PRECIPITATION OF STRUVITE IN HUMAN URINE

AIMING ITS REUTILIZATION AS A NATURAL FERTILIZER

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The recovery of nutrients contained in human excreta and its recirculation to agricultural areas have shown to be an interesting alternative for the reduction of environmental impacts [1] and for reducing the consumption of fertilizers [2]. With this perspective, this work aims to study the precipitation of struvite ($MgNH_4PO_4$) in human urine aiming the recovery of P and N for posterior use in agriculture as a natural fertilizer of slow release. The precipitation of struvite was made by the addition of magnesium in the magnesium oxide form (MgO – 98%) in urine, obeying the following molar ratios (Mg:P) 1:1, 1,3:1 e 1,6:1, for every 1,0L of urine. These concentrations were added into 2,0L beakers and were maintained under agitation using a jar-test equipment. Following that, the samples were filtered and both filtrand and filtrate were analyzed under the following parameters: orthophosphate, ammonia and also K, Mg, Ca, S and Na. The methodologies used for the analyses obeyed recommended procedures from the Standard Methods for the Examination of Water and Wastewater [3]. The results showed that the maximum removal of orthophosphate was 99,2% for the 1,3:1 (Mg:P) ratio, and for the 1:1 e 1,6:1 ratios the removal was 89,6 e 97,6%, respectively. Due to the large excess of ammonia [4], the nitrogen removal was little significant, only 3,5%. Analysis of the filtrand (Table 1) showed that the amount of P, N e Mg for the 1.3:1 and 1.6:1 ratios was close to the composition of pure struvite [5]. In conclusion it was found that human urine has fertilizing value and the studied treatment can contribute for a better management of such practice as it facilitates the handling, storage and transportation of human urine to agriculture, and, beyond all, offers an interesting alternative to the consumption of industrial fertilizers.

Table 1: Analysis of the filtrand composition obtained after precipitation tests.

Filtrand	Mg : P	Concentration in % (m/m)						
	(mol:mol)	P	N	K	Mg	Ca	S	Na
Proper Values	1:1	9,78	1,90	0,40	17,0	0,67	0,06	0,14
	1.3:1	13,24	5,35	0,30	9,56	0,18	0,05	0,09
	1.6:1	12,91	4,98	0,65	8,97	0,24	0,09	0,11
Liu, et al 2007	Pure Stuvite	12,62	5,70	-	9,91	-	-	-
	1.2:1	13,46	4,48	0,35	8,84	0,12	-	1,08
	1.3:1	13,51	4,44	0,31	8,72	0,12	-	1,41

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