

## The Effect of Nodules on the Quality Indicators of Soybean Grain of the Varieties “Uzbek-6”, “Madad”, “Orzu”

E. A. Choriyeu

Basic doctoral student

**Abstract:** The effect of biopreparation on the quality indicators of soybean grain of the varieties “Uzbek-6”, “Madad”, “Orzu” was studied and the results of the research were presented.

**Keywords:** Symbiosis, soybean, biopreparation, phenology, nodules, pods, flowering, biochar, nodule bacteria, protein, oil, strain.



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Global soybean production is expected to grow by 2.2% annually, reaching 371.3 million tons in 2030. Soybeans are grown on 32% of the total cultivated area in the United States, 31% in Brazil, and 18% in Argentina. Today, soybeans are a very important crop worldwide.

The current global soybean production is 276,500 million tons. The global area under this crop is 111,300 thousand hectares. The average yield is 24.8 t/ha.

For a long time, legume-rhizobial symbiosis was considered a manifestation of the activity of nodule bacteria, their virulence and efficiency. However, in recent years, it has been proven that the host plant plays no less active role in the formation and functioning of legume-rhizobial symbiosis than bacterial cells. Such data were obtained as a result of studying the host specificity of nodule bacteria, that is, the dependence of their symbiotic activity on the plant species. (Provorov, 1985; Karpunina, Soboleva, 2001; Delmotte va boshq., 1999; Howieson et al., 2000; Moulin Lionel et al., 2001).

The formation and activity of the bean-rhizobial symbiosis is the result of complementarity of the genotypes of the partners: all stages of formation, as well as their efficiency and nitrogen-fixing activity, are controlled by the genes of both plants and bacteria. (Simarov, Tixonovich, 1985; Provorov va boshqalar., 1994; Hardarson, 1993; Tikhonovich et al., 1997; Schultze, Kondorosi, 1998; Gualtieri, Bisseling, 2000).

Studies on symbiotic nitrogen fixation have shown that its increase is not possible only due to microorganisms. In addition, the efficiency of symbiotic nitrogen fixation largely depends on the genotype of the host plant (Peterson, 1981; Doyle, Doyle, 1997; Douglas, 1997; Santalla et al., 2001). Therefore, it is very important to study the interaction between plants and microorganisms.

The studies were conducted in the experimental field of the Rice Research Institute. The soybean varieties “Uzbek-6”, “Madad”, “Orzu” and the strains of Tuganak bacteria br.sp-1 and br.sp-2 were used as research materials.

Soybean varieties “Uzbek-6” “Madad” “Orzu” were sown in pure form and with nodule bacterial strains as controls. The seeds harvested from the control variant contained 37.4% protein in the “Uzbek-6” variety, 21.96% oil content, 33.65% crude protein. In the “Madad” variety, the protein content was 36.77%, 22.3% oil content, 32.74% crude protein. In the “Orzu” variety, the protein content was 36.78% oil content, 21.77% crude protein, 33.73% crude protein.

Soybean seeds “Uzbek-6” “Madad” “Orzu” were sown inoculated with br.sp-1 nodule bacterial strain. As a result, the harvested seeds of the “Uzbek-6” variety contained 38.57% protein, 21.57% oil, and 34.32% crude protein. The “Madad” variety contained 36.81% protein, 21.83% oil, and 33.54% crude protein. The “Orzu” variety contained 37.63% protein, 22.26% oil, and 33.41% crude protein. As a result, the “Uzbek-6” variety was sown inoculated with the br.sp-2 nodule bacterium strain “Madad” and “Orzu” seeds. As a result, the harvested seeds of the “Uzbek-6” variety contained 37.23% protein, 21.75% oil, and 32.52% crude protein. The “Madad” variety had a protein content of 37.65%, an oil content of 22.04%, and a crude protein content of 33.62%. The “Orzu” variety had a protein content of 37.76%, an oil content of 23.12%, and a crude protein content of 34.53%. (Table 1)

**Table 1. “The effect of nodulation on the quality indicators of soybean grain of the varieties “Uzbek-6”, “Madad”, and “Orzu””**

Option	Variety name	Grain quality indicators		
		Protein, %	Oil, %	Crude protein, %
Control	O`zbek-6	37,4	21,96	33,65
	Madad	36,77	22,3	32,74
	Orzu	36,78	21,77	33,73
Br.sp 1	O`zbek-6	38,57 +0,87	21,57 -0,39	34,32 +0,67
	Madad	36,81 +0,04	21,83 -0,47	33,54 +0,8
	Orzu	37,63 -0,11	22,26 +0,49	33,41 +0,32
Br.sp 2	O`zbek-6	37,23 -0,47	21,75 +.21	32,52 -1,13
	Madad	37,65 +1,12	22,04 -0,26	33,62 +0,88
	Orzu	37,76 -0,02	23,12 +1,35	34,53 +0,8

As a result, the protein content in soybean “Uzbek-6” seeds increased by +0.87% in the 1st variant compared to the control

and decreased by 0.47% in the 2nd variant

The protein content in soybean “Madad” seeds increased by +0.4% in the 1st variant compared to the control and increased by 1.12% in the 2nd variant

The protein content in soybean “Orzu” seeds decreased by -0.11% in the 1st variant compared to the control and decreased by 0.02% in the 2nd variant

The oil content in soybean “Uzbek-6” seeds decreased by -0.39% in the 1st variant compared to the control

and increased by +0.21% in the 2nd variant

The oil content in soybean “Madad” seeds decreased by -0.39% in the 1st variant compared to the control and decreased by 1.13% in the 2nd variant

The oil content of soybean “Orzu” seeds increased by +0.40% in the 1st variant and by +1.35% in the 2nd variant compared to the control.

The crude protein content of soybean “Uzbek-6” seeds increased by +0.67% in the 1st variant and by -1.13% in the 2nd variant compared to the control.

The crude protein content of soybean “Madad” seeds increased by +0.8% in the 1st variant and by +0.88% in the 2nd variant compared to the control.

The crude protein content of soybean “Orzu” seeds increased by +0.32% in the 1st variant and by +0.8% in the 2nd variant compared to the control.

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