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INFLUENCE OF SOME HERBICIDES OVER THE QUANTITATIVE INDEXES OF VARIETIES AND HYBRIDS OF SUNFLOWER

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Abstract

Yanchev. I., H. Kirchev. 2007. Effect of some herbicides on the quantitative indices of sunflower varieties and hybrids.

A field experiment with band growing of sunflower and wheat was carried out at the Educational Experimental Area of the Agricultural University – Plovdiv during 2004-2006. The quantitative indices of sunflower, on the grounds of the herbicide combination Linuron 150g/da and Pendimetaline 132 g/da and the mechanical control of weeds were examined. Four varieties and hybrids were used: Albena, San Luca, Favorit and Peredovik. It was found out that the varieties grown on an area treated with Linuron and Pendimetaline gave higher height of the stem, diameter of the head, yield per plant and seed yield per square meter in comparison to the check. In the hybrids Albena and San Luca higher values of 1000 seed weight were established the treated variant, and in the varieties Favorit and Peredovik – in the check. The laboratory and field germination were not essentially influenced by the way of growing.

Key words: Herbicides – sunflower – quantitative indexes – varieties – hybrids

Резюме

Янчев, И., Х. Кирчев. 2007. Влияние на някои хербициди върху количествените показатели при сортове и хибриди слънчоглед

През 2004-2006 г. в опитното поле на Аграрен Университет – Пловдив е изведен полски опит с лентово отглеждане на слънчоглед и пшеница. Проследявано е влиянието на хербицидната комбинация Линурон в доза 150 g/da + Пендиметалин в доза 132 g/da и механична борба с плевелите върху някой количествени показатели при четири сортове и хибриди слънчоглед: Албена, Сан Лука, Фаворит и Передовик. Установено е, че сортовете и хибридите, отглеждани при третиране с Линурон и Пендиметалин проявяват по-голяма височина на стъблата, диаметър на питата, добив от 1 растение и от 1 m^2 в сравнение с контролата. При хибридите Албена и Сан Лука по-висока маса на 1000 семена е установена при третираните варианти, а при сортовете Фаворит и Передовик – при контролата. Лабораторната и полска кълняемост не се влияе от начина на отглеждане.

Ключови думи: Хербициди – слънчоглед – количествени показатели – сортове – хибриди

INTRODUCTION

Sunflower is a valued oil seed crop, the economic importance of which is constantly growing. Generally speaking, its usage is connected with three basic directions – a source

for food products, for fodder and for technical purposes (Tonev, 2005; Ivanova and Tahsin, 2005).

Sunflower is the most important oil seed crop in terms of food for the countries with moderate climate, including Bulgaria. This is basically due to the high nutritious and biological value, as well as to the very good taste qualities of the refined oil. There are great problems in the growing of this crop connected with diseases, pests and weeds (Kolev et al., 2001; Yankov et al., 2002).

The weeds impede the processing, decrease the quality of the production and help the development of different kinds of diseases and pests, which play the part of intermediate hosts. The weeds are competitive with respect to the vegetation factors (Sabev. 1996; Sabev et al., 1997).

The aim of the present research was to determine the effect of the herbicide combination Linuron + Pendimetaline on some quantitative indices of sunflower.

MATERIAL AND METHOD

During 2004 -2006 a field experiment with band growing of sunflower and wheat was carried out at the Educational Experimental Area of the Agricultural University – Plovdiv. A number of indices for both crops were observed. In the present publication we investigated the effect of the herbicide combination Linuron 150g/da and Pendimetaline 132 g/da on the quantitative indices of four sunflower varieties and hybrids: Albena, San Luca, Favorit and Peredovik.

The two herbicides were introduced into the soil after sowing the sunflower and before the sprouting of weeds. Data is not given on the action of herbicides on the weeds, as it has been a long time since these were put into practice. The indices considered in this publication were the following:

- stem height at the moment of harvesting sunflower in cm – from an averaged of 25 plants
- head diameter in cm – 25 heads on the average
- yield per plant, g – from 25 plants on the average
- seed weight per 1m^2, g
- 1000 seed weight, g – according to the Bulgarian National Standard
- germination, %

Two-factor dispersion analysis was used to determine the quantitative authenticity between the tested factors.

RESULTS AND DISCUSSION

Table 1. Effect of the herbicides on stem height and head diameter of sunflower varieties and hybrids.

Varieties and hybrids	Linuron + Pendimetaline		Control (earthed up)	
	Stem height, cm	Head diameter, cm	Stem height, cm	Head diameter, cm
Albena	171.5	16.3	166.0	15.7
San Luca	157.2	15.8	141.4	15.2
Favorit	190.4	20.1	172.6	18.0
Peredovik	182.7	20.6	179.5	19.2

Table 1 provides data on the biometrical indices of stem height and head diameter.

In the first index, sunflower stem height, a higher plant height is observed in the four varieties and hybrids, after treating the plants with herbicides, in comparison to the check variant. This difference was more evident in San Luca and Favorit, 16 and 18 cm respectively, and less manifested in varieties .Albena and Peredovik, 6.5 cm and 3 cm respec-

tively.

With respect to the head diameter, the differences between variant treated with herbicides and the check were lower. They varied from 0.6 cm for San Luca to 2.1 cm for Favorit , whereas . varieties Albena and Peredovik take an intermediate position. It is obvious that the herbicide combination Linuron + Pendimetaline depressed a vast range of weeds and created more favorable conditions for growing of sunflower, compared to check.

Table 2 shows the indexes yield per plant and seed weight per 1m^2.

Concerning the first index, yield per plant from the treated variant the best results were given by hybrid Albena – 161 g, followed by San Luca – 123 and Peredovik – 110 g. The results for this index from the check variant were lower for all four varieties and hybrids, in comparison with the treated variant. The greatest difference was found in the hybrids San Luca and Albena, 16 and 17 g respectively.

Table 2. Effect of the herbicides on yield per plant and seed weight per 1 m^2 of sunflower varieties and hybrids

Varieties and hybrids	Linuron + Pendimetaline		Check (earthed up)	
	Yield per plant, g	Seed weight per 1 m^2, g	Yield per plant, g	Seed weight per1 m^2, g
Albena	161	418	147	375
San Luca	123	318	107	299
Favorit	97	291	85	272
Peredovik	110	283	102	258

The results for the second index are to a great extent analogical to those for the first one. Hybrid Albena showed highest yield per 1m^2 in the treated variant and in the check as well, as the difference was up to 43 g in favor of the herbicide option. In varieties San Luca, Favorit and Peredovik these differences were smaller, but always in favour of the herbicide option. We can hereby conclude that the herbicide combination created more favourable conditions for the growing of sunflower in comparison to the check.

Table 3 presents the results from the indices 1000 seed weight and germination of sunflower varieties and hybrids. It becomes obvious from the data in the table that 1000 seed weight varied between the treated variant and the check from 1 to 4 g. In hybrids Albena and San Luca higher values of the index were observed in the treated variant, in comparison to the check, whereas varieties Favorit and Peredovik showed the opposite tendency.

For the last index, germination, the percentage of both variants of the varieties and hybrids was high – from 98% to 100%, which is in compliance with the requirements of the Bulgarian National Standard for first class. It is clear that the seed germination in the four varieties was affected neither by the herbicides (Linuron and Pendimetaline), nor by the hilling of sunflower.

Table 3. Effect of the herbicides on germination and 1000 seeds weight in sunflower varieties and hybrids.

Varieties and hybrids	Linuron + Pendimetaline		Control (earthed up)	
	1000 seeds weight, g	Germs, %	1000 seeds weight, g	Germination, %
Albena	62.10	99.0	58.00	99.5
San Luca	66.60	100.0	63.20	100.0
Favorit	81.60	98.0	85.80	100.0
Peredovik	82.30	99.0	83.70	99.0

Table 4 gives the results from a two-factor analysis which allowed to observe the individual effects of the two factors studied – the way of weeds control /factor A/ and genotype /factor B/ on the investigated indices.

The highest significance of the differences /P=0.1%/ compared to the check /not treated with herbicides/ was revealed by the indices yield per plant and seed weight /m^2, followed

by stem height and head diameter, significant at level P = 5%. There were no significant differences as far as it concerns the indices germination and 1000 seed weight, which leads to a conclusion that herbicides application on sunflower affected more the quantity characteristics of the yield than . the quality characteristics of the seeds /Table 4A/

By excluding the factor herbicide application at seeds crops of different sunflower varieties and hybrids, the individual effect of the genotype factor on the studied indices could be more clearly observed for the definite crop /Table 4B/.

The genotype differences with regard to stem height were proven in comparison with the check hybrid Albena, so as for the three remaining genotypes. The lowest stem was observed in hybrid San Luca. The varieties Favorite and Peredovik formed the highest stems and due to the genetic similarities of the two varieties, the stems were of almost equal height. It is known that variety Favorite was developed with the participation of variety Peredovik. The difference in head diameter, cm between Albena and San Luka has not been proven significant yet, probably because of the genetic proximity of the two hybrids and their common parents. Varieties Favorite and Peredovik formed bigger racemes with a significant difference in comparison with the standard for P=0.1%.

Table 4. Two-factor dispersion analysis results

A. Differences by factor A

Index	Values by factor A		GD			F criteria df=1/14
	A1 – earthed up	A2 – Linuron + Pendimet aline	5%	1%	0.1%	
Stem height, cm	164.80	175.45^{A}	7.75	10.7	14.93	7.58
Head diameter, cm	17.03	18.20^{A}	0.91	1.26	1.75	0.17
Seed weight/plant, g	110.25	122.75^{C}	5.33	7.39	10.27	23.4
Sees weight/m^2, g	301.0	327.5^{C}	2.38	3.30	4.59	1980
Germination, %	99.63	99.00^{NS}	0.66	0.92	1.28	1.44
1000-seed weight, g	72.68	73.15^{NS}	0.94	1.30	1.80	22.67

B. Differences by factor B

Index	Values by factor B				GD		
	Albena	S. Luca	Favorit	Pered.	5%	1%	0.1%
Stem height, cm	168.75	149.3^{B}	181.5^{A}	181.1^{A}	10.9	15.2	21.1
Head diam., cm	16.00	15.50^{NS}	19.05^{C}	19.90^{C}	1.28	1.78	2.47
Seed weight per plant, g	154	115^{C}	91^{C}	106^{C}	7.54	10.45	14.5
Sees weight per m^2, g	396.5	308.5^{C}	281.5^{C}	270.5^{C}	3.37	4.67	6.49
Germination, %	99.25	100^{NS}	99.0^{NS}	99.0^{NS}	0.94	1.30	1.81
1000 seed weight, g	60.05	64.9^{C}	83.7^{C}	83.0^{C}	1.33	1.84	2.55

A, B, C, - Significance by differences in comparison to the checks at P = 5%, 1%, 0.1% respectively. NS – non -significance

The highest yield per plant, seed weight/ m^2, and 100 grain weight were formed by hybrid Albena. The decrease of these indices in the other genotypes was significant in comparison to the standard at P = 0.1%. The dispersion analysis made proved that seeds germination was not affected by the genotype due to lack of significant differences between the variants.

CONCLUSIONS

Sunflower varieties Albena, San Luca, Favorit and Peredovik grown over an area treated with Linuron 150 g/da and Pendimetaline 133 g/da showed higher height of the stem, diameter of the head, yield per plant and seed yield per square meter.

Hybrids Albena and San Luca showed higher values for 1000 seed weight in the treated variant, whereas the varieties Favorit and Peredovik – in the check variant. In both variants seed germination had high values which proved that it was not particularly affected by the way of growing.

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