

## COMPARATIVE TESTING OF OIL SUNFLOWER HYBRIDS IN THE REGION OF NORTH – EAST BULGARIA

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### Abstract

*The field experiment was carried out in the experimental selected area in Dropla village (North-East Bulgaria) in the period 2012 - 2014. The test was performed by means of a block method with four repetitions; experimental field area - 25 m<sup>2</sup> after winter wheat predecessor. The following sunflower hybrids were tested; Kondi, Neoma, Adajhio, Alego and PR64F50. The aim of the investigation was to determine the potential of yield of the tested sunflower hybrids in the region of North-East Bulgaria. The analysis of the results showed that the highest values of elements of productivity were reported with the hybrid Neoma and the lowest – with the PR64F50 hybrid. Hybrid Neoma was most suitable for growing under the conditions of North-East Bulgaria; it gave maximum mean seed yield (3523 kg/ha) and oil yield (1742 kg/ha) during the three years of testing. This was the hybrid with highest mean crude fat content – 49.3%. Lowest seed and crude fat seed yields were obtained from the Alego hybrid (3160 and 1456 kg/ha).*

**Key words:** sunflower, hybrids, seed yield, crude fat seed yield.

### INTRODUCTION

Important role in realizing the potential of a variety or hybrid have as genetic traits and region with the specific soil and climatic conditions in which are cultivated (Georgiev et al., 2009; Iliev, 2004; Safahani et al., 2014; Krizmanic et al., 2003; Ribeiro and Raiher., 2013). In our country constantly test new hybrids with high productive potential and valuable economic qualities, that's why this study in various areas of the country is of great interest. Therefore, to use the full productive potential of the hybrid as a factor for obtaining high yield important is the right choice of the most suitable for each agro-ecological area (Nenova et al., 2005; Penchev et al., 2006; Saldjiev., 2004). This raises the need for systematic studies of hybrid sunflower in different regions of the country (Nenova et al., 2007; Tahsin and Yankov, 2006; Tahsin, 2012; Yankov et al., 2009).

The aim of this study is to determine the yield potential of some sunflower hybrids in Northeastern Bulgaria.

### MATERIALS AND METHODS

In the period 2012-2014 was carried out field experience in the village Dropla municipality Balchik - Northeastern Bulgaria. For compara-

tive testing included oil sunflower hybrids - 'Kondi', 'Neoma', 'Adajhio', 'Alego' and 'PR64F50'.

The experiment was set in block method in four repetitions, size of the crop area of 25m<sup>2</sup>/plant with precrop wheat. The sunflower was grown without irrigation conditions adopted for region technology. For realizing the aim of the study account was taken following parameters: plant height, diameter of the disk, number seed of one disk, seed weight on the disk, mass of 1000 seeds, seed yield, crude fat content and yield of raw fat. The experimental data were processed by way of the analysis of variance (ANOVA), and the differences between the versions - by Duncan-test (1995).

The testing period (2012-2014) covers the years whose daily average temperatures during the growing season of sunflower are very close to each other and slightly higher than those reported in multiannual period but different in terms of rainfall collateral which have an impact on growth and development plant. The amount of precipitation during the growing season of sunflowers are as follows; 2012 - 171,2 mm, 2013 - 190.0 mm and 2014 - 532,4 mm in multi-standard - 304 mm.

The amount of rainfall during critical phases plants, has a significant impact on the productivity of investigational hybrids. In this respect, the most favourable was 2014, when during

budding, flowering and seed filling, the amount of precipitation was 297 mm and the resulting yields of all hybrids are highest compared to previous years. In the year 2012, the amount of rainfall during critical development stages of the sunflower was 43,6 mm i.e. insufficient to realize the productive potential of investigational hybrids and receive lower yields.

## RESULTS AND DISCUSSIONS

The resulting averages for the height of plants and the structural elements of the yield is presented in Table 1.

Table 1. Height of plants and structural elements of the yield, average during the period 2012-2014

Hibrids	Height of plants (cm)	Head diameter (cm)	Number of seed per head	Weight of seed per head (g)	1000 seed weight (g)
Kondi	196.7 d	17.5 b	1108 b	68.7 b	62.0 b
Neoma	190.3 c	19.0 c	1257 d	77.0 d	68.0 c
Adazhio	180.3 a	16.0 a	1134 c	69.2 b	61.0 b
Alego	186.0 b	16.3 a	1158 c	72.5 c	58.0 a
PR64F50	184.0 b	16.5 a	1085 a	61.8 a	57.0 a

Data show that the tested sunflower hybrid differ materially signs height of the plants. Statistically proven with the lowest altitude plants are of hybrid Adazhio (180.3 cm), while the highest - those of hybrid Kondi – 196.7 cm. This indicator hybrids Alego and PR64F50 are inferior to Neoma average of 2.9%.

Analysis of the disk shows that hybrid Neoma mathematically proven by all the values of the structural elements of yield exceeds hybrids Kondi, Adazhio, Alego and PR64F50.

Hybrid Neoma has a diameter of disk - 19.0 cm and surpasses by 8.6% - Kondi. Hybrids PR64F50, Alego and Adazhio have the lowest values of this parameter that are too close and the differences between them are unproven. The index number of seeds in a head when tested hybrids ranged from 1085 in number - PR64F50 to 1257 in number - Neoma. Hybrids Adazhio and Alego outperform - Kondi respectively with 26 and 50 pieces. Statistically proven hybrid Neoma superior hybrids Alego; Adazhio; Kondi and PR64F50 8.5; 10.8; 13.4 and 15.8%. The lowest values of the indicator mass of seeds in one disk were reported in hybrid PR64F50 - 61,8 g. and inferior to

Kondi, Adazhio, Alego 11.2; 13.1 and 17.3 and Neoma with 24.6 % respectively. The mass of 1000 seeds in sunflower hybrids tested ranged from 57.0 to 68.0 g.

Neoma hybrid outperforms Kondi and Adazhio average of 6.5 g, and Alego and PR64F50 - with 10.5 g.

The favourable combination of weather in 2014, are a prerequisite for obtaining high yields of seed compared to 2012 and 2013 (Table 2).

Table 2. Seed yield - kg/ha

Hibrids	Years of study			Average for the period (kg/ha)
	2012 (kg/ha)	2013 (kg/ha)	2014 (kg/ha)	
Kondi	2940 b	3100 b	3800 b	3280
Neoma	3210 e	3380 e	3980 c	3523
Adazhio	3000 c	3150 c	3790 b	3313
Alego	2800 a	3020 a	3660 a	3160
PR64F50	3160 d	3180 d	3610 a	3317

The values obtained ranged from 3610 kg/ha for hybrid PR64F50 to 3980 kg/ha at - Neoma. This hybrid proven exceeded seed yield hybrids Kondi and Adazhio respectively 180 and 190 kg/ha, and Alego and PR64F50 - 320 and 370 kg/ha.

In the second experimental year (2013) obtained yields of the tested hybrids from 13.5 to 17.7% lower than 2014 year statistically processing of the data shows that the differences between all studied hybrids are significant. Alego is inferior hybrid seed yield of PR64F50 by 5.3% and Neoma 11.9%.

The lowest yields of sunflower seeds were recorded in the first experimental year (2012) and range from 2800 kg/ha in hybrid Alego to 3210 kg/ha at - Neoma. Hybrid Adazhio excels at mining Kondi by 2.0%, but inferior to PR64F50 5.3%. Average for the period of study (2012-2014 g) hybrid Neoma yield of 3523 kg / ha superior of 6.2 to 11.5% in all studied hybrids.

The lowest yield was recorded in hybrid Alego - 3160 kg/ha, which gives way to the other - with 120 to 363 kg/ha. The results of the analysis of variance (Table 3) show that the variation of the yield of sunflower seeds is

determined as the weather conditions during the years (97,0%) and of hybrids (82.0%).

Table 3. Analysis of variance for seed yield

Source of Variation	Sum of Square	DF	Mean Square	Sig of F	% η 2
Hibrids	819899,77	4	204974,94	,000	82
Years	6292471,03	2	3146235,5	,000	97
2- Way Interactions	224007,63	8	28000,95	,000	55
Residual	186581,50	45	4146,26		

There is a well proven interaction between test factors (hybrid x year) - 55.0%.

The yield of crude fat in tested sunflowers hybrids varies, as over the years and the average cultivation period and follows the trend emerging in the yield seeds (Table 4).

Table 4. Crude fat seed yield - kg/ha

Hibrids	Content of crude fat - % (2012-2014)	Years of study			Average for the 3 years kg/ha
		2012 (kg/ha)	2013 (kg/ha)	2014 (kg/ha)	
Kondi	47,3	1396 b	1457 b	1824 c	1559
Neoma	49,4	1541 e	1656 e	2030 d	1742
Adajhio	47,2	1410 c	1496 d	1781 b	1562
Alego	46,1	1296 a	1389 a	1684 a	1456
PR64F50	46,4	1454 d	1469 c	1698 a	1540

The highest values of this indicator is obtained in 2014, followed by 2013 and the lowest - in 2012.

In the most favourable for sunflower i.e. the third testing year, the values of this indicator in the study are hybrids the range of 1684 in Alego to 2030 kg/ha with Neoma. Differences between the variants are statistically significant.

In 2012 and 2013 years, the yield of crude fat in sunflower hybrids tested on average 30.9 and 22.0% lower compared to 2014

Average for the three years of study with the highest yield crude fat stands hybrid Neoma - 1742 kg/ha, follows Adajhio - 1562 kg/ha, while the lowest - hybrid Alego - 1456 kg/ha.

The results of ANOVA showed significant influence of both factors (hybrid and year) on the obtained crude fat yield per hectare (Table 5).

Table 5. Analysis of variance for crude fat seed yield

Source of Variation	Sum of Square	DF	Mean Square	Sig of F	% η 2
Hybrids	1618629,59	4	809314,79	,000	99
Years	524768,34	2	131192,08	,000	99
2- Way Interactions	76709,87	8	9588,73	,000	98
Residual	1562,17	45	33,50		

## CONCLUSIONS

Structural elements of the yield of investigational sunflower hybrids with the highest value in hybrid Neoma.

Best suited to the conditions of northeastern Bulgaria's was hybrid Neoma which gives maximum average yield seeds (3523 kg/ha) and crude fat yield (1742 kg/ha) in the three years years of study.

He is also a hybrid with the highest crude fat content - 49.3%. The lowest seed yield and oil were obtained from hybrid Alego (3160 and 1456 kg/ha).

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