Influence of municipal solid waste compost application on soil fertility and barley yield

H. Oueriemmi[*(1,2,4)], R.I. Zoghlami [(2)],K. Ardhaoui[(2,3)],P.S. Kidd[(4)],M. Moussa[(2)]

[1]High Institute of water sciences and techniques, University of Gabes, 6072 Gabes, Tunisia
[2]Arid Regions Institute,Medenine 4119,Tunisia
[3]ISBAM , University of Gabes, Medenine 4119,Tunisia
[4] Agrobiological Research Institute of Galicia, 15705 Santiago de Compostela, Spain
[(*)]*Principal Author's Phone Number and email: +21654798911;*
houdaoueriemmi@outlook.com

1. Introduction –

In the Mediterranean region, climate is arid and soils are relatively poor in term of organic matter and present a low porosity and slow infiltration while organic wastes are produced in a huge quantity. Nevertheless, the substantial employ of mineral fertilizers increases the risk of pollution due to the excessive leaching of nutrients. Therefore, there is an increasing trend of using organic fertilizers such as municipal solid waste compost in agriculture. This biosolid has beneficial impacts on soil physico-chemical properties and may promote nutrient availability and plant yield due to its organic matter richness. The aim of this research was to investigate the impacts of a single land application of municipal solid waste compost on soil properties and barley productivity.

2. Experimental –

The experimental protocol was set up using a completely randomized block with three replications. Three treatments were applied in autumn by including three levels of MSWC (D1:20 t ha^{-1}; D2: 40 t ha^{-1} and D3: 60 t ha^{-1}) in addition to the control (C) (without amendment). Soil chemical analysis were conducted as described by [2]. Immediately after the MSWC soil application and at the harvest time, soils were sampled at a depth of 0–20 cm from each plot for these analysis: pH, electrical conductivity (EC), soil total nitrogen (STN) and root total nitrogen (Kjeldahl method), Organic Matter (OM) (Oxidation method). The measured yield components agronomic were grain yield (GY); 1000 grains weight (TWG).

3. Results and Discussion –

The application of MSWC improved all soil chemical properties as function of compost application rates, especially OM which increased by 19.5 % in comparison with D3 and C. However, this single application did not have a great impact on soil pH. Indeed, pH values increased by 1% in comparison between the higher pH value (D2) and the control (C). Our results showed the ability of the soil to maintain a constant pH. In the other hand, the higher soil EC (1960µS cm-1 at D3 rate) did not lead to soil salinization that generally admitted at EC values ≥4000 µScm^{-1}[1]. Furthermore, our results show a decrease of C/N ratio with MSWC doses. In fact, the addition of 60 t ha-1 (D3) decreased the C/N by 33% in comparison with the control. This funding could be explained by the high production of (STN) which increased the organic matter decomposition rate. This hypothesis was confirmed by the relationship between C/N and STN which is highlighted by significant correlations ($r= -0.991$, $P<0.01$). Data obtained on barley grain yields showed a noticeable increase with all treatments when compared to the control, with a significant correlations between OM and GY ($r=0.978$, $P<0.05$).The increase in nutrient absorption (particularly at root nitrogen content) with compost dose due to the increase of OM ($r=0.913$, $P<0.05$).

4. Conclusions -

Single application of MSWC is a useful strategy to raise soil nutrient quality, organic status and plant productivity. Nonetheless, long-term field experiments are needed to evaluate completely the long- term effects of single compost application in sandy soils.

5. References

[1]H.Hamdi.,S.Hechmi.,M.Khelil.,RI.Zoghlami.,S.Benzarti.,S.MokniTlili.,A.Hassen.,N.Jedidi,*Catena*.,**17 2**,(2019) p:11-20.

[2] J.M. Pauwels, E. Van Ranst, M. Verloo, Z.E.A. Mvondo, "Manuel de laboratoire de pédologie: Méthodes d'analyse des sols et des plantes". Equipement, gestion des stocks de verrerie et de produits chimiques. Publications agricoles – 28. AGCD, Bruxelles, 1992.