

Solovyov A.B.

PhD, associated professor of the Belgorod national research University «Belgorod state University», Belgorod, Russia, solovev@bsu.edu.ru

Polyakova T.A.

PhD, associated professor of the Belgorod national research University «Belgorod state University», Belgorod, Russia

Vagurin I.Y.

Graduate student, Belgorod national research University

Tarubarova A.N.

Student, Belgorod national research University

THE INFLUENCE OF AGRO-CLIMATIC CONDITIONS ON THE YIELD OF SUNFLOWER IN THE BELGOROD REGION¹

The Belgorod region is the agrarian district, and industrial crops have a significant share in the structure of the regional crop pattern. Therefore, the study of agro-climatic potential of the Belgorod region and the changing conditions of the industrial crops growth which depend on climate variations are very important for further development of the regional agricultural complex. Scientifically-based measures increasing the efficient use of the agro-climatic resources can significantly improve the efficiency of agricultural production in the region.

In recent years, the dynamics of the industrial crops yield in the Belgorod region was markedly affected by the specific material conditions, and changes if the agro-climatic conditions. The most important industrial crop in the region is sunflower. Since 1999 in the structure of the regional crop pattern the share of sunflower has began to increase rapidly. However, the highest value it has reached in recent years – more than 180 thousand quintals per hectare (2010-2015). The average yield of sunflower in the Belgorod region for the period under review was 16.5 quintals per hectare of harvested area. The lowest yield was marked in 1980 - 2.9 quintals per hectare (Fig.1.).

First, we defined the weather indicator, informative for assessment of the effectiveness of the techniques of agricultural machinery. To our opinion, as a weather indicator of the degree of favorability for the cultivation of sunflower it is necessary to use hydrothermal coefficient (HTC) for a number of years. It should be considered as favorable the terms of a magnitude of the HTC during the period of active vegetation, which is equal to or greater than the mean of multiyear values. Accordingly, to adverse conditions the factors that will be less than the average of annual value may be referred. This will give the opportunity to really see the share of factors influence over the productivity of sunflower in long-term changes of the weather conditions.

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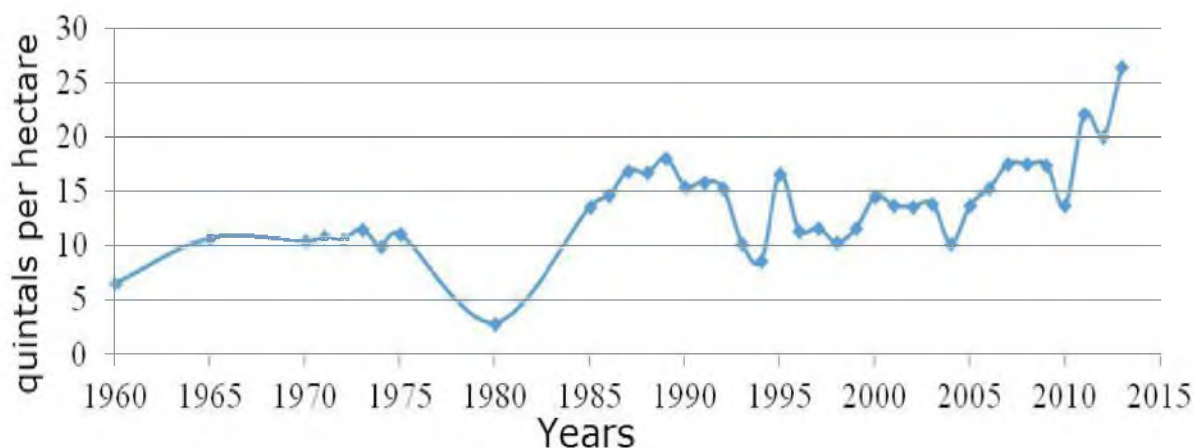


Fig.1. Dynamics of sunflower productivity in the region

Analysis of HTC for the period of active vegetation of crops in the southwestern part of the region over a long period indicates the clear trend of its lowering

The research showed that current climatic changes over the territory of Belgorod region are expressed as follows: the duration of vegetation period and the amount of active temperatures have been increased, winters have become milder without extreme cold temperatures. But, however, the quantity of rainfall (June-July) has been decreased [1]. The volatility of productive moisture stocks in the arable layer of soil has been significantly increased in late summer - early September [2].

The impact of agro-climatic factors on the yield of the industrial crops was assessed on the average from 2 to 4%. The lack of heat is inhibited the germination of sunflower. The analysis showed that the development of plants and their productivity largely are depended on the combination of meteorological conditions in different periods of the growing season. Favorable moisture conditions in the first half of seeds formation, during the intensive growth of the seed and low relative humidity at the end of this period contributes to a more full achenes. On average over the entire period of seeds formation such regularity is observed: the lower the air temperature (in the range of 18.7 - 26°) and higher average daily relative humidity (in the range of 44.3 – 70.9%), the greater is the weight of seeds.

The oil content of sunflower is determined by its varietal opportunities and conditions, in particular by the hydrothermal regime during the formation of seeds.

It was determined that at a relatively low temperature during the formation of the seeds oil contains more unsaturated acids, primarily linoleic. It was revealed that at late sowing dates (3 - 9 June), when the oil formation occurs during low temperatures, the content of linoleic acid in the oil increases. The

level of daily average air temperature also affects seed oil content. The inverse correlation between the seed oil content (kernel) and the air temperature at the time of baskets formation – blooming was determined and straight - in period flowering – ripening.

With adequate moisture and moderate temperatures in the first half of the loading phase, when the oil formation occurs especially intensively, seed oil content is more than in adverse weather conditions. Excessive soil moisture during the ripening of seeds reduces the overall level of oil accumulation on 2 – 3% and increases the biosynthesis of linoleic acid.

However, it should be noted that the level of the water using is not determined only by the water availability of each year, but also by the complex of other climatic conditions, characterized by the so-called coefficient of moisture [1].

Based on the above information we can conclude that the sunflower, like other crops is closely contacted with the climate. And the warming will lead to changes of the sunflower cultivation conditions.

The research showed that natural conditions and agro-climatic resources of the Belgorod region potentially are rather favorable for the cultivation of sunflower. However, due to considerable variability of the agro-meteorological conditions in time and space, the sunflower yield will experience substantial variability by years and by the administrative districts of the region.

References:

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