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2022



**BOOK OF  
ABSTRACTS**

*XIII International Scientific Agriculture Symposium  
"AGROSYM 2022"  
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# INVESTIGATION OF Si-LIGNIN INTERACTION BY FLUORESCENCE TECHNIQUES AND ATOMIC FORCE MICROSCOPY- POSSIBLE APPLICATION IN AGRICULTURE

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## Abstract

Silica is beneficial element for plants. Many studies of silica show the useful effects that Si can provide on plant-environment relationships in a wide variety of crops, as increase in growth and yield and improvement of resistance to metal toxicity, salt stress, drought resistance etc. The occurrence of Si within a plant is a result of its uptake in the form of soluble  $\text{Si}(\text{OH})_4$  or  $\text{Si}(\text{OH})_3\text{O}$  ion from the soil, and its polymerization at a final location. Si is mostly accumulated in the cell walls (CWs), thus providing strengthening of CWs, increasing mechanical strength, and alleviating effects of various biotic and abiotic types of stress. Lignin, as one of the main components of the plant CW, is a natural phenolic polymer with high molecular weight and complex structure. Accumulation of silica in plants is directly connected with chemistry and structure of lignin. Silicon affects the composition of CWs by its binding to the phenolic and carbohydrate CW components in polymerization reactions by altering linkages of non-cellulosic polymers and lignin. We studied, in an *in vitro* system, the interaction of  $\text{SiO}_2$  with the peroxidase catalyzed polymerization of a lignin monomer into the lignin model compound (DHP). Fluorescence microscopy and spectroscopy combined with AFM technique showed that Si was bound to the final polymer, and the structure of the Si-DHP differed from pure DHP. We show that Si significantly influence on lignin structure. The results contribute to understanding of Si binding to lignin in cell walls, which may have impact on possible Si applications in agriculture.

**Keywords:** *Silica, lignin, cell wall, fluorescence, AFM.*