ACTA SCIENTIFIC AGRICULTURE (ISSN: 2581-365X)

Volume 3 Issue 1 January 2019

Research Article

Study on The Effects of Some Weeds Herbicides on Spring Rape (Brassica Napus)

Stoyanova Svetlana*

Institute of Agriculture and Seed Science "Obraztsov Chiflik", Ruse, Bulgaria

***Corresponding Author:** Stoyanova Svetlana, Institute of Agriculture and Seed Science, "Obraztsov Chiflik", Ruse, Bulgaria.

Received: October 12, 2018; **Published:** December 18, 2018

Abstract

In 2007 - 2009 in the experimental field of IASS "Obraztsov chiflik" a field experiment was conducted with herbicides in spring rape herbicid "JURA". The herbicides: napropamide 450g/l (Devrinol 4F), fluazifop-P-butyl 150g/l (Fuzilad forte 150 EC) and kvizalafop-P-ethyl 50g/l (Taurus) were studied, applied at the optimal dose and in combination between them. Napropamide (Devrinol 4F) herbicide was applied before sowing with shallow incorporation into the soil, and the other herbicides fluazifop-P-butyl (Fuzilad forte 150 EC) and kvizalafop-P-ethyl (Taurus) in 3-5 leaf stage of weeds, and rosette phase of the rape. The experiment was designed after the block method in four replications, the size of the harvesting plot being 10 m2 and randomized distribution of the variants. The efficacy of the herbicides was reported on the 25-th day after spraying in constant sampling plot of 1m2 for yield estimation. The species composition of weeds was registered by the method of visual estimation and the degree of weed infestation - by quantity - weighting method.

The purpose of this study was to investigate the effects of action of the herbicides: napropamide, fluazifop-P-Butyl and kvizalafop-P-ethyl on weed plants on spring rape hybrid Jura.

Devrinol 4F herbicide applied after sowing before emergence of the crop at a dose of 157.5 g/da a.i. reduced the density of the cereal weeds to 100%, and the density of the broad-leaf weeds by 73% and 93%, respectively. Fuzilad forte 150EK and Taurus herbicides, applied at a dose of 22.5 g/da a.i. and 7.5 g/da a.i. were effective against cereal weeds, reducing their efficiency up to 98%, and against broad-leaved weeds the percentage of efficiency was up to 83%. Devrinol 4F herbicide applied in a system with herbicides Fuzilad forte 150 EC and Taurus showed excellent herbicidal efficiency against annual cereal weeds (up to 100%) and against broad-leaved weeds (up to 93%).

Keywords: Spring Rape; Weeds; Herbicides; Efficiency

Introduction

Rape is a main oil crop in our country, which has become increasingly important over the years. The presence of weed vegetation in rapeseed crops favors the development of pests by creating outbreaks for their multiplication. Thereupon cares for the crops during the vegetation are critical for yield. They are mostly focused on maintaining the area free of weeds [1-4].

As a culture of merged surface rape has significant agro-technical importance for the soil cleaning of weeds, to maintain aeration of tillage layer and for the proper crop rotation in field crop rotations. The method used for weed control in spring rape at this stage is chemical - use of appropriate herbicides. Use of the chemical method for weed control requires the use of a large range of effective herbicides against annual and perennial mono and dicotyledonous weeds. The application of herbicides is necessary to take place after thorough investigation - as on the effect against weeds, also on the response of spring rape varieties and hybrids [5-8].

The purpose of this study was to investigate the effects of action of the herbicides: napropamide, fluazifop-P-butyl and kvizalafop-P-ethyl on weed plants on spring rape hybrid Jura. This study is necessary for further development of appropriate integrated control of weeds.

Material and Methods

In 2007 - 2009. In the experimental field of IASS "Obraztsov chiflik" a field experiment was conducted with herbicides in spring rape herbicid "JURA". The herbicides: napropamide 450g/l (Devrinol 4F), fluazifop-P-butyl 150g/l (Fuzilad forte 150 EC) and kvizalafop-P-ethyl 50g/l (Taurus) were studied, applied at the optimal dose and in combination between them. Napropamide (Devrinol 4F) herbicide was applied before sowing with shallow incorporation into the soil, and the other herbicides fluazifop-P-butyl (Fuzilad forte 150 EC) and kvizalafop-P-ethyl (Taurus) in 3-5 leaf stage of weeds, and rosette phase of the rape (Table 1).

	PGR (mg/L)			
BA	**Kn**	**2-iP**	**Shoot number/ explant (%)**	**Shoot length (cm)**
-	-	-	30.55 ± 0.27^{e}	2.10 ± 0.08^{a}
1	-	-	65.17 ± 0.29^{abc}	2.40 ± 0.04 ^{a}
2	-	-	66.67 ± 0.23 ^{ab}	2.56 ± 0.08 ^{a}
2.5	-	-	70.30 ± 0.11^{a}	2.61 ± 0.05 ^{a}
3	-	-	64.96 ± 0.46^{abc}	2.38 ± 0.07 ^{a}
-	1	-	47.22 ± 0.35^{cde}	2.27 ± 0.05 ^{a}
-	2	-	54.27 ± 0.20^{abcd}	2.33 ± 0.04 ^{a}
-	2.5	-	54.59 ± 0.23^{abcd}	2.39 ± 0.06 ^{a}
-	3	-	54.27 ± 0.29^{abcd}	2.38 ± 0.03 ^{a}
-	-	1	38.89 ± 0.35^{de}	2.17 ± 0.06 ^{a}
-	-	2	46.15 ± 0.29^{de}	2.12 ± 0.09 ^{a}
-	-	2.5	47.22 ± 0.13c^{de}	2.14 ± 0.08 ^{a}
-	-	3	50.00 ± 0.46^{bc}d	2.28 ± 0.06 ^{a}

Table 1: Effect of different concentrations of diverse cytokinins on shoot induction and elongation from nodal bud explants of *A. spinosa* after four weeks of culture.

Each experiment consisted of at least 13 explants and was repeated thrice. Values represent means ± SE of three replicates. Data were recorded at the end of the fourth week. Values in each column with the same lower-case letters are not significantly different according to the one-way ANOVA, Least Significant Difference multiple range test at $P \leq 0.05$.

The experiment was designed after the block method in four replications, the size of the harvesting plot being 10 m2 and randomized distribution of the variants.

Tillage included: plowing, disking, rotary tillage and rolling before and after sowing. Sowing of the crop took place after precisely cleaning the field of plant residues in the optimum period for the region, according to a technology, standard for the crop. For the spring rape sowing, large, well-fed and cleaned seed was used, obtained of normally developed seed producing stands. Sowing was carried out as soon as possible (in March) at a depth of 2-3 cm. with a narrow-spaced drill with length of 1.20 m. Rape was grown after predecessor wheat, by fertilization with nitrogen - 14 kg/da a.s., phosphorus - 8 kg/da a.s. and potassium - 4 kg/da a.s. on leached chernozem with low humus content, low reserve nitrogen and phosphorus, and well stocked with potassium. The soil reaction was slightly acid (pH - 5.2). With main cultivation phosphorus and potassium, nitrogen - 30% were once imported before sowing and the remainder - in the phase of bud formation.

Herbicides were imported via a knapsack sprayer at the rate of the working solution

- 30 l/da of soil herbicides (after sowing before emergence of the crop).
- 20 l/da herbicides for vegetation (at 3-5 leaf stage of weeds and rosette phase of rape).

The efficacy of the herbicides was reported on the 25-th day after spraying in constant sampling plot of 1m2 for yield estimation. The species composition of weeds was registered by the method of visual estimation and the degree of weed infestation - by quantity - weighting method.

Mathematical processing of the experimental data was performed by dispersion and correlation analysis with SPSS.

Results and Discussion

Meteorological conditions over the years were favorable for the development of rape. Precipitation and temperatures varied within optimal range, enabling the timely crop emergence and the effects of soil and vegetation herbicides.

The area were the study was conducted had a natural background of weed infestation, 18 weeds being dominant, that conditionally could be divided into 3 groups: annual cereals, annual broad-leaved and perennial weeds (Table 2).

In the experimental plots during the period of study the annual cereal weeds were represented by green bristlegrass - *Setaria viridis* (L.), the annual broad-leave weeds - by 12 species, as the following of them showed the highest density: black bindweed - *Falopia convolvulus* (L.), red dead nettle - *Lamium purpureum* (L.), white goosefoot - *Chenopodium album* (L.), deady nightshade - *Solanum*

Weed species composition	Years			
	2007	2008	2009	Average
I. Annual cereal				
1. *Setaria viridis* (L.)	13	24	11	16
TOTAL	13	24	11	16
II. Annual, dicotyledonous				
1. *Falopia convolvulus* (L.)	3	13	9	8
2. *Anthemis arvensis* (L.)	2	3	7	4
3. *Lamium purpureum* (L.)	4	3	2	3
4. *Chenopodium album* (L.)	5	16	6	9
5. *Solanum nigrum* (L.)	3	6	3	4
6. *Anagalis arvensis* (L.)	3	3	6	4
7. *Abutilon teophrasti Medic*	2	0	0	1
8. *Viola tricolor* (L.)	3	0	4	2
9. *Poligonum aviculare* (L.)	3	6	2	4
10. *Persicaria lapathifolia* (L.)	5	14	3	7
11. *Amaranthus retroflexus* (L.)	0	14	0	5
12. *Capsella bursa pastoris* (L.)	0	2	2	1
TOTAL	33	80	44	52
III. Perennial				
1. *Convolvulus arvensis* (L.)	21	8	6	12
2. *Cirsium arvense* (L.) Scop.	6	10	5	7
3. *Cardaria draba* (L.) Desv	6	13	0	6
4. *Taraxacum officinale* (L.)	2	2	3	2
5. *Sorghum halepense* (L.)	3	0	0	1
TOTAL	38	33	14	28

Table 2: Species composition and density of weeds before treatment with herbicides.

nigrum(L.), pimpernel - *Anagalis arvensis* (L.), abutilon - *Abutilon teophrasti Medic*, field violet - *Viola tricolor* (L.), knotgrass - *Poligonum aviculare* (L.), curltop lady's-thumb - *Persicaria lapathifolia* (L.), beggarticks - *Bidens Tripartita* (L.), pigweed - *Amaranthus retroflexus* (L.) and chamomile - *Anthemis arvensis* (L.). Perennial broad-leave weeds were represented mainly by bindweed - *Convolvulus arvensis* (L.), canada thistle - *Cirsium arvense* (L.) Scop., cress - *Cardaria draba* (L.) Desv, spurge - *Taraxacum officinale* (L.). In the experiment a single representative of the perennial cereal weeds - johnson grass - *Sorghum halepense* (L.) was registered.

The annual weed species were the main group of weed invaders of the experimental areas - 88% of the weed association. Among the perennial, the sobole weeds were the most widely distributed - bindweed - *Convolvulus arvensis* (L.), canada thistle - *Cirsium arvense* (L.) Scop., cress - *Cardaria draba* (L.) Desv., to a lower extent - spurge - *Taraxacum officinale* (L.).

The degree of weed infestation in 2007 varied between 8 - 71 pcs./m^2 on the average in the variants with herbicide applied, and 87 - 109 pcs./m^2 in the zero control. In 2008 in the variants with herbicides applied the weed plants were from 6 to 44 pcs./m^2 and in the zero control that number varied from 14 to 24 pcs./m^2. In 2009 the weed infestation in the variants studied was 38 - 68 pcs./m2 and in the zero control - 76 - 78 pcs./m^2.

The diversity of the main weed species in the experimental plots was not large, but their percentage ratio was different by year (Figure 1).

Figure 1: Degree of weed infestation.

During the three years of the period of study, a representative of the annual cereal weeds - bristlegrass - *Setaria viridis* (L.) was the dominant species of the weed association - about 48%. Among the annual broad-leave weeds black bindweed - *Falopia convolvulus* (L.), white goosefoot - *Chenopodium album* (L.) and curltop lady's-thumb - *Persicaria lapathifolia* (L.) were predominant species. Representatives of the perennial broad-leave weeds were canada thistle - *Cirsium arvense* (L.), bindweed - *Convolvulus arvensis* (L.) and cress - *Cardaria draba* (L.) Desv.

The precipitation fallen during the first 10 days after treatment, to the 15th day and to the 30-ty day were shown in the table 3 by date and year. The data from the table showed that the precipitation in 2007 during the first 15 days after the application of Devrinol 4F soil herbicide also was favorable for its action. In 2008 and 2009 precipitation was scarce and the applications of soil herbicide did not show 100% effect. Data about the rainfalls within the first 30 days after the application of Devrinol 4F soil herbicide were summarized in table 3.

The number of weeds varied in years, in 2007 - from 2 to 46 pcs./m^2, in 2008 - 2 - 70 pcs./m^2 and in 2009 varied from 3 to 40 pcs./m^2. The species composition of the weeds determined in the

zero control and their large vegetative mass did not permit the normal emergence and development of rape plants. Their development legged in that led to low yield and poor quality of seed.

On figure 2 the dynamics of the efficacy of Devrinol 4F herbicide on the main weed groups were traced. Through years of study of Devrinol 4F herbicide, positive effects on the weeds were observed. Less influence was reported in perennial weeds. The herbicide used successfully, fought and destroyed the annual cereal and broad-leave weeds. The efficacy of Devrinol 4F varied in years of study because of the various climatic conditions. The effects on annual cereal and certain broadleaf weeds varied from 73 to 93%, as field bindweed - *Convolvulus arvensis* (L.), canada thistle - *Cirsium arvense* (L.) and black nightshade - *Solanum nigrum* (L.) howed higher resistance. Despite the high resistance, the rape plants succeeded to develop in their initial phase of development and they alone suppressed the weeds. The duration of the herbicide was assessed on the background of the soil moisture, as the effect weakened after 30 days, and in the treated plots perennial weeds and some annual broad-leave weeds were observed. After about 60 days rape plants took over and suppressed them. With the application of Devrinol 4F soil herbicide a control in the early stages of development of rapes plants was exercised and the plots remained practically clean by the end of the vegetation.

Figure 2: Efficiency of Dervinol 4F herbicide, %.

On figure 3 the dynamics in the efficacy of the vegetation herbicides applied was traced on the three groups of weeds. During the years of study via Fuzilad forte 150EK and Taurus herbicides, a herbicidal effect was achieved up to 100% in annual cereals and certain perennial weeds. In terms of multiannual johnsongrass - *Sorghum halepense* (L.), Canada thistle - *Cirsium arvense* (L.) Scop. and bindweed - *Convolvulus arvensis* (L.) thistle and bindweed, the herbicides showed unsatisfactory effect. The weak activity of those preparations was influenced by the fact, that the preparations were anticereal, and because of the advanced stage of weed plant development during the time of treatment. Because of the insufficient effect registered on perennial weeds - bindweed - *Convolvulus arvensis* (L.), Canada thistle - *Cirsium arvense* (L.) Scop. and johnsongrass - *Sorghum halepense* (L.), the same were mechanically removed from the experimental harvesting plots. Despite of the low herbicidal effects reported, weed species were reduced to a number and state that did not have a negative impact on crops.

Figure 3: Efficiency of Fuzilad forte 150 EK and Taurus, %.

When applying herbicide preparations in combination, the lower percentage of dead weeds was due to the specific types of weed infestation - greater distribution of broad-leaved and perennial weeds that during the years of the experiment occupied about 60-70% of the total number of weeds. The combination of Devrinol 4F and Fuzilad forte 150EK (Figure 4) herbicides was the less effective in some broad-leaved and perennial weeds, i.e. affected white goosefoot - *Shenopodium album* (L.), wild pansy - *Viala tricolor* (L.), knotgrass - *Poligonum aviculare* (L.), bindweed - *Convolvulus arvensis* (L.) and canada thistle - *Cirsium arvense* (L.).

In herbicide combination Devrinol 4F and Taurus (Figure 4), a very good herbicide efficacy was achieved in annual cereal weeds. In broadleaved weeds, a better efficiency was observed only in 2009. In terms of perennial weeds - best efficiency was recorded in 2008. It depends on the phenophase of the weed plant, the time of application of the preparation and the climatic conditions during the period of application of herbicides. The sprouted weeds, especially those who have undergone leaf rosette phase are being affected no more than 40-50%.

Figure 4: Efficiency of Dervinol 4F and Fuzilad forte 150 EK and Dervinol 4F and Taurus, %..

Conclusion

- Jura hybrid showed good tolerance to the herbicides used.
- Devrinol 4F herbicide applied after sowing before emergence of the crop at a dose of 157.5 g/da a.i. reduced the density of the cereal weeds to 100%, and the density of the broad-leaf weeds by 73% and 93%, respectively.
- Fuzilad forte 150EK and Taurus herbicides, applied at a dose of 22.5 g/da a.i. and 7.5 g/da a.i. were effective against cereal weeds, reducing their efficiency up to 98%, and against broad-leaved weeds the percentage of efficiency was up to 83%.
- Devrinol 4F herbicide applied in a system with herbicides Fuzilad forte 150 EC and Taurus showed excellent herbicidal efficiency against annual cereal weeds (up to 100%) and against broad-leaved weeds (up to 93%).

Bibliography

1. Dechkov Z. "Projection of the cropping of the crops". Zemizdat, Sofia (1979).
2. Amelung D. "Unkräuter bestimmen und erkennen". *Raps* 17.4 (1999): 177-181.
3. Amelung D. "Unkräuter bestimmen und erkennen". *Raps* 18.4 (2000): 148-149.
4. Dimitrova Tsv. "Weed control in rapeseed". *Agriculture Plus* 4 (2006): 15-16.
5. Dimitrova Tsv. "Possibilities of Use of Herbicides in Spring Rape". *Plant Breeding Sciences* 3 (1991): 112-116.
6. Dimitrova M and R Ivanova. "Effectiveness and selectivity of new herbicides in winter rape". *Plant Breeding Sciences*, Sofia (2007): 365-367.
7. Estela GS., *et al.* "Effect of Different Sowing Patterns of Oil Linseed (Linum usitatissimum L.) Crop on Brassica sp. as a Strategy for Sustainable Weed Management". *Biological Agriculture end Horticulture* 25.2 (2007): 123-131.
8. F Graef., *et al.* "Agricultural practice changes with cultivating genetically modified herbicide-tolerant oilseed rape". *Agricultural Systems* 94 (2007): 111-118.

Volume 3 Issue 1 January 2019