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THE BEHAVIOR OF SOME SUNFLOWER GENOTYPES UNDER ASPECT OF VARIABILITY OF THE PRODUCTIVITY ELEMENTS

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Abstract
The objectives for improvement concerning the sunflower may vary a lot dependent on production area, abiotic stress and cultivators' preferences. Before developing a program for each character improvement, it is essential to be determined the existent variability and the hereditability method. Also, there is needed some knowledge on the correlations existent between the considered characters. The selection of a character may alter the other characters, sometimes reducing the genetic gain. The researches accomplished in the central area of Oltenia (Romania), have demonstrated the different reaction of some sunflower hybrids depending on the genotype. Although some experimented hybrids have presented a sunflower capitulum with great diameter, exhibiting an obvious heterosis from this point of view, they have the advantage of a smaller number of seeds, due to the central area with dry seeds, which is greater than in the case of the hybrids with small or medium sized capitulum. For improvement, there are desired genotypes of sunflower with medium compact capitulum. This is the reason why it is appreciated that Romina and Saturn genotypes stand for a valuable matter in selecting the consanguineous lines which are meant to accumulate the abundant fructification characters, with productive central area, without dry seeds.

Keywords: genotype, sunflower, variability

1. INTRODUCTION

The agro-production process consists of a series of elements which depending on the soil, the species and the vegetation. They can be of a general character, with mandatory application to all agricultural crops, or a particular character with application for certain crops or applied only to plants (Pandia et al., 2018). The annual forage crops are more often cultivated as mixtures. With a greater application in the practice are cereal and legume mixtures with species from other botanical families as sunflower, rapeseed etc. (Lingorski, 2015).

Sunflower continues to be (after soybean) a world leader of the plants with high nutrition value, as it is considered a miraculous source of food and a therapeutic miracle in the treatment of many diseases. Vegetable oils, such as sunflower, are often used in fast-food foods. Due to consumer health concerns, fat content of some foods is an important parameter to be controlled during processing (Al-Abbad and Basuny, 2011; Basuny et al., 2011; Basuny et al., 2012; Bonciu and Sarac, 2016; Bonciu, 2017). The modern science of nutrition and numerous biotechnological findings suggest that the diet is one of the most important environmental factors affecting the health and the quality of life of every person (Butnariu, 2012; Butnariu and Caunii, 2013; Butnariu, 2014; Butnariu et al., 2016; Rosculete C. et al., 2018; Rosculete E. et al., 2018; Rosculete et al., 2019).

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As a result of changes in the economics of farming, improvement in crop varieties for temperate regions and possibly perceived or actual climate change, several crops are now more widely grown. These crops include sunflower. Sunflower however, is an increasingly important crop in the Romania and literature regarding its pollination requirements abounds from continental Europe and elsewhere. The objective of commercial sunflower hybrids development programs is to develop new inbred lines to produce hybrids that combine to produce high yields and superior agronomic performance. The primary trait breeders seek is yield. Important breeding objectives are also those regarding resistance to drought and heat and pollen self-compatibility. F1 sunflower forms an easy source for the creation of consanguineous lines which restore the pollen fertility, and whose Rf genes are built in the petiolaris type cytoplasm. As in the cases of the genera with free pollination, the improvement value of this source is however conditioned by the genetic diversity of the F1 hybrids. În general, the limited genetic diversity of the commercial sunflower hybrids may be explained by means of the operation of a single source of cytoplasmatic androsterility. Sunflower hybrids have a genetic basis narrower than the one of the genera with free pollination and due to this fact each agro-ecological region needs a certain type of genotype.

2. MATERIALS AND METHODS

The biological material used for the experiment has been represented by 5 sunflower genotypes, in the presence of a control, namely: Romina, Saturn, Festiv, Flavia, Barolo and Favorit (Ct.). The experiment has been located at no irrigated, following the method of multi-stage blocks, in year 2018. There were performed both in the field and lab measurements and determinations regarding the variability of productivity traits: the capitulum diameter, the number of seeds to the capitulum, MMB and the membranes percentage, as well as the seeds production and the oil percentage in the seeds. The oil content in seeds has chemically determined using extraction with ether as solvent in Soxhlet apparatus.
The fluctuation study of some quantitative characters was done based upon the biometrical measurements.

3. RESULTS AND DISCUSSIONS

Experimental results concerning the variability of the sunflower capitulum diameter and the number of seeds to the capitulum are reported in Figure 1. In this respect, compared to Ct (18.8 cm), the researched cultures have registered values between 19.1 cm (Romina) and 21.1 cm (Flavia). Although some experimented hybrids have presented a sunflower capitulum with great diameter, exhibiting an obvious heterosis from this point of view, they have the disadvantage of a smaller number of seeds, due to the central area with dry seeds, which is larger than in the case of the hybrids with small or medium–sized capitulum. For improvement, there are desired genotypes of sunflower with medium compact flower heads. This is the reason why it is appreciated that Romina (19.1 cm) and Saturn (19.4 cm) genotypes stand for a valuable matter in selecting the consanguineous lines which, by means of hybridization, are meant to accumulate the medium – sized capitulum and abundant fructification characters, with productive central area, without dry seeds. Regarding the number of seeds to the capitulum, the Festiv genotype has registered the maximum number of seeds (771 seeds), followed by Flavia (768 seeds), Barolo (720 seeds), Saturn (712 seeds) etc. (Figure 1).
An important method to increase the sunflower seeds yield is the selection for fertilizing the sunflower capitulum central area. However, this character is genetically influenced, but this is not an exhaustive condition. The sunflower capitulum has a variable diameter, according to the

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genotype and the environment conditions. All this was proved by means of the selection of some consanguineous lines with great fertility throughout the flower head area (Bonciu, 2013). This character is transmitted to the first generation hybrids and, although it displays a partial dominance, may provide hybrids with high fertility in the flower head central area, especially if the other genitor possesses such character. From this point of view, the results suggest that Saturn and Festiv genotypes may stand for valuable sources of germplasm in the process of improving the sunflower in order to increase the fertility of the capitulum central area.

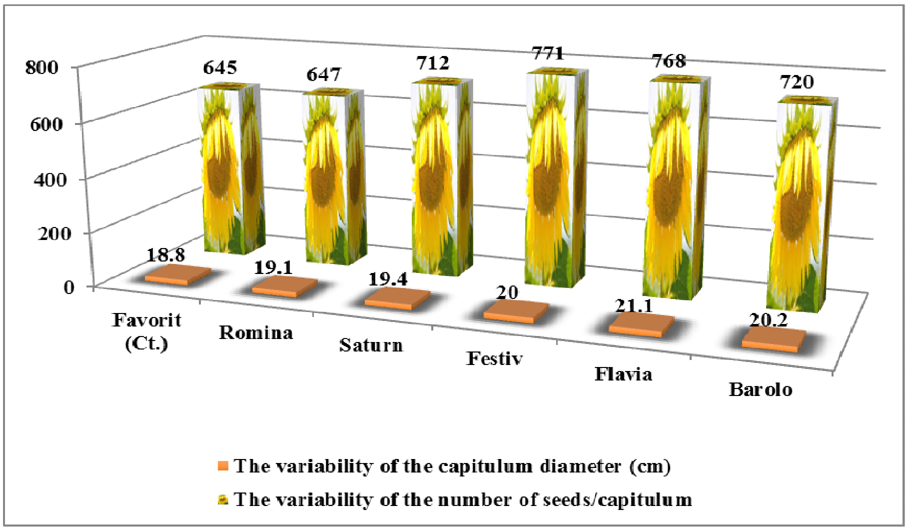

Figure 1. The variability of the capitulum diameter and the number of seeds/capitulum to some sunflower genotypes

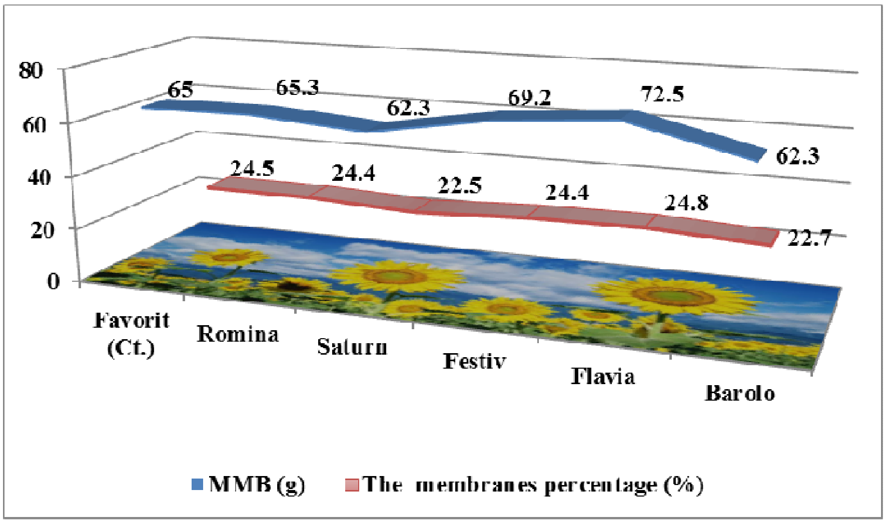

Figure 2. The variability of the MMB value and the membranes percentage to some sunflower genotypes

As can be observed in Figure 2, the most significant MMB value was reported at Flavia genotype (72.5 g), towards the control, while Barolo and Saturn genotypes reported the smallest MMB value (62.3 g), but they also proving the lowest membranes percentage (22.7% and 22.5%); Flavia genotype reported the highest membranes percentage (24.8%).

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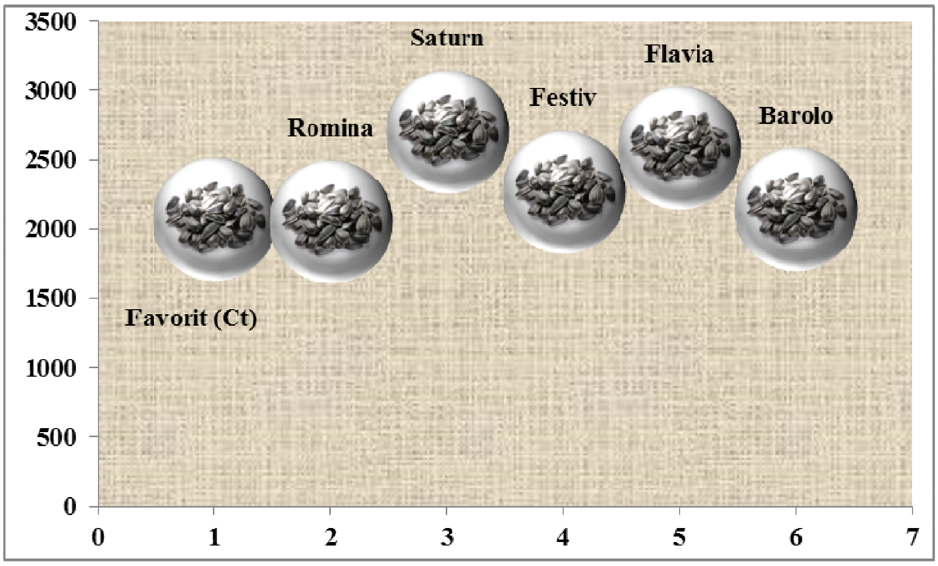
It may be appreciated that the Flavia sunflower genotype may become a valuable matter in the process of sunflower improving in order to achieve a higher MMB. However, there is no need to exaggerate with the MMB increasing, because it implies also a series of disadvantages the most important of which are an increased percentage of husks and a reduced amount of oil extracted from seeds. There is a positive correlation between the low membranes percentage, the high MMB value and the seeds production.



DL 5%=285 kg/ha DL 1%=321 kg/ha DL 0.1%=350 kg/ha

Figure 3. The variability of the seed production (Kg/ha) to some sunflower genotypes

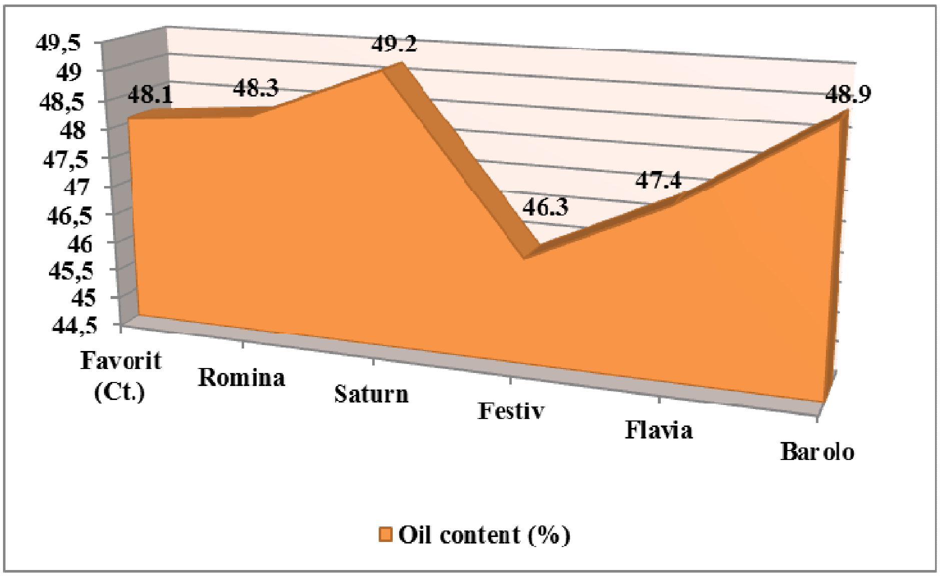


Figure 4. The variability of the oil content (%) to some sunflower genotypes

In Figure 3 is reported a synthesis of the seed production results of the experimented sunflower genotypes. We observe that Saturn and Flavia genotypes has clearly separated from the control, registering a seeds production of 2705 kg/ha (Saturn) and 2593 kg/ha (Flavia), but the most significant oil content value was reported at genotype Saturn (49.2%), followed by Barolo (48.9%)

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and Romina (48.3%) as can be observed in Figure 4. There is a positive correlation between the capitulum diameter and the seeds production.

4. CONCLUSIONS

The experimental results prove the variability of productivity traits to sunflower genotypes experimented. The high ranges registered by the capitulum diameter, prove a wide phenotypical variety from this point of view. Also, all the genotypes they were distinguished as the number of seeds, this being a remarkable character. The highest value of the oil content has been reported by Saturn genotype.

Experimental results suggest the fact that selection for increased yield on the basis of yield elements selection can have important value for sunflower breeding proceeding. The Saturn and Flavia genotypes have demonstrated an excellent adaptability to environmental conditions of the experimental area, and thus it is recommended to be extended into production (in association with Barolo and Romina), in order to achieve a genetic diversity which should suppose a great and constant yield of seed and oil per area unit. Also, these genotypes can be able to be introduced in the programme of improving the sunflower genetics, as parents of the some new productive hybrids.

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