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WEATHER AND COTTON BOLL RIPENING IN UZBEKISTAN

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Abstract: This article presents the results of a study of the weather and ripening of the cotton boll in Uzbekistan. Methods for predicting the yield of cotton fiber for the provinces of the Republic of Uzbekistan are reviewed. Biological and economic indicators of plants are compared. Scientific research and production experience have shown that only the maximum use of the natural and climatic conditions of the regions, during the growing season of cotton, guarantees that its agrotechnical features are taken into account to obtain stable crops with high quality.
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Introduction

Cotton is a photophilous plant. With a lack of direct sunlight, the plants weaken, stretch upwards and shed their fruit elements. It also reacts strongly to the duration of illumination. Short days are required for normal growth and development. However, different forms of cotton are not equally related to the length of the day. Some authors have found that even within the same species, the response to the light regime in varieties is not the same.

After the emergence of seedlings above the ground, a new stage begins in the development of a young seedling. Its nutrition due to the reserve substances of the cotyledons gradually stops, organic compounds begin to form due to the activity of the green cotyledons, and as the main stem grows, the first true leaves appear sequentially. The higher the temperature, the more favorable the growing conditions, the sooner the first leaf appears, and vice versa. Under normal conditions, this occurs on the 7th - 10th day after germination. Subsequent leaves are first formed on average after 4-5 days, then faster and then on average after 2-3 days. This acceleration in development is associated with an increase in air temperature.

Such calculations were mainly carried out from zero degrees, while the sum of temperatures included both the temperatures necessary for development and those at which the given plant does not develop at all. Therefore, in further studies, more and more attention began to be paid to finding effective temperatures, which are formed not from meteorological zero, but from the temperature at which plant development begins. This is how the concept of effective temperatures arose. The determination of the lower limit of effective temperatures has led to the emergence of a number of mathematical methods for finding it.

The Main Findings and Results

Calculations show that an increase in fiber yield by one percent with modern cotton planting areas on the territory of Uzbekistan will additionally produce about 7-8 thousand tons of fiber. Thus, while maintaining the same production volumes of cotton - fiber in the republic, it is possible to reduce the sown area under cotton by about 15-16 thousand hectares, and this is only by increasing the yield of fiber by one percent. This fact indicates the need for research work during the formation of cotton fiber, depending on agrometeorological factors.

On the issue of the method for predicting the yield of cotton fiber for the regions of the Republic of Uzbekistan, it can be based on taking into account the trend in yield and assessing deviations in yield from the trend line, depending on the agrometeorological conditions of the period of development and formation of the crop, which has the following form:

$$У_П = У_Т \pm \Delta У, \qquad (1)$$

where $У_П$ is the predicted yield of cotton fiber, c/ha or t/ha; $У_Т$ - average yield of cotton fiber by regions, calculated by interpolation or by the trend equation using the method of harmonic weights, c/ha or t/ha; $\Delta У$ –deviation of the average yield of cotton fiber by region from the trend line (c/ha or t/ha) depending on agrometeorological factors.

The yield of cotton fiber is the cumulative economically valuable result of labor of producers. It depends on many factors: the soil and climatic conditions of the cotton season, the natural properties of the breeding variety, the timing and methods of sowing, the placement and density of plants, the technology of cultivating cotton, protecting it from pests and diseases, the state of equipment of ginneries, storage periods and cotton processing technology. -raw, etc. Therefore, the fiber yield can be considered as an indicator of the level of development of the entire cotton-growing complex in any country in the world.

Thus, the trends in the development of the productivity of cotton crops in our country and the decline in the production of cotton fiber are explained by the following reasons: limited and reduced suitable land for cotton production; lack of fresh water for irrigation; decrease in the effectiveness of mineral fertilizers; a drop in soil quality (pollution, soil salinization, climate change, etc.). Based on the above reasons for the decline in the production of cotton fiber, it follows that only a systematic integrated approach in research will contribute to the success of solving the tasks set, and work in this direction continues.

Scientific research and production experience show that only the maximum use of the natural and climatic conditions of the regions, during the growing season of cotton, guarantees taking into account its agrotechnical features to obtain stable crops with high quality.

Comparisons of biological and economic indicators made it possible to note that the yield index of new varieties of raw cotton is more than 55% of the biological mass of plants, for previously sown varieties, the index was 40-45%. Therefore, over the past 5 years, the planting area of new varieties S-6524, Bukhara-8, Bukhara-6, Bukhara-102, Namangan-77, An-Bayaut-2 and Omad has increased, which is more than 70%. Along with this, improvements in the cotton industry made it possible to obtain 5 times more quality fiber, that is, fiber quality increased from 17 to 84%. This is due to the fact that organizations engaged in cotton breeding in the republic, over the years of independence, have achieved significant success in creating and introducing new early-ripening, highly productive varieties of cotton that meet the requirements of the modern textile industry for fiber quality. For example, planted varieties of medium-staple cotton are characterized by such fiber quality parameters as micronaire (range 4.4-4.6), good fiber strength, which meets the requirements of the world cotton market. To assess the quality of the fiber of different varieties of cotton, microneural indicators are used. Micronair is a characteristic of the fineness and maturity of cotton fiber, determined by the breathability of a sample of the fiber. The assessment of microneural indicators is carried out according to the following scale: less than 3.0 - the fiber is very thin; from 3.0-3.9 - thin; from 4.0-4.9 - average; from 5.0-5.9 - rough.

In a practical aspect, the distribution of the size of the distribution area according to the early maturity of various cotton varieties is of interest. In this regard, Figure 1 and Table. 1 shows the distribution of the size of the sowing area by early maturity, namely: very early ripening varieties of cotton and these mainly include cotton varieties An-Bayavut, Namangan-77, Bukhara-102, Andijan-35, S-4727, Omad and under production conditions, which occupy 46% of the total area under crops.

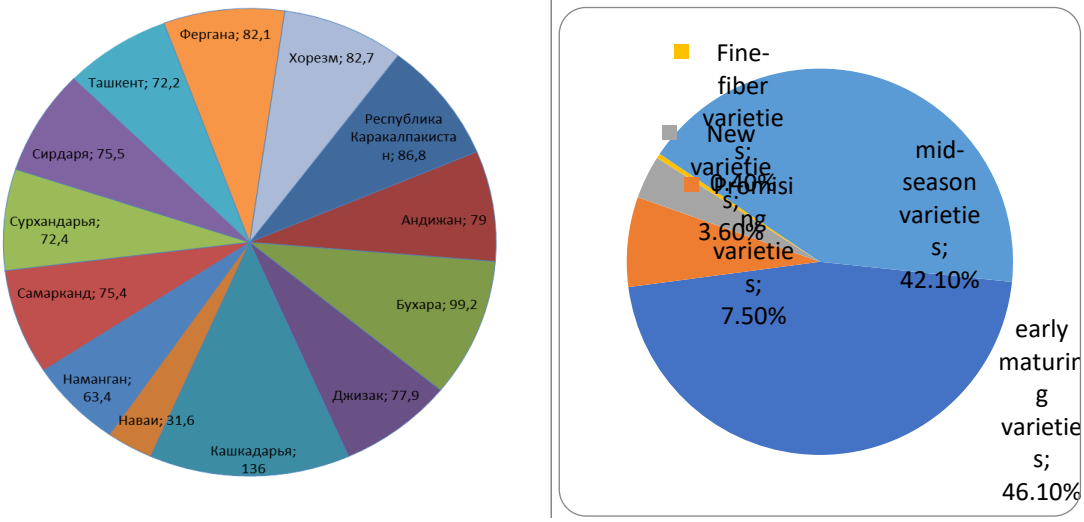

Figure 1. In 2022, the percentage distribution of cotton sown areas in the regions of Uzbekistan and Karakalpakstan in relation to the sown areas in the whole country and the distribution of the area sown with early maturing varieties of cotton.

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From the presented diagram, it can be seen that the second place in terms of area coverage (42%) is occupied by mid-ripening varieties of cotton, and promising and new varieties, respectively - 7.5% and 3.5%. The last place in terms of sowing area, fine-fiber varieties are a meager value - only 0.4%.

It should be noted that over the past 5 years, micronure indicators have been used to assess the quality of the fiber of different varieties of cotton. The assessment of microneural indicators is carried out according to the following scale: less than 3.0 - the fiber is very thin; from 3.0-3.9 - thin; from 4.0-4.9 - average; from 5.0-5.9 - rough.

Table 1. Zoned varieties of cotton recommended for sowing on the territory of the Republic (R) of Karakalpakstan and regions of the Republic of Uzbekistan

region number	Republic (R), region	Cotton varieties recommended for sowing in 2022	Total number of varieties
1	R Karakalpakstan	Sultan, Akdarya-6,S-4727, Chimbay 5018	4
2	Andijan	Andijan-35, Andijan-37, Andijan R-37	3
3	Bukhara	Bukhara-6,Bukhara-102,Porlok-4,Andijan-37, Bukhara-8	5
4	Jizzakh	Sultan, Bukhara-102, An-Bayavut-2, Porlok-4,S-6524	5
5	Kashkadarya	Bukhara-6, Bukhara-9,S-01	3
6	Navoi	Bukhara-6, Namangan-77, Porlock-1, Bukhara-102	4
7	Namangan	Namangan-77, S-6577, Sultan-6524	3
8	Samarkand	Omad, Sultan, S-8266	3
9	Surkhandarya	Sultan	1
10	Syrdarya	Bukhara-102, Porlock-1, Sultan	3
11	Tashkent	Namangan-77, S-6524, Bukhara-102	3
12	Fergana	S-8290, Andijan-37	2
13	Khorezm	Khorezm-150, Khorezm-127	2

In Uzbekistan, certification of cotton fiber is carried out at the Sifat-Quality Center. A new system of certification of compliance of cotton fiber with international standards has been introduced.

The grade of cotton fiber is determined by its color and maturity. Five varieties of cotton fiber have been established in both medium-staple and long-staple cotton fiber. Varieties are called ordinal numbers in Uzbek: BIRINCHI, IKKINCHI, UCHINCHI, TURTINCHI, BESHINCHI, ("FIRST, SECOND, THIRD, FOURTH, FIFTH.")

The BIRINCHI variety is given for normally ripened cotton, not damaged by weather conditions. The remaining varieties differ in the presence of spots, deterioration in the appearance of the fiber, its maturity.

For varieties BIRINCHI and IKKINCHI, the basic range of the micronaire index is from 3.5 to 4.9. When deviating from this interval, cotton fiber of the BIRINCHI and IKKINCHI varieties decreases in price.

The class of cotton fiber characterizes the content of its contamination in the form of defects and weed impurities. The classification system by class is the same for medium-staple long-staple cotton fiber. The BIRINCHI and IKKINCHI varieties have five classes each, the UCHINCHI and TURTINCHI varieties have four classes each, and the BESHINCHI variety has three classes. In total - 21 classes. The classes are called OLIY, YAKSHI, URTA, ODDIY, IFLOS, which in Uzbek means High, Good, Average, Ordinary and Weedy. For each class in each variety, limiting norms of weediness are established. Samples of cotton fiber according to its grades and classes, designed to classify the fiber by appearance, are produced in five boxes, each of which contains all classes of fiber of the same grade. Each class is represented by two cells.

For practical purposes, it is very important to study the agrometeorological conditions for the formation of raw cotton fiber and the forecast of its quantity on the territory of our republic. In this direction, a number of works were carried out (A. K. Abdullaev, R. S. Nazarov, G. Kh. Kholbaev, Kh. R. Kutlimuratov and M. B. Ruzieva, etc.), in which the influence of agrometeorological factors on the formation raw cotton fibers. This topical research work, carried out according to the requirements of manufacturers, continues in the context of climate change.

In general, in Uzbekistan, the dates of the air temperature transition through 10^0C will shift in spring by five to ten days to an earlier period, and in autumn by five to fifteen days to a later period, and the sum of effective air temperatures will increase by 9-16%.

Due to the increase in temperature, the dates of their transition through the biological limits and phases of vegetation are shifted, so it is necessary to shift the sowing

of crops to earlier dates, otherwise the generative period will take place at elevated, relatively optimal, air temperatures. A shift in sowing dates relative to the optimal ones by 5-10 days reduces the yield by an average of 10-20% if the moisture supply is insufficient. With optimal water supply and the existing reclamation state, with an increase in air temperature by 1-2°C and sowing at the optimal time, an increase in productivity by 3-12% is possible. With a further increase in air temperature by 2-3°C and higher, the yield decreases by 2-4%. For the regions of the Ferghana Valley and the Samarkand region, the increase in temperature is generally favorable under the accepted scenarios and leads to an increase in yield by 2-10%. In Surkhandarya region, temperatures above the norm by 2-3°C reduce crop productivity by 4%, in Karakalpakstan - by 2-3%.

Conclusion

However, as estimates have shown, an increase in the number of days with air temperatures above 39°C can lead to an additional reduction in the cotton yield by 5-20%. In conditions of low efficiency of irrigation systems and limited water resources, irrigation water supply is low. Only 40% of the water entering the borders of viloyats reaches agricultural crops directly (40% are losses in the irrigation network, 20% are losses during irrigation). A decrease in water supply to 80% of the required one leads to a reduction in crop yields by 15-18%, and with a water supply of 50%, crop losses reach 35-49%. Under conditions of low water availability, stress conditions intensify with an increase in the number of days with high air temperatures. During the growing season, crop losses amount to 20-25%. Potential benefits in agriculture under climate change: reduced ripening time and increased productivity of early crops; an increase in the growing season of industrial crops (especially cotton), which will lead to the opening of a larger number of ripe bolls. However, the data obtained in such ways are only relative. Biological significance cannot be attached to them, especially in relation to the lower temperature limit at which germination processes begin in the seed of plants. Therefore, the establishment of the biological values of the desired temperature values is of great theoretical and practical importance. This indicator is most important for resolving the issue of the timing of sowing crops, in particular such an important industrial crop as cotton.

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