THE IMPACT OF USING SOME RHIZOBACTERIAL STRAINS AS BIOFERTILIZERS ON THE TOTAL CONTENT OF SOLUBLE PROTEINS IN CORN CARYOPSES (*ZEA MAYS*)

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Abstract: Present researches are oriented to achieve a better understanding of the complex relations established between plants and rhizobacterial strains, all of these because of the increasing economic importance of the microbiotic flora. The results show us that using rhizobacterial strains as fertilizers improve the quantity and the quality of crops.

INTRODUCTION

Analyzing these relations it is very important both theoretically and practically to study the microorganisms which growth and develop on the surface and in the proximity of the roots and also to study and understand the impact of these relations on both sides: for the plants and for the microorganisms. All these interactions are based on the simple fact that they satisfied the nutritive needs of both partners. The interactions between the microorganisms and plant roots have complex characteristics. They are based on the interactive soil modifications which are based on the processes such as water intake and elimination of organic compounds by the plant roots, producing of some growth factors by the microorganisms and intake by the roots (mediated by the microorganisms) of some mineral nutrients and the list could continue. (ZARNEA, 1994, SYLVIA, 1999)

Usage of the isolated bacteria from crop-plant’s rhizosphere for productivity increase may be an alternative to organic fertilizers. The main goal is to reduce the pollution and to preserve the environment in the spirit of practicing an ecological agriculture.

Because corn represents a crop of major economic importance, a study was performed to analyze the impact of colonization of the corn rhizosphere with some rhizospheric bacteria during vegetative development in case of not using organic fertilizers conditions. The main purpose was to study the influence of some rhizobacterial strains on the soluble protein contents in corn caryopses.

MATERIAL AND METHODS

From the rhizosphere of corn plants (at the beginning of fructification) were isolated, according to morphological characteristics, 7 different bacteria strains (for convention Rp_1-Rp_7). From the studied strains, it was prepared a suspension in sterile distillated water that served like inoculum. The concentration of biopreparate was determined with counter colonies technique, and it was estimated at 39×10^6 CFU/ml. After a previous sterilize of all caryopses, were inoculated only for the caryopses of the probe lot. Both lots (control and probe) were inseminated using a small experimental seeding machine. The experiment was made at “Ion Ionescu de la Brad” Didactic Station of USAMV, within the “Ezăreni” didactic farm, Iaşi, 2005, on a cambic cernoziom with adobe-clay texture and good fertility, with moderate humus and highly nitrogen content, with moderate mobile phosphor supply, with highly potassium content and with a very low acid reaction, almost neutral.

During vegetation period no chemical fertilizers were supplied to the plants. Only current maintenance operations were performed on the culture. The resulted corn plants were used as material on which were performed all the analysis. Soluble protein content was determined according to Bradford method and an analysis has been performed using SDS-PAGE techniques according to Laemli. The images of the gels were analyzed using specialized software, ImageQuant, from Amersham/GE HealthCare.

RESULTS AND DISCUSSIONS

By applying rhizobacterial preparate on the surface of caryopses before they are seeded it was observed an increase in total content of soluble proteins in the caryopses of the working probe to 123.3 mg protein/100 g compared with the caryopses of the control probe in which were found 144.74 mg protein/100 g in the case of distilled water extraction and in the case of NaCl extraction to 153.78 mg protein/100 g compared with 180.19 mg protein/100 g. (figure 1)

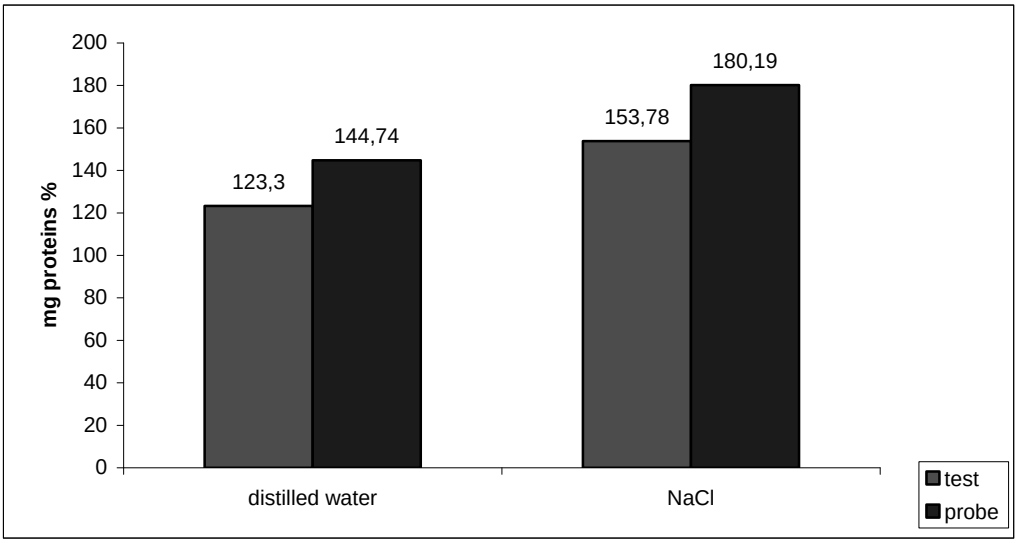

Figure 1 – Soluble protein content in corn caryopses formed during „*in vivo*" cultivation

In the purpose of analyzing the influence of the rhizobacterial inoculum on the protein spectrum in the corn caryopses it was made an electrophoretic separation of the extracts using the SDS-PAGE technique. To interpret the results ImageQuant software from Amersham (GE Healthcare) was used.

Analyzing the image of the gel (figure 2) it is easy to see the multitude of the proteins with many well contoured fractions and distributed over the entire spectrum of molecular masses.

The fractions identified have a distribution of the molecular masses from 116 kDa to 30 kDa for the control probe and from 90 kDa to 30 kDa in the working probe. (Figures 3 and 4)

Considering the results achieved it is possible to say that the modifications induced by the rhizobacterial inoculum are only quantitative ones (in the positive way of increasing production) but without any significant modification in the protein spectrum.

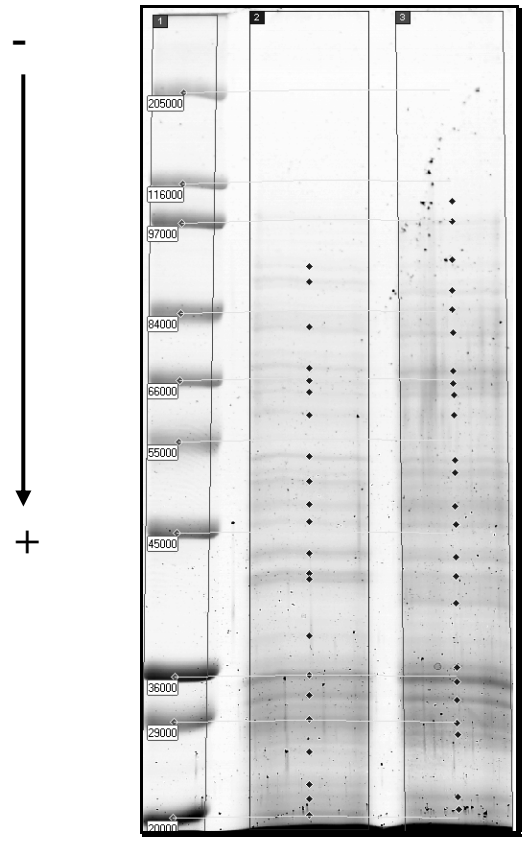

Figure 2 – Electrophoretic analysis of the soluble proteins from corn caryopses (1. Molecular wight marker; 2. Working probe; 3. Control probe)

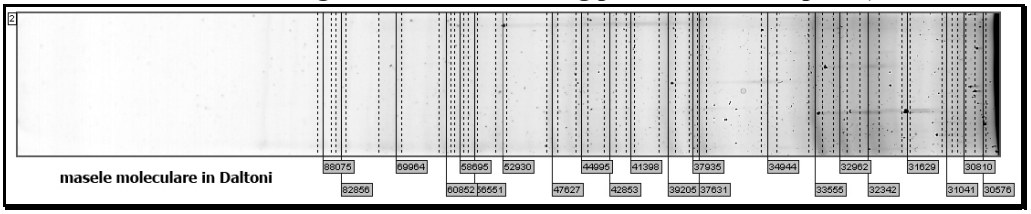

Figure 4 – Molecular weight distribution of the proteins from corn caryopses in the working probe.

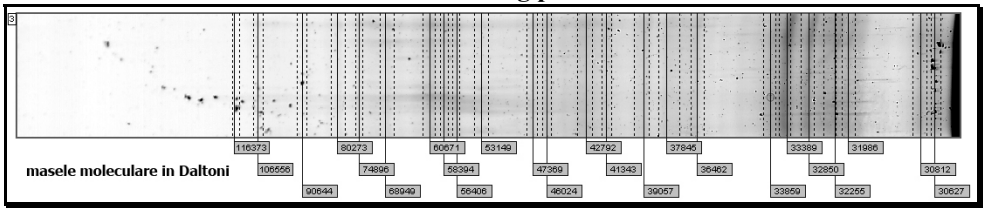

Figure 4 – Molecular weight distribution of the proteins from corn caryopses in the test probe.

CONCLUSIONS

The metabolic activity of the selected rhizobacterial strains induces increased proteins biosynthesis which are stored in the corn caryopses.

The inoculum with selected rhizobacterial strains doesn't induce any major modification in the spectrum of the proteins from the caryopses.

The bacterial strains isolated from the *Zea mays* rhizosphere can be used as a mean to increase the quantity and the quality of the crop, with direct, positive, economic implications. Main implication could be the returning to green farm without using all the chemicals involved today in the agriculture.

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