USE OF JORDANIAN ZEOLITIC TUFF IN ANIMAL WASTE TREATMENT AND POLLUTION CONTROL

by

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Abstract

This study aimed to investigate the chemical and mineralogical composition and some technical characteristics for the zeolitic tuff in Aritain area in the north eastern of Jordan and to evaluate its effects in treating animal waste and to control the pollution resulting from it.

The zeolitic tuff is composed of zeolites mineral such as phillipsite and faujasite and other non-zeolitic material such as palagonite, olivine and calcite.

The cation exchange capacity of the zeolitic tuff ranges from 99-227meq/100gm. The percentage of phillipsite in the zeolitic tuff ranges from 27 (for the size fraction <0.106mm) to 62.88 (for size fraction 0.5-0.25mm). while the maximum adsorption capacity for vapor exceeds 10% of total weight of the zeolitic tuff for size fraction (0.5-0.25mm).

The results of treating manure with the zeolitic tuffs would be as the follow:

The zeolitic tuff is able to remove ammonium ions from semiliquid manure. It conserves about a half of the ammonium content of the treated manure if stored under aerobic conditions for a period of one year. Also it would conserve $\text{NH}_4^+$ in the manure even at high temperature (150°C). The results also revealed that using zeolitic tuff in animal waste treatment would decrease the amount of released and volatalized ammonia by manure to less than the half and reduces greatly the odour intensity; the zeolitic tuff is able to purify the air from ammonia gas released by manure and passed through zeolitic tuff media by adsorption 77%-93% of the air content of ammonia. The result indicate that the zeolitic tuff is able to conserve a part of $\text{NH}_4^+$-
N during aerobic decomposition, thus reducing NH$_4^+$ voltilization and conversion to other nitrogen forms which are easily lost when applied to lands as a fertilizer. Where as there is no clear effect for the zeolitic tuff on the nitrogen content of the manure in the case of anerobic decomposition.

It has been found that the zeolitic tuff has acted as slow releaser media for NH$_4^+$ and K released from manure which would make these nutrients available for long period of time after manure being applied for land as a fertilizer. It has been also found that the zeolitic tuff has increased the amount of Mn and Fe in the manure zeolitic tuff-mixtures. All results emphasize that zeolitic tuff improves greatly the efficiency of the manure as a fertilizer. The study also show that the zeolitic tuff decreases the washability of bacteria as a total bacteria, gram positive and gram negative bacteria.

The study concluded that using of zeolitic tuff in animal waste treatment and / or as air purification media inside of animal houses would reduce the odour intensity and ammonia gas concentration within the building, therefore, reduce the air ventilation needs, consequently, reduce the energy consumption. And at the same time creates enhanced conditions for animals to live and for labour to work. Also the capture of NH$_4^+$, NH$_3$ and probably trace elements and reduction of odour intensity and bacterial washability from manure would help in limiting the problems of air and water pollution from animal houses, feedlots and manure piles.