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Selectivity of post-emergence herbicides applied in chick-pea

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Workshop Information

I Workshop of Plant Biology (I Workshop de Biologia Vegetal) was held in the Bioscience Institute – UNESP, campus of Rio Claro, Brazil, during August 20 and 21, 2012. Workshop was a scientific event organized by Post-graduate students from that Institute aiming to integrate Post-graduate and Graduate students from different areas related to Plant Biology (Anatomy, Ecology, Evolution, Morphology, Physiology, and transitional areas) from different Universities. Workshop Organization offered a large number of speaking activities, scientific discussions, and extra short-courses to improve the knowledge and formation of students in Plant Biology.

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INTRODUCTION

Chick-peas exhibit excellent source of carbohydrates and proteins that constitute about 80% total weight of the dry seeds (Braga 1997). Information about factors that affect the development of chick peas are scarce thus, more research is needed with the chick-peas to obtain appropriate conditions for the cultivation economically viable in Brazil.

Weeds compete with crops for environmental resources, especially water, light and soil nutrients, depreciating the quality of the product, and also act indirectly as intermediate hosts to pests, diseases, nematodes and plant parasites and also interfering in the practice of harvest (Pitelli 1987).

The basis for the success of chemical control weeds in agricultural production is the selectivity of the herbicides, which can be defined as the measurement of the differential response of plant species to the application of a given molecule (Oliveira Júnior 2001).

This work was aimed at evaluating the selectivity of herbicides in relation to crop development like plant height (cm), leaves number, diameter, branches number and phytotoxicity note.

MATERIAL AND METHODS

The experiment was conducted in field conditions at the Department of Agricultural Biology at Universidade Estadual Paulista "Julio de Mesquita Filho" Câmpus de Jaboticabal, in Jaboticabal city, SP, Brazil.

In this work, it was used a completely randomized design with twelve treatments and five replications. The seeds were sown in boxes (0.60 x 0.60 x 0.15 cm) and the treatments were: T1 (control applied with water, without herbicide); T2 (chlorimuron ethyl – 1.4 g ai ha^{-1}); T3 (chlorimuron ethyl – 1.04 g ai ha^{-1}); T4 (chlorimuron ethyl – 0.7 g ai ha^{-1}); T5 (oxyfluorfem – 3.6 g ai ha^{-1}); T6 (oxyfluorfem – 2.7 g ai ha^{-1}); T7 (oxyfluorfem – 1.8 g ai ha^{-1}); T8 (tepraloxidim – 0.4 g ai ha^{-1}); T9 (tepraloxidim – 0.3 g ai ha^{-1}); T10 (tepraloxidim – 0.2 g ai ha^{-1}); T11 (haloxifope – 0.24 g ai ha^{-1}); T12 (haloxifope – 0.18 g ai ha^{-1}); T13 (haloxifope – 0.12 g ai ha^{-1}); T14 (control without spraying herbicides in plots with weeds); T15 (control without spraying herbicides in plots with no weeds).

The products were applied 10 days after chickpeas sowing (DAS). For application was used a pressurized costal sprayer with CO_2, equipped with fan type

nozzles (TTJ60 VP-11002), working at a constant pressure of 2.3 kgf cm^{-2} and volume of 200 L ha^{-1}. At the moment of application, data were recorded air temperature, relative humidity and average wind speed.

Evaluations were at 10, 20, 30, and 60 DAS and the parameters evaluated were: plant height (cm), leaves number, diameter and phytotoxicity note. Evaluations of phytotoxicity were assigned grades 1-9 according to EWRC (1964) scale, where: 1 (null), 2 (very mild), 3 (mild), 4 (regular), 5 (average) 6 (almost strong), 7 (strong), 8 (very strong) and 9 (total destruction). Herbicide efficacy was evaluated by the ALAM rating system, the control percentages were considered: 0-40 (nothing or poor), 41-60 (regular), 61-70 (enough), 71 - 80 (good), 81-90 (very good) and 91-100 (excellent).

The results were subjected to analysis of variance by F test for the comparative test means. Tukey's test was applied at 1 or 5% probability level.

RESULTS AND DISCUSSION

It was observed at 10 DAS (Table 1) that the treatment with oxyfluorfem (1.8 g ai ha^{-1}) and tepraloxidim (0.4, 0.3, and 0.2 g ai ha^{-1}) and haloxyfop (0.24 g ai ha^{-1}) showed a lower chickpea growth. The treatment with chlorimuron (1.4 and 1.04 g ai ha^{-1}) and oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) reduced chickpea growth when compared it with control and other treatments. It was verified at 20 DAS significant differences of all treatments comparing it with control, except when was sprayed haloxyfop (0.12 g ai ha^{-1}). When was used the herbicides chlorimuron ethyl (1.4 and 1.04 g ai ha^{-1}) and oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) occurred plant death. Evaluation at 50 DAS showed that the treatments with chlorimuron ethyl (0.7 g ai ha^{-1}), oxyfluorfem (1.8 g ai ha^{-1}) and haloxyfop (0.24 and 0.18 g ai ha^{-1}) reduced chickpea growth plant.

It was verified at 10 DAS less development stem diameter when was sprayed chlorimuron ethy (1.4 and 1.04 g ai ha^{-1}), oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) and haloxyfop (0.24 g ai ha^{-1}). It was observed at 20 DAS significant differences of all treatments, comparing it with control, except when was sprayed haloxyfop (0.12 g ai ha^{-1}). When was used the herbicides chlorimuron ethyl (1.4 and 1.04 g ai ha^{-1}) and oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) occurred plant death.

In general way, all treatments evaluated at 50 DAS showed reduced chickpea stem diameter (Table 2).

Sprayed with chlorimuron ethy (1.4, 1.04, and 0.7 g ai ha^{-1}), oxyfluorfem (3.6, 2.7 and 1.8 g ai ha^{-1}) and tepraloxidim (0.4, 0.3, and 0.2 g a.i ha^{-1}) reduced leaves number at 10 DAS. It was observed that control with weeds showed the lowest leaves number. All treatments, evaluated at 20 and 50 DAS, exhibited significant differences comparing it with control, except when was sprayed haloxyfop (0.12 g ai ha^{-1}) at 20 DAS. The treatments with chlorimuron ethyl (1.4 and 1.04 g a.i ha^{-1}) and oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) provided greater reduction leaves number (Table 3).

Table 1. Plant height of chickpea evaluated at 10, 20, 30, and 60 days after herbicide spraying (DAS), in post-emergence. Jaboticabal-SP. 2012.

Treatments	Doses g a ha^{-1}	Height		
		Evaluations (days after spraying)		
		10 DAS	20 DAS	50 DAS
Control with water	-----	12.2 a	16.8 ab	24.3 a
Chlorimuron ethyl	1.4	5.7 d	0.0 g	0.0 f
Chlorimuron ethyl	1.04	6.3 d	0.0 g	0.0 f
Chlorimuron ethyl	0.7	10.7 ab	12.5 ef	18.4 de
Oxyfluorfem	3.6	6.0 d	0.0 g	0.0 f
Oxyfluorfem	2.7	6.7 d	0.0 g	0.0 f
Oxyfluorfem	1.8	10.1 bc	11.8 f	16.0 e
Tepraloxidim	0.4	8.7 c	13.5 def	21.6 abcd
Tepraloxidim	0.3	9.4 bc	14.0 de	22.4 abc
Tepraloxidim	0.2	10.1 bc	15.1 bcd	23.3 ab
Haloxifope	0.24	9.1 c	12.9 ef	18.8 de
Haloxifope	0.18	10.9 ab	14.8 cd	20.8 bcd
Haloxifope	0.12	11.8 a	16.3 abc	23.4 ab
With weeds	-----	9.9 bc	14.2 de	19.2 cde
With no weeds	-----	11.8 a	17.2 a	23.9 ab
F		49.59**	387.21**	220.42**
CV (%)		7.48	7.27	9.66
DMS		1.55	1.72	3.34

** Significant 1% of probability by F test; ^{NS} Significant of probability by F test Average followed by same letter in the column do not differ at 5 % by Tukey Test.

Table 2. Stem diameter of chickpea evaluated at 10, 20, 30, and 60 days after herbicide spraying (DAS), in post-emergence. Jaboticabal- SP. 2012.

Treatments	Doses g a ha^{-1}	Stem diameter		
		Evaluations (days after spraying)		
		10 DAS	20 DAS	50 DAS
Control with water	-----	3.2 a	4.5 a	5.0 bc
Chlorimuron ethyl	1.4	1.9 ef	0.0 e	0.0 f
Chlorimuron ethyl	1.04	2.1 cdef	0.0 e	0.0 f
Chlorimuron ethyl	0.7	2.6 abcd	3.0 cd	3.2 e
Oxyfluorfem	3.6	1.8 f	0.0 e	0.0 f
Oxyfluorfem	2.7	1.9 def	0.0 e	0.0 f
Oxyfluorfem	1.8	2.6 abcde	2.9 d	3.4 e
Tepraloxidim	0.4	2.5 abcdef	2.8 d	4.0 de
Tepraloxidim	0.3	2.5 abcdef	2.9 d	4.5 bcd
Tepraloxidim	0.2	2.7 abcd	3.6 bc	4.9 bc
Haloxifope	0.24	2.3 bcdef	3.2 cd	4.4 bcd
Haloxifope	0.18	2.6 abcde	3.4 bcd	4.8 bcd
Haloxifope	0.12	2.7 abcd	4.1 ab	5.2 b
With weeds	-----	2.7 abc	3.4 cd	4.3 cd
With no weeds	-----	2.9 ab	4.1 ab	6.6 a
F		6.74**	135.28**	183.34**
CV (%)		14.05	12.57	11.01
DMS		0.77	0.71	0.83

** Significant 1 % of probability by F test; Average followed by same letter in the column do not differ at 5 % by Tukey Test.

It was observed at 10, 20, and 50 DAS significant differences of all treatments when it compared with control (Table 4).The treatments with chlorimuron ethyl (1.4 and 1.04 g ai ha^{-1}) and oxyfluorfem (3.6 and 2.7 g ai ha^{-1}) showed higher phytotoxicity note.

Table 3. Leaves number of chickpea evaluated at 10, 20, 30, and 60 days after herbicide spraying (DAS), in post-emergence. Jaboticabal-SP. 2012.

Treatments	Doses g a ha^{-1}	Stem diameter		
		Evaluations (days after spraying)		
		10 DAS	20 DAS	50 DAS
Control with water	-----	15.8 a	27.4 ab	98.4 ab
Chlorimuron ethyl	1.4	10.8 ef	0.0 f	0.0 f
Chlorimuron ethyl	1.04	12.6 cde	0.0 f	0.0 f
Chlorimuron ethyl	0.7	13.0 bcd	18.6 de	61.8 d
Oxyfluorfem	3.6	12.2 cde	0.0 f	0.0 f
Oxyfluorfem	2.7	12.8 bcde	0.0 f	0.0 f
Oxyfluorfem	1.8	13.0 bcd	19.4 de	28.4 e
Tepraloxidim	0.4	11.0 def	17.0 e	67.4 cd
Tepraloxidim	0.3	12.0 cde	19.6 de	70.4 cd
Tepraloxidim	0.2	12.8 bcde	20.6 d	80.2 bc
Haloxifope	0.24	14.0 abc	24.0 c	64.6 cd
Haloxifope	0.18	14.8 ab	25.0 bc	65.0 cd
Haloxifope	0.12	16.0 a	26.0 abc	70.4 cd
With weeds	-----	9.0 f	17.0 e	57.6 d
With no weeds	-----	14.0 abc	28.4 a	98.6 a
F		21.74**	361.62**	95.69**
CV (%)		6.92	7.78	16.05
DMS		2.00	2.82	18.25

** Significant 1% of probability by F test; ^{NS} Significant of probability by F test Average followed by same letter in the column do not differ at 5 % by Tukey Test.

Table 4. Percentage of phytotoxicity of chickpea evaluated at 10, 20, 30, and 60 days after herbicide spraying (DAS), in post-emergence. Jaboticabal-SP. 2012.

Treatments	Doses g a ha^{-1}	Stem diameter		
		Evaluations (days after spraying)		
		10 DAS	20 DAS	50 DAS
Control with water	-----	1.0 g	1.0 d	1.0 f
Chlorimuron ethyl	1.4	5.8 ab	9.0 a	9.0 a
Chlorimuron ethyl	1.04	4.8 bc	9.0 a	9.0 a
Chlorimuron ethyl	0.7	3.6 cd	4.0 b	4.0 bcd
Oxyfluorfem	3.6	6.4 a	9.0 a	9.0 a
Oxyfluorfem	2.7	6.0 ab	9.0 a	9.0 a
Oxyfluorfem	1.8	4.4 cd	4.6 b	4.0 bc
Tepraloxidim	0.4	3.2 de	4.2 b	5.0 b
Tepraloxidim	0.3	1.6 f	2.8 c	3.0 de
Tepraloxidim	0.2	1.4 f	2.4 c	2.0 e
Haloxifope	0.24	4.0 cd	4.6 b	5.0 b
Haloxifope	0.18	3.4 d	4.4 b	4.0 bcd
Haloxifope	0.12	2.0 ef	2.8 c	3.0 cde
With weeds	-----	1.0 g	1.0 d	1.0 f
With no weeds	-----	1.0 g	1.0 d	1.0 f
F		107.81**	225.29**	188.25**
CV (%)		13.86	10.32	10.72
DMS		1.21	1.19	1.3

** Significant 1 % of probability by F test; Average followed by same letter in the column do not differ at 5 % by Tukey Test.

CONCLUSIONS

The use of chlorimuron ethyl (1.4 and 1.04 g ai / ha) and oxyfluorfem (3.6 and 2.7 g ai / ha) were more effectively chickpea control.

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