SUMMARY

Soil, an essential component of environment, the key factor in ensuring human existence as primary source of nutrients, is irreproducible and inextensible. Being integrated to environment and an environmental conditions integrator that reflects so well, soil is the indicator of ecosystem quality and quantity.

Intensive development of agriculture implies increased mechanization by increasing the number of tillage. Loosening and excessive soil disturbance by tillage practices causes the increase of physical and chemical soil damages, with negative consequence on yield.

Literature review shows that soil structural degradation is one of the major problems of agriculture both as frequency and magnitude of the phenomenon and interference with other environmental aspects, leading to synergistic effects that compromise the environmental quality on long term and in the same time on human health.

Macromolecular compounds (polymers) are chemical combinations with high molecular weight, which follow a mutual principle that consists in macromolecular chain repetition of a group of atoms called structural unit. These units are identical or similar in composition with monomers from which polymers have been synthesized. Due to their property, polymers determine soil structure stabilization, prevent crust formation and decrease the dissipation intensity of soil particle by rain and hence water erosion intensity.

In this context, the PhD thesis ”CONTRIBUTIONS TO SOIL STRUCTURE STABILIZATION WITH CARBOXYLIC POLYELECTROLYTES” brings original contribution on soil structural improvment, based on a unitary concept of research achievement. The main objective of the research is to bring considerations on the use of soil conditioners to restore the degradated soil structure, to enhance soil fertility and yields. Achieving this topic of the research involves performing a series of related objectives:

- the influence of *Ponilit GT1* solution on increasing soil structural aggregation;

- the influence of *Ponilit GT1* solution on hydric stability of soil structure;

- the influence of *Ponilit GT1* solution on preventing crust formation in the period between sowing and emergence of winter wheat, soybean and maize plants.

- the influence of different tillage systems on pedomorphological and physical indicators of chernozem soil;

- the influence of different tillage systems, *Ponilit GT1* solution and fertilization level on productivity elements at winter wheat, soybean and maize crops.

PhD thesis is structured in two parts and eight chapters. First part realizes the bibliographic part, that establish the current state of knowledge related to soil structural improvement with macromolecular compounds, as well as a study on mechanical, physico-chemical and biochemical processes that induce soil structure degradation.

The First chapter presents the theoretical issues related to the importance of soil structure, soil structural aggregation, structure types, as well as the main factors that contribute to soil structural degradation. Also, in this chapter are characterized the polymeric substances used to restore soil structure, as well as a list research on macromolecular compounds used to improve soil structure both in Romania and worldwide.

The second part of the thesis contains the results of the research on soil structure improvement using carboxylic polyelectrolyte.

The Second chapter presents the natural environmental conditions in which researches were conducted. It has been realized a characterization of the climatic conditions, vegetation and physico-chemical, mineralogical and microbiological soil area.

In Chapter III and IV are presented the material and research methods used in the context, both morphological characteristics, physico-chemical properties and the distribution of total and mobile forms of microelements of cambic chernozem profile, as well as morphological characterization of cross sections of soil treated with polymeric substances.

Morphological description of soil profile was made based on pedomorphological indicators according to the official methodology of pedological studies indicating a cambic chernozem type, silt loamy texture and the emergence of calcium carbonate at 78 cm with a Ap, Atp, Am, AB, Bv1, Bv2, Bv_3k, Cca_1, Cca_2 and II Ck morphology.

Quantitative description of soil microelements profile reveals a large variation of Mn and Zn content compared with Co and Ni values where the similar distribution indicate the same evolution.

Chapter V presents a study on the influence of *AM 97.2* and *AV 127.2* polymeric substances on mobile forms of microelements.

Experimental results obtained shows that *AM 97.2* and *AV 127.2* polymeric substances had an increasing effect on Zn and Cu accessibility for plants, which did not affect the growth in vegetation season. The maximum values of Zn content from Ap horizon treated with 0.1% *AM 97.2* polymeric substance is due to soil heterogeneity and not to the direct action of polymers.

The range of mobile Cu values is closely and between the two variants treated with synthetic polymers, the values are similar.

Soil treated with *AM 97.2* and *AV 127.2* polymeric substances, concentrate the active manganese and increases the mobile forms in organic matter accumulative horizons. In terms of polymeric type used, the highest values obtained by Ap, Cca and Ea were registered by hydrophylic comonomer *AV 127.2* compared to Bv horizon where was noted the hydrophobic comonomer *AM 97.2.*

Mobile forms of Pb and Cd have an irregular increase in pedogenetic horizon while mobile forms of Ni decreased in accumulative horizons of carbonates (Ccca) and increased slight in eluvial albic horizon (Ea), Bc and in plough layer. Higher values of mobile forms of Fe have been registered in the horizons with moderate acidic reaction (Ea) with medium texture and a very low content of humus and are due to stagnant excess moistures.

Chapter VI presents the results of tillage systems and *Ponilit GT1* polymeric substances on some physical properties of the soil. For each crop and tillage system was established the characteristic bulk density, total porosity and penetration resistance.

Macromolecular compound contributed on soil structure improvement, the effect being in each year of experimentation and only at soil sampled at 0-5 cm layer in the period between sowing and winter wheat, soybean and maize emergence.

Analyzing the evolution of bulk density, the disk harrow variant leads to maximum values. Similar values of the analyzed indicator were obtained based on different concentration of synthetic polymer in all the variants and depths.

The values of total porosity are indicating that the synthetic polymer causes a better micro structural development which led to a higher pore volume and a better aeration of the cambic chernozem soil. At the lower layer (5-50 cm) the indicator values are very close to control variant, characterizing this property as “very small“ to “small” in all the experimental variants. Improvement of cambic chernozem structure with *Ponilit GT1* solution did not reduce the compaction state resulted from the different agrotechnical practices combined with soil moisture dynamics.

The values of penetration resistance show a similar trend both on depth and all the tillage systems. The analysis of mean values shows that the plant growth was not disturbed and penetration resistance showed similar values to control variant, describing this property as “very low” to “low” in all experimental variants.

Improvement of cambic chernozem structure with carboxylic polyelectrolyte *Ponilit GT1* solution, determined the distribution of structure aggregate by decreasing the percent of

aggregate with diameter < 1mm and increasing the percent of 1-5 mm and > 5 mm aggregates. The mean values of the analyzed indicators are influenced by *Ponilit GT1* concentration applied.

The values of mean weight diameter increased with increasing the synthetic polymeric dose applied, resulting maximum values on ploughed at 30 cm and minimum values on chisel and paraplow variants.

Ponilit GT1 treatment in different concentrations, improved soil structural state by increasing aggregate hydro stability.

Chapter VII presents the influence of tillage systems and polymeric substances on productivity elements.

The productivity elements varied due to polymer concentration, tillage systems and soil fertility level.

Finally the paper presents the general conclusion and the bibliography.