

SUNFLOWER AND SOYBEAN CROPS CULTIVATED IN A MIXED INTERCROPPING SYSTEM, IN THE 2022

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Abstract

The intercropping system employs growing several species in between each other, during the same season. Intercropping practices differ in arrangement, sowing time, and plant combination. Intercropping has significant advantages over monoculture farming, which aims to boost yields and more efficient usage of land and resources. The most fundamental intercropping benefits include increased profit, better pest management, improved weed management, and enhanced biodiversity and ecological stability. In 2022, an experiment was organized in the intercropping system, using sunflower and soybean crops. Ten sunflower hybrids and ten soybean varieties have been studied, regarding some morphological, and physiological characteristics, quality, and production. The results showed that even though the climatic conditions were not highly favorable for the crops developing, the seed and grain yields released by both crops were very good. There have been some differences between the experimented varieties and hybrids. The best varieties and hybrids, which can be cultivated in this system, can be recommended for the farmers in the studied area.

Key words: sunflower, soybean, intercropping, advantages, biodiversity.

INTRODUCTION

The intercropping system employs growing several species in-between each other during the same season. Intercropping practices differ in the arrangements, sowing time and plant combination.

In intercropping system, the practice is based on principles and rules with respect to different plant families, architecture, time of maturing, sunlight and water (Jeffrey, 2016).

Intercropping has significant advantages over monoculture farming, which are aimed at boosting yields, more efficient usage of land and resources, also a better protection of crops (Runyon et al., 2009; Almeida et al., 2019).

Sunflower is grown in an increasing area in the world (around 29 million hectares), with a production of over 55 million tons and its importance in human and animal nutrition is therefore increasing (Miklic, 2022).

Soybean is economically the most important bean in the world, providing vegetable protein for millions of people and ingredients for hundreds of chemical products (Enciclopedia Britannica, 2023).

Sunflower was reported as a serious candidate for strip, row, and relay intercropping systems (Echarte et al., 2011). Its desirable characteristics, such as erect growth habit, harvestable head, resistance to lodging and drought, and minimal land cover make sunflower an excellent component to intercrop

with a short stature and/or duration crop, like soybean (Andrade et al., 2012; De la Fuente et al., 2014). The optimal variety type for successful intercropping has not been extensively examined (Olowe and Adeyemo, 2009). There have been studies on the performance of a small number of sunflower varieties intercropped with soybean (Olowe and Adebimpe, 2009). There have been observed significant differences among the tested varieties.

It must be studied varietal traits for maximizing the performance of the intercropping system.

MATERIALS AND METHODS

It was used a strip intercropping method. This practice involve the arrangement of plants in rows, having six rows each crop, with section of land wide, to facilitate machine operations.

There have been studied nine soybean varieties and ten sunflower hybrids. All of them are commercial varieties.

There have been collected climate data from the Meteorological Station of ARDS Braila.

RESULTS AND DISCUSSIONS

The climatic conditions in Braila location (Figure 1) were not so good, specially regarding the rainfall quantity. It was quite small in all season of plants development. For sunflower the rainfall helped to have quite good development. For soybean it was not sufficient.

The air temperature in time of sunflower flowering was not so high, being favourable, also for soybean.

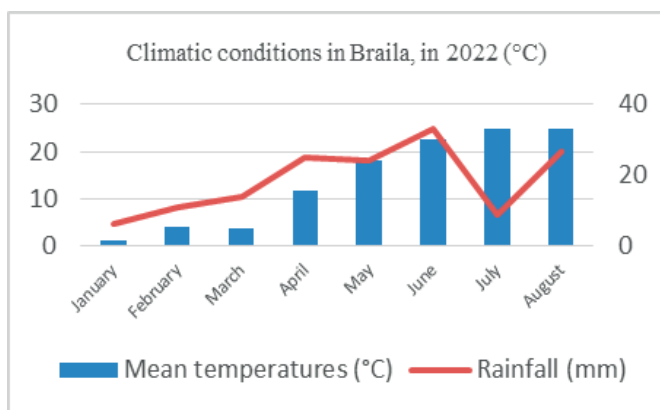


Figure 1. Rainfall (mm) registered in Braila and Fundulea, in year 2022

În Table 1 are presented the results regarding the period from emergence to flowering for the two crops varieties.

For sunflower this period was from 52 to 65 days, for soybean being from 55 to 69 days.

In Table 2 there are presented the results regarding some important characteristics for

sunflower hybrids. The highest plant height has the hybrid P64E136 and the lowest NK Brio and Mas 83. The highest head diameter was for the hybrid P64E136, also the TKW value.

The lowest head diameter was for the hybrid Ilinca. The highest HW was in case of the hybrid ES Aver and the lowest for hybrid NK Brio.

Table 1. The period from emergence to flowering, for studied varieties

Variety	The period from emergence to flowering (days)							
	Sunflower				Soybean			
	Int.	Dif.**	Average	CV***	Int.	Dif.**	Average	CV***
	var.*			(%)	var.*			(%)
H1/S1	53-64	11	57	6.76	55-64	9	59	4.34
H2/S2	53-64	11	59	6.58	57-64	7	60	4.18
H3/S3	54-65	11	59	6.35	58-65	7	61	4.36
H4/S4	55-62	7	58	4.40	57-65	8	61	4.78
H5/S5	54-62	8	58	6.03	59-66	7	62	4.22
H6/S6	54-62	8	58	5.14	57-65	8	61	4.90
H7/S7	52-60	8	56	5.42	59-67	8	63	4.26
H8/S8	55-64	9	60	4.89	60-69	9	64	4.04
H9/S9	53-61	8	56	5.44	57-66	9	61	4.77
H10	54-63	9	58	6.63				

Table 2. Data regarding some important characteristics, of studied varieties, in Braila, 2022

Sunflower hybrids	Braila			
	Plant height (cm)	Head diameter (cm)	TKW (g)	HW (kg/ha)
Ilinca	123.33	19.67	81.5	43.0
DS 121	127.67	23.67	88.0	43.6
ES Aver	119.50	21.00	80.3	44.7
NK Br	111.33	20.67	80.1	38.0
Mas83	111.33	19.33	85.3	44.9
LG CLP	128.67	22.33	102.4	42.8
P64E136	148.67	23.00	84.3	38.1
FD 27	134.67	22.33	84.6	44.1
FD 70	116.00	20.33	103.5	43.0
Perf.	146.33	20.67	80.7	41.1
Media	126.7	21.9	87.0	42.0

In Table 3 the results are showing some important characteristics for the experimented soybean varieties. The highest plant height was for the variety Andruta and the lowest for

Camelia. The highest number of levels with capsules was for the varieties Andruta, Ilaria and Ileana and the highest number of grain in capsule was for the variety Ileana.

Table 3. Data regarding some important characteristics, of studied varieties, Braila, 2022

Soybean varieties	Braila			
	Plant height (cm)	Number of levels with capsules (cm)	Number of capsules on level	Number of grains in capsule
Andruta	95.00	18	4	9
Florina	84.33	12	3	9
Ilaria	93.11	18	4	12
Safta	89.44	16	3	12
Camelia	65.33	14	4	10
Ileana	93.11	18	4	14
Iris TD	68.11	12	4	8
Turda	80.00	16	3	8
Adonis	78.00	14	4	12

The results in Table 4 show that the resistance to lodging and to stem broken is very good for all hybrids, also, the resistance/tolerance to some important diseases is very good. Very important

is the behavior of the sunflower hybrids regarding the resistance to the parasite *Orobanche cumana* (broomrape). Even the hybrids which have not a good genetic

resistance to the parasite had a small attack degree. It must be mentioned that the hybrids

having resistance to imazamox (CL or CLP) have not been treated with herbicides.

Table 4. Some characteristics of sunflower hybrids, in Braila area, in 2022

Sunflower hybrids	Braila			
	Resistance to stem broken (notes)	Resistance to lodging (notes)	Resistance <i>Phomopsis</i> (%)	Resistance <i>Orobanche</i> (%)
Ilinca	2	1	5.9	6.7
DS 121	2	1	2.1	3.9
ES Aver	1	1	0.8	3.5
NK Brio	2	2	1.8	3.8
Mas83	1	1	6.3	6.2
LG CLP	1	1	3.6	4.7
P64136	2	2	1.7	0.4
FD 27E	1	1	2.3	1.2
FD70CL	1	1	3.7	4.2
Perf.	1	2	8.4	21.6

In Figure 2 are presented the results regarding the seed yield, for sunflower hybrids experimented in Braila. The highest seed yield was released by LG 58390 CLP, ES Averon SU and FD15E27 hybrids.

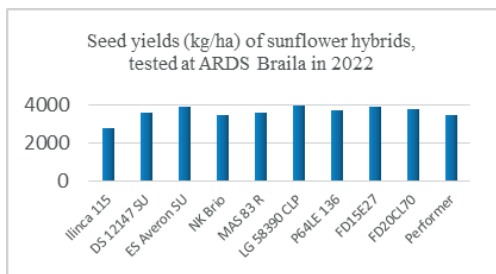


Figure 2. Seed yields of sunflower hybrids tested in Braila

In Figure 3 are presented results regarding the grain yield for soybean varieties, studied in an intercropping system with sunflower. The highest yield was released by Ileana, Ilaria, and Safta varieties.

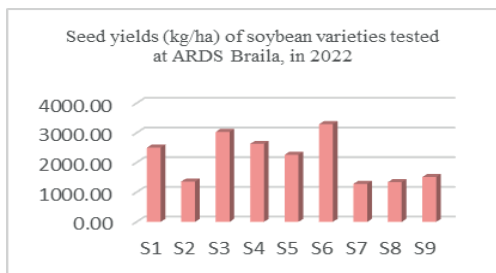


Figure 3. Seed yields of soybean varieties tested in Braila

CONCLUSIONS

The studied sunflower hybrids and soybean varieties have different vegetation period, depending by variety genetic, also by the climatic conditions, specific to the location of cultivation.

Even the climatic conditions in the experimentation period were not as it is request for these crops, this system of cultivation bring benefit for each sunflower and soybean.

The sunflower hybrids, cultivated in this system, have good resistance to lodging and stem broken, due to the genotype, also to the cultivation system. Also, very good behavior had the hybrids regarding the resistance/tolerance to the pathogen *Phomopsis helianthi* and to the parasite broomrape.

The grain yield was very good, for many of studied varieties, in this type of cultivation system.

We consider that, among the protection of the crops by some pathogens or pests, this system of cultivation was given the attractiveness for some beneficial insects.

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