

Study of the Antagonistic Activity of Soybean Nodules and Nodule Bacteria in Relation to Verticillium Dahlia Kleb

Kuchkorov Astonakul Musurmonkulovich

Candidate of Biological Sciences, Head of the Department of Plant Protection,
Agrochemistry and Agrosoil Science of the Agrobiological Faculty of the
Termez Institute of Agrotechnology and Innovative Development, Termez, Uzbekistan

ABSTRACT

This article presents the results of studying the antagonistic activity of soybean nodules and nodule bacteria in relation to the causative agent of cotton wilt. It has been substantiated that the antagonistic activity of nodules and nodule bacteria is one of the main factors of the effective suppressive action of soybeans against the soil phytopathogenic fungus *Verticillium dahlia* Kleb. This can be enhanced with the use of the bacterial preparation "Rizotorfin".

How to cite this paper: Kuchkorov Astonakul Musurmonkulovich "Study of the Antagonistic Activity of Soybean Nodules and Nodule Bacteria in Relation to *Verticillium Dahlia Kleb*" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-6 | Issue-1, December 2021, pp.1778-1780, URL: www.ijtsrd.com/papers/ijtsrd49141.pdf



IJTSRD49141

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Relevance of the topic. All over the world, among leguminous crops, soybeans have high protein productivity, the crops of which in the republics of Central Asia, including Uzbekistan, occupy significant areas from year to year and are becoming increasingly important in providing the population with food, animal husbandry - full-value protein fodder, and the soil - biological nitrogen. Soybean (*Glycine hispida* L.) belongs to the botanical legume family (Fabaceae).

As you know, in Uzbekistan, on large areas, the dangerous disease of cotton verticillium wilt is noticeably widespread. In this regard, the study of the role of soybeans as a precursor in anti-wilt crop rotation, as well as the identification of the antagonistic activity of soybean nodules and nodule bacteria in relation to *Verticillium dahlia* Kleb is a very urgent issue and, in turn, it is of great theoretical and practical importance.

All of the above determined the importance of the topic of this scientific article.

Research Methodology and Materials

Small-plot experiments were carried out on an experimental basis, laboratory studies were carried out in the laboratory "Study of the biology of soil pathogens" of the Wilt department of the Uzbek Research Institute for Plant Protection (UzNIIZR). In the experiments, seeds of a high-yielding soybean variety "Dustlik" were sown. Soybean variety "Dustlik" is zoned, the most promising, tall grain-fodder. Before sowing, soybean seeds were treated with the bacterial preparation "Rizotorfin" obtained from the All-Russian Research Institute of Agricultural Microbiology (VNIISKhM).

"Rizotorfin" was used at the rate of 200 grams per hectare rate of soybean seeds. The seeding rate of soybeans is 80 kg per hectare. For the purpose of testing, a highly effective strain "Rizotorfin" - 640 "B" was used (Recommendation of the All-Russian

Research Institute of Agricultural Industry on the use of rhizotorfin on seeds of legumes, 1986).

The agrotechnics of soybean cultivation in the experiments was carried out in accordance with the methodology of the department of leguminous crops of the Uzbek Research Institute of Rice (Recommendation for the cultivation of soybeans on irrigated lands in Uzbekistan, 1982).

Research results. In the literature, we have not seen data on the antibiotic activity of soybean nodules and nodule bacteria in relation to the causative agent of wilt. Therefore, we set out to identify and obtain more specific data on the effect of the antagonistic activity of soybean nodules and nodule bacteria on the cotton wilt pathogen *V.dahliae*. The causative agent of cotton wilt is a widely specialized phytopathogenic fungus, *V.dahliae*, which mainly lives in soil and plant debris.

Soybean nodule bacteria belong to the genus *Rhizobium japonicum* (Pechi-Kövesh Kristina, 1976).

It is generally known that nodule bacteria exist on the roots of soybeans in a symbiotic relationship and the phenomenon of accumulation of atmospheric nitrogen in the soil in an amount of 130-150 to 250 kg per hectare per year occurs (Romanov, Mirzazhonov, Talibullin, 1990).

The antagonistic activity of soybean nodules and nodule bacteria in relation to *V.dahliae* was first studied and proved by us in laboratory conditions. "Rizotorfin (peat nitragin)" in the form of a preparation is made on the basis of soybean nodule bacteria. In laboratory experiments, the antibiotic activity of strain 640 "B" in relation to *V.dahliae* was investigated. To study the fungicidal properties, we used soybean nodules from a small-plot experiment sown with the use of rhizotorfin for presowing seed treatment. Before the liquidation of the experiment in the fall (in the phase of filling the grain of soybeans), nodules were selected to determine their fungicidal activity, which were carried out by placing the nodules - whole and crushed - on the lawns of the fungus *V.dahliae*. Czapek's medium served as a nutrient medium in these experiments. The experiments were performed in 4-fold repetition.

Before applying the nodules to the lawns of *V.dahliae*, the surfaces of the nodule lumps were sterilized in the usual way (using mercuric chloride) and then washed with sterile water. In the control variant, inoculations of the fungus *V.dahliae* on Czapek's medium without nodules. For the study, large, medium and small pink soybean nodules taken from the root system were used. Daily observations were made for the width of the lack of growth of the

fungus *V.dahliae* under the influence of nodules and nodule bacteria of soybeans. On the 5th day, a sterile zone appeared around the nodules. A particularly large zone was observed on the 10th day under the influence of crushed nodules. On this day, the diameter of the sterile zone was 20.8 mm. Table 1.

Effect of soybean nodules on the suppression of the growth of the fungus *V.dahliae*

(Average of 4 reps). Laboratory experience.

Options	The diameter of the sterile zone, d-mm
1. Control - no nodules	0,0
2. Crushed nodules	20,8
3. Whole nodules	15,1

It is known from the literature that nodule bacteria are found inside the nodules. On the Czapek nutrient medium, the development and reproduction of the emerged bacteria from the nodules, where there were crushed nodules, was observed directly on the Czapek medium. The emerging nodule bacteria showed antagonistic activity to *V.dahliae*, as a result, a zone of suppression of the growth of the fungus *V.dahliae* on the nutrient medium was observed. Numerical data are shown in Table 1. As can be seen from the table, antibiotic activity of soybean nodules and nodule bacteria in relation to the causative agent of wilt is observed. The most effective in suppressing the growth of the fungus *V.dahliae* was when using cut nodules. Whole nodules were also antagonistic against the fungus *V.dahliae*.

Conclusions

As a result of research, it was found that nodules and nodule bacteria are antagonistic towards *V.dahliae*. Soybean inoculation with rhizotorphin in field experiments significantly reduced the content of *V.dahliae* in the soil.

Nodule bacteria and soybean nodules serve as fixers of biological nitrogen and at the same time are antagonists of the causative agent of cotton wilt. Synthesized physiologically active and other substances by nodule bacteria stimulate the growth and development of plants, increase resistance to diseases. Soybean nodules themselves protect the root system from various soil phytopathogens. This is a biological way of combating soil phytopathogens.

The results obtained make it possible to suggest that the antagonistic activity of nodules and nodule bacteria is one of the main factors of the healing effect of soybeans as a precursor of cotton in anti-wilt cotton crop rotations. This can be enhanced using the bacterial preparation "Rizotorfin" of the nodule bacteria strain (640 "B"), which has a strong

antibiotic effect against the soil phytopathogenic fungus *V.dahliae*, the causative agent of cotton wilt.

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