

## EFFECT OF THE DROUGHT AND HIGH TEMPERATURES ON THE YIELD IN SUNFLOWER

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### SUMMARY

The effect of the drought and the extreme high temperatures were studied on the plant development and the yield formation in comparative varietal trials during the period of 1982 to 1987. The results obtained showed that the head floret and seed number character was marked by the highest modification variability. The unfavourable conditions effected more weakly on the 1000-seed weight and the oil content.

### INTRODUCTION

Sunflower in Bulgaria is grown mainly on non-irrigated areas. Of the agroclimatic factors both the precipitation amount for the period October-March (winter supply) and the rainfall quantity and distribution during the vegetation period (April-August) exerted most highly on the plant development and yield formation.

### MATERIALS AND METHODS

The basic structural elements determining the yield are the whole seed number and size per plant and the oil content. These components were studied in the period 1982-1987.

1983 and 1985 were marked by a especially high-expressed water deficit when the winter supply had reached just about 61.3 and 74.9% of the rate. The total precipitation amount for the same years was by 17.5 and 34.2 % less. Extreme high temperatures were recorded in July 1983, 1985 and 1987.

In a comparative varietal trial with four replications 10 heads were taken of each replication in technical maturity phase. The number of full and empty seeds was determined as well as the 1000-seed weight after conditioning. Two samples of each plant were analyzed for the oil determination on NMR instrument. Three open pollinated varieties, Peredovik, Hemus, No260 and three simple hybrids, No 486, NS-26, NS-27, were studied.

### RESULTS AND DISCUSSION

A lot of open pollinated varieties with different vegetation period participated in the first four years. The response of those populations possessing quite different genetic base was studied. The data in Table 1 show that the average yield both for the variety group and for the hybrid one is changed in the same manner. In 1985 the water deficit was great. The soil moisture in the layer of 0-100 cm was under 60% of the maximum soil water capacity still in budding phase after June 10. A rapid leaf withering of the low floor began. The mean and even the top leaves lost their turgor. The yield was extremely low but differences did not exist between the two groups. The yield in the varieties was just about 56.4% of that in 1982 and 1984 when the climatic conditions could be considered favourable, while for the hybrids the value was only by 1% less-55.4%. The specific interaction genotype-environment was expressed in a less degree. A high variability was observed in hybrid No486, varieties Hemus and No260. Since there was not essential differences between varieties and hybrids regarding the variation of the characters studied, only the data of cv. Peredovik and hybrid NS-27 would be presented. In Fig.1 the yield of seeds is expressed in years. Both the lines follow the same move. The number of the full seeds is a typically varietal character. In favourable conditions Peredovik has reached on the average to 1391 seeds per plant, while NS-27 - up to 2024 (Table 2). The difference between the minimum and maximum value for Peredovik was 478 or 42.8% toward the average number of the period. In NS-27 the interval was almost two times greater and compared to the mean value the percentage was 61.3. The Peredovik's seeds are significantly larger than these of NS-27. The difference in 1000-seed weight is 20.2 g. The variation in Peredovik was from 48.4 to 68.0 g and for NS-27 from 35.2 to 47.0. Although there was a great difference in the mean values of the character the variety and hybrid variability had nearly the same limits. Whereas in seed number per plant and 1000-seed weight Peredovik and NS-27 were differed rather well, these were equal in oil content in the seed. The mean values were in ranges of 43.6 to 51.8% and the variability referred to the average one for the period was 15.6-16.8%.

#### Conclusion

The varieties and hybrids studied responded the same way to the

drought and high temperatures.

The character number of full seeds per plant was marked by the highest variability and by the lowest one - oil content in the seed. The 1000-seed weight character possessed an average variability.

Table 1. Seed yield in kg/ha

Year	1982	1983	1984	1985	On the average for four years
Variety					
Hybrid					
No 260	2741	2505	3062	1574	2470
Hemus	3347	2765	3123	1787	2759
Peredovik	3072	2561	2938	1801	2593
Var. average	3053	2610	3041	1721	2606
No 486	3575	2421	2947	1516	2615
NS-26	2870	2417	3062	1781	2532
NS-27	2504	2179	2605	1570	2214
Hybr. average	2983	2339	2871	1622	2453
in % of the varieties	97.7	89.6	94.4	94.2	94.1

Table 2. Main yield elements.

Year	Seed No per plant		1000-seed weight-g		Oil content in %	
	Peredovik	NS-27	Peredovik	NS-27	Peredovik	NS-27
1982	1391	2024	58.3	35.5	51.1	51.8
1983	1100	1380	58.4	39.3	49.5	49.9
1984	1185	1384	65.8	47.0	51.7	49.8
1985	913	1137	48.4	35.2	46.5	48.2
1986	1058	1405	60.5	38.6	47.2	47.6
1987	1055	1352	68.0	42.7	43.6	44.2
at the average	1117	1447	59.9	39.7	48.3	48.6

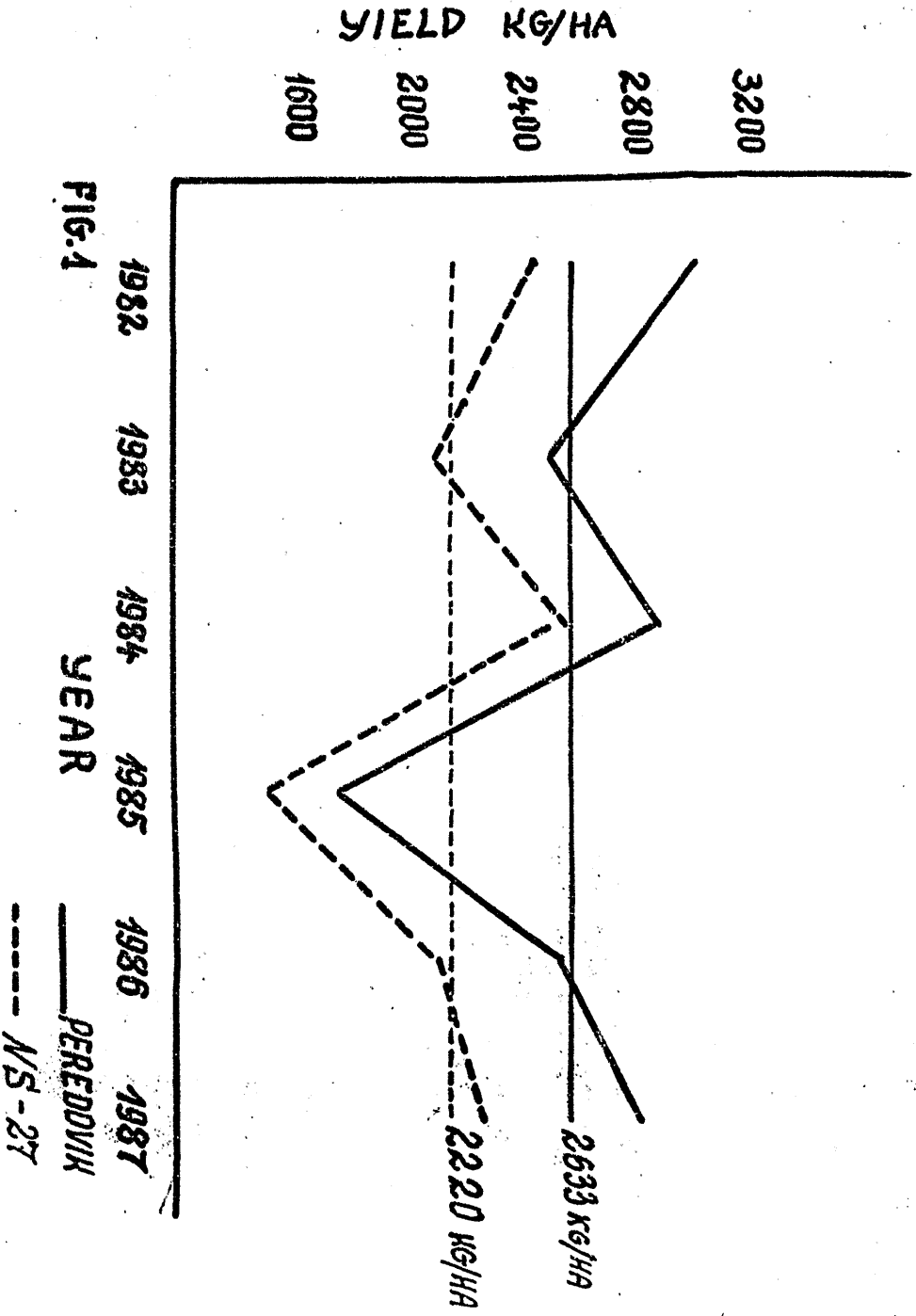


FIG. 1

YEAR

PEREDOVIK  
N/S-27