

## THE MAIN PHYSIOLOGICAL PROCESSES THAT PARTICIPATE AT THE FORMATION OF THE VEGETAL MASS FOR THE OLT CORN HYBRID

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### **Abstract**

*This paper presents originality by the fact that helps us understand better and special supports the farmers to understand the importance of knowing the main physiological, biochemical and chemical elements which determine the formation of vegetable mass for the corn. In this paper it was studied the Olt corn hybrid which is cultivated on large areas of land especially in the SW area of Oltenia, more precisely on the territory of the Caracal Plain. It is important to remember that on the forming and the welfare of the corn mass depends on the future production. Both the humus reserve in the soil and also the unequal administration of some doses of nitrogen and phosphor determines increased production. It has been watched the vegetation's state of this hybrid in correlation with the chemical changes of the plants through the use of chemical fertilizers that are correlated also by the cultivation system that had been used so named irrigated and non-irrigated system.*

**Key words:** *physiological processes, humus, hybrid, chemical composition*

### **INTRODUCTION**

Due to the unrealistic exploitation of soils, today we are dealing with arid areas knowing that the destruction of the first fertile layer of the soil where 3 cm of soil are going to recover between 300-1,000 years, 20 cm are going to recover between 3-7 thousands of years [2]. It is known that chemical pollution of the soil with fertilizers, especially the ones with nitrogen, which if are being not used rationally, in too large doses has already caused severe phenomena of pollution of the soil and water with nitrates and seriously affects the health of humans and animals from these areas [2].

The corn being not a too pretentious plant for our environment conditions and that occupies the second place after wheat culture, finds more and more the interest of the scientists to find methods and studies for obtaining lines or hybrids more productive and more resistant. As for the formation of the harvest is needed to carry out the normal process of photosynthesis, and capability of warehousing, which are heavily influenced by

the plant density. By increasing the number of the plants per square meter is being obtained a significant increase in both foliar surfaces, obtained by all the plants of the unit area (square meter), rendered by the foliar surface index, and the total number of grains that we obtain by a greater number of cobs/square meter. The direct relationship between the two productivity elements with the sowing density has as a limit the reduced production done by the plant [13].

The combined influence between the variety and the cultivation technology determines the main changes of the physiological characteristics that may influence the acquisition of larger productions by the differential administration of the fertilizer doses [8].

Watering system comes to support the normal development of maize of water where the optimum water consummation and the needed water for irrigation depend first on the climate and less on the soil [1].

Pursuing the changes aspects brought by the excess of the water in the soil, as well as knowing the interactions soil-plant - the

atmosphere is very important in optimizing the agricultural production [5].

Research regarding the water consumption of the irrigated crop (the maximum real evapotranspiration, was the subject of various publications in the country and abroad [3, 4, 10, 7].

The nitrogen and phosphorus fertilizers administered differentially to some hybrids of corn determines the major changes in physiological processes that take place for the corn in various stages of vegetative growth [9].

## MATERIALS AND METHODS

The device with experiences has been set at the plant farm SC Record SRL, from Caracal, Olt County, Romania, having as reference years: 2016, characterized by a hydric deficit and 2017, a year favorable for the cultivation of corn, and the size of the plots were 20 m/20 m.

For a better presentation with the concrete results obtained by physiological processes studied, were taken sampling of soil from the plots established at a depth between 0-25 cm before installing in thaw field the device with field experiences. Thus, the experience being polifactorial were studied three factors:

**Factor A:** Olt corn hybrid

**Factor B:** The application of differential doses of Nitrogen and Phosphorus with four graduations, as follows: N<sub>0</sub>P<sub>0</sub>, N<sub>60</sub>P<sub>80</sub>, N<sub>80</sub>P<sub>100</sub>, N<sub>100</sub>P<sub>120</sub>, and N<sub>120</sub>P<sub>140</sub>.

**Factor C:** irrigation system with two graduations: (i) Watering system and (ii) Non-watering system.

From the physiological processes studied we remind: the respiration, the coefficient of transpiration, the intensity of smooth assimilation, the photosynthesis, sucking force, absorption capacity, the total of the chlorophylls, total content of nitrogen and phosphorus followed by ISF (the index of foliar surface).

For the correct use of the doses of nitrogen fertilizer in tight connection with the active growth factor action has been applied the following formula:

$$DOE_N = \frac{10g \left( 2.3 \cdot C \cdot A \cdot \frac{VUP}{CUI} \right) - CP_s}{C}$$

Source: [6]

where:

(C) = the coefficient of nutritional element in the soil or the chemical fertilizer calculated by authors;

A = expected maximum harvest;

VUP - the value per unit of the product;

CUI = the cost per kg of the fertilizers a.s.o.

CP<sub>s</sub> = calculated nutrient input from the soil reserve after the agrochemical mapping values evaluated after.

Determination of soil analyses were done by the following methods:

The soil pH by potentiometric methods; Ah with the solution of a state that hydrolyses in an alkaline way; Sb by Kappen method; Phosphorus by the Engner method-Riehm-Domingo; the humus by Walklei and Black method; The nitrogen is determined by colorimetry using the photocolimeter [11].

Plant analysis determinations concreted through:

Total Nitrogen by the Kjeldahl method; Total phosphorus by fotocolorimetric method; Photosynthesis by Baradulina method; The net yield of assimilation method (N.A.R.); The intensity of respiration by Boysen-Jensen method; The intensity of the transpiration through L.A. Ivanay method; ISF Lan method through weighting and reported to the respective surface m<sup>2</sup>/m<sup>2</sup> ground-absorptive capacity by the gravimetric method [12].

## RESULTS AND DISCUSSIONS

In 2016, before replacing the experimental device were collected soil samples from four different places from the field and we got the following results which are presented below:

After the results from the soil samples collected, led to the conclusion that they are characteristic of the experienced soil, so we can say that the pH reaction is neutral, with the exception of 3 way that slights towards alkalinity, total capacity of cation exchange

(T) has medium values between 28.36-29.15, degree of saturation in (V) is less than the variants 1, 2, and 4, but grows to 3 to 85.81., and the data are expressed in mill equivalents and has values between 23.11-23.17.

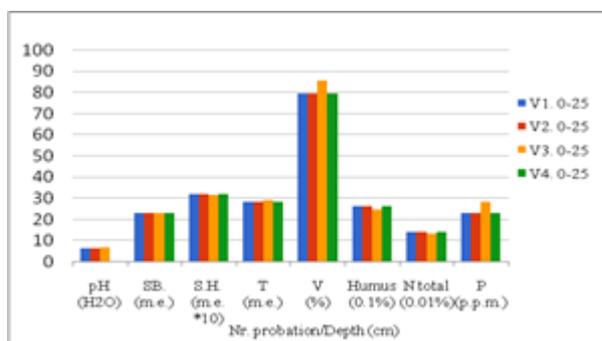


Fig. 1. Determination of the main features of the chemical properties of the soil from argiloiluvial type in 2016 from the experimental device

Source: Author's results.

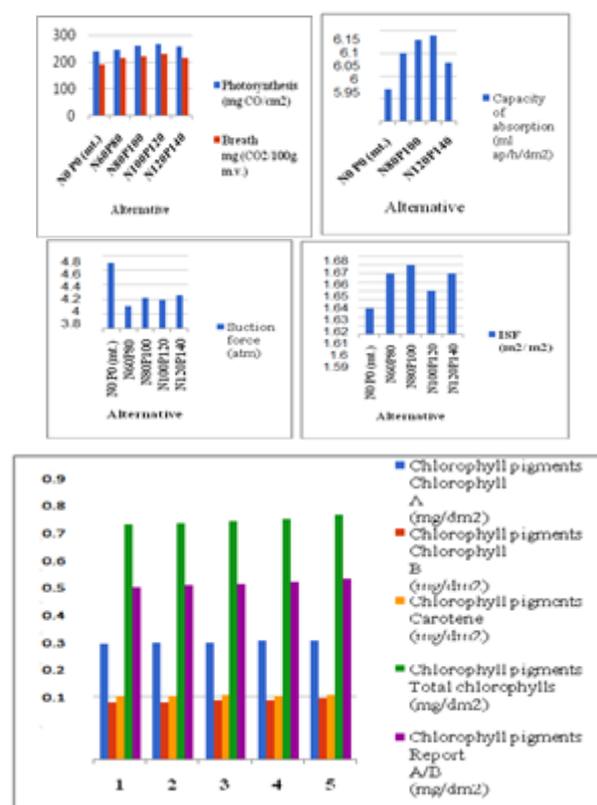


Fig. 2. The physiological processes that take place on forming the four leaves under the influence of the fertilizer doses and the planting un irrigated system. Year 2016

Source: Author's results.

Because the content of humus, Nitrogen and Potassium is low, these results have a negative effect on the natural fertility of the soil, which is why we will intervene with the

doses determined by Nitrogen and Phosphorus for each repetition.

Because the Olt hybrid is a semitardive hybrid with a vegetative growth period of about 138 days, by combining the fertilizers doses with irrigated and non-irrigated system, we have determined some physiological processes taking place especially in the complete training of four leaves.

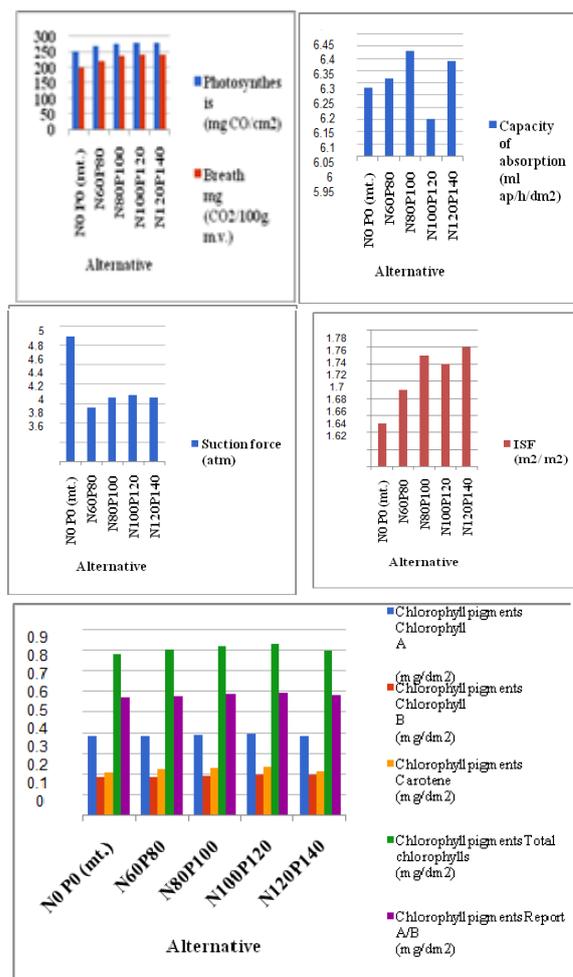


Fig. 3. The physiological process that takes place on forming the four leaves under the influence of the fertilizers doses and the irrigated system. The year 2016. Source: Author's results.

From Fig. 2 and 3 it can be seen that the values of the photosynthesis process are higher than the version control and presents an increase of 18% in relation to irrigation system at non-irrigated, but for N<sub>120</sub>P<sub>140</sub> in the two systems it feels a slight lowering of the intensity of the photosynthesis, and that at this dose, the corn doesn't react so good.

In the process of breathing, there aren't big differences in relation to the both systems, and results that the amount of carbon dioxide eliminated isn't significant in the cases of variants that we studied.

Absorption capacity has insignificant values in relation to the witness in non-irrigated system 6.02-6.14, but together with the administration of the fertilizers and the irrigation system the values are significant.

Suction pressure force presents an increase in the non-irrigated system from the first three options in relation to the control group, followed by a decrease in the values. In the irrigated system values are significant in three variants, and the variant N<sub>120</sub>P<sub>140</sub> presents a slight decrease. Chlorophylls pigments are superior comparing the w irrigated with the un irrigated system. The ratio of chlorophyll A/B, is superior to the chlorophyll A in chlorophyll B detriment on the both systems. The foliar surface index limits is closely related to a Variant to another with good results in the two systems from the application doses N<sub>80</sub>P<sub>100</sub>.

The net rate of assimilation presents increasing values on the application of chemical fertilizer doses for both systems considered in the study.

Because I took into account the two years of study I will make the same determinations of soil and plant, except that this year is richer in precipitation.

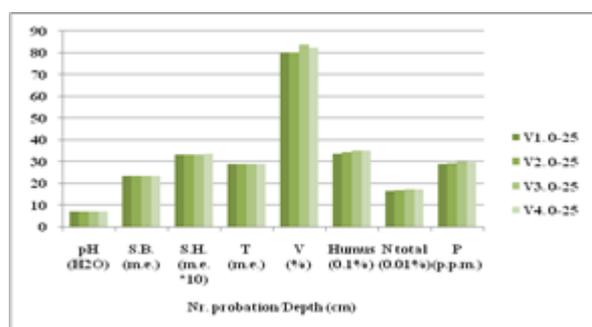


Fig. 4. The determination of the main features of the chemical properties of the argiloiluvial soil type in 2017 from the experimental device  
 Source: Author's results.

Due to the precipitation which fell and who helped all the chemical properties of the studied soil characteristics to become positive and to characterize argiloiluvial soil as favorable for the growth and development of corn and hence leading to the desired production.

There were again taken samples of plants to study the same physiological processes as in the previous year. The results are shown below.

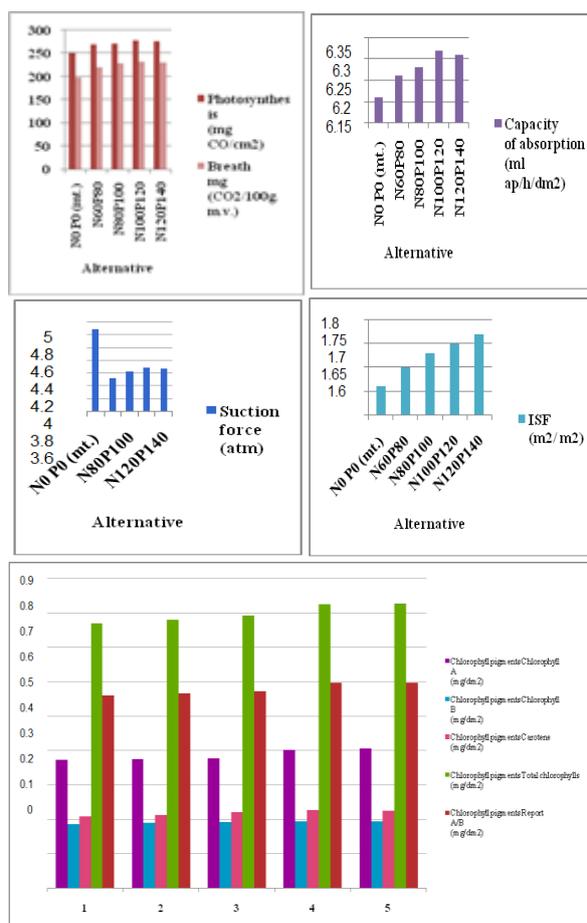


Fig. 5. The physiological processes taking place in the formation of the four leaves under influence of the fertilizers doses and non-irrigated crop system. The year 2017 Source: Author 's results.

The application of differentiated doses of nitrogen and phosphorus causes changes and increases all physiological processes taken into study with the difference in relation to witness that recorded all the lowest results.

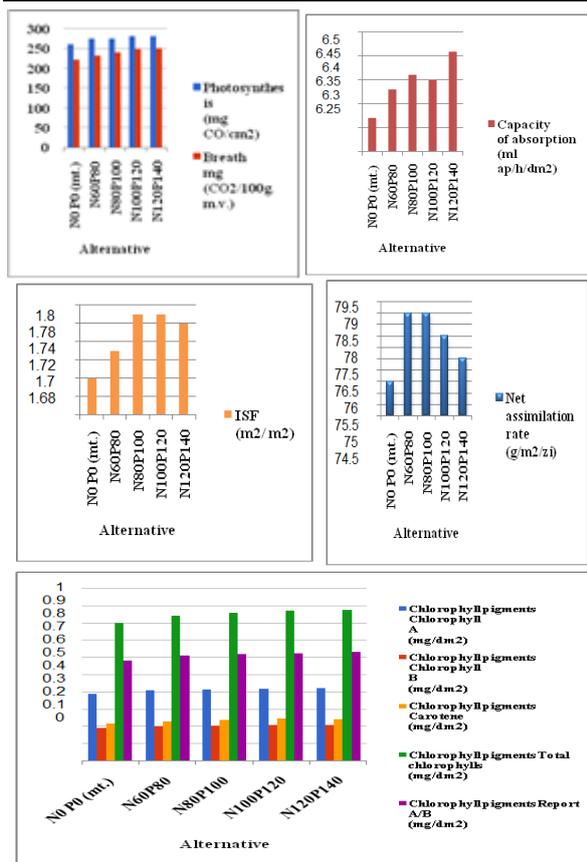


Fig. 6. Physiological processes taking place in the formation of the four leaves under influence of fertilizer dose and irrigation system. The year 2017. Source: Author's results.

So the intensity of the photosynthesis has higher values in the relation to witness on the irrigated system at 261.7 at 282.2 mg CO<sub>2</sub>/cm<sup>2</sup>, and in the non-irrigated system the values are between 250.1 to witness and 277.2 mg CO<sub>2</sub>/cm<sup>2</sup> to the application of the dose of N<sub>100</sub>P<sub>120</sub>.

The capacity of breathing presents a higher value in irrigated system in relation to the witness 221.5 CO<sub>2</sub>/100g green mass but higher on dose application N<sub>120</sub>P<sub>140</sub>, in return the best results obtained in non-irrigated system are those to which has been applied a dose of fertilizer N<sub>100</sub>P<sub>120</sub>.

The absorption capacity presents an uptrend in both systems but with better results in watering system in the application of the dose of N<sub>120</sub>P<sub>140</sub> ml value 6.46. ap/h/dm<sup>2</sup> in relation to witness 6.32 ml. ap/h/dm<sup>2</sup>. The suction force, expressed in atmospheres, is growing steadily in both systems, and there's no significant difference, however, with slight differences between the two systems.

The chlorophylls are highlighted specially by the significant values of the chlorophyll, but chlorophylls B show no spectacular increase except where the application of irrigation system of N<sub>120</sub>P<sub>140</sub> in irrigated system value recorded is 0.212 mg/dm<sup>2</sup>.

The total of the pigments presents significant percentage differences between witnesses and the experimental variants, significantly increasing in both culture systems with increasing the doses of the fertilizer.

The index of the foliar surface presents increasing values in relation to the witness to non-irrigated system variant from 1.66 m<sup>2</sup>/m<sup>2</sup> at 1.77 m<sup>2</sup>/m<sup>2</sup> the variant in which the applied dose of N<sub>120</sub>P<sub>140</sub> otherwise the best result in the irrigation system meets the N variant 100 P<sub>120</sub> and N<sub>80</sub>P<sub>100</sub> where is the value of 1.79 m<sup>2</sup>/m<sup>2</sup>.

## CONCLUSIONS

From the determinations of the Olt corn hybrid, it has appeared that the application of the doses of chemical fertilizer result the major changes of the physiological processes that take place in the period of vegetative growth of the corn.

Application of fertilizers together with the irrigation system enhances the metabolism of existing nutrients in plants.

The a analysis of the physiological processes studied, lead to the conclusions that the highest potential value was recorded in the irrigation system, in particular the application of fertilizer doses N<sub>100</sub>P<sub>120</sub> followed by the version with doses of N<sub>120</sub>P<sub>140</sub>.

We can conclude that the studied Olt corn hybrid performs very well on the soils of the Caracal.

It is recommended to be taken in the culture at the doses of N<sub>100</sub>P<sub>120</sub> and N<sub>120</sub>P<sub>140</sub>.

Aplicarea îngrășămintelor împreună cu sistemul de irigații intensifică metabolismul nutrienților existenți în plante.

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