B	121.37a A
	Halosulfuron	150	132.25a A	106.75ab B	114.5ab B
	Isoxaflutole	90	126.25a A	103.75ab B	119.3a A
	Ametryn	5,000	123.75a A	102.12ab B	121.25a A
	ametryn + clomazone	1,500 + 1,000	128a A	91.62bc B	95.12c B
	Amicarbazone	1,500	126.37a A	84.5c C	108abc B
	Control	-	128.12a A	108.37a B	121.25a A
28	ametryn + trifloxysulf.	1,280 + 32.4	129.5a A	107.88a B	115.38bc B
	Imazapic	150	131.75a A	116.63a B	135.5a A
	Halosulfuron	150	135.25a A	117.63a B	127.25ab AB
	Isoxaflutole	90	134a A	117.25a B	131.75a A
	Ametryn	5,000	129.5a A	113.5a B	133a A
	ametryn + clomazone	1,500 + 1,000	131a A	104.63ab B	104.25c B
	Amicarbazone	1,500	136.38a A	90b C	120.63ab B
	Control	-	130.25a A	116.25a B	132.12a A
35	ametryn + trifloxysulf.	1,280 + 32.4	146.15a A	119a B	130.72cd B
	Imazapic	150	147.9a A	132.4a B	154.55a A
	Halosulfuron	150	152.27a A	132.47a B	145.97abc AB
	Isoxaflutole	90	151.57a A	129.6a B	151.3ab A
	Ametryn	5,000	144.52a A	125.25a B	153.47a A
	ametryn + clomazone	1,500 + 1,000	148.9a A	114.82a B	115.7d B
	Amicarbazone	1,500	152.9a A	95.27b C	133.7bcd B
	Control	-	143.9a AB	130.78a B	152.22ab A
42	ametryn + trifloxysulf.	1,280 + 32.4	157.5a A	129.15a B	145.82cd AB
	Imazapic	150	160.95a AB	147.22a B	171.85a A
	Halosulfuron	150	164.75a A	146.02a B	162.9abc AB
	Isoxaflutole	90	166.17a A	142.12a B	168.55ab A
	Ametryn	5,000	156.65a A	136.85a B	171.3a A
	ametryn + clomazone	1,500 + 1,000	162.07a A	125.8a B	126.45d B
	Amicarbazone	1,500	167.32a A	100.15b C	146.92bcd B
	Control	-	153.7a AB	143.17a B	169.6a A

[1] Days after application; [2] trifloxysulfuron. [3] The mean values followed by the same lowercase letters, in the columns, within each cultivar and upper case, in the rows, among the cultivars, did not differ statistically from each other by the Tukey test (P <0.05).

It was observed that the greatest reduction in height occurred with the application of ametryn + clomazone, these results are in agreement with the evaluation of phytotoxicity. Already, the CTC 14 variety was the one that suffered the most reduction in the height of the plants with the application of the herbicides (Table 5). However, this fact may be related to the genotypic differences of the studied materials. Some cultivars of sugarcane can present different responses after the application of herbicides, which may influence the phenotypic characteristics or even the quality of the raw material, it should be emphasized that part of this influence is related to the characteristics of the cultivarscultivars (Schiavetto et al., 2012).

The cultivar factor and herbicide were significant in the different evaluation periods for the number of tillers in the development of sugarcane PSS (Table 6), and there was a significant effect for the interaction between cultivar and herbicide at 28 and 42 DAA.

The comparison between the cultivars for this parameter does not bring gains to the discussion, because there are genetic differences between the studied cultivars. Thus, only information on the effect of herbicides within each cultivar is adequate for discussion (Table 6). At 14 DAA, it was observed that the emission of tillers was not affected by any of the herbicides used in cultivars CTC 7 and RB966928, but in CTC 14 there was a negative effect of the application of amicarbazone, with a reduction of 87.0% in relation to the control (Table 6).

Table 6. Number of tillers per PSS plant of sugarcane under effect of herbicides applied in post-emergence.

DAA[1]	Treatments	Dose (g ha^{-1})	Cultivars		
			CTC 7	CTC 14	RB966928
14	ametryn + trifloxysulf[2].	1,280 + 32.4	7.5ab B[3]	7a B	10.25a A
	imazapic	150	8a A	6.75ab A	9ab A
	halosulfuron	150	7ab A	7a A	8.25ab A
	isoxaflutole	90	5.5ab AB	5.75ab B	8ab A
	ametryn	5,000	5.25ab B	5.5ab B	8.5ab A
	ametryn + clomazone	1,500 + 1,000	4.75b B	5.25ab AB	7.5ab A
	amicarbazone	1,500	4.5b AB	3.75b B	6.5b A
	Control		7.25ab A	7a A	8.5ab A
28	ametryn + trifloxysulf.	1,280 + 32.4	12a A	9.5a B	11a AB
	Imazapic	150	11.75ab A	8.5a B	9.5ab AB
	halosulfuron	150	11ab A	8a B	8.5ab B
	isoxaflutole	90	6.5c A	8.5a A	8.5ab A
	ametryn	5,000	7.75c A	7.5ab A	9.75ab A
	ametryn + clomazone	1,500 + 1,000	8.75bc A	8.25a A	8.75ab A
	amicarbazone	1,500	6c AB	4.5b B	7.25b A
	Control		8.75bc A	8.5a A	8.5ab A
42	ametryn + trifloxysulf.	1,280 + 32.4	14.5a A	10.25a B	13.5a A
	imazapic	150	13.75ab A	9.5a B	10.75b B
	halosulfuron	150	13.25abc A	9.25a B	9.5bc B
	isoxaflutole	90	9de A	10.25a A	9.25bc A
	ametryn	5,000	11cde A	9.5a A	11ab A
	ametryn + clomazone	1,500 + 1,000	10.75cde A	10.75a A	10.25bc A
	amicarbazone	1,500	8.5e A	6.5b B	8c AB
	control		11.25bcd A	10.25a A	9.5bc A
		14 DAA	28 DAA		42 DAA
	F Cultivar (C)	27.9 **	6.3 **		24.2 **
	F Herbicida (H)	8.3 **	12.2 **		19.2 **
	F (CxH)	0.5 ^{ns}	2.3 **		4.2 **
	CV (%)	20	16.8		11
	D.M.S. (C)	2.3	2.4		1.9
	D.M.S. (H)	3.0	3.2		2.5

[1] Days after application; [2] trifloxysulfuron-sodium. [3] Means followed by the same lowercase letter, in the columns, within each cultivar and upper case, in the lines, among the cultivars, do not differ statistically from each other by the testTukey (P <0.05). ^{ns} not significant; ** Significant at 1% probability

At 28 DAA the behavior of the previous evaluation was keept, and the herbicide amicarbazone started to provide a reduction of 89.0% in the emission of tillers of cultivar CTC 14. However, at the end of the study, at 42 DAA, only amicarbazone affected the emission of tillers in

cultivars CTC 7 and CTC 14, with reductions of the order of 32 and 58%, respectively (Table 6). It should be noted that the application of ametryn + trifloxysulfuron-sodium provided a stimulating effect on cultivars CTC 7 and RB966928, as they showed an increase in the number of tillers in relation to control (Table 6).

There was a significant effect for the main factors studied, as well as for the interaction (Cultivar X Herbicide) for the accumulation of dry mass in sugarcane plants (Table 7). It is noted that the effects observed within the cultivars are mainly due to genotype differences, which can be verified by the significant difference between the controls.

The herbicides ametryn + trifloxysulfuron, ametryn, isoxaflutole and ametryn + clomazone, have hampered the accumulation of dry mass of cultivar CTC 7(Table 7).

In the specific case of amicarbazone, this also reduced the accumulation of dry mass of cultivars CTC 14 and RB966928 in 32.6% and 32.6%, respectively. It should be noted that the ametryn + clomazone mixture also determined a decrease of 30.1% in the accumulation of dry mass of the CTC cultivar. Souza et al. (2009) verified that the application of amicarbazone at the dose of 1,260 g ha-1, did not affect soluble solids, purity, pol, reducing sugar, total recovered sugar, fiber and stem yields of six sugarcane varieties, but the researchers worked with a lower dose of the herbicide.

With the emergence of new planting modalities and possible herbicide positions to the different sugarcane cultivars and phenological stages of the crop, more studies are necessary to meet the new technologies in the planting of the sugarcane crop, as well as tetes under field conditions.

Table 7. Dry mass of the different cultivars of pre-sprouted sugarcane seedling under the effect of post-emergence applied herbicides collected at 42 DAA

Treatments	Dose (g ha^{-1})	Cultivars		
		CTC 7	CTC 14	RB966928
ametryn + trifloxysulfuron	1,280 + 32.4	23.69bc A[1]	23.08ab A	19.61abc A
imazapic	150	29.52ab A	24.03a B	24.3a B
halosulfuron	150	28.71ab A	25.92a AB	23.65ab B
isoxaflutole	90	19.59cd A	22.21ab A	24.03a A
ametryn	5,000	24.04bc A	21.73ab A	25.3a A
ametryn + clomazone	1,500 + 1,000	21.35cd A	17.32b A	17.37bc A
amicarbazone	1,500	17.13d A	8.21c B	16.04c A
Control	-	31.84a A	24.78a B	23,82ab B
F Cultivar (C)		26.86 **		
F Herbicida (H)		12.9 **		
F (CxH)		3.26 **		
CV (%)		13.1		
D.M.S. (C)		6.5		
D.M.S. (H)		5.0		

1 Mean values followed by the same lowercase letter, in the columns, within each cultivar and upper case, in the lines, among the cultivars, did not differ by the Tukey test (P <0.05)

** Significant at 1% probability

Conclusion

The three sugarcane cultivars studied differed in the application of the different treatments, with the herbicides ametryn + trifloxysulfuron-sodium, isoxaflutole, ametryn, ametryn + clomazone and amicarbazone for cultivar CTC7 (ametryn + clomazone) and amicarbazone for CTC14 and amicarbazone for RB966928, which are detrimental to initial growth of pre-budded seedlings.

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