

## AGRICULTURAL SCIENCES

### THE INFLUENCE OF PLANT QUANTITY AND USING GROWTH REGULATOR “APPETIZER” ON THE COEFFICIENT OF BRANCHING OF SORGHUM BICOLOR HYBRIDS IN CONDITIONS OF THE STEPPE ZONE OF UKRAINE

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DOI: <https://doi.org/10.30525/978-9934-26-498-6-7>

Sorghum bicolor is grown for using its grain in the food industry (production of starch, syrups, cereals, alcohol, etc.) and its biomass recently in the energy industry (production of bioethanol, briquettes and pellets) [3]. The key to obtaining high yields when growing agricultural crops is the realization of the genetic potential of plants [1], which is possible only due to a correctly selected set of agrotechnical methods and elements of growing technology. One of the critical periods while vegetation of sorghum bicolor is the phase of branching. The deficit of moisture and nutrients at this time lead to the formation of a panicle of a smaller size as well as a smaller number of flowers than the hybrid potentially should have. Plant growth regulators are one of the adaptive elements of modern cultivation technologies, as they ensure an increase in the absorption and assimilation of nutrients by plants, improve their productivity, while being economically and practically beneficial [2]. This became a prerequisite for studying the branching of sorghum bicolor hybrids depending on the plant quantity and using the plant growth regulator “Appetizer” (consists of seaweed extract – 95,2%, manganese chloride – 1%, zinc chloride – 1%).

We created a scheme of a three-factor experiment to achieve the set goal, in which the first factor is sorghum bicolor hybrids of different maturity groups: Kalatur, EC Alize, EC Foen, Albanus and EC Musson. The second factor is the plant quantity – 170, 200 and 230 thousand units per ha. The third factor is the application of the plant growth regulator (PGR) “Appetizer” in the phase of 4–5 leaves and in the phase of 7–8 leaves with a consumption rate of the regulator of 0.5 l/ha and a consumption rate of the solution of 150 l/ha.

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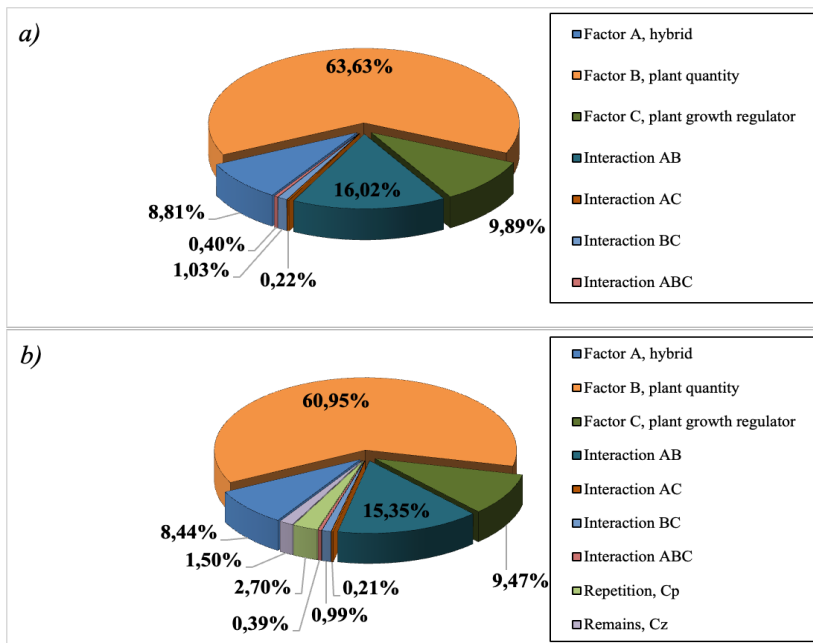
Cultivation technology in the experiment is generally accepted for the Steppe zone, with the exception of the studied elements. The predecessor is winter wheat. The soil of the experimental site is ordinary chernozem. Repetition of variants was a fourfold. Results that we obtained are recorded in Table 1.

Table 1

**Branching coefficient of sorghum bicolor hybrids depending on the plant quantity and using the plant growth regulator “Appetizer” during 2022-2024**

Plant quantity	Plant growth regulator	Hybrid	Period of research			
			2022	2023	2024	Average
170 thousand unit per ha	Standard	Kalatur	1,2	1,4	1,2	1,3
		EC Alize	1,1	1,2	1,0	1,1
		EC Foen	1,2	1,4	1,2	1,3
		Albanus	1,6	1,4	1,2	1,4
		EC Musson	1,5	1,5	1,4	1,5
	PGR	Kalatur	1,5	1,5	1,4	1,5
		EC Alize	1,3	1,4	1,2	1,3
		EC Foen	1,5	1,5	1,4	1,5
		Albanus	1,8	1,7	1,4	1,6
		EC Musson	1,7	1,8	1,6	1,7
200 thousand unit per ha	Standard	Kalatur	2,4	2,3	2,1	2,3
		EC Alize	2,2	2,1	2,1	2,1
		EC Foen	2,5	2,4	2,2	2,4
		Albanus	1,7	1,6	1,5	1,6
		EC Musson	2,4	2,3	2,1	2,3
	PGR	Kalatur	2,7	2,8	2,6	2,7
		EC Alize	2,4	2,4	2,3	2,4
		EC Foen	3,0	2,9	2,8	2,9
		Albanus	2,3	2,4	2,0	2,2
		EC Musson	2,7	2,8	2,6	2,7
230 thousand unit per ha	Standard	Kalatur	1,4	1,4	1,3	1,4
		EC Alize	1,7	1,6	1,4	1,6
		EC Foen	1,2	1,2	1,0	1,1
		Albanus	1,7	1,5	1,4	1,5
		EC Musson	2,2	2,1	2,1	2,1
	PGR	Kalatur	1,7	1,6	1,5	1,6
		EC Alize	2,0	1,9	1,7	1,9
		EC Foen	1,5	1,5	1,3	1,4
		Albanus	2,1	1,8	1,6	1,8
		EC Musson	2,4	2,4	2,3	2,4

Based on the results of the research 2022–2024, we conducted a variance analysis and established the influence of the studied factors and their interaction (figure 1) on the branching of sorghum bicolor and smallest significant differences (SSD<sub>05</sub>).



**Figure 1. The influence of the studied factors and their interaction on the branching of sorghum bicolor according to the results of variance analysis: a) in the factorial sum of squared, %; b) in the total sum of squared, %**

So, SSD<sub>05</sub> is equal to 0,06 for factor A; 0,04 – for factor B; 0,04 – for factor C; 0,1 – for interaction between AB, BC, AC and ABC. The highest index was recorded at variant Kalatur (k=2,7), EC Foen (k=2,9) and EC Musson (k=2,7) with plant quantity 200 thousand units per ha and the application of the plant growth regulator “Appetizer”.

The lowest index was recorded at variant EC Alize (k=1,1) with plant quantity 170 thousand units per ha without application of the PGR and EC Foen (k=1,1) with plant quantity 230 thousand units per ha without application of the PGR.

Analysis of variance indicates that the actual difference in branching is 0,02-0,33 between hybrids; also, this index increases by 0,94 with an increase of plant quantity to 200 thousand unit per ha, and increases by 0,27 with an increase of plant quantity to 230 thousand unit per ha (compared with the variant of 170 thousand unit per ha). The branching index of plants is increased by 0,31 when the plant growth regulator ‘Appetizer’ is used in comparison to the standard. In general the coefficient of the branching of sorghum bicolor hybrids differs from 1,1 to 2,9 depending on the plant quantity and application of the plant growth regulator “Appetizer”.

Despite the fact that the ability to branching of sorghum plants is a positive aspect because secondary stems compensate the loss of plants during the period of the vegetation, there are also negative sides such as secondary stems often do not give ripe grain and complicate the harvesting.

On the assumption of the results, we consider that the ability to purposefully regulate the process of branching by agrotechnical measures takes an important place in cultivation technology and the using of the plant growth regulator “Appetizer” is adaptive element of growing technology of sorghum bicolor in the conditions of the Steppe zone of Ukraine.

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