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Rhizobium inoculant and seed-applied fungicide effects on the soybean symbiotic apparatus under drought as a biotechnology solution in the climate change conditions

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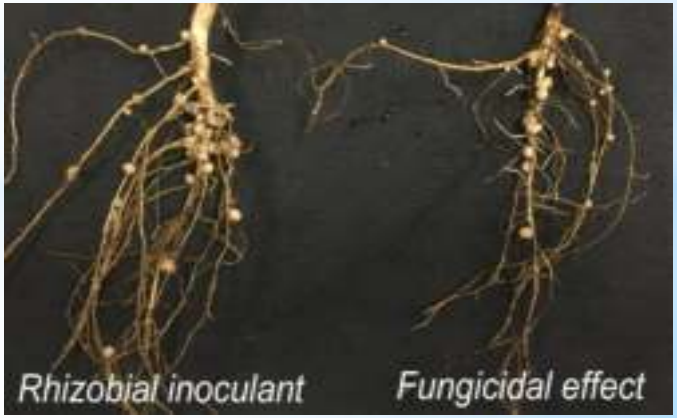
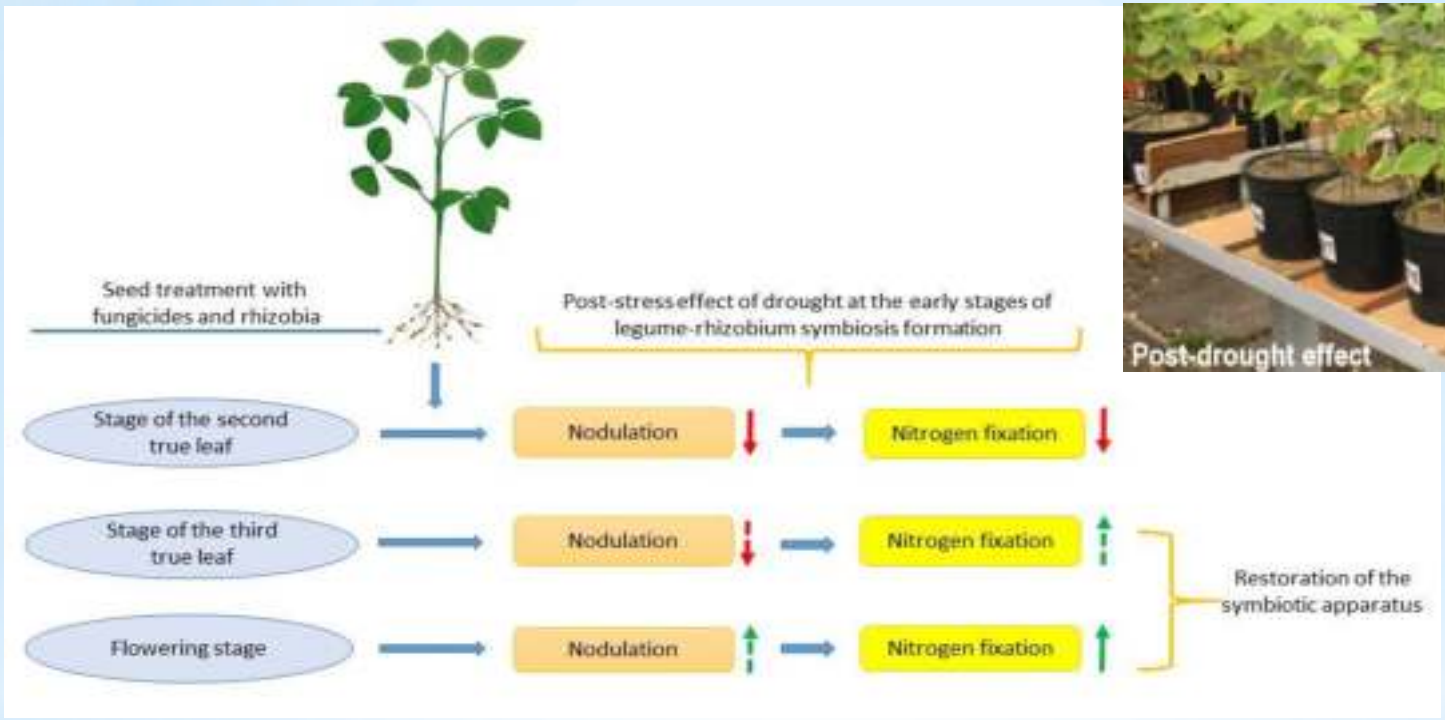
Actual problems of today. The world community attention is focused on the ecological state of environment and solving the problems of rational use of natural water resources and agricultural land. Due to climate change and increasing the drought frequency, the study of key aspects of plant drought resistance is an important approach of research.

Aim. To study the effeciency of fungicide treatment in combination with rhizobial inoculant (Bradyrhizobium japonicum B1-20) on soybean seeds to improve biological protection and nitrogen-fixing potential of plants, as well as increase their adaptation to drought.

Scientific hypothesis. The use of this processing method can be an alternative solution for providing leguminous plants with molecular nitrogen and at the same time contributes to the development of their drought tolerance.



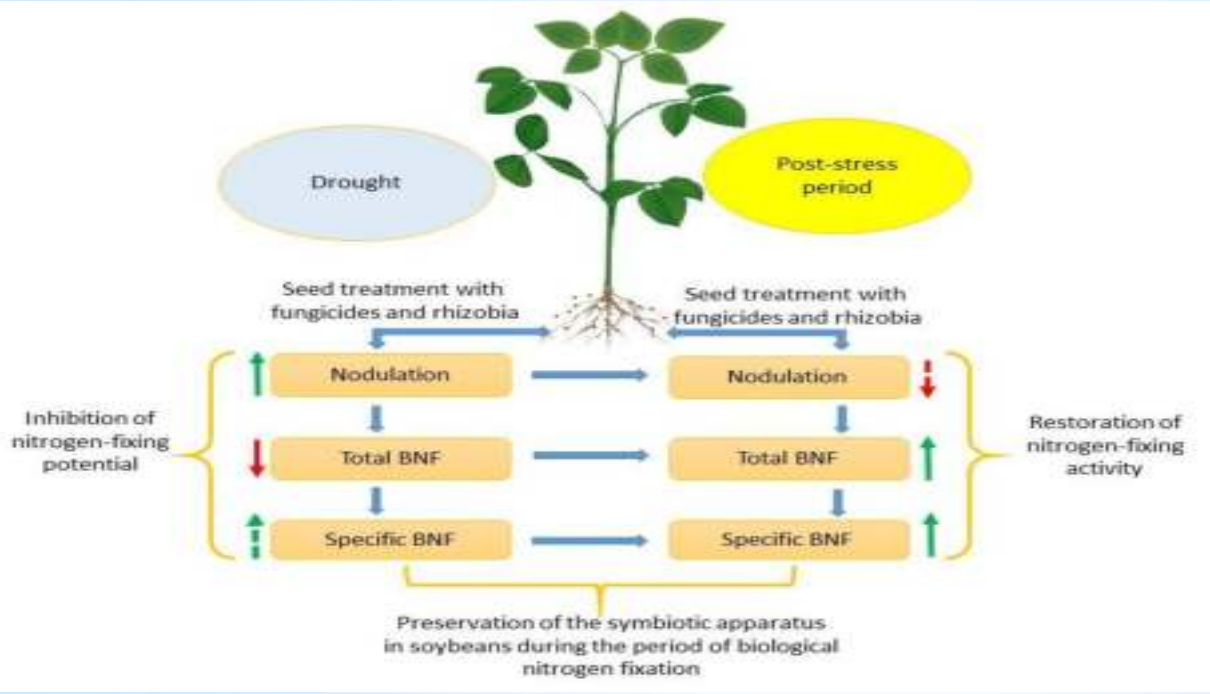
The post-stress effect of drought on the early stages of soybean-rhizobial symbiosis formation by the seed treatment with fungicide (fludioxanil, 25 g/l) and active rhizobia (*Bradyrhizobium japonicum* B1-20) inoculation.



The colored arrows indicate the increasing or decreasing of the studied parameters, and the broken lines indicate the insignificant changes of parameters by different seed treatment (using fungicide and without it).

It was established that despite of the harmful drought effect on the nodulation process and nitrogen fixation at the initial stages of the legume-rhizobial symbiosis formation, and the application of seed treatment with fungicide and rhizobial inoculant contributes to the restoration of the soybean symbiotic apparatus functioning in the post-stress period.
This happens primarily due to the restoration of the efficiency of molecular nitrogen fixation per soybean nodules mass unit in the stages of the third true leaf and flowering.

Drought effect in the period of active biological nitrogen fixation (BNF) by soybean at the stages of the third true leaf – budding and after watering the plants in the flowering stage by the seed treatment with fungicide (fludioxanil, 25 g/L) and rhizobial inoculant (*Bradyrhizobium japonicum* B1-20).



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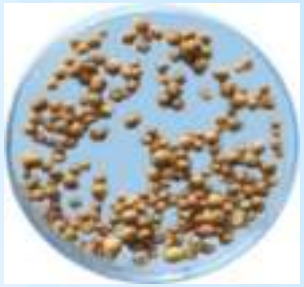
Soybean nodules

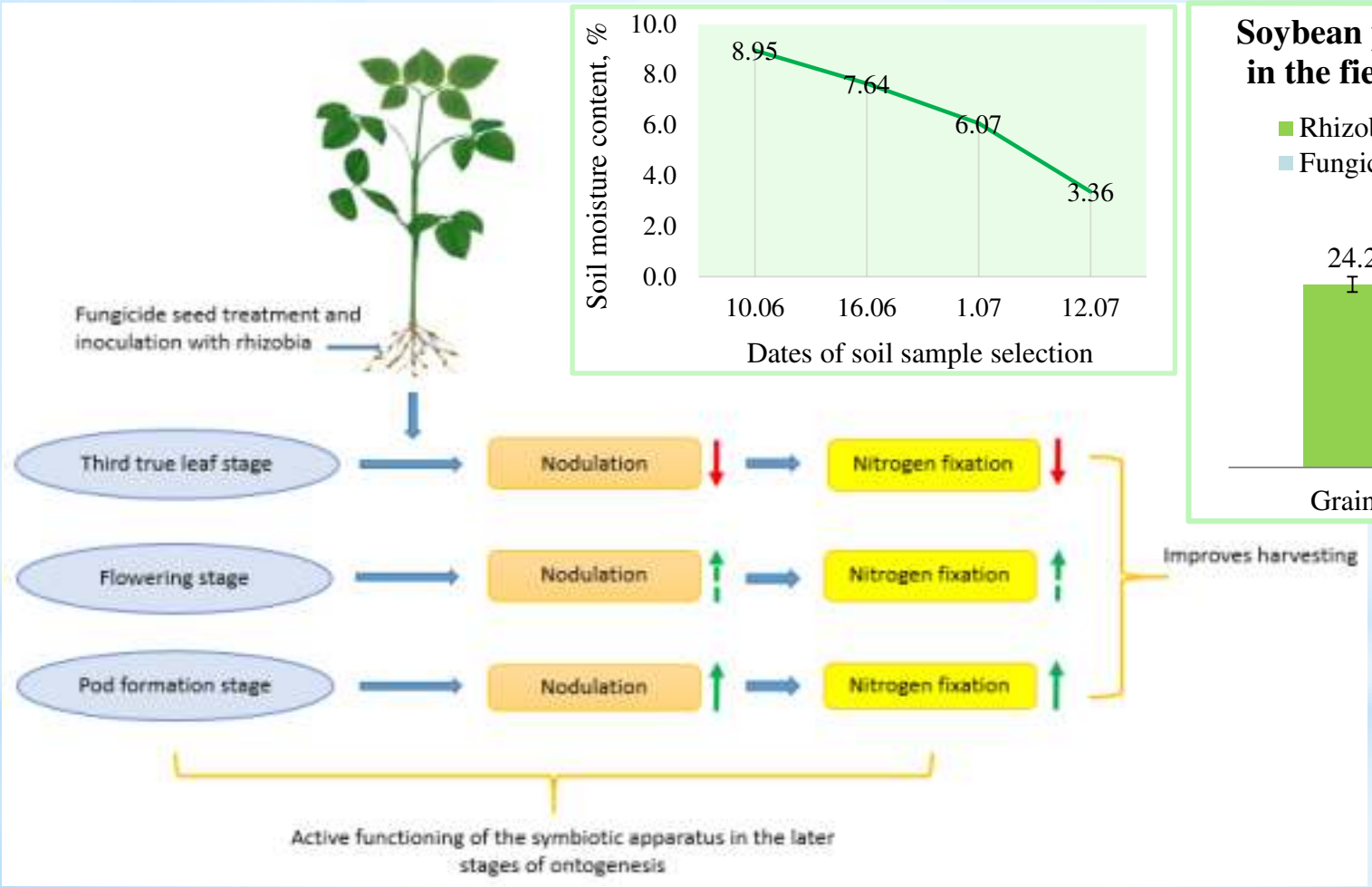


optimal water supply

drought

Therefore, the use of fungicide and rhizobial inoculant for seed treatment ensures the preservation of the legume-rhizobial symbiosis functioning under droughts in the active nitrogen fixation period by soybean nodules. The result is the increasing of specific nitrogen fixation per nodules mass unit under the drought, as well as the rapid recovery of nitrogen-fixing soybean potential after post-stress period.

It is proved that fungicidal (fludioxonil, 25 g/L) seed treatment and inoculation with active rhizobia (B. japonicum B1-20) are effective for soybean growing in the field to extend the period of nitrogen fixation at the generative and reproductive stages of plant development, which helps to increase the grain yield (17.8%).



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