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# THE IMPORTANCE OF KNOWLEDGE OF FOLIAGE SURFACE INDEX (ISF) INFLUENCE ON PRODUCTION

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***Abstract***

*This paper comes from a study of four maize hybrids sown in Amărăşti de Jos Commune, Dolj county, which were cultivated in different variants of plant density per hectare, in order to determine the influence of the foliar system on the average grain production returns per 1 dm$^2$ of leaf, knowing that the number of leaves denotes the vigour of the plant, but with influences on the vegetation period. The four hybrids have been selected for their resistance to water and thermal stress that is established in the S-V Oltenia areas, and the Olt hybrid is the most demanded by farmers to be cropped. As a result of the biometric determinations, all four hybrids behaved very well to the hydro and thermal stress conditions, but the Olt hybrid showed the most significant results for each determined element.*

***Key words*****:** *hydric, thermal stress, hybrid, foliar surface*

## INTRODUCTION

Knowing and using the climatic resources in agriculture is an important source of growth in plant and animal production [2] and agro-climatic risk management.
In this context, the superior valorisation of the entire climatic potential of a certain geographical region, as well as the knowledge of the risks affecting the harvest, is one of the basic conditions of its sustainable develop-pment in economic and social terms [1].
So knowing and recommending to culture the most valuable hybrids is of major importance to farmers. Due to the sandy soils that predominate in S-V Oltenia, the adaptation of these hybrids or the attempt to make a selection only for those who are resistant to water and heat stress is necessary [6, 9].
By increasing the number of plants per square meter there is a significant increase in both the foliar surface obtained by all the plants per unit area (square meter), expressed by the index of the foliar surface, and the total number of grains obtained by a greater number of cobs / square meter. The direct relationship of the two productivity elements with the sowing density has as its limit the decrease of the production produced by the plants [10]. Environmental factors have a greater influence on the protein content of bean protein-rich hybrids than on the protein content of normal hybrids. The use of hybrids adapted to the crop area allows for significant quantitative and qualitative production with satisfactory economic efficiency. The high production potential of selected hybrids can bring a guaranteed profit in the case of an agricultural year with modest rainfall and loss of plants due to excessive environmental conditions [4]. In the paper, Aspects on the Concept of Stress, Heat and Drought in Corn Cultivation, [5] presented the concept of modern hybrids that have been greatly improved for stress-producing production in bloom. In a recent study, 18 hybrids recorded between 1953 and 2001 (about 3 hybrids/ decade) were tested for about 50 days under non-irrigated conditions, with only precipitation water. The genetic gain per year during this period was under non-stress conditions (211 kg ha/yr) with 41% loss in

blooming stress conditions and up to 77% under stressful conditions when filling grains.

## MATERIALS AND METHODS

The studies were conducted in 2017 in the commune of Amărăşti de Jos in Dolj county, more precisely at the agricultural company SC Flamura SA, an unit that takes care of 85 ha of agricultural land, cultivated with various cereal crops in which maize culture holds the highest share. Due to the climatic and soil conditions existing in this area, the plant needs the knowledge of maize hybrids that can be sown under existing conditions. Four maize hybrids: Olt, DKC were studied. 3409, Biocrop, and Kapitalis FAO 410, which were sown in four variants on different densities, namely: 100/31.25 to 50,000 plants/ha; 100/ 43.75 to 35,712.5 plants/ha; 100/56.25 to 27,750 plants/ ha; 100/68.75 (22,750 plants/ ha). In order to determine the number of leaves, the biometric method [8] was used, where average samples of each variant were taken at 100 plants. The value of the correlation coefficient was also determined (± r). Depending on the average foliage area and the yield of the grains on the obtained plant, the amount of grain expressed in grams per hectare of each leaf $dm^2$ was calculated.

## RESULTS AND DISCUSSIONS

For better experimentation, a new hybrid Kapitalis FAO 410 hybrid was taken separately, with high genetic value but also high resistance to water and heat stress. It was cultivated on different densities: 100/31, 25 to 50,000 plants/ha; 100/43.75 to 35,712.5 plants/ha; 100/56.25 to 27,750 plants/ha; 100/ 68.75 (22,750 plants/ha).

Depending on these densities, correlations were made on the average number of leaves per plant, the calculation of the average leaf area of a plant expressed in $dm^2$, the calculation of the grain production on a plant expressed in grams, the calculation of grain production in kg/ha, the calculation of the coefficient expressed in grams of grains for 1 $dm^2$ of the leaf and the calculation for the correlation between the foliar surface and the grain production [3].

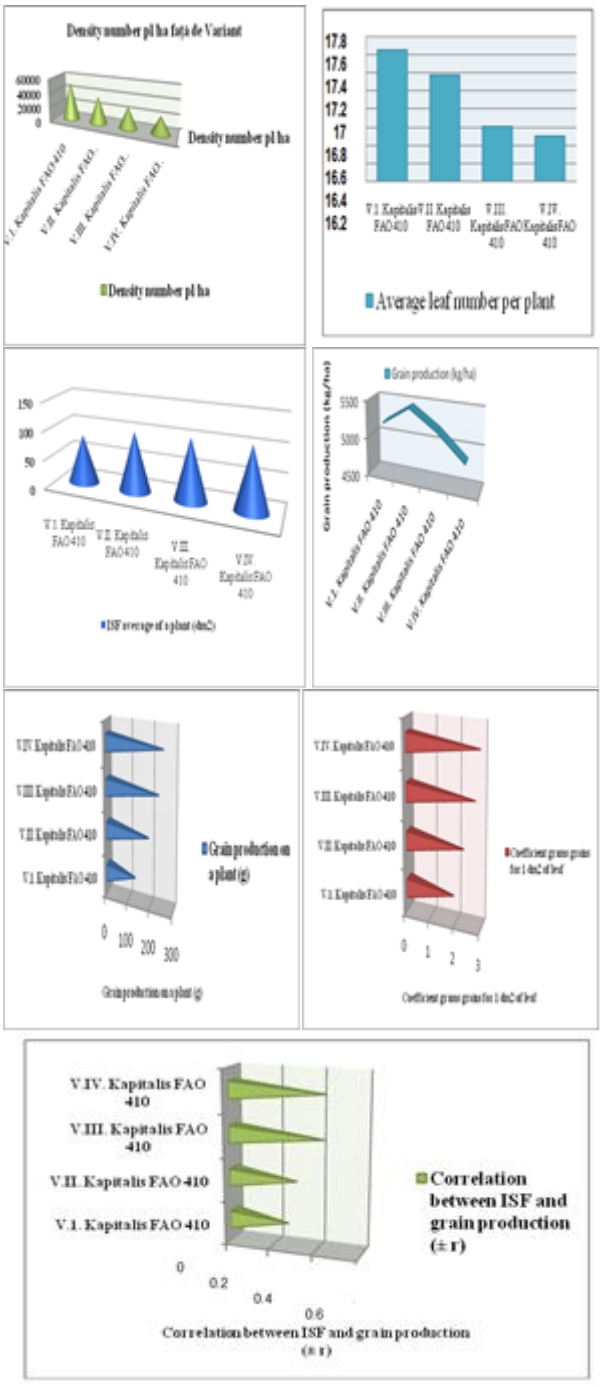


Fig.1. Correlation between the foliar surface and the grain production
Source: Authors' results.

From the data we can see that the number of leaves is influenced by the density of the plants, so in variant I we have the highest density of leaves per plant, respectively 17.65, but also the number is influenced by the leaf size which for these variants is less than

85.2375 dm2, and the second variant having a density of 35,712.5 plants per hectare, the foliar surface is 104.075 dm2.

With the growth of foliar surfaces for variants III and IV, the average number of foliar surface index decreases from 16.8125 to 16.7 for variant IV but we have a more vigorous vegetative growth because of the lower plant density per hectare and thus the foliar average surface area reaching version III with 106.8625 to 108.7125 dm2.

In the case of the calculation of average grain yields expressed in kg/ha, the results obtained show that at low plant density per hectare, production decreases, the highest production is recorded in variant II with 5,445 kg of berries and the lowest at variant IV with a density of 22,750 plants per hectare, the yield of berries is only 4,847.5 kg/ ha.

Grain yields on one plant are those with the highest plant area, and in terms of grain weights per 1 dm2 of leaf, the best results are found in the more vigorous plants, respectively, for variant IV with 2.9 g/dm2 of leaves and is continuously decreasing II followed by variant III and variant I showing the lowest value respectively 1.9 g/dm2 of leaf.

The ratio between the foliar surface and the grain production shows a significant increase from the first variation to the IV variant when the value is 0.435.

Other three hybrids, Olt, DKC 3409 and Biocrop were also taken into consideration for the reasoning of the proposed ones. DKC 3409 and Biocrop hybrids were also characterized for their resistance to water and thermal stress [7].

It was noticed that the Olt hybrid is most often taken in culture in this area with good results being adapted for soil and climate conditions in Amărăşti de Jos, but also the experimentation of the other two hybrids that besides the qualities of the Olt hybrid also have increased resistance against diseases and pests.

For these hybrids, only two densities were taken, namely 50,000 plants per hectare and 22,750 plants per hectare.

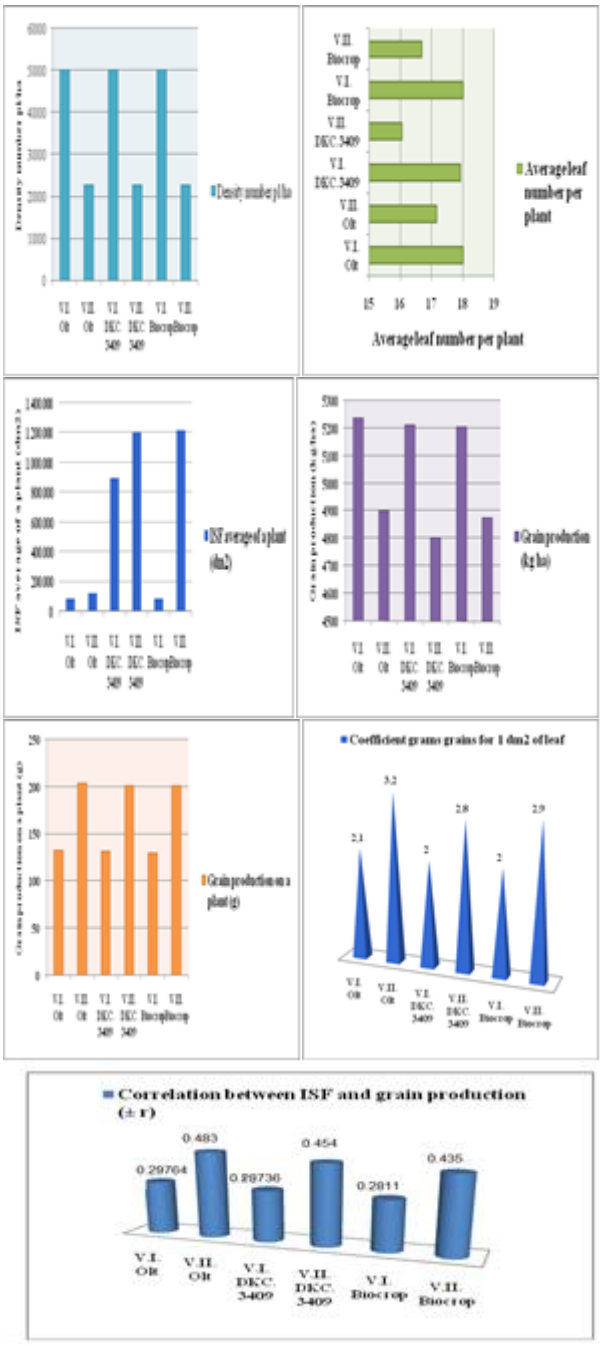


Fig.2. The correlation between the foliar surface ratio and the grain production for the Olt, DKC 3409 and Biocrop hybrids
Source: Authors' results.

From the data obtained for the three maize hybrids experimented on minimum and maximum densities from the Kapitalis FAO 410 hybrid, the best results were obtained by the Olt hybrid at a density of 50,000 plants per hectare in terms of the average number of leaves per hectare which was 18.2 versus the density of 22,750 plants per hectare with an average leaf count of 17.17.

The other two hybrids with 17.92 and 16.5

respectively for the DKC hybrid recorded a slight decrease for this item. 3409 and 18.01 and 16.7 for the Biocrop hybrid.

To study the average ISF of a plant per dm2 of the three hybrids the best results are obtained by the Olt hybrid at a density of 50,000 plants per hectare with a significant increase for the density of 22,750 plants per hectare where the values reach 122.514 at 121.9870.

Depending on plant vigour and vegetative system, grain production expressed in kg/ha is positive for high density variants and 5,236.47 respectively for the Olt hybrid followed by the DKC hybrid. 3409 and Biocrop with 5,201.47 kg berries per hectare.

Regarding the density of 22,750 plants per hectare, the results are decreasing, so the Olt hybrid has a value of 4,898.32 kg/ha compared to 4,847.5 recorded in the Biocrop hybrid. Also, the single-plant grain yield element was studied, the best values are obtained at the highest studied density, and the Olt hybrid has the highest value of 132.312 g with a slight decrease in the DKC hybrid 3409 of 131.615 and Biocrop with 129.871g, instead of studying the same element at lower density production is upward from the Olt hybrid to the other two hybrids studied from 203.6 g to 200.4 and 200.5 g respectively.

Calculation of the grain ratio in relation to 1 dm2 leaves the Olt hybrid to record positive results for both densities, namely 2.1 and 3.2 g/dm2. Calculation of the correlation between ISF and grain production makes all Olt hybrids achieve positive results at a density of 50,000 plants per hectare, ranging from 0.29764 to 0.28110 for the Biocrop hybrid. Not the same result is recorded at the density of 22,750 plants per hectare where the values increase; the Olt hybrid has the value between 0.483 g, DKC. 3409 g has a drop value of 0.454 g, and Biocrop reduces slightly to 0.435g.

From these biometric determinations, hybrids that are more experienced than the Olt hybrid have lower values but can be taken in culture because the foliar appliance is well developed and can provide high yields in water and thermal stress deficiency areas.

## CONCLUSIONS

After studying the four maize hybrids sown in Amărăşti de Jos, there were noticed many important elements that make them to be cultivated in the dried areas., existing in the South - West Oltenia.

The most important element to take into account is the density of the plants per hectare where the Olt Hybrid obtains the best results followed by the Biocrop hybrid.

The grain yield reported for the four hybrids is a normal production characteristic for them and deserves to be taken in cropping but for high plant density relative to the surface unit.

The well-developed foliar system gives rise to vigorous plants and a large grain production.

It is recommended that all the three new hybrids with good genetic dignity to be promoted and in addition, the Olt hybrid has a great capacity to adapt to this area and resist against diseases and pests.

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