FERTILIZATION VALUE OF TANK SILTS

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The ameliorative influences of silts as fertilizers in husbanding impoverished or effete soils has been known for decades; in certain parts of the world, silts carried by rivers are the only means of fertilization to the soil. The practice of incorporating silt into nursery bed soils for raising rice seedlings is followed in China, Japan and elsewhere. It is well known that silts contain valuable organic matter and provide the basic nutritional factors for augmenting plant growth, similarly, the value of sewage sludge as organic manure is a recognized fact. It must be mentioned, however, that silts occurring in different environs are bound to vary in their chemical composition and fertilizing value (Mukerji, 1923; Waksman, 1938; Hoon and Dhawan, 1944). According to Hoon and Dhawan (1944) silts carried by the rivers of the Punjab contained very small quantities of nitrogen, phosphates and potash and thus could not be regarded as direct fertilizers. Much work has been done in evaluating the fertilizing value of sewage sludge (Brouwer, 1941; Joshi, 1945; Stephenson and Bollen, 1946); according to Stephenson and Bollen (1946) the chemical composition of the sludge investigated by them was equal to that of farm-yard manure, although Hall (1929) states that the action of sludge as manure is very small. The overall beneficial effects of silts and sewage sludge on plant growth is a recognized fact but very little is known as to how exactly the constituents of these organic manures influence plant growth.

The experiments reported here and carried out in pot culture studies under glasshouse conditions were planned essentially for providing preliminary gleanings in understanding the fertilizing value of tank silts. The problem was very kindly suggested by Prof. T. S. Sadasivan, M.Sc., PH.D. (London), Director, University Botany Laboratory, Madras, and was taken up at the instance of the Collector of Madras.
MATERIALS AND METHODS

The silt samples used in these investigations were collected from Chitrakulam (sample A) and Kapaleswar (sample B) tanks, Madras City, and were supplied by the Collector of Madras. Rice was selected as the indicator plant in evaluating the status of these silts as fertilizers mainly because the index of growth response of rice to manures and fertilizers is easily amenable to logical interpretation. The percentage of moisture in both the silt samples was determined at the time of experimentation by standard methods (A.O.A.C., 1945). Both silt samples were incorporated into sieved garden soil (sandy loam) to give concentrations of 5, 10, 15, 20, 25, 50, 75 and 100 per cent. (pure silt) on dry weight basis. The silt soil mixtures were put into earthenware pots of 6 x 5 x 3 size at the rate of 500 g. per pot. In all 5 pots were maintained at every concentration for each of the silt samples; similarly, 5 pots containing garden soil alone served as control. Rice seeds at the rate of 25 seeds per pot were sown by first removing 100 g. of the upper soil layer, spreading the seeds equidistant from one another and finally covering up with the removed soil. The pots were watered daily and the entire experiment incubated under glass-house conditions for 3 weeks; after this period the seedlings in the pots were removed carefully and measurements of shoot length and dry weight determinations were conducted, taking into account 15 seedlings in all, 3 seedlings being taken from each replicate.

**TABLE I**

*Showing Influence of Various Concentrations of Silt on Shoot Length and Dry Weight of Rice Seedlings*

(taken three weeks after sowing)

<table>
<thead>
<tr>
<th>Percentage concentration of silt in garden soil</th>
<th>Shoot length in inches (mean of 15 readings)</th>
<th>Dry weight of shoots of 15 seedlings (in mg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample A</td>
<td>Sample B</td>
</tr>
<tr>
<td>5</td>
<td>10.5</td>
<td>8.0</td>
</tr>
<tr>
<td>10</td>
<td>10.6</td>
<td>10.7</td>
</tr>
<tr>
<td>15</td>
<td>11.7</td>
<td>11.8</td>
</tr>
<tr>
<td>20</td>
<td>11.5</td>
<td>11.7</td>
</tr>
<tr>
<td>25</td>
<td>11.5</td>
<td>11.6</td>
</tr>
<tr>
<td>50</td>
<td>11.5</td>
<td>11.6</td>
</tr>
<tr>
<td>75</td>
<td>11.6</td>
<td>11.6</td>
</tr>
<tr>
<td>100</td>
<td>11.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Control</td>
<td>7.6</td>
<td>7.6</td>
</tr>
</tbody>
</table>
**Fertilization Value of Tank Silts**

**TABLE II**

*Showing Percentage Content of Nitrogen and Potassium in the Silt Samples and in Garden Soil*

(calculated on dry weight basis)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Percentage moisture</th>
<th>Percentage nitrogen</th>
<th>Percentage potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample A</td>
<td>80</td>
<td>356 mg.</td>
<td>426 mg.</td>
</tr>
<tr>
<td>Sample B</td>
<td>46</td>
<td>230 mg.</td>
<td>316 mg.</td>
</tr>
<tr>
<td>Garden soil</td>
<td><strong>116 mg.</strong></td>
<td><strong>245 mg.</strong></td>
<td></td>
</tr>
</tbody>
</table>

Chemical assays of the silt samples were carried out as follows: Nitrogen was estimated employing a modification of the method of Narayanayya and Subramanian (1935), the modification being essentially in the direction of absorbing the evolved NH₃ in 2 per cent. boric acid and back titration of NH₃ with standard HCl using Ma Zuzaga reagent. To estimate potassium the silt was first ignited and extracted as described by Rajagopalan (1939). Iron and other bases were then precipitated as recommended by Bouger (Narayanayya and Subramanian, 1935), and filtered off; potassium was then estimated in the filtrate by the method of Wilcox (1937). Results are incorporated in Tables I and II.

**Discussion of Results**

The manifestation of fertilizing value of the silt samples in catalyzing seedling growth in rice was very striking as shown by Plate V and Tables I and II. Addition of silt even at such low concentrations as 5 and 10 per cent. contributed to considerable increase in shoot length and dry weight of seedlings, this being more marked in the case of sample A wherein at 5 per cent. level the shoot length increased by about 3 inches over that of the control; the corresponding figures of dry weights were 256 mg. and 184 mg. respectively (Table I). However, in the case of sample B at 5 per cent. concentration no appreciable increase in dry weight or shoot length was observed (Table I). This may be explained by the fact that sample A contained 126 mg. per cent. of nitrogen in excess of that contained in sample B (Table II), whereas in the former the percentage nitrogen present was more than three times that present in ordinary garden soil, in the latter it was only about twice as much. The corresponding values of potassium showed that sample A contained considerably more of potassium than sample B, although both the samples were very rich in this element as compared to garden soil (Table II).
It was interesting to note that, whereas the growth of rice (as manifested by increase in shoot length and dry weight) increased considerably with the increase in silt concentration from 5 to 15 per cent., no further increase in growth was observed beyond 15 per cent. concentration. At levels of 20, 25, 50, 75 and 100 per cent. silt concentration, the dry weight of seedlings and shoot length remained almost the same as in the case of 15 per cent. level. In both the cases 15 per cent. level was found to be the optimum dosage. It seems plausible that both N and K of these silt samples are directly and easily mobilized but that beyond an optimum level of concentration, no further mobilization of these elements occurs. Conforming with these results, Brouwer (1941) has mentioned that out of waste water rich in nutrients and humus, only a part of the total N and K is utilized by plants. In his comparative fertilizer experiments with waste water and pure water containing corresponding amounts of N, P and K, pure water was found superior. According to Hall (1929), N, P and K elements in sewage sludges are combined in extremely inactive form; field trials showed that the action of these sludges as manures is so small as to be negligible unless the material is applied in very large dosages. In the present investigation, however, even the application of the silt in small quantities produced marked increase in growth over that of the control; in fact the action of the silts was considerable at lower dosages of administration and no further growth response by increasing the dosage was noticed. It is, however, not clear as to why all or greater part of the N and K was not activated in larger dosages of silt application and only further work will throw light on this anomaly.

Finally it must be mentioned that these studies were undertaken essentially as preliminary experiments to a broader understanding of the fertilization and manurial values of tank silts; further experiments are being undertaken in this subject.

ACKNOWLEDGEMENTS

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