Root silicification of grasses and crops from Pampean region and its relevance on silica and silicophytolith content of soils

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Root tissues of grasses and dicots can accumulate amorphous silica. Particularly in Poaceae family, silica can be restricted to the endodermis, spread throughout all tissues or deposited into intercellular spaces. The aim of the present study were 1) to analyze the silica content in typical grasses and crops (soybean, maize, wheat) from Pampean region, Argentina; 2) to evaluate the potential input of silica and silicophytoliths from roots to soils in natural and cultivated areas. Roots from eight typical pampean grasses and three crops were collected from field. Also, soil samples, including the roots developed within them, were collected every 10 cm along the profiles from natural and cultivated areas. They were dried and weighted, and the relative contribution of roots to total weight was calculated. Root silicophytoliths were extracted following a calcination technique and the content was calculated as percentage of dry weight. Silicophytolith morphologies were described under light microscope, according to previous literature. Silicophytolith content ranged between 4-11% in pampean grasses and between 0.8-4.20% in crops. *Bothriochloa laguroides* and *Sorghastrum pellitum* produce silica aggregates in endodermal walls; while the rest of the grasses produce silicifications of endodermal walls and xylem. In crops, silica is deposited in xylem, endodermal cells and epidermal cells. In soils, the abundance of roots was higher in the first 10 cm. In this section the roots represented the 0.39% of the weight of natural soils and 0.03% of cultivated soils. Towards the base to the profiles the values ranged between 0.0013-0.023% and 0.002-0.001%, in natural and cultivated soils, respectively. Considering a 15% (mean value) of silica content of roots obtained from soils, the total silicophytolith input from roots to soils was 0.0585 gr per 100 gr of soil (at first 10 cm) and between 0.000195-0.00345 gr per 100 gr of soil (10-60 cm) in the natural area. Instead, in crop area, where silica in roots was 11%, the mean value of silica input was 0.0033 gr per 100 gr of soil (first 10cm) and 0.00011-0.00022 gr per 100 gr of soil (10-60cm). The main morphologies found in soil roots were silicified xylem and elongate phytoliths, similar to those found in roots from Pooideae grasses and crops. The results obtained in this study revealed that 1) silicophytolith production in roots from pampean grasses and crops is abundant; 2) the morphologies found are consistent with previous studies in relation to Poaceae; 3) the input of silica and silicophytoliths from roots to soils may be more relevant in natural than in cultivated areas, due to the higher development of roots but also due to the higher production of silicophytoliths in native grasses. Since root silicophytolith morphologies seem to be more labile than the morphologies produced by other grass organs, it may be possible that they have a strongest influence on silica cycle

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in soils, due to a higher/faster dissolution rate; they also may contribute to the preservation of soil aggregates, due to the role that silica has on soil structure. Acknowledgments: PICT 2036, PICT 1583, EXA 741/15

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