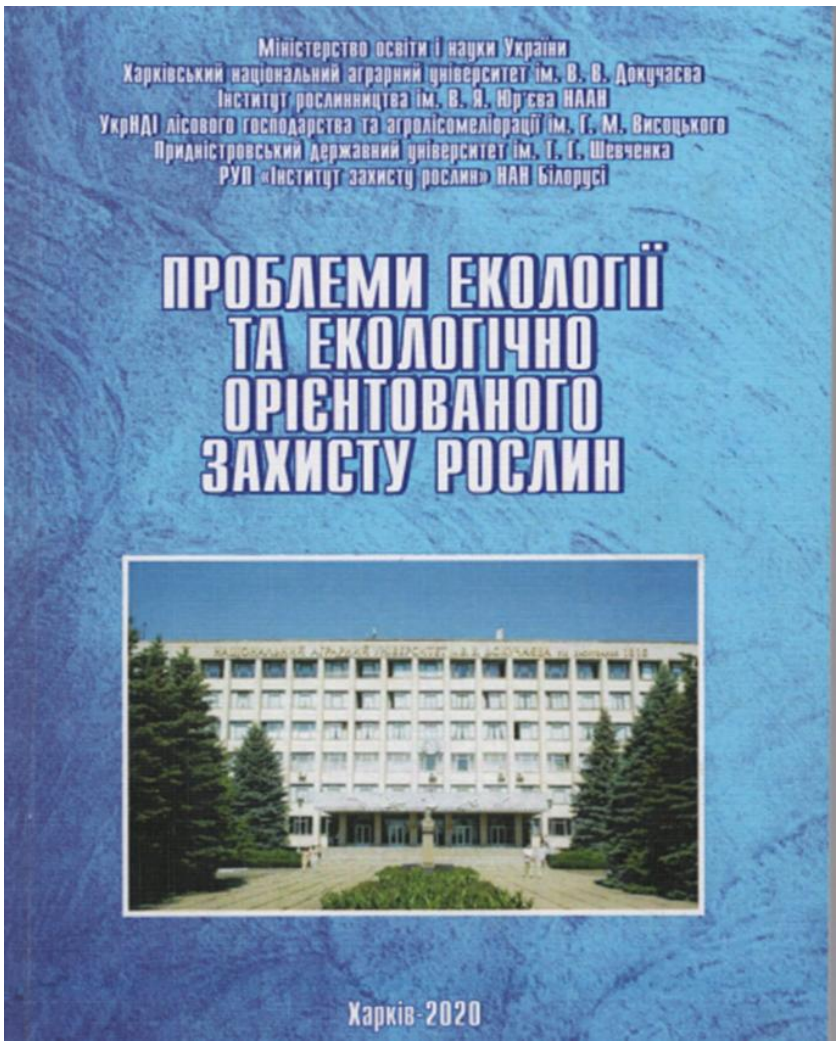

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INTERACTION BETWEEN PLANT AND BENEFICIAL MICROORGANISMS IN AGRICULTURE

In the natural environment, plants are closely related to microorganisms. Some fungi, bacteria, streptomyces and yeasts can be used to offend other kinds of organisms, which is the basic condition of biological control. Plants provide nutrients for root microbes through photosynthesis which can transform light energy into nutrients. Microorganisms change organic matter into inorganic matter in soil, which is easy for plants to absorb and use; at the same time, microorganisms promote plant growth by releasing vitamins and growth stimulating factors. The existence of microorganisms can greatly improve the oxygen environment and soil moisture around the plant root. Only when we fully understand the interaction between microorganisms and plants, can it be used in agriculture reasonably, which is conducive to agricultural production and harvest.

Rhizosphere microorganisms, known as the second genome of plants, are all kinds of microorganisms on the surface of plant roots and in the soil area adjacent to plant roots. They are very important for the normal growth of plants. The beneficial rhizosphere microorganisms can be divided into two groups according to their action mechanisms: PGPM (plant growth promoting microbiology) and BCA (biological control agents). PGPM can change the condition of ineffective mineral elements, make them active and easy to be absorbed by plants; they can secrete plant hormones

to promote plant growth. BCA are mainly used to resist harmful microorganisms and produce antibiotics against plant infection, thus reducing the invasion of plant pathogens.

The substances secreted by plant roots can exchange nutrients and transmit information with rhizosphere microorganisms. There are five kinds of substances secreted by roots: (1) substances released by epidermal cells, root terminal cells and root cap cells without mature rhizosphere; (2) compounds with small molecular diffused by epidermal cells of plant rhizosphere; (3) products decomposed by mature cells of plant rhizosphere through respiration and photosynthesis; (4) metabolites secreted by plant rhizosphere cells; (5) substances of epidermal cells and root hair cells of natural death. The substances secreted by the roots of different plants are different, which can induce different kinds of microorganisms to settle around the rhizosphere and become rhizosphere microorganisms. Therefore, the species of rhizosphere microorganisms can be determined to a certain extent.

In the field of agriculture, microbial control refers to the antagonism between beneficial microorganisms and pathogenic bacteria, which can inhibit the invasion of plant pathogens, cause the death of pathogenic microorganisms. Beneficial microorganisms can also trigger the immune mechanism of plants to enhance plant disease resistance. *Streptomyces* sp. are becoming an increasing obvious choice for microbial control agents. Several genus streptomyces were reported that they showed antibacterial activity against wheat diseases caused by *Magnaporthe oryzae*, *Fusarium* spp., *Rhizoctonia solani, Gaumannomyces graminis.* In our research, the strain streptomyces HU2014 had the high antifungal activity against wheat sharp eyespot caused by *Rhizoctonia* and *Rhizoctonia solani.* Meanwhile, we analyzed the enzyme activities of Peroxidase (POD) and Phenylalanine ammonialyase (PAL), that were significantly enhanced in wheat leaves under lower concentrations of mycelia and extracellular filtrate of this strain HU2014.

Researchers are interesting to find new mechanisms of between plant diseases and microorganisms, and obtain more biocontrol agents that can be used to resist plant diseases. Although there are many reports on the interaction between plant and microorganisms, the relationship among plant, soil and microorganism is very complex, which makes the research difficult. It is necessary to try new research methods combined with traditional methods to reveal more mysteries of the interaction between rhizosphere microorganisms and plants.