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Cardoon (*Cynara cardunculus* L.) biomass production in a calcareous soil amended with sewage sludge compost and irrigated with sewage water

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Energy use is one of the most important current global issues. Traditional energetic resources are limited and its use generates environmental problems, i.e. Global Warming, thus it is necessary to find alternative ways to produce energy. Energy crops represent one step towards sustainability but it must be coupled with appropriate land use and management adapted to local conditions. Moreover, positive effects like soil conservation; economical improvement of rural areas and CO_2 storage could be achieved. Treated sewage water and sewage sludge compost were used as low-cost inputs for nutrition and irrigation, to cultivate cardoon (*Cynara cardunculus* L.) a perennial Mediterranean crop. The aim of the present field experiment was to ascertain the optimum dose of compost application to obtain maximum biomass production.

Four compost treatments were applied by triplicate (D_1=0; D_2=30; D_3=50; D_4=70 ton/ha) and forty eight cardoon plants were placed in each plot, 12 per treatment, in a calcareous soil (CLfv; WRB, 2006) plot, located in the South East of Spain, in semi-arid conditions. The experiment was developed for one cardoon productive cycle (one year); soil was sampled three times (October, April and July). Soil, compost and treated sewage irrigation water were analyzed (physical and chemical properties). Stalk, capitula and leave weight as well as height and total biomass production were the parameters determined for cardoon samples. Analyses of variance (ANOVA) at p=0,05 significance level were performed to detect differences among treatments for each sampling/plot and to study soil parameters evolution and biomass production for each plot/dose.

Several statistical differences in soil were found between treatments for extractable zinc, magnesium and phosphorus; as well as Kjeldahl nitrogen and organic carbon due to compost application, showing a gradual increase of nutrients from D_1 to D_4. However, considering the evolution of soil parameters along time, pH was the only with marked and significant decreasing trend from the first to the last sampling period.

Mean cardoon biomass production in D_1subplot was 13 ton/ha which differed significantly from D_4 production, which was about 20 ton/ha. Hence, the maximum biomass production was obtained with the maximum compost dose.

The results show that compost amendment increased cardoon biomass production, probably due to the improvement of soil properties, especially plant nutrient availability. No significant differences were found in soil parameters along time, with the exception of pH. However, longer test time is needed to evaluate long term effects in soil and to check the maintenance of biomass productivity.

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