PURIFICATION AND CHARACTERIZATION OF IRON CHELATES FROM SOYBEAN NODULES. J. E. Moran*,†, R. V. Klucast, R. Grayer§, J. Abián¶, & M. Becanay. †Department of Biochemistry, The Beadle Center, University of Nebraska-Lincoln, Lincoln NE 68588-0664, USA. §Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, U. K. ¶Centro de Investigación y Desarrollo, CSIC, Jordi Girona 18-26, 08034 Barcelona, Spain. ¥Departamento de Nutrición Vegetal, Estación Experimental Aula Dei, CSIC, Apdo 202, 50080, Zaragoza, Spain

In biological systems, iron, either in free form or bound to many chelates, can act as a deleterious catalyst producing hydroxyl radical through Fenton chemistry. The soybean nodule cytosol contains iron that is capable of catalyzing free radical production. This iron appear to be bound to low molecular chelates as indicated by anion exchange chromatography and gel-filtration of the low-molecular-mass extract (<1 kDa). A large portion of the catalytic iron pool was identified as phenolic compounds of three classes: phenolic acids, cinnamic acids, and flavonoids. The ability of many of these phenolic compounds to react in free radical mediated reactions was determined in a systematic structure-activity relationship study. All of the compounds that were tested were able to chelate iron, as judged from their inhibitory effect on site specific deoxyribose degradation. However, only those having catechol, pyrogallol, or 3-hydroxy-4-carbonyl groupings were potent chelators and reductants of iron at pH 5.5. The same phenolics promoted oxidative damage to DNA and to deoxyribose, but inhibited linolenic acid peroxidation by chelating and reducing iron and by neutralizing lipid radicals. It is reasoned that under the reducing and acidic conditions prevailing in the nodules, phenolics are likely to act primarily as antioxidants.