

Effect of soil gypsum content on decomposition of different organic materials and humic acids formation and the effect of that on status and behaviour of potassium

By

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Abstract

Three laboratory experiments were conducted to study the effect of soil gypsum content and kind of organic matter on the decomposition of organic matter, humic materials amounts and the status and behavior of potassium.

Soils of different gypsum content were used in these experiment ,low (3.7% gypsum), medium (16% gypsum) and high (28.5% gypsum), for each has used two kind of organic wastes (poultry waste and wheat straw), at level of 2% with respect of soil organic carbon and without addition of OM to control treatment .

Factorial experiments were carried out in completely randomize design (CRD) in three replicates. Treatments were incubated at $30(\pm 2)^{\circ}\text{C}$ for (90) days in the first experiment and the amount of released CO_2 were determined in followed period ,

- from 1- 10 days determined in all day .
- from 10 – 20 days determined in two days .
- from 20 -31 days determined in three days .
- from 31 -60 days determined in 7th days .
- from 60 -90 days determined in 15th days .

The treatments of the second experiment was incubated for 30,60 and 90 days, hummification of organic materials (fulvic acid and humic acid) were determined after 30,60 and 90 days. Infrared-spectroscopy were carried out for it. Where as the treatment of third experiment were

incubated for 90 days and some thermodynamic parameters were determined to study the status and availability of potassium which is taken in 2.5 g soil and added with CaCl_2 and MgCl_2 solution (0.04M) which contain different concentrations from KCl (0, 0.2, 0.4, 0.8, 2, 4 and 8 mmol.l^{-1}).

The study showed the following result :

1. The soil of low gypsum content gave higher accumulative quantity of released CO_2 comparing with medium and high, the of soil treatment were as follow.

Poultry waste > Wheat straw > Control .

2. The soil of low gypsum content gave higher amount of Fulvic acid comparing with medium and high, at all of the incubation period the sequence of soil treatment were as follow .

Poultry > wheat > control .

The incubation periods in treatments of poultry wastes in the three soils followed the order:

(90) days period > (60) day period > (30) days period.

Whereas incubation in treatments of wheat straw in three soils followed the order:

(60) days period > (90) days period > (30) days .

3. The soil of low gypsum content gave higher amount of Humic acid comparing with medium and high, at all in the the three soils treatments were as follow ed the the order :

Wheat straw > poultry waste > control .

Whereas the incubation periods in three soils treatment were as followed the order:

(90) days period > (60) days period > (30) days period.

4. Infrared spectra for HA and FA extracted from soils treatment were almost similar, But the fulvic acid gave higher content of carbonyl , carboxyl and hydroxyl group comparing with humic .
5. The result of thermodynamic parameters showed that values of coefficient activity (f_k) were between (0.79 - 0.82)) that is (21 – 18%) of soluble potassium in soil solution found in unactive status, the values of ionic activity were from 2×10^{-5} to 195×10^{-5} , the free energy of replacement values were from -5852.88 to -3180.82 Cal.mol.

Regarding to Q/I , a linear relationship was obtained between quantity and intensity of potassium in all soils treatments. Potassium buffering capacity was between (17.36 - 58.53) $\text{cmol.Kg}^{-1}/(\text{mol.L}^{-1})^{1/2}$. Values of labile - K calculated from the intercepts of Y- axis, were (0.0028 - 0.5307) cmol..kg^{-1} . The labile – K values increased in all soils when the organic matter was applied and it decreased as gypsum content increased in the control soil (with out OM)