

International Conference on the Management of Naturally Occurring Radioactive Materials (NORM) in Industry

VIRTUAL EVENT

International Conference on
**Management of Naturally
Occurring Radioactive
Material (NORM) in Industry**

19–30 October 2020

#NORM2020



Contribution ID: 270

Type: **Poster**

Use of Phosphogypsum as a resource for soil reclamation

The study was performed to estimate the effect of phosphogypsum (PG) on the physical and chemical soil properties and barley yields in arid area, for four successive seasons. The experiments were conducted at eight different locations in Khanasser valley, in Syria, with four replicates for each treatment. At each respective site, PG was applied in two rates, i.e. 20 and 40 t/ha; phosphate fertilizer (P) was used in the third treatment as P₂O₅ with a rate of 50 kg ha⁻¹; the last site represented a check ot that was free of P-fertilizer or PG. P-fertilizer was applied every year whereas PG was used only one time at the first planting season. The data revealed that using PG increased significantly the mean of grain yield by ca. 40 and 50% and the biomass by 41 and 50% for PG rates of 20 and 40 t ha⁻¹, respectively. The four successive addition of P-fertilizer increased the mean yield of grain by 19% and the biomass by 23%. Using PG (containing 416 Bq kg⁻¹ 226Ra) enhanced the radioactivity of the soil upper layer (0–15 cm) by 5 and 9 Bq kg⁻¹ for PG rate-application of 20 and 40 t ha⁻¹, respectively. However, the concentration of 226Ra in barley's straw and grains were below the detection limit (i.e. 1 Bq kg⁻¹ dry weight). Application of 40 t ha⁻¹ of PG improved the moisture content of the surface soil layer by 22%, slightly decreased the soil pH and increased the available phosphorous content by one order of magnitude (from 5.3 to 50.5 µg g⁻¹). The concentration of heavy metals such as Cd, Cu, Zn and Pb in soil and plants remained almost constant upon PG application. It could be concluded that using PG has generally enhanced the yield of barely and amend the physical and chemical properties of soil; hence, PG could be considered as a resource material rather than NORM waste.

Keywords: Phosphogypsum, Soil, Barely, Reuse, Radioactivity, Trace elements.

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Session Classification: Session VI - Solutions for Residue and Waste Management

Track Classification: NORM Residue and Waste Management