



Influence of *Cynara cardunculus* L. over essential cations on semiarid low productive agricultural soils.

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Soil conservation through proper management is essential to maintain natural cycles and to avoid detrimental effects on human health. Complex energy and matter fluxes occur continuously among different systems, including the anthropic one. Whenever the fluxes balance is altered, inefficient and detrimental effects arise. In this sense, nutrient cycling is broken in some agricultural lands as a result of farming practices. In addition, these lands are prone to be abandoned as productivity and benefits decrease. In this scenario, low organic matter levels, erosion and structure degradation are common features to soils, moreover is climate conditions favor these processes, like in semiarid soils. Species like *Cynara cardunculus* L. with low nutritional and irrigation requirements and high biomass production could act as a natural barrier to diminish erosion and became a source of organic matter or monetary profit (bioenergy). The aim of this work is to ascertain if certain macronutrients (Ca^{+2} ; Mg^{+2} ; K^{+} and also Na^{+}) dynamics are influenced by *Cynara cardunculus* L. (*cynara*) growth, giving special attention to Exchangeable Sodium Percentage (ESP) and bivalent/monovalent ratio ($([\text{Ca}^{+2}] + [\text{Mg}^{+2}]) / ([\text{Na}^{+}] + [\text{K}^{2}])$).

Four low productive agricultural calcareous soils, located in the South East of Spain under semi-arid conditions, were chosen for the experiment and cultivated with *cynara*. During a year period, three sampling were carried out (October, April and July), taking four samples from each (top soil layer: 0-15 cm). Soil and irrigation water were analyzed (physical and chemical properties). No mechanical tillage was applied since the beginning of the experiment, so weeds were removed manually. Exchangeable Ca, Mg, K, and Na were extracted with ammonium acetate and determined by atomic absorption acetylene flame technique. ESP (in extraction) and bivalent/monovalent (b/m) ratio were calculated with the previous data. Analyses of variance (ANOVA) at $p=0.05$ significance level were performed to evaluate soil parameters dynamics.

Na^{+} concentration increased through time while K^{+} levels remain unaltered. No significant trends were found for Ca^{+2} and Mg^{+2} , but the b/m ratio value (≈ 6) showed the prevalence of these cations, mainly because of Ca^{+2} concentration effect. Although Na^{+} levels increased, the overall effect over soil structure may not be so negative. No significant trends were found in macronutrients dynamics as a consequence of *cynara* growth. Longer test time is needed and more parameters should be included into consideration to improve the knowledge of the effect of this energy crop over soil dynamics..

References

- Fernandez J., Curt, M.D., Aguado P.L. Industrial applications of *Cynara cardunculus* for energy and other uses. Industrial Crops and Product 24 (2006) pp 222-229.
- Wood C.W., Adams J.F., Wood B.H. Macronutrients. In Elsevier Encyclopedia of soils. pp 387-393.
- Potts D.L., Harpole S.W., Goulden K.N., Suding K.N.; The impact of invasion and subsequent removal of an exotic thistle, *Cynara cardunculus*, on CO_2 and H_2O vapor exchange in a coastal California grassland. Biol.Invasions (2008) 10, pp 1073-1084