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LS-2-P-3306 The development of silica phytoliths in plants is morphologically pre-determined even under the absence of silica

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Many plant species are able to accumulate high amounts of silicon and form biogenic opal – silica phytoliths [1]. There is a potential to use the silica phytoliths, because of their physical and chemical features, in electro-technical and building industry [2]. The goal of this study was to characterise the silicon- and cadmium-dependent silica phytoliths formation in endodermal cells and to test the possibility to change the size and morphology of silica phytoliths with the aim to produce particles of requested features for industry.

Tested plants of *Sorghum bicolor* were cultivated in hydroponics containing wide concentration range of Na_2SiO_3, as silicon source, and of cadmium. After three-day treatment the seminal roots of plants were investigated by a combination of negative phase contrast and differential interference contrast, fluorescent, transmission and scanning electron microscopy (equipped with EDXA) to characterise the development, exact localisation, shape and morphology of silica phytoliths related to the composition of cultivation media and to the endodermal cell wall modifications.

At the concentrations of silicon above 0.8 μmol/L the silica phytoliths form uniformly in endodermal cells of *S. bicolor* seminal roots with a positional effect consistently with a gradual development of suberin lamellae. The low silicon concentrations in the hydroponic media affect negatively the size of silica phytoliths and the continuous size-dependent gradient shifts towards the base of the root. Plants form, even under silicon deficient conditions, in the responsible cells morphologically pre-determined areas for silica phytoliths formation. The cadmium affects not only the size, but also the exact localisation of phytoliths. At still relatively low concentrations of cadmium the phytoliths stop to form and the silicon is spread ectopically in the tissues of root.

Based on the results the exact localisation of silica phytoliths is pre-determined and silica phytoliths are formed uniformly under natural conditions. However, their development, size and morphology can be changed by silicon starvation or by use of compounds affecting the silicon metabolism and/or mechanisms of phytoliths formation in plants. The further investigation, understanding, and modification of processes involved in the phytoliths development can help to produce particles of requested features for industry.

1. M.J. Hodson et al., An Bot 96 (2005), p. 1027-1046.

2. S. Neethirajan et al., Trends Biotech 27 (2009), p. 461-467.

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