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PRELIMINARY IDENTIFICATION OF ROMANIAN SUNFLOWER HYBRIDS SUITABLE FOR ORGANIC AGRICULTURAL SYSTEM

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ABSTRACT

In order to identify sunflower hybrids with good performance under organic (ecological) agricultural system, nineteen Romanian sunflower hybrids were tested in 2009 in dryland yield trials under organic agricultural system, in four locations from South Romania (Ştefan cel Mare, Stupina, Şimnic and Fundulea). At Fundulea yield trials were performed in parallel also under conventional agricultural system. The hybrids tested in organic farming were very different both in average yield (which varied from 1283 to 2224 kg/ha) and in yield stability, as reflected by the coefficient of variation (which varied from 8.4 to 52.7%). Several hybrids, such as H13 and H7 combined high average yield and good yield stability. The performance of the hybrids under organic farming at Fundulea was correlated with the performance under and conventional agricultural system (r = +0.82*), but several exceptions were identified. Testing under different agricultural systems can be useful in identifying sunflower hybrids with broad adaptability.**

Key words: sunflower, organic agricultural system, yield.

INTRODUCTION

„Environmentally sustainable agriculture" protects those ecological structures and functions („laws of nature"), that provide the goods and services that will allow agriculture to be economically viable and maintain or improve the quality of life, now and for future generations. Thus, at long term, agriculture cannot be economically viable without being environmentally sustainable (The Land Stewardship Centre of Canada and LandWise Inc.).

Healthy soil, clean water and air and protection of biodiversity by ecological agricultural system are requirements for continued food production (Ţerbea and Vrânceanu, 1988; Ţerbea et al., 1995). Maintaining these resources are not only critical for agricultural production, but critical for ensuring access to local and international markets.

Due to the fast increase of market needs for organic products (about 21 mil. Euro in 2004 and 25.5 mil. Euro in 2009), during 2004, European Union has adopted the Lisbon Strategy.

This new strategy has as main aim to stimulate growth of organic products, including financial support for integrated programs (information, research, rights and protection). Besides the insufficient quantity of organic seeds, one of the most important problems of ecological agriculture is the absence of the genotypes suitable for ecological agriculture (Report of Organic Agricultural Research Institute, FIBL from Swiss, 2006).

As a result of these technological and commercial realities, during recent years, the European Union countries have organized networks of yield trials, including local populations, hybrids and parental lines from national institutes, regional centers and private farms, with the aim to develop a guide with recommendations about species and genotypes, that can be used to improve the biodiversity for the production and marketing of organic and/or low input products (Carolyn et al., 2001).

The aim of this paper is to present the behavior of several sunflower hybrids grown under organic system conditions, in order to identify the hybrids suitable for this agricultural system.

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MATERIAL AND METHODS

Nineteen Romanian sunflower hybrids with good drought resistance originated from NARDI Fundulea were tested in 2009 in dryland yield trials, under organic agricultural system in four locations from South Romania (Ştefan cel Mare, Stupina, Şimnic and Fundulea) and under conventional agricultural system at Fundulea.

The crop technology applied under ecological system was similar in all testing locations. The main difference was the preceding crop (alfalfa at Şimnic and winter wheat at Fundulea, Ştefan cel Mare and Stupina). The control of weeds under the ecological farming system was the same in all locations (two manual weedings).

RESULTS AND DISCUSSION

All testing sites were characterized by hot summer, the average temperature of summer (June - August) being over 21°C. The maximum air temperature was registered at Şimnic, during July - August (which coincided with the appearance of reproductive organs, pollination and grain filling) (Table 1).

Total rainfall and its monthly repartition were totally different in the testing locations.

Table 1. Average temperature (°C) and monthly distribution of rainfall (mm) during the sunflower vegetation period

Month	April	May	June	July	August	September	Sum
Temperature 2009							
Fundulea	11.5	17.6	21.8	24.0	23.3	18.5	-
Şimnic	12.7	17.5	21.2	25.0	25.3	18.9	-
Ştefan cel Mare	11.8	16.8	23.2	24.7	23.6	19.0	-
Stupina	11.8	16.8	23.5	24.7	23.6	18.5	-
Rainfall 2009							
Fundulea	22.1	35.8	103.6	119.5	24.6	43.2	348.8
Şimnic	24.0	63.0	100.0	83.0	12.0	27.2	309.2
Ştefan cel Mare	11.5	45.5	25.5	86.2	22.6	28.1	219.4
Stupina	3.5	24.5	37.0	81.7	16.6	8.0	171.3

At Fundulea, in 2009, the cumulated rainfall during sunflower vegetation period was 348.8 mm, suggesting favorable conditions for the crop, but rains were unevenly distributed during the vegetation period. Thus, April and May registered a moisture deficit, while during June and July 103.6 mm and 119.5 mm respectively, were registered. Similar conditions were registered at Şimnic, but at Ştefan cel Mare and Stupina a water deficit was registered, more obviously at Stupina, where rainfall was only 171.3 mm (Table 1).

Yields reflect mainly the influence of total rainfall during the sunflower vegetation period, being maximal at Fundulea and Şimnic. However, although total rainfall was higher at Ştefan cel Mare than in Stupina, due to a more favorable monthly distribution of rainfall, most hybrids were more productive under Stupina conditions (Table 2).

Table 2. The seed yield of sunflower hybrids under ecological agricultural system (The results from Fundulea trials were provided by Ion Toncea, PhD)

Hybrid	Yield (kg/ha)					Coefficient of variation (%)
	Şimnic	Stupina	Ştefan cel Mare	Fundulea	Average	
H7	2332	1886	2025	2653	2224	15.3
H13	2083	2303	1860	2075	2080	8.7
H1	2821	1837	1542	1923	2031	27.2
H3	2873	1610	1586	1639	1927	32.7
H20	2240	1755	1463	2115	1893	18.6
H17	2088	1753	1828	1768	1859	8.4
H5	2292	1828	1375	1888	1846	20.3
H2	1753	1712	1311	2435	1803	25.9
H19	1977	1695	1320	2133	1781	20.0
H12	2485	864	1220	2150	1680	45.4
H18	1692	1374	1607	1971	1661	14.8
H16	1726	1388	1782	1580	1619	10.9
H14	2601	1019	1037	1800	1614	46.6
H11	2267	1609	222	1950	1512	59.6
H6	2315	891	791	1881	1469	50.9
H9	1222	1647	618	2336	1456	49.7
H10	1902	1098	518	1750	1317	48.3
H15	1615	1253	1203	1200	1317	15.2
H4	1359	1043	561	2170	1283	52.7

The tested hybrids were very different both in average yield (which varied from 1283 to 2224 kg/ha) and in yield stability, as reflected by the coefficient of variation (which ranged from 8.4 to 52.7%). Several hybrids, such as H13 and H7 combined high average yield and good yield stability (Figure 1).

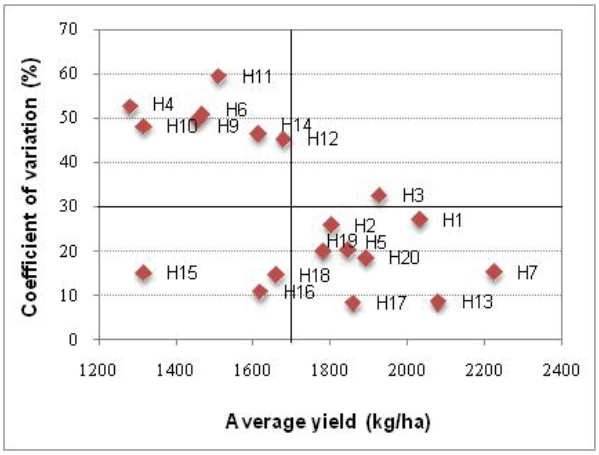

Figure 1. Average yield and coefficient of yield variation in 19 sunflower hybrids tested under organic agricultural system in four locations

At Fundulea the sunflower hybrids were tested under both organic and conventional agricultural systems (Figure 2).

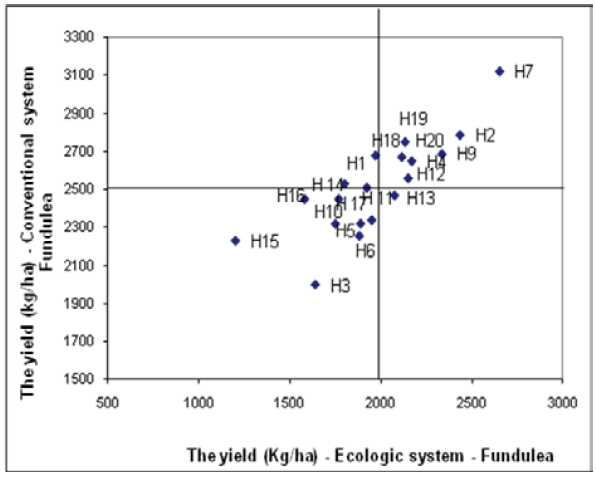

Figure 2. The yield of sunflower hybrids under ecological and conventional agricultural systems at Fundulea

The performance of the hybrids under these different conditions were generally similar (r = 0.82***, Figure 3).

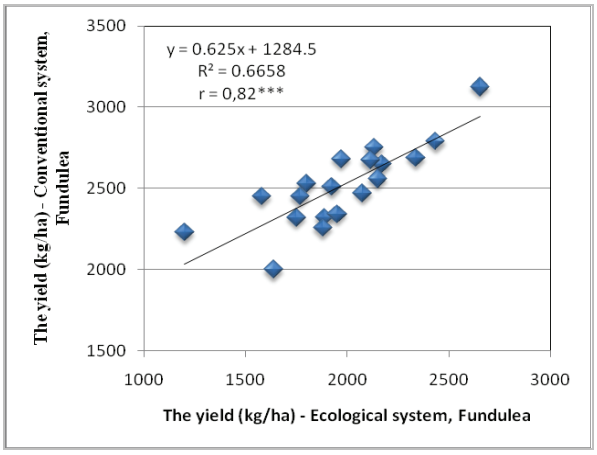

Figure 3. The relationship between the sunflower yield obtained under ecological system and sunflower yield obtained under conventional system

The hybrid H7, which gave the highest average yield in four locations under organic farming was the best also under conventional agricultural system. However, hybrid H13, placed the second on average in organic farming was below the average of all hybrids in the conventional system.

CONCLUSIONS

Sunflower hybrids able to perform well under both organic and conventional systems and at various levels of water stress were identified.

Although performance of the tested hybrids under the two agricultural systems was generally similar, several hybrids performed relatively better under organic farming than under conventional one.

Testing under different agricultural systems can be useful in identifying sunflower hybrids with broad adaptability.

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