STUDIES REGARDING THE INFLUENCE OF ACTIVE SUBSTANCES QUIZALOFOP-P-ETHYL AND – QUISALOFOP-P- TEFURIL IN SUPPRESSING *SORGHUM HALEPENSE* SPECIES IN WATERMELON CULTURE

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***Abstract**: Research and field studies were conducted to determine the efficacy of substances quizalofop-p-ethyl and quisalofop-p-tefuril, applied post emergent in order to control the problem weed Sorghum halepense in watermelon culture. Watermelon variety used in the experiment was Crimson Sweet. The Field studies on reducing the population of the species Sorghum halepense L. were conducted in 2010 and 2011 on Didactical and Experimental Station at University of Agricultural Sciences and Veterinary Medicine of Banat Timişoara. The experimental plot was placed on cambic chernozem with 6 variants in three repetitions. Systemic postem herbicides used in experience were: Leopard 5 EC and Pantera 40 EC, applied in two doses. The herbicides were applied post emergent when Johnson grass plants had 10-15 cm height. After establishing the level of weed infestation through numerical quantitative method revealed that in the experimental variants were present Johnson grass plants, the number ranging from 48-152 plants/sqm. Unfavorable climatic conditions (2010) influenced the efficacy of herbicides applied postemergent. Obtained results regarding the efficacy of Substances quizalofop-p-ethyl and p-tefuril quisalofop against Johnson grass showed differences. After applying chemical treatments occurrence of phytotoxicity were not recorded. The administration of herbicide Leopard 5 EC using the recommended dose has led to the best effectiveness in reducing the number of individuals of Sorghum halepense in agroecosystems of watermelon. The results obtained in the four variants treated with herbicides showed very significant positive differences compared to untreated control, situation changed when these results were compared with the hoed control, which are very significant negative. Studies have shown that translocation of herbicides in plants of Johnson grass realized better when there is an excess of precipitation to the multiannual average. The results obtained in the variant treated with Leopard 5 EC 1.0 l / ha and 1.5 l / ha are very significantly positive compared the mean of experience. The most infested variant with Sorghum halepense was that treated with herbicide Panther 40 EC at 1.0 l / ha.*

***Key words:** control, efficacy, herbicides, watermelon, Johnson grass*

INTRODUCTION

Watermelon is now cultivated on an area of 2,409,000 ha (STAN N. şi MUNTEANU N., 2001). Watermelons culture present special importance for the sandy soils and is one of the cultures that leverages high economic efficiency under specific environmental conditions

In Romania from total area of 44 400 ha planted with watermelons, 51.5% were located on sandy soils in the counties Dolj, Galaţi, Brăila, Olt, Mehedinţi, Teleorman, Bihor and Satu Mare (http://hortitom.ro/tehnologii/pepeni-verzi-timpurii).

Weeds cause substantial loses in agricultural production, so producers must manage the weed spectrum to optimize the quantity and quality of agricultural production (MOVAHEDPOUR F. şi col., 2010). The most damaging weeds in watermelon culture are *Cynodon dactilon, Agropyron repens, Sorghum halepense.*

Sorghum halepense is difficult to control due to prolific seed production, extensive rhizome system fragmentation and regeneration capacity of these, plus the adaptability to a wide range of habitats (http://ncforestservice.gov/ publications/Forestry%20Leaflets/IS12.pdf). This problem weed can affect the culture of watermelon trough:

- direct competition for water, nutrients and light (VARSHNEY, 1991);
- or indirectly by producing allopath substances which has a negative impact on economic growth and performance (INDERJIT ET WESTON, 2000).

Studies on chemical control of weeds from watermelon culture were performed by CRAIG R. ANDERSEN, 1997 as well as researchers from the University of Arkansas, Division of Agriculture, 2003 they recommending substances: trifluralin, naptalam, bensulide, sethoxydim, paraquatul.

In Romania for monocotyledonous weed control in watermelon crop the herbicides: Fusilade S 2 l/ha, Gallant EC 1,5 – 2,0 l/ha, Targa 2 l/ha were recommended (http://hortitom.ro/tehnologii/pepepeni-verzi/).

The objective of this study was to determine the efficacy of herbicides Leopard 5 EC (50 g/l quizalofop-p-ethyl.) and Pantera 40 EC (40g/l quisalofop-p-tefuril) in suppression of Johnson grass from watermelon culture. Studies regarding Panther 40 EC and Leopard 5 EC herbicide efficacy on weed control in various crops were conducted by researchers OROIAN I şi col., 2009 (onion), KALOYANOVA, N. and col., 2008, IANCU S. and col., 2009 (alfalfa), FRITEA T and col., 2009 (sun flower), STOIMENOVA I. col., 2008 (researches have been conducted on stubble). STOIMENOVA I. and col., 2008 states that the effectiveness of herbicides, Pantera 40 EC and Leopard 5 EC, applied on stubbles in order to control the species *Sorghum halepense* was very low.

MATERIAL AND METHODS

The Field studies on reducing the population of the species *Sorghum halepense* L. were conducted in 2010 and 2011 on Didactical and Experimental Station at University of Agricultural Sciences and Veterinary Medicine of Banat Timişoara. The experimental field was placed after Latin rectangle method with variants in three repetitions. The variants randomization was done according to data in the literature (CIULCĂ S., 2002).

Systemic postem herbicides used in experience were: Leopard 5 EC and Pantera 40 EC. Experimental variants of the experience differ by: application of two herbicides used to control Johnson grass and dose used (recommended dose by producing company and a lower dose than recommended).

Experimental plot regarding the control of species *Sorghum halepense* in watermelon culture included 6 variants (tabel 1.) where one is untreated - unhoed one hoed and the other 4 were treated with the two herbicides: Leopard 5 EC and Pantera 40 EC.

Tabel 1.

Detailing the experience

		Commercial product	Active substance	Applied doses
Detailing the experience watermelon				
Variant	1.	Control 3 hoeing	-	-
	2.	Control unoed	-	-
	3.	Leopard 5 EC	50 g/l quizalofop-p-ethyl.	1,0 l/ha
	4.	Leopard 5 EC	50 g/l quizalofop-p-ethyl.	1,5 l/ha
	5.	Pantera 40 EC	40g/l quisalofop-p-tefuril	1,0 l/ha
	6.	Pantera 40 EC	40g/l quisalofop-p-tefuril	1,5 l/ha

The herbicides were applied post emergent when Johnson grass plants had 10-15 cm height. Treatments were performed with atomizer using a quantity of 250 liters water / ha. To

determine the weed infestation degree has been used numerical quantity (PENESCU A, 2001).

Herbicides efficiency was determined by visual estimation of the control percentage 30 days after application (TUESCA D.şi col., 1999).

Watermelon variety used in the experiment was Crimson Sweet. The planting distance was 50/150 cm.

RESULTS AND DISSCUSIONS

In tables 2, 3, 4 the data regarding the control of Johnson grass from rhizomes, in experimental year 2010, in watermelons culture.

Table 2

Effectiveness of herbicides in reducing Johnson grass population compared with the control unhoed, in experimental year 2010

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	71,67	73,67	70,33	71,89	-71,86	xxx
2.	Leopard 5 EC 1,5 l/ha	90,14	89,58	93,42	91,05	-91,01	xxx
3.	Pantera 40 EC 1,0 l/ha	69,56	67,22	65,34	67,37	-67,34	xxx
4.	Pantera 40 EC 1,5 l/ha	90,5	86.75	87.50	88,25	-88,22	xxx
5.	Control unhoed	0,0	0,0	0,0	0,0	0,00	-
DL 5% = 3,50; DL 1% = 5,10; DL 0.1% = 7,65							

The results obtained in the four different herbicides showed significant positive differences to the untreated control (table), situation changed when these results were compared with the hoed control, which is very significantly negative (table1). From the two tables we can see that in the variants treated with herbicide Leopard 5 EC higher percentages of control were recorded.

Table 3

Effectiveness of herbicides Johnson grass control, compared with the control hoeing, in experimental year 2010

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	71,67	73,67	70,33	71,89	28,11	000
2.	Leopard 5 EC 1,5 l/ha	90,14	89,58	93,42	91,05	8,95	000
3.	Pantera 40 EC 1,0 l/ha	69,56	67,22	65,34	67,37	32,63	000
4.	Pantera 40 EC 1,5 l/ha	90,5	86,75	87,50	88,25	11,75	000
5.	Control hoeing	100,0	100,0	100,0	100,0	0,00	-
DL 5% = 3,51; DL 1% = 5,11; DL 0.1% = 7,66							

In 2010 the amounts of precipitation recorded were higher than in 2011, this increased the herbicides effectiveness against Johnson grass.

Table 4

Effectiveness of herbicides against Johnson grass compared with the mean of experience, in experimental year 2010

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	71,67	73,67	70,33	71,89	7,75	xxx
2.	Leopard 5 EC 1,5 l/ha	90,14	89,58	93,42	91,05	-11,41	xxx
3.	Pantera 40 EC 1,0 l/ha	69,56	67,22	65,34	67,37	12,26	000
4.	Pantera 40 EC 1,5 l/ha	90,5	86,75	87,50	88,25	-8,61	xxx
5.	Mean of experience	80,46	79,30	79,14	79,64	0,00	-
DL 5% = 3,46; DL 1% = 5,03; DL 0.1% = 7,55							

The results obtained in the variant treated with Leopard 5 EC 1.0 l/ha and 1.5 l/ha are significantly positive compared with the mean of experience (Table 4).

The results obtained in the variant treated with Pantera 40 EC 1,0 l/ha are significantly negative compared with the mean of experience. At the second doses a increased effectiveness was observed by herbicide Pantera 40 EC against Johnson grass, exerting a very positive significant to experience mean.

In the tables 5, 6, 7 results are presented on Johnson grass suppression in watermelons culture recorded in 2011. The best results for the control (89.05%) were obtained in the variant treated with Leopard 5 EC at a dose of 1.5 l/ha. The most infested variant with *Sorghum halepense* was the one treated with herbicide Panther 40 EC at 1.0 l/ha.

ŞARPE N. et al., 2010, OROIAN I. et al. 2009 şi FRITEA T. et al., 2009 through researches has emphasized the efficacy of herbicides, Pantera 40 EC and Leopard 5 EC in annual and perennial monocotyledonous weeds, applied to different crops.

Compared with untreated control variant the two herbicides applied in two doses showed very significant positive differences.

Table 5

Effectiveness of herbicides against Johnson grass compared with the control unhoed, experimental year 2011

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	66,50	65,22	66,37	66,03	-66,00	xxx
2.	Leopard 5 EC 1,5 l/ha	90,14	87,58	89,42	89,05	-89,01	xxx
3.	Pantera 40 EC 1,0 l/ha	57,15	58,98	61,56	59,23	-59,20	xxx
4.	Pantera 40 EC 1,5 l/ha	86,67	84,0	83,33	84,67	-84,63	xxx
5.	Control unhoed	0,0	0,0	0,0	0,0	0,00	-
DL 5% = 2,78; DL 1% = 4,05; DL 0.1% = 6,07							

Table 6

Effectiveness of herbicides against Johnson grass compared with the control hoed in experimental year 2011

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	66,50	65,22	66,37	66,03	33,64	000
2.	Leopard 5 EC 1,5 l/ha	90,14	87,58	89,42	89,05	10,62	000
3.	Pantera 40 EC 1,0 l/ha	57,15	58,98	61,56	59,23	40,44	000
4.	Pantera 40 EC 1,5 l/ha	86,67	84,0	83,33	84,67	15,00	000
5.	Control hoed	100,0	100,0	99,0	99,67	0,00	-
DL 5% = 2,88; DL 1% = 4,19; DL 0.1% = 6,29							

Table 7

Effectiveness of herbicides against Johnson grass compared with the mean of experience, in experimental year 2011

No.	Herbicide	Control degree %			Average	Diff. abs.	Sign. of diff.
		Replication I	Replication II	Replication III			
1.	Leopard 5 EC 1,0 l/ha	66,50	65,22	66,37	66,03	8,71	000
2.	Leopard 5 EC 1,5 l/ha	90,14	87,58	89,42	89,05	-14,30	xxx
3.	Pantera 40 EC 1,0 l/ha	57,15	58,98	61,56	59,23	15,51	000
4.	Pantera 40 EC 1,5 l/ha	86,67	84,0	83,33	84,67	-9,92	xxx
5.	Mean of experience	75,115	73,945	75,17	74,74	0,00	-
DL 5% = 2,73; DL 1% = 3,97; DL 0.1% = 5,95							

From the data above it is noted hoed variant superiority to herbicides studied, this also results from statistical point of view, all herbicides are very significant negative to control variant "3 hoeing."

Figure 1 gives percentages of control obtained in 2011 compared with mean of experience. The two herbicides applied to watermelons culture at the recommended dose showed very significant positive results compared to the mean of experience. The control degree registered in variants treated with lower doses showed significant negative differences compared to the mean of experience.

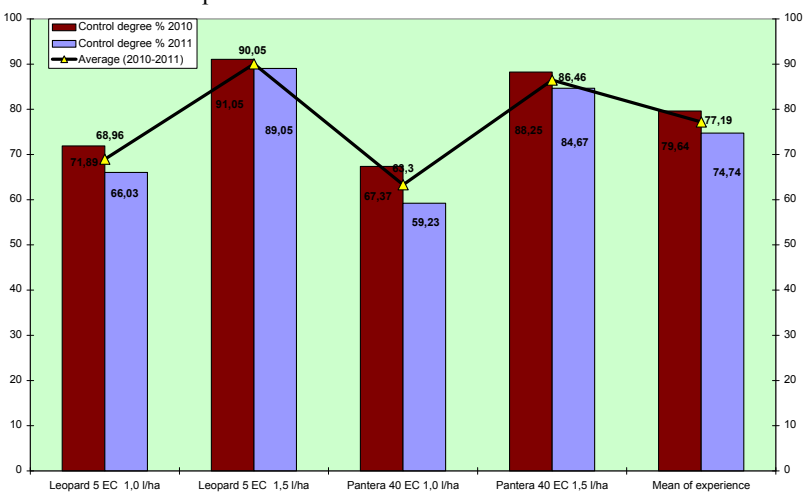

Figure 1 - Synthesis of the results regarding Johnson grass control in watermelons culture in the two experimental years (2010-2011)

From the graphic it is observed that herbicide efficacy Leopard 5 EC was the best, at all doses used, compared with the results obtained in the variants treated with herbicide Panther (figure 1). These results were obtained at 30 days after treatment application.

The research conducted by STOIMENOVA I. et al., 2008 regarding the control of Johnson grass from stubble throughout treatments with Leopard by 5 EC (200 ml/da) and Panther 40 EC (250 ml/da) showed that the biomass is destroyed in a high percentage, but on rhizomes necrotic symptoms are not present leading later to plant regeneration.

CONCLUSIONS

Following research, on testing the two herbicides (Leopard 5 EC, Pantera 40 EC), in reducing the population of the species *Sorghum halepense* (L.) Pers. has revealed the following conclusions:

The highest efficacy of herbicides used to control the species *Sorghum halepense* L. climate was recorded in 2010, this being rich in precipitation (813.7 mm) registering a higher amount than the multiannual average (600.9 mm), herbicides movement is much better in rhizomes.

- Johnson grass control from rhizomes depended heavily on applied dose. This phenomenon was seen in both herbicides.
- in the watermelon culture Leopard 5 EC herbicide effectiveness in Johnson grass control was higher than herbicide Panther 40 EC.

Good results were also recorded by applying three hand hoeing, but this solution is not viable because it requires a lot of labor and control only temporarily Johnson grass.

BIBLIOGRAPHY

1. ANDERSEN CRAIG R., 1997 - Extension Horticulturist – Vegetables. MP-128, Vegetable Gardening in Arkansas. University of Arkansas, Division of Agriculture, Cooperative Extension Service
2. CIULCĂ S., 2002 – Tehnică experimentală, Ed. Mirton, Timişoara
3. FRITEA TEOFIL, CRUCIȚA SÎRCA, FLORICA MOISA, ALEXANDRINA POPESCU, MARIA SIKE, DAN NAGY, 2008 - Sow thistle *(Sonchus arvensis* L.*),* a "problem" weed in North-Western area of Romania?**,** AN. I.N.C.D.A. Fundulea, vol. LXXVI, pp. 131-136
4. IANCU S., POPESCU C., CIOBANU A., IANCU D., GRECU FLORINA, 2009 - Integrated with weeds control alpha-alpha crop, Analele Universității din Craiova, seria Agricultură - Montanologie - Cadastru, vol. XXXIX, pp. 396-399
5. INDERJIT WESTON LA, 2000 - Are laboratory bioassays suitable for prediction of field responses?. J. of Chemical Ecology, 26, 2111-2118.
6. KALOYANOVA N., DZHONOVA E., STOIMENOVA, I., SERAFIMOV, P., 2008 - Evaluation of the changes in the quantity and structure of the soil microflora depending on the applied herbicides for chemical combating *Sorghum halepensis* (L.) Pers, Soil Science Agrochemistry and Ecology, vol. 42 (3), Bulgaria
7. MOVAHEDPOUR FAEZEH, ADEL DABBAGH MOHAMMADI NASSAB, MOHAMMAD REZA SHAKIBA, AHARIZAD SAIED, 2010 - *Sorghum halepense* (Johnsongrass) water extract effects as alone and integrated with current methods on weed control in soybean, Ed. WFL publisher, Helsinki,vol. 8 (2) FINLANDE, pp. 908-913
8. MP-44, 2003 - Recommended Chemicals for Weed and Brush Control. University of Arkansas, Division of Agriculture, Cooperative Extension Service
9. OROIAN IOAN, IOAN OLTEAN, VIOREL FLORIAN, ANTONIA ODAGIU, IOAN BRASOVEAN, PETRU BURDUHOS, 2009 - Comparative study concerning the influence of different herbicide treatment in onion culture, Journal Central European Agriculture, vol. 9, no. 4 pp.743-748
10. PENESCU A., CIONTU C., 2001- Agrotehnică, Editura Ceres, Bucureşti, 2001
11. SOUFAN R., ALMOUEMAR A., 2009 - Allelopathic effects of some weeds on growth of maize (*Zea mays* L.), XIII-ème Colloque international sur la biologie des mauvaises Herbes Dijon
12. STAN NISTOR, NECULAI MUNTEANU, 2001 - Legumicultură, vol. 2, Editura Ion Ionescu de la Brad, Iaşi
13. STOIMENOVA I., MIKOVA A., ALEKSIEVA S., STRATIEVA S., DIMITROVA TS., SERAFIMOV P., 2008 - *Sorghum halepensis* (L.) Pers. and weed control, Soil, Science Agrochemistry and Ecology, vol. 42 (3), Bulgaria
14. ŞARPE N., BORESCU FLOAREA , NEGRILĂ E., 2010 - Chemical control of weeds from Acacia (*Robinia pseudoacacia*) tree nurseries, Journal of Horticulture, Forestry and Biotechnology Volume 14 (1), pp. 96-98
15. TUESCA DANIEL, EDUARDO PURICELLI, LUISA NISENSOHN, Delma Faccini, Juan Papa, 1999 - Decision criteria for optimizing postemergence johnsongrass control in soybean crops in Argentina, Pesq. agropec. bras. vol.34 no.5 Brasília
16. VARSHNEY JC, 1991 - Studies on critical stage of weed crop competition in maize. Indian J. of Agronomy, 36, 2, 153-158.