

## COMPARATIVE STUDY OF CONVENTIONAL AND MODERN CLEARFIELD TECHNOLOGY FOR SUNFLOWER HYBRIDS CULTURE IN BRĂILA PLAIN

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### *Abstract*

*There are a number of technical restrictions for achieving higher production of sunflowers, including: providing temperature and water regime in critical phases of vegetation, against competition created by weeds and pests or diseases control. The experience described in this paper is to reveal the comparative results between conventional and modern Clearfield technology for three consecutive years, in pedoclimatical conditions of Braila Plain.*

*The biological material used in this research was four Limagrain hybrids including two used in conventional culture and other two hybrids improved genetic resistance for Pulsar herbicide, to use the Clearfield technology.*

*Determinations made during the vegetation period about spectrum and density of weeds, and weeds control efficiency by two chemical methods. The results were statistically interpreted by analysis of variance, with average of hybrids like control. Economic efficiency was calculated for this two culture technologies, also.*

*Of the four hybrids studied, the highest production was obtained hybrid LG 56.63 CL achieving very significant positive differences to average of hybrids analyzed. The lowest production were obtained of LG 56.55 hybrid grown in conventional culture system in all three experimental years, with very significant negative differences to control. LG 56.63 CL hybrid has superior quality seeds of all other hybrids studied, with values of hectoliter weight ranging between 48 and 49.8 kg/h, while a thousand grain weight values ranged from 60 to 65.8 g.*

**Key words:** sunflower, conventional technology, modern Clearfield technology, efficiency.

### INTRODUCTION

Vegetable oil production worldwide reach an average of 50 million tons annually. In the hierarchy of large oil producing plant fall crops as follows: first place is occupied by soybean (38% of total world production, with a production of 17 million tons annually), the second is sunflower, rapeseed third, fourth cotton and ranks fifth peanuts. Sunflower is one of the most important oilseed crops grown in the world (13% of world oil production) and most important oilseed crops in Romania, because the oil extracted from sunflower achenes is semisativ and is characterized by color, taste, and fragrant, high in vitamins (A, D, E, K) and aromatic substances, possibility of easy storage for a longer period.

Clearfield production system used by the company BASF uses a combination of superior genetics, represented by sunflower hybrids adapted to local environmental conditions, with herbicide Pulsar 40, which is easily applied to provide the best integrated solutions in order to

obtain quantitative and qualitative production. The experience described in this paper is to reveal the comparative results between conventional technology and modern technology Clearfield, in the same soil and climatic conditions of Braila Plain.

### MATERIALS AND METHODS

The biological material used in the experiment was represented by four hybrids Limagrain, including two used in conventional culture and the other two, improved genetic resistance to the herbicide Pulsar, use the Clearfield technology.

The experience was bifactorial, type A x B with the experimental factors: A-culture technology with two graduations: a1-and a2 conventional technology-modern technology Clearfield, B-hybrid sunflower with two graduations for each technology (b1-b2 hybrid and LG 56.55-56.65 LG hybrid, conventional technology and b3-b4 hybrid CL and 56.63 LG-LG 56.58 CL, Clearfield technology. experimental plot was 2

ha for each variant settlement scheme experience of being in complete blocks, loft dispersed in three repetitions, as Figure 1. The experiments were located on a typical chernozem soil type, with profile: Am-AC-Cca.

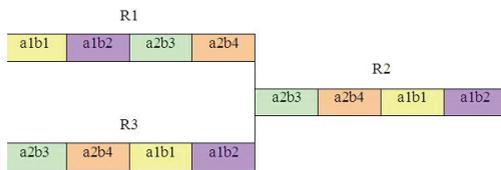


Figure 1. Scheme of experience

The experimental variants were randomized within each block to eliminate data errors variants influence and affect of neighboring. Also, they observed the isolation of 2m between variants and field uniformity for all experimental variants in the three experimental years.

During the vegetation period were made determinations plant density, determination of the degree of weed and weed spectrum present by method of metric frame. Plant density determination was performed in floral button phenophase training by attending and throwing diagonally plot at random.

For the results to be interpreted correctly, statistically speaking, the experience took place in three consecutive years (2007-2010), calculating and economic efficiency to technology analysis compared the two crops.

## RESULTS AND DISCUSSIONS

Agricultural year 2007-2008, the year of climate contrasts, characterized by autumn-winter-spring rainfall assured, temperature has exceeded normal throughout the year, with an average of 1.7°C, and summer was particularly dry, intake rainfall of 105 mm is being carried under multiannual climatic deficit widened (Figure 2).

In this context, climate, moisture reserves satisfactory first half ensured the agricultural yields good autumn crops throughout the county. Shock spring crops have suffered very harsh climate of a summer rainfall and temperature, agricultural yields stood at modest levels.

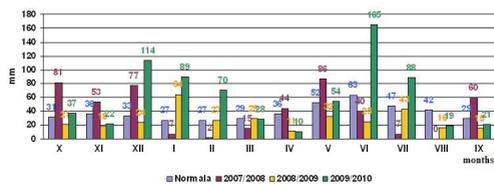


Figure 2. Rainfall (mm) recorded monthly in three experimental years compared to normal

Agricultural year 2008-2009 was poor in precipitation, with an average of 363 mm to 447 mm normal annual average, but evenly distributed in the vegetation period of sunflower, thus ensuring optimum air humidity of between 64 and 75%.

Agricultural year 2009-2010 was also a year of climate contrasts, which was characterized by excess rainfall regime in June and July, exceeding the annual average of 100 mm, a heat balance positive climate where temperatures exceeded monthly multiannuals with 1-4°C. In Figures 3 and 4 are plotted the data temperature and relative humidity in the three experimental years.

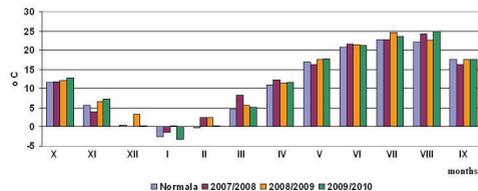


Figure 3. Chart of monthly temperatures recorded in the three experimental years compared to normal

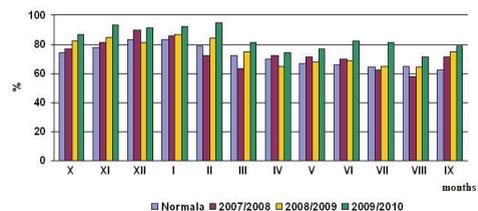


Figure 4. Chart of monthly relative humidity values in the three experimental years compared to normal

Compared to normal, the driest year was 2008/2009, while the highest values of rainfall records were recorded in June 2010 with a surplus of 100 mm and in July 2010, when it exceeded the normal 41mm.

Improved sunflower hybrids for use in Clearfield production system are tolerant to the herbicide Pulsar, produced and marketed by the company BASF. Pulsar tolerance was obtained through traditional plant breeding, which involves the introduction of DNA by genetic engineering techniques. Tolerance is not the result of genetic engineering so that sunflower plants that are grown in Clearfield system and presenting these features are not transgenic, genetically modified organisms being considered. Pulsar 40 is the first selective herbicide application after sowing, broad-spectrum weed control used in Clearfield system, which combats a wide range of weeds, both dicotyledonous and monocotyledonous some. Yields obtained for each experimental variant, in the three years of study were summarized in Figure 5.

Technology (A)		Hybrid (B)	2008	2009	2010
a1 - conventional		b1- LG 56.55	2968	2900	3100
			2980	2925	3110
			2965	2930	2998
		b2- LG 56.65	3400	3340	3420
			3450	3375	3460
			3445	3380	3455
a2 - Clearfield		b3- LG 56.63 CL	3996	3985	4002
			3990	3975	4010
			4000	3990	4005
		b4- LG 56.58 CL	3350	3260	3420
			3400	3280	3410
			3380	3300	3415

Figure 5. Productions of experimental variants (hybrid x technology LG), in 2008-2010 (kg/ha)

Calculating the average for each experimental variant were obtained productions represented in Figure 6.

Was established by analysis of variance (Table 1) significance of difference between productions of hybrids using the average of all hybrids (3437.8 kg/ha).

Analysis of variance for yields of LG hybrids obtained in two different culture systems reveal that the most productive hybrid in all three experimental years was 56.63 LG CL, achieving very significant positive differences in production to witness the average of represented hybrids analyzed. LG 56.58 CL

hybrid obtained a significant difference from the control distinct negative in 2009 due to strong attack by *Sclerotinia* registered in the previous two years and has obtained significant differences compared to the control, as well as hybrid LG 56.65, cultivated by conventional technology.

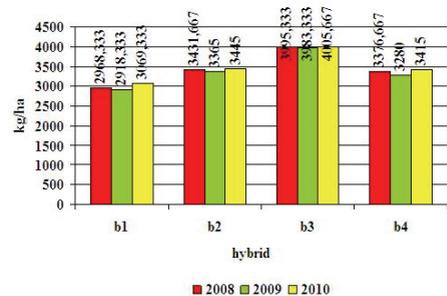


Figure 6. The average production of hybrids studied in the three experimental years

Table 1. Analysis of variance for differences between yields obtained by LG hybrids

Varianta (hibrid x tehnologie)	Producția absolută (kg/ha)	Producția relativă %	Diferența		Semnificația	
			absolută (kg/ha)	relativă (%)		
a1b1	2008	2968,3	86,34	-469,5	-13,7	***
	2009	2918,3	84,89	-519,5	-15,1	***
	2010	3069,3	89,28	-368,5	-10,7	***
a1b2	2008	3431,7	99,82	-6,1	-0,2	-
	2009	3365	97,88	-72,8	-2,1	-
	2010	3445	100,21	7,2	0,2	-
a2b3	2008	3995,3	116,22	557,5	16,2	***
	2009	3983,3	115,87	545,5	15,9	***
	2010	4005,7	116,52	567,9	16,5	***
a2b4	2008	3376,7	98,22	-61,1	-1,8	-
	2009	3280	95,41	-157,8	-4,6	**
	2010	3415	99,34	-22,8	-0,7	-
Martor (media)	3437,8	100	-	-	-	-

DL 5% = 89

DL 1% = 121

DL 0,1% = 162

The lowest results were obtained for the production of hybrid LG 56.55 in all three experimental years, with very significant negative differences to the control. It was thus found that the hybrid LG 56.63 CL is the most productive in terms of Braila Plain conditions, compared with genetic counterpart LG 56.65 which is grown with conventional technology. However, other hybrid modified for resistance to treatment Pulsar achieved lower production compared with the control in 2009 (with a difference of -4.6%) due to higher sensitivity of *Sclerotinia* attack against the hybrid LG CL 56.63.

To highlight the differentiation about technology for weed control (Figure 5), was determined density and weed plants in flower button phenophase training by attending and throwing diagonally plot at random with the frame metric, and averages results were summarized in Table 2.

Table 2. Results on plant density and weed spectrum

Specification	Year	Variant (average of determinations)			
		a1b1	a1b2	a2b3	a2b4
Density of plants/m <sup>2</sup>	2008	65	6	5,5	5
	2009	5,5	5,5	6	4,5
	2010	6	6	6	5
No weeds/m <sup>2</sup>	2008	45	32	9	10
	2009	52	35	7	16
	2010	38	27	8	14

Determined by the metric frame results showed that the application of herbicide Pulsar in Clearfield technology reduces over 2/3 degree of weed compared to conventional technology culture, recommending its application in the climatic conditions of Braila Plain area. Determined quality indices results, means hectoliter mass and the mass of a thousand grains, for the four hybrids analyzed under different conditions of application of the technology culture, were given in Figure 7.

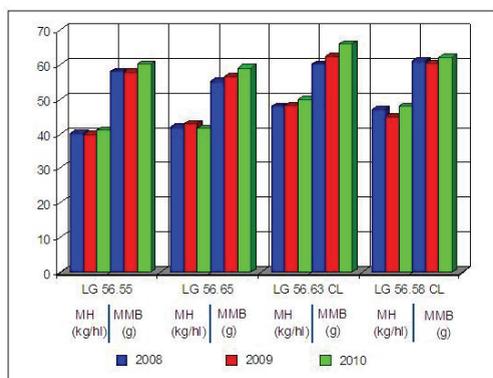


Figure 7. Indices of quality for experimental variants

The two indices of production quality (hectoliter weight MH and a thousand grains weight MMB) of LG hybrids was found that the hybrid LG 56.63 CL had a superior quality seeds to other hybrids studied, with hectolitre weight (MH) ranging between 48 and 49.8 kg/hl, while the weight of a thousand grains (MMB) were between 60 and 65.8 g of the

lowest mass per storage volume and mass of a thousand grains were recorded 56.55 LG hybrid grown with conventional technology, which ranged from MH 40 kg/hl in 2008 and 41 kg/hl in 2010.

LG 56.58 CL hybrid obtained production with significant differences from the control, we found that quality indicators analyzed were superior to those of hybrids grown with conventional technology. Thus, this hybrid hectoliter weight was between value of 44.8 kg/hl in 2009 and 48 kg/hl in 2010, and a thousand grain weight ranged from 60.2 g value in 2009 and 62 g in 2010, in 2008 both qualitative indices such as intermediate values. Figure 8 represented the economical efficiency for each technology and for each hybrid compared to average of agricultural production in three years.

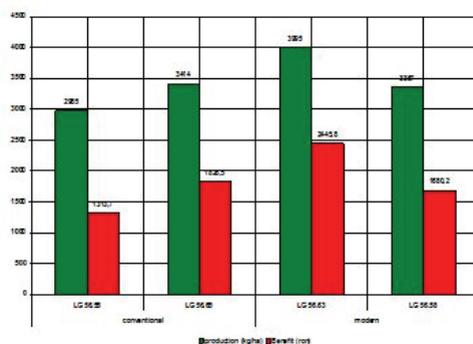


Figure 9. Economic efficiency of conventional technology and modern culture LG hybrids studied

Of economic calculations made, it can be seen that the highest efficiency was 56.63 LG CL hybrid, with a difference of 1,132 Ron per hectare of crops, compared to 56.55 LG hybrid grown in conventional systems, in terms of Braila Plain conditions.

## CONCLUSIONS

The physical-chemical indices of soil showed that the soil in the Braila Plain area is favorable for sunflower crop, both in the conventional system, especially in Clearfield system.

Among hybrids LG analyzed in the three experimental years, the production of 56.63 LG CL hybrid achieving very significant positive

differences in production to control represented average of hybrids analyzed.

The lowest results were obtained for the production of hybrid 56.55 LG grown in conventional culture system in all three experimental years, with very significant negative differences represented by average of hybrids

Hybrid LG 56.63 CL had a superior quality seeds of all other hybrids studied, with values ranging between 48 and MH 49.8 kg/hl, while MMB values ranged between 60 and 65.8 g

The calculation of economic efficiency for these four hybrids grown in two different culture systems (conventional and Clearfield) revealed that highest efficiency can get LG hybrid CL 56.63, a difference of 1,132 Ron per hectares of crops, to 56.55 LG hybrid grown in conventional systems, in terms of the Braila Plain.

The Clearfield opportunity to obtain superior yields compared to the conventional sunflower crop, in soil and climate conditions of the Braila County, with the recommendation to make timely treatment against diseases and

pests, observing that breeding hybrids for resistance to Pulsar has a susceptibility to disease attack, especially in favorable years for these.

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