

**RESEARCHES ABOUT THE INFLUENCE OF REDUCING THE ASSIMILATION
SURFACE ON NUMBER OF GRAINS/COB CORN AT SOME MAIZE HYBRIDS**

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Abstract

In this work it was analyzed the influence of reducing leaves surface on the number of grains/cob corn at four maize hybrids created at The National Institute for Researches and Development Fundulea. The results show that in the phenological phase of formation of stigmata, at studied hybrids, the most important factor which influenced the number of grains/cob corn were the last three leaves under panicle. On average, leaf removal produced losses in the number of grains /cob corn compared with the control values for all variants tested. Losses ranged between 12 and 26% compared to the control variant. The most obvious reduction in the number of grains / cob corn for analyzed hybrids were recorded in the variant where the leaves are removed from the top of the corn cob and remained only the leaf under the panicle. (74 % of control). In phenological phase of 15 days after stigmata formation, the lowest value of this character was recorded in experimental version which have been removed all the leaves above the cob corn, respectively 80 % of controls, and the maximum value of the analyzed hybrids was registered in experimental version which have been removed all the leaves below the corn cob.

Keywords: maize, hybrids, assimilation surface, number of grains

1.INTRODUCTION

Biomass accumulation by crops depends both on light interception by leaves and on the efficiency with which the intercepted light is used to produce dry matter. [6]. Duncan et al.[3] proved that, basically, the amount of yield depended on the assimilation performance of the plant and described the strong relationship between the yield and the leaf area. Therefore, one of the basic elements of the yield formation process is the development of the assimilation system – especially the leaf blade – of the plant. [9]. Changes in plant architecture also permit modern hybrids to attain higher leaf photosynthetic rates than older hybrids at high plant densities [4].

Research conducted by Voldeng and Simpson at wheat have shown that foliar surface is an indicator of productivity and flag leaf, the most important plant leaf, may have significant role [10]. Other research conducted within I.N.C.D.A. Fundulea described relations between the size of leaf area and net assimilation rate in wheat varieties grown in Romania [5].

Because the role of each leaf in achieving production from corn is less discussed we considered it appropriate to deal with limited, however, this issue of the maize plant biology. They followed this purpose losses recorded by removing the leaves of plants during fertilization thereby reducing the surface of the assimilation. As is known, in works to improve the corn plant is eliminated by castration and 1, 2, 3 leaves, which harm the production, reported in large areas under cultivation.

The foliage of the maize plants (in particular the leaves at the top of the plant) can be destroyed by the extreme weather events such as hail or strong winds, and if this is

manifested by the appearance of stigmata plants, production losses may be considerable. Also, diseases, pests, animal attack, can cause damage to maize leaves.

After GAY and BLOC 1984 quoted by CRISTEA et al., 2004, maize production is the result of six components: the number of plants per hectare, the number of cobs per plant, the number of rows of eggs on the cob, the number of eggs per row, the percentage of embryos, the mass of a thousand grains. Each of these components based on genotype and environmental conditions have a maximum value that cannot be exceeded [2].

2.MATERIAL AND METHOD

The material used for the research was represented by four corn hybrids developed at the National Institute of Research Development Fundulea. Studied hybrids were Olt, Olimp, Campion and Milcov, hybrids which in terms of the growing season are semitardy. They were grown in the climatic conditions of the area of The North Romanian Plain .

To highlight the importance of different leaves from the stalk in sizing some elements of productivity at analyzed hybrids I conducted a two-year experience in the following variants:

- plant with all the leaves (control) ;
- all leaves below the cob eliminated (V1) ;
- all the leaves above the cob eliminated (V2);
- all the leaves above the cob eliminated, leaving a single leaf below the panicle (V3) ;

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- all the leaves above the cob eliminated, leaving two leaves below the panicle (V4);
- all the leaves above the cob eliminated, leaving three leaves below the panicle (V5).

In conventional corn crops surface assimilation growth stops, usually, with the appearance of the panicle [11]. The phenological phases of growth in which elimination were made was :

- the appearance of stigmata (I) ;
- 15 days from appearance of stigmata (II).

At the tested plants was measured, relative to a control plant, number of grains per cob. For comparison, were used control plants that were allowed to grow normally with all the leaves. All results were compared to the value obtained in the control variant, in each case which was considered as 100 %.

3.RESULTS AND DISCUSSIONS

The results are found in tables 1 and 2.

Table 1. Influence of reducing the assimilation surface on the number of grains / corn cob at the appearance of stigmata (average years)

Hybrids/variants	Olt		Olimp		Campion		Milcov		Average	
	No.	% of control	No.	% of control	No.	% of control	No.	% of control	No.	% of control
Control	646	100	662	100	610	100	662	100	645	100
All leaves below the cob eliminated	580	90	584	88	461	78	621	94	562	88
All the leaves above the cob eliminated	532	83	426	64	517	86	508	77	496	77
All the leaves above the cob eliminated, leaving a single leaf below the panicle	532	83	371	56	476	80	519	79	474	74
All the leaves above the cob eliminated, leaving two leaves below the panicle	557	86	492	74	538	89	502	76	522	82
All the leaves above the cob eliminated, leaving three leaves below the panicle	580	90	464	70	532	77	567	86	537	82

Table 2. Influence of reducing the assimilation surface on the number of grains / corn cob at 15 days from the appearance of stigmata (average years)

Hybrids/variants	Olt		Olimp		Campion		Milcov		Average	
	No.	% of control	No.	% of control	No.	% of control	No.	% of control	No.	% of control
Control	671	100	666	100	588	100	592	100	629	100
All leaves below the cob eliminated	553	82	594	89	514	87	558	94	555	88
All the leaves above the cob eliminated	596	89	502	75	388	66	517	87	501	80
All the leaves above the cob eliminated, leaving a single leaf below the panicle	524	78	501	75	575	98	573	97	543	86
All the leaves above the cob eliminated, leaving two leaves below the panicle	619	92	349	52	508	86	552	93	507	81

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All the leaves above the cob eliminated, leaving three leaves below the panicle	638	95	409	61	542	92	570	96	540	86
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Defoliation of maize plants at the appearing of stigmata negatively influenced the number of grains/cob at experimented hybrids (Table 1). The plants had a different number of grains on the cob from a hybrid to another and from one variant to another depending on the number of leaves removed and the contribution that they make to the formation of this character. In the process of photosynthesis, apart from leaves, a considerable role may also be played by stems and cob covering leaves [8].

By eliminated all leaves below the cob (V1) values obtained at analyzed hybrids were ranged from 78 % of control in hybrid Champion and 94 % of control in hybrid Milcov. Higher values of the number of grains / cob have achieved hybrids Olimp and Olt (88 and 90 % of control). The lowest number of grains /cob was obtained by hybrid Campion (78 % of control).

When was eliminated all leaves above the cob (V2) the number of grains /cob ranged between 64 and 86 % of control from one to another hybrid. The lower values was obtained from the hybrid Olimp (64 % of control) and the maximum from the hybrid Champion (86 % of control). Values close to maximum where obtained from the hybrid Olt 83 % of control.

If a single leaf remained under panicle and the other above the cob were removed, their removal has influenced also negatively number of grains /cob. Thus, the values obtained ranged between 56 and 83% of selected control. It had a minimum value at Olimp hybrid and a maximum from Olt hybrid. High values , close to maximum were recorded at the hybrids Milcov and Campion (79 and 80 % of control).

If two leaves remain under panicle and above the cob were eliminated (V4), the number of grains /cob reached values between 74 and 89 % of control (Olimp - 74 % , Campion - 89 %) . Low levels recorded of this character recorded hybrid Milcov 76 % of control. Olt hybrid achieved a value close to the maximum 86 % of control.

In V5 in which three leaves per plant remained below panicle, values recorded from number of grains / cob were within 70 % of control from hybrid Olimp and 90 % of control from hybrid Olt .

The number of grains /cob was heavily influenced by defoliation at hybrid Olimp who presented four of the five experimental variants minimum values of this character.

On average, leaf removal produced losses in the number of grains /cob compared with the control values for all variants tested. Losses ranged between 12 and 26%

compared to the control variant. The most obvious reduction in the number of grains / cob corn for analyzed hybrids were recorded in the variant where the leaves are removed from the of the corn cob and remained only the leaf under the panicle (74 % of control).

The number of grains per cob has also suffered changes where defoliation of plants to 15 days from silk, for all hybrids analyzed. (Table 2).

Loss rates in the case of removal the leaves below the cob (V1) ranged between 6 and 18% compared to control. The minimum value of analyzed character was obtained at Olt hybrid and the maximum at Milcov hybrid.

If the leaves are removed from above of the cob (V2) were obtained cobs with a small number of grains which represented 66-89% of the control value according to the hybrid. The minimum value was obtained by Campion hybrid and the maximum at Olt. Cobs with low number of grains were recorded at hybrid Olympus that has made only 75% of the control value. On the other side, the Milcov hybrid presented in this variant the number of grains /cob close to the maximum value, namely 87% of the value in the control.

In the V3, in which on the plant is the last leaf in the above panicle and the other were removed were obtained plants which presented the number of grains /cob from 75 to 98% of the control value according to the hybrid. A high value of this character has made the Milcov hybrid, and 97% of control.

In the V4, in which case on the plant remaining two leaves below the panicle, number of grains /cob was reduced at a rate of 7-48% compared to control, the minimum recorded at Olimp hybrid and the maximum at Milcov. High values of this character have presented Olt hybrid - 92% of control.

In the latest variant with three leaves on the plant remained under panicle, were registered corn cobs with number of grains between 61 and 96% of the control value. The minimal amount of character has presented a hybrid Olimp and the maximum Milcov hybrid. Also, high levels of grain number / cob have achieved and hybrids Olt and Champion, respectively 95 and 92% of control.

From hybrids of the group, Olympus was heavily influenced by defoliation in terms of the number of grains / cob presenting it in three minimum values of character analyzed. Best behaved in this aspect was Milcov hybrid who presented three of the five variants in terms of maximum number of grains /cob selected compared to the control.

Average of analyzed hybrids about influence of leaf removal on the number of grains / cob presented different values in different variants, depending on the number of leaves removed. The lowest value of this character was recorded in the variant have been removed all the leaves above cob and 80% of control, and the maximum was recorded in variant have been removed all the leaves below the cob.

Values close to the maximum were registered in the plant variants that were present 1-3 leaves under panicle emphasizing their role in formation of productivity elements in maize.

Figure 1. Influence of reducing surface assimilation on the number of grains/cob at the appearance of stigma (ave

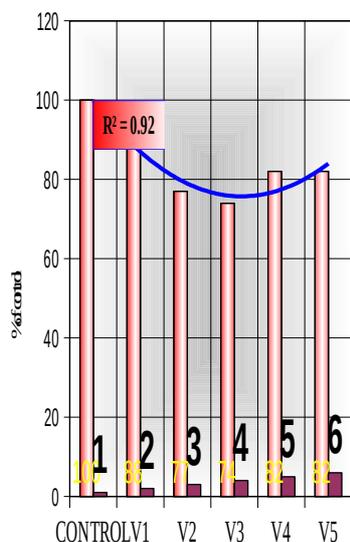
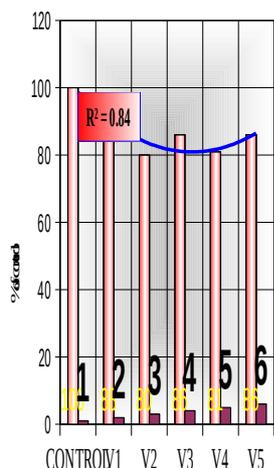


Figure 2. Influence of reducing surface assimilation on the number of grains/cob at 15 days from appearance of stigma (average year)



Graphs 1 and 2 contain the average values on all five variants experimental compared to control for each of the analyzed characters.

Index values obtained from regression (very close to 1) reflect a strict interdependence between leaf number and

analyzed character. Thus, in Figure 1, it is noted that the regression index has exceeded 0.9239, statistical coverage expressed therein indicating a highly significant correlation. Figure 2 shows a moderately significant correlation between leaf number and the parameter studied, in this case the value of the regression index being 0.838. These regression index values indicate a significant correlation between the number of leaves remaining on the plants and the parameter analyzed.

4. CONCLUSIONS

- assimilation surface plays a decisive role in forming the production elements in maize, based on clear role of leaves below the panicle in the formation of number of grains / cob;
- differences obtained between hybrids due to genotypic effects, each hybrid react differently at remove some leaves;
- there is a direct proportion between the remaining leaves under panicle and value obtained for the analyzed character from studied hybrids;
- the most sensitive hybrid to defoliation was Olimp who is recorded more significant losses;
- on average, reducing the assimilation surface by removing leaves above the cob has obvious negative effect on the number of grains /cob compared to removal leaves under cob;
- in all cases processed statistically, the productivity element analyzed, according to the index regression, is almost 100% dependent on the number of existing leaves/ plant.

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