Geophysical Research Abstracts
Vol. 19, EGU2017-13137, 2017
EGU General Assembly 2017
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Effect of temperature and concentration on the surface tension of chia seed mucilage

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The production of mucilage by the seed coat during hydration is a common adaptation of many different plant species. The mucilage may play many ecological roles in adaptation and seed germination in diverse environments, especially in extreme desert conditions. The major compound of the seed mucilage is polysaccharides (e.g. pectins and hemicelluloses), which makes it highly hydrophilic. Consequently, it can hydrate quickly in the presence of water; forming a gel like coating surrounding the seed. However, the seed mucilage also reported to contain small amounts of protein and lipid which may exhibit surface activity at the water-air interface. As a result, decay in the surface tension of water can be occur and consequently a reduction in soil capillary pressure. This in turn may affect the water retention and transport during seed germination. The physical properties of the seeds mucilage have been studied mainly in conjunction with its rheological properties. To the best of our knowledge, its surface activity at the water-air interface has been reported mainly in the realms of food engineering, using a robust method of extraction. The main objective of this study was to quantify the effect of temperature and concentration on the surface tension of seed mucilage. The mucilage in this study was extracted from chia (Salvia hispanica L.) seeds, using distilled water (1:20 w/w) by shaking for 12 h at 4ºC. The extracts were freeze dried after centrifuge (5000rpm for 20min). Fresh samples of different concentrations, ranging from 0.5 to 6 mg/ml, were prepared before each surface tension measurements. The equilibrium surface tension was measured by the Wilhelmy plate method using a tensiometer (DCAT 11, Data Physics) with temperature control unit. For a given mucilage concentration, surface tension measurements carried out at 5, 15, 25, 35, 45 ºC. The quantitative and thermodynamic analysis of the results will be presented and discussed.