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Therese Atallah
Faculty of Agricultural Sciences, LU. Lebanon. therese.atallah@gmail.com

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Al Chami Z.1, Bou Zein Eldeen S.1,2, L. Bitar1 and Atallah T.2*

1. IAM, Bari. Valenzano, Italy.
2. Faculty of Agricultural Sciences, Lebanese University. therese.atallah@gmail.com
*Corresponding author.

Abstract
Organic amendments, green manure and plant residues incorporation are the main sources of nutrients in organic farming, their decomposition rate is crucial for the accumulation and long-term storage of organic matter in soils. In this study the decomposition of compost from olive mill waste (N: 29.3 g kg-1; total dissolved nitrogen or TDN: 3.82 g kg-1), goat manure (N: 31.5 g kg-1; TDN: 0.94 g kg-1), the shoots (N: 33.6 g kg-1; TDN: 17.57 g kg-1) and roots (N: 22.12 g kg-1; TDN: 8.87 g kg-1) of Medicago sativa was followed in three Lebanese soils. The nitrogen, phosphorus and potassium released were followed over one year, starting in early winter (December-January). The mild sub-humid Mediterranean conditions allowed a rapid mass loss in alfalfa shoots 30 days after incorporation. Manure and compost were more persistent. Between 80 and 90% of TDN were released, after 30 days of in-situ incubation for compost, the release was over 90% for alfalfa shoots. The movement of P was slower, as the compost (6.99 g kg-1 of P) and manure (9.81 g kg-1 of P) lost 33% and 22%, respectively, during 30 days of incubation. After one year, 15 to 35% of P remained in the soils. The manure was the richest in potassium (19.66 g kg-1) followed by the alfalfa shoots (15.56 g kg-1), the compost (8.19 g kg-1) and the roots (5.96 g kg-1). The loss of potassium was important, as over 88% had disappeared over the year. All decomposition curves followed an exponential model. The calculated coefficients of decomposition for total nitrogen (lnfinal – lninitial/days) were significantly higher for alfalfa shoots (0.00547 day-1) and similar for the compost (0.00184 day-1) and the manure (0.00175 day-1). The ANOVA test showed a difference between two of the sites (Site A: 521 g kg-1 of clay and 42 g kg-1 of calcium carbonate; Site S: 260 g kg-1 of clay and 269 g kg-1 of $CaCO_3$) and the third one (Site L: 315 g kg-1 of clay and 591 g kg-1 of $CaCO_3$). The relationships between the soil calcium carbonate and the coefficients for the compost and the manure were linear. An increase of 50‰ of $CaCO_3$ would cause a decrease of the coefficient by 0.0001 in the case of compost, and by half of this for the manure. Rather than the clay content, the calcium carbonate seemed to slow down the decomposition of relatively stable products such as the compost and manure.
Keywords: organic amendments; nutrients release; Lebanese pedo-climatic conditions.