SUMMARY

of the doctoral thesis entitled:

RESEARCH REGARDING THE BEHAVIOR OF SORGHUM HYBRIDS CULTIVATED IN PEDOCLIMATE CONDITIONS FROM A.R.D.S. BRĂILA

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The plant that was the subject of this work is represented by grain sorghum (Sorghum bicolor). This plant is characterized by its ability to adapt to soils poorer in nutrients and in restrictive climatic conditions, represented by poorer supply in precipitation and the presence of prolonged heat.

These conditions have been increasingly common in the last period of time worldwide and implicitly in our country, which led to the finding of new genetic and technical solutions with the aim of counteracting the negative effects induced by climate change.

The aim of the work was to research and to observe the characteristics and behavior of some grain sorghum hybrids sown at two different densities in terms of biological characteristics, grain production and characteristic biomass on the component parts of the plant and total biomass per hectare.

The work was structured in two parts. The first part represents the bibliographic study carried out within the addressed theme and is divided into two chapters. The second part is represented by the own research that highlights the material and working method and the results obtained during the years of the study.

Chapter I presents the current state of knowledge of grain sorghum cultivation with references to the importance of the crop, systematics of sorghum, global and national cultivated area evolution along with cultivation technology and the use of sorghum in various branches of industry. These elements were taken from the specialized literature, from researchers who studied and were in direct contact with the sorghum culture.

Grain sorghum ranks fifth in worldwide cereal cultivated area. In the period 2016-2021 it was cultivated on 41.2 million hectares, African countries representing the main countries cultivated with this plant.

In **Chapter II**, the institutional framework and the natural framework of own research are highlighted. The work was developed within two institutions, these being the University of Agronomic Sciences and Veterinary Medicine from Bucharest together with the Agricultural Research-Development Station from Brăila.

In the first of these institutions, the theoretical studies were carried out, with the help of university professors and experts in the field of agricultural research. The practical studies took place in the second mentioned institution, A.R.D.S. Brăila, a suitable framework for setting up and monitoring experiences in the field, but also for using the laboratory to extract the results in order to place them in the written work.

From the point of view of the natural conditions, the pedo-climatic conditions and the difference between them specific to the years of the experience are highlighted. The year 2021 stands out from the point of view of the amount of precipitation, with a positive deviation of 147 mm compared to the multi-year average.

Chapter III refers to the objectives of the research and the material and methods used in conducting the experiment. The objectives of the research were the establishment and proper maintenance of the experience in the field of research from Braila; making observations in field and laboratory conditions and interpreting the results and drawing the resulting conclusions.

Regarding the material and working methods, the experience was bifactorial with Factor A represented by hybrids, with eight graduations: Es Alize, ES Shamal, Es Arabesk, Es Foehn, Anggy, Ggustav, Bellugga, and Huggo, and factor B represented by sowing denisty with two graduations: 220 k seeds per hectare and 250 k seeds per hectare. The research was carried out over a period of three years, the years 2021-2023, each of them presenting certain particularities from the climate point of view and from the point of view of the agrotechnical technology used.

Chapter IV presents the results from the 2020-2021 agricultural year represented by the following indices: plant height, number of leaves, leaf surface index, panicle length, total biomass obtained per hectare, dry matter production per hectare, average grain weight of panicles, hybrid production per hectare and thousand kernel weight (TKW).

The average height of the hybrids was 118.6 cm for the two densities used, the highest values being obtained for the density of 220 k seeds per hectare. The Es Foehn hybrid recorded the highest average height of 130.1 cm, being very significantly positive compared to the experience average.

Biomass production per hectare varied within the limits of 12.83 t/ha for the Bellugga hybrid and 22.97 t/ha for the Es Foehn hybrid.

From the point of view of grain production of the hybrids, the average value obtained in the experiment was 7.13 t/ha. The highest production was recorded for the Ggustav hybrid, sown at 220 k seeds/ha, obtaining 8.62 t/ha. The average production for the hybrids sown at the density of 220 k seeds/ha was 7.30 t/ha, and in the case of the other sowing density, the average production was 6.97 t/ha.

Chapter V presents the results of the 2021-2022 agricultural year represented by the same indices as in the previous agricultural year. The 2021-2022 agricultural year stood out from a climatic point of view as very dry. It registered a negative deviation of 155.6 mm compared to the multiannual average, leading to lower results compared to the previous agricultural year.

The average height of the hybrids was 106.0 cm for the two densities used, the highest values being obtained for the density of 220 k seeds/ha. The hybrids Ggustav

and Anggy recorded the highest average heights, 115.5 cm and 115.1 cm, respectively, being very significantly positive compared to the experience average.

Biomass production per hectare varied between 10.87 t/ha for the Bellugga hybrid sown at density of 220 k seeds/ha and 17.54 t/ha for the Es Foehn hybrid sown at 250 k seeds/ha density.

From the point of view of grain production of the hybrids, the average value obtained in the experience was 5.63 t/ha. The highest production was recorded for the Ggustav hybrid, sown at 220 k seeds/ha density obtaining 6.54 t/ha. The average production for the hybrids sown at the 220 k seeds/ha was 5.70 t/ha, and in the case of the other sowing density, the average production was 5.56 t/ha.

In **Chapter VI**, the results of the 2022-2023 agricultural year are presented, represented by the same indices as in previous agricultural years. The 2022-2023 crop year was very close to the multi-year average, recording a negative rainfall deviation of 4.1 mm. The average height of the hybrids was 107.9 cm for the two densities used, the highest values being obtained for the density of 220 k seeds per hectare. Huggo and Anggy hybrids recorded the biggest average heights of 117.5 cm and 115.8 cm, respectively, being very significantly positive compared to the experience average.

Biomass production per hectare varied between 12.26 t/ha for Bellugga hybrid sown at 220 k seeds/ha and 17.54 t/ha for Anggy hybrid sown at 250 k seeds/ha.

From the point of view of grain production, the average value obtained in the experience was 7.60 t/ha. The highest production was recorded for the Ggustav hybrid, sown at 220 k seeds/ha, obtaining 9.26 t/ha. The average production for the hybrids sown at 220 k seeds/ha density was 7.82 t/ha, and in the case of the other sowing density, the average production was 7.33 t/ha.

Chapter VII presents the average results of the experience during the three years of the study, the years 2021-2023.

The average plant height was 110.8 cm. At the density of 220 k grains/ha, higher values were recorded compared to the density of 250 k grains/ha plot. The average height of the hybrids sown at density of 220 k grains/ha was 112.2 cm, and in the case of the other sowing density, the average was 109.5 cm. The highest value corresponds to the Anggy hybrid sown at density of 220 k grains/ha, which is 119.7 cm.

The number of leaves per plant turned out to be higher in the case of the 220 k grains/ha density compared to the 250 k grains/ha density for the three years studied. For the initial sowing variant, the number of leaves presented the average value of 7.9 leaves/plant, and for the density of 250 k grains/ha, the average value of the number of leaves per plant was 7.6.

The leaf area index (L.A.I.) presented an average of 2.90 during the years 2021-2023 for the two densities. For the sowing density of 220 k grains/ha, L.A.I. recorded the average value of 2.86, lower than 2.96, which is the corresponding value of the average L.A.I. for the density of 250 k grains/ha

From the perspective of panicle length, the average value was 23.7 cm for the years 2021-2023 at the experience level. For the 220 k grains/ha sowing density, the average value obtained was 24.3 cm. In the case of the other sowing variant, the panicle length recorded an average of 23.2 cm.

The total secondary biomass obtained per hectare had an average value of 17.08 t/ha at the study level. The 250 k grains/ha sowing density proved to be more productive, thus obtaining the average amount of 17.73 t/ha, superior to the amount of 16.40 t/ha, corresponding to the sown density of 220 k grains/ha. The most productive hybrids were Anggy, which obtained 18.17 t/ha for the density of 220 k grains/ha and the hybrid Es Foehn, with the production of 19.76 t/ha for the density of 250 k grains/ha.

The dry matter per hectare presented the upper average value for the sowing density of 250 k grains/ha within the experiment. For this parcel, the amount of dry matter obtained was 4.65 t/ha, and for the parcel of 220 k grains/ha, the average production of 4.38 t/ha was obtained.

The 220 k grains/ha sowing density proved to be more advantageous in terms of grain weight per panicle. For this variant, the average value obtained was 37.0 g/panicle, compared to 32.7 g/panicle for the sowing density of 250 k grains/ha. At the experience level, the average grain weight per panicle was 34.8 g.

Grain production per hectare recorded over the three years at the experience level was 6.79 t/ha. For the density of 220 k grains/ha, the production of 6.94 t/ha was obtained, being superior to the amount of 6.62 t/ha, corresponding to the sown density of 250 k grains/ha. The most productive hybrids at the level of experience were Ggustav and Anggy, with productions of 7.90 and 7.53 t/ha, respectively.

Chapter VIII presents the individual conclusions of each year of the experience: 2020-2021, 2021-2022, and 2022-2023. The first agricultural year stands out from a pluviometric point of view, in that a quantity of 147 mm of precipitation was recorded compared to the multi-year average. This contributed decisively to the very good development of the plants and to obtaining a grain production of 7.13 t/ha and a secondary biomass production of 19.40 t/ha.

The second agricultural year was characterized by a very pronounced rainfall deficit compared to the multi-year average. This year recorded 286.3 mm of precipitation, 155.7 less than the years' normal. This deficit was manifested in a reduced amount of grains and secondary biomass compared to the previous year.

The agricultural year 2022-2023, the last of the experience, presented an amount of precipitation very close to the multiannual average, with a negative deviation of 4.1 mm and an increase in temperature of 1.7°C.

The grain production obtained was 7.60 t/ha, and the secondary biomass production was 17.10 t/ha.

As recommendations, very important are the choice of superior hybrids in terms of production potential and tolerance to diseases and pests, the choice of a clean land in terms of Sorghum halelpense infestation, the use of agrophytotechnical methods suitable for perfecting the potential of hybrids sorghum you use.