THE PRODUCTION LEVEL OF SOME SUNFLOWER HYBRIDS FROM THE NEW GENERATION, CULTIVATED IN WEST AREA OF ROMANIA, WITH HOVEYBEES AS POLLINATORS

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Abstract: *The researches represent a novelty in the field, since there have been no other recent researches that would accurately present the special contribution that bees have on pollinating the sunflower crop. High-performance hybrids analyzed in terms of 2012 showed good yields of sunflower of over 3.400 kg/ha. The high-performance sunflower hybrids, given that the critical flowering stage is helped by bees, make very high yields of over 5.000 kg/ha. Additional bee pollination was good for sunflower in 2012, all analyzed hybrids showed yield increases ranging from 10-20%. The purpose of this paper is to emphasize the major contribution that bees have in sunflower crop pollination. All hybrids, currently existing on the Romanian market, need in their blossoming stage additional bee pollination. The varieties of cultivated sunflower were from companies Syngenta hybrid Brio and Neoma, Caussade Semences hybrid Imeria and Dalia and Pioneer with hybrids PR64LE19 and PR36A90. Sowing date was within the range 02-IV.2012 and 02.V.2012. The plant generally used in the pre-planting period was wheat, but in Cenei locality at two varieties (PR36A90 and Imeria) corn was used. In the reference area, beekeepers located bee colonies for crop pollination, different in number. Likewise, the strength of these bee families was different. Following these observations, we wanted to study the effectiveness of pollination by bees with every commercial hybrid in part, and finally the sunflower production was determined for each hybrid in all localities where research was conducted. The notable difference between the numbers of bee families used as pollinators in the localities studied made the sunflower production fluctuating within the same hybrid researched. In the case of hybrid Dalia CS in Sandra locality with a number of 120 bee families, there was a yield of 3.000 kg/ha, and in locality Cenei at a number of 350 bee families, there was a yield of 3.400 kg/h*

Key words: *bee families, pollen, sunflower, hybrids, yields*

INTRODUCTION

When it comes to unsung heroes of agriculture, it is hard to find another candidate more deserving than honey bees, which perform at least two absolutely free basic services - production of honey and pollination of entomophilous plants (Ion Nicoleta, 2010).

The importance of bees emerges not only from the production of honey, beeswax, propolis, royal jelly and venom, but also the role that they have in the pollination of entomophilous crops. It was found that the increase of agricultural production is achieved by using bee pollination, more than 10-15 times the value of bee products (Bura M. et al., 2003 quoted by Jivan A. et Tabără V., 2011).

Pollination of agricultural entomophilous crops by bees is an important agro-technical measure that contributes to a natural, clean and without any additional investment growth in the production of seeds, fruit and vegetables (Bura M. et. al., 2005).

Sunflower is largely cultivated for the oily seeds in many European countries, above all in Eastern and Southern ones, where it represents to bees an important source of nectar and pollen. The extension of cultivation and consequently the production of unifloral honey varies

from year to year according to the European agricultural policy (Persano Oddo L. et Piro R., 2004).

Sunflower is one of the most important field crops in Romania taking into account the cultivated surface; it takes the third place after maize and wheat. In the same time with the increase of the cultivated surface with sunflower in the last years, the hybrid offer has become diversified very much with Romanian hybrids as well as with hybrids from abroad. The melliferous capacity of sunflower hybrids differs. (Ion Nicoleta et. al. 2002 quoted by Pătruică Silvia, 2012).

Thus, the farmer cultivating sunflower have to know these hybrids from a morphological and biological point of view, but especially from a productive point of view, in view to have a right choice of the hybrid or hybrids that are mostly corresponding to the specific growing conditions (Ştefan V. et al., 2007).

MATERIAL AND METHODS

The research was conducted in 2012 in seven localities in Timis County (Lovrin, Cenei, Comlo□ul Mare, Voiteg, □andra, Liebling □i Cenad). Commercial sunflower crops from many companies in the locality were studied.

Their evolution was followed from beginning until harvest time. The following were taken under observation: sowing date, cultivated hybrid, flowering date, number of bee families at flowering time within the locality concerned, and finally the harvested sunflower production.

The sunflower hybrids included in the study were the same in each city, but the area of land occupied by each variety in one of the three locations was different. The varieties of cultivated sunflower were from companies Syngenta hybrid Brio and Neoma, Caussade Semences hybrid Imeria and Dalia and Pioneer with hybrids PR64LE19 and PR36A90. Sowing date was within the range 02.IV.2012 and 02.V.2012. The plant generally used in the pre-planting period was wheat, but in Cenei locality at two varieties (PR36A90 and Imeria) corn was used.

In the reference area, beekeepers located bee colonies for crop pollination, different in number. Likewise, the strength of these bee families was different. Following these observations, we wanted to study the effectiveness of pollination by bees with every commercial hybrid in part, and finally the sunflower production was determined for each hybrid in all localities where research was conducted.

RESULTS AND DISCUSSIONS

The researches were carried out under conditions of 2012; the data collected are representative of the climatic conditions of the areas where researches were made. The experiment studied several sunflower hybrids from leading companies in producing seed certified as being the most qualitative in Romania. The sunflower hybrids productions had considerable variations, determined by the type of hybrid used in the culture; the type of soil, the agrofond on which the respective crop was established and, among the above listed factors, one is essential and very crucial for better sunflower production per unit area, the pollination with the help of bees.

All localities taken in this study benefited from bee families, brought to the pastoral for sunflower crop pollination, beneficial to beekeepers since sunflower is a good melliferous plant that results in important honey productions and a proper development for bee families.

Table 1 presents the genetic varieties and the sunflower production yielded in commercial crops, where bees were used as pollinators.

Table 1

Average statistical indicators of sunflower production for reference hybrids

Descriptive Statistics					
Sunflower hybrids	**N**	**Mean**		**Std. Deviation**	**Variance**
	Statistic	**Statistic**	**Std. Error**	**Statistic**	**Statistic**
Brio NK	7	1,5429	0,06213	0,16439	0,027
PR64LE19	7	3,2786	0,06061	0,16036	0,026
Imeria CS	7	2,6643	0,08502	0,22493	0,051
PR36A90	7	1,1286	0,04206	0,11127	0,012
Delia CS	7	3,2000	0,04880	0,12910	0,017
Neoma NK	7	3,2071	0,07748	0,20500	0,042

Within this research, we pursued the average of the statistical index in the sunflower production for each hybrid. The amount of harvested sunflower was influenced by the number of hives in the pastoral, on the respective land surface, but differences were noticed between the genetic potential of hybrids too.

Table 2

The ANOVA test for variation indices studied

ANOVA					
Source of variation	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	30,941	5	6,188	212,888	***
Within Groups	1,046	36	0,029		
Total	31,987	41			

The data collected were analyzed statistically for a clear outline in the production of each sunflower hybrid. It was observed that in Voiteg and □andra localities, the number of hives was lower than in the rest of the localities and the harvested sunflower production showed 10-15% lower values for all hybrids included in the study. The maximum amount of sunflower harvest was 3400 kg / ha was obtained in localities Cenei, Cenad and Comloşul Mare at hybrids Neoma NK, PR64LE19 and Dalia CS. The number of bees recorded in these localities was very high (310-400 bee families) compared with other localities. In □andra and Voiteg localities there were fewer bee families (120) and the sunflower production values were lower, as compared to the same aforementioned hybrids, not exceeding 3.000 kg / ha.

Table 3

Multiple comparisons between yields achieved in analyzed sunflower hybrids

Multiple Comparisons Tukey HSD						
Sunflower hybrids		Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Brio NK	PR64LE19	-1,73571	0,09113	***	-2,0099	-1,4615
	Imeria CS	-1,12143	0,09113	***	-1,3956	-0,8473
	PR36A90	0,41429	0,09113	**	0,1401	0,6885
	Delia CS	-1,65714	0,09113	***	-1,9313	-1,3830
	Neoma NK	-1,66429	0,09113	***	-1,9385	-1,3901
PR64LE19	Imeria CS	0,61429	0,09113	***	0,3401	0,8885
	PR36A90	2,15000	0,09113	***	1,8758	2,4242
	Delia CS	0,07857	0,09113	0,953	-0,1956	0,3527
	Neoma NK	0,07143	0,09113	0,969	-0,2027	0,3456
Imeria CS	PR36A90	1,53571	0,09113	***	1,2615	1,8099
	Delia CS	-0,53571	0,09113	***	-0,8099	-0,2615
	Neoma NK	-0,54286	0,09113	***	-0,8170	-0,2687
PR36A90	Delia CS	-2,07143	0,09113	***	-2,3456	-1,7973
	Neoma NK	-2,07857	0,09113	***	-2,3527	-1,8044
Delia CS	Neoma NK	-0,00714	0,09113	1,000	-0,2813	0,2670
**p<0,01; ***p<0,001						

After statistical processing (table 2 and 3), significant differences were noticed between the sunflower production in the studied hybrids. Therefore, hybrid Brio NK has a high significance level, as compared to all other groups ($p<0.001$). This can be explained due to the genetics of the hybrid, and it failed to exceed the quantity of 1.700 kg/ha in the best environment.

Between the hybrid PR64LE19 and Dalia CS and Neoma NK there are no significant differences in production, this lack of significance representing the genetic stability of the hybrid under various climatic and fertilization conditions, and the presence of bees was beneficial because the production yield was 400 kg/ha, bigger in localities Cenei and Comlo□ul Mare as compared to □andra locality.

Comparing hybrid PR39A90 with Dalia CS, Neoma NK and PR64LE19, statistically speaking, there is a significance between the yields, as there is an obvious difference in the production. Biologically speaking, the explanation is given by the genetic performance of other hybrids, and PR39A90 is currently obsolete.

Observing the pollination effect carried out by bees, we realize that the differences in production are significant in the studied localities. In localities where several bee families were identified, the sunflower quantity taken from the same hybrid (PR39A90) was higher. Thus, in

Cenad locality (400 bee families) the yield was 1.300 kg / ha compared to localities Sandra (120 bee families) and Voiteg (150 bee families) where it indicated 1000 and 850 respectively.

CONCLUSIONS

Additional bee pollination was good for sunflower in 2012, all analyzed hybrids showed yield increases ranging from 10-20%.

High-performance hybrids analyzed in terms of 2012 showed good yields of sunflower of over 3.400 kg / ha.

The notable difference between the numbers of bee families used as pollinators in the localities studied made the sunflower production fluctuating within the same hybrid researched. In the case of hybrid Dalia CS in Sandra locality with a number of 120 bee families, there was a yield of 3.000 kg/ha, and in locality Cenei at a number of 350 bee families, there was a yield of 3.400 kg/ha.

ACKNOWLEDGMENTS

This work was published during the project "POSTDOCTORAL SCHOOL OF AGRICULTURE AND VETERINARY MEDICINE", POSDRU/89/1.5/S/62371, co-financed by the European Social Fund through the Sectorial Operational Programme for the Human Resources Development 2007-2013.

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