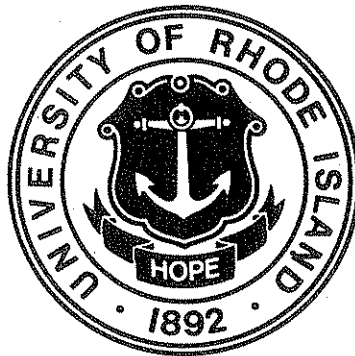


PHOSPHATE RELEASE
in
LABORATORY SOIL COLUMNS



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PHOSPHATE RELEASE IN LABORATORY SOIL COLUMNS

by

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ABSTRACT

A soil column study was initiated to determine the magnitude of phosphorus release from phosphorus enriched soil treated with various rejuvenation products. Columns filled with soil collected at the base of seepage pits (cesspools) were treated with 100 ml solutions of 50% H_2SO_4 , 16% H_2O_2 , 1% Drainz, 1% enzyme and distilled water. Total phosphorus was determined on column extracts after contact times of 24 and 168 hours. The results indicate that the H_2SO_4 treatment extracted the greatest amount of phosphorus from the soil followed by peroxide (H_2O_2), Drainz and enzyme treatments. Increasing contact time increased amounts of total phosphorus in the H_2SO_4 and enzyme treatments. Problems associated with the fate of released phosphorus from these systems needs to be investigated further.

PHOSPHATE RELEASE IN LABORATORY SOIL COLUMNS

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The objective of this soil column study was to determine the magnitude of phosphorus release from phosphorus enriched soil treated with various rejuvenation products. Rejuvenation products are routinely applied to septic systems in an attempt to restore soil permeability after biological clogging has occurred.

PROJECT ACCOMPLISHMENTS

Soil columns were constructed from a bulk soil sample collected from the base of a seepage pit (cesspool). The seepage pit was constructed in outwash materials and had been in continuous use for approximately 35 years. Previous research by Wright, Galgowski and Kelly (OWRT No. A-705 R.I.) indicated that high concentrations of phosphorus were found in the soil at the base of seepage pits.

The bulk soil was air dried and ground to pass a 10 mesh sieve. The gravels (10 mesh) were discarded and the finer fraction was analyzed for total phosphorus using a perchloric acid digestion method outlined by Sommers and Nelson (1972). Total phosphorus content of the bulk sample was 934 ppm.

Columns were constructed of 6.25 cm diameter PVC pipe which was fitted with glass wool and rubber stoppers. The rubber stoppers were fitted with Tygon tubing and a clamp

to permit sampling after 24 hour and 168 hour contact times with the various treatments. The soil columns were packed to a density of 1.2 g/cc.

Six replicate columns were constructed for each of 5 treatments. The treatments consisted of 100 ml solutions of 50% H_2SO_4 , 16% H_2O_2 , 1% Drainz, 1% enzyme and distilled H_2O . The concentrations of the various treatments were selected to represent the concentration of commercial application rates. The distilled water treatment served as a control.

The various treatments were applied and the solutions were withdrawn after 24 hours of contact time. A subsample was withdrawn and the remaining solution was reintroduced into the column. Total phosphorus content of the leachate after 24 hours of contact time is reported in Table 1.

The H_2SO_4 treatment extracted the greatest amount of phosphorus from the phosphorus enriched soil, followed by the peroxide, Drainz, and enzyme treatments respectively. Phosphorus concentration of the distilled water was negligible.

Total phosphorus concentrations for the various treatments after 168 hours of contact time are given in Table 2. The results follow a similar trend found with the 24 hour contact time. The H_2SO_4 treatment extracted the greatest amount of phosphorus followed by decreasing phosphorus content in the H_2O_2 , Drainz and enzyme treatments.

Increasing the contact time from 24 hours to 168 hours resulted in significant increases in total phosphorus content in both the H_2SO_4 and enzyme leachates. The results suggest that 24 hours was insufficient time for the H_2SO_4 and enzyme to react completely with the soil.

No significant increase in total phosphorus content was found in the leachate by increasing the contact times of the H_2O_2 and Drainz treatments. The H_2O_2 appeared to be rapidly consumed upon introduction to the columns. Increasing the contact time did little to increase phosphorus content.

The data obtained from this study indicates that large quantities of phosphorus are extracted from phosphorus enriched soils treated with various rejuvenation products. The fate of this extracted phosphorus in the soil system has yet to be determined. The phosphorus may be re-adsorbed by the underlying soil material or may be released to groundwater.

Additional studies are needed to determine the ability of the soil to adsorb phosphorus from these rejuvenation leachates charged with phosphorus.

CITATIONS

Sommers, L.E. and D.W. Nelson. 1972. Determination of total phosphorus in soils: A rapid perchloric acid digestion procedure. Soil Sci. Soc. Am. Proc. 36:902-904.

Wright, W.R., Galgowski, C.E. and W.E. Kelly. Phosphate movement from on-site sewerage disposal systems. OWRT Project No. A-075-RI.

TABLE 1

Concentrations of Total Phosphorus in leachates for various treatments after 24 hours of contact time.

	<u>H₂SO₄</u> <u>ppm</u>	<u>H₂O₂</u> <u>ppm</u>	<u>Drainz</u> <u>ppm</u>	<u>Enzyme</u> <u>ppm</u>	<u>H₂O</u> <u>ppm</u>
	297	137	26	11	-
	263	107	33	17	-
	307	93	51	8	5
	281	101	37	--	-
	244	161	61	27	-
	<u>351</u>	<u>128</u>	<u>40</u>	<u>5</u>	<u>-</u>
Mean	291	121	41	14	-

TABLE 2

Concentrations of Total Phosphorus in leachates for various treatments after 168 hours of contact time.

	<u>H₂SO₄</u> <u>ppm</u>	<u>H₂O₂</u> <u>ppm</u>	<u>Drainz</u> <u>ppm</u>	<u>Enzyme</u> <u>ppm</u>	<u>H₂O</u> <u>ppm</u>
	371	159	29	53	-
	408	109	41	27	-
	446	112	62	32	-
	309	117	41	22	-
	389	153	61	29	-
	422	136	57	19	-
Mean	391	131	49	30	-