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LIME REQUIREMENT OF POND SOILS FOR AQUACULTURE AROUND COCHIN BACKWATERS*

The use of lime in pond fish culture has been advocated by fish culturists over a large part of the world. It is frequently applied to improve the water quality, and several workers have described the favourable effects of liming and stressed its use for increased fish production. Liming increases the pH of bottom mud and thereby increases the availability of phosphorous added as fertilizer. The waters may also be cleared of humic stains of vegetative origin which restrict light penetration. The net effects of changes in water quality following liming is the increase in phytoplankton productivity which in turn, leads to increased fish production.

The application of lime to improve the fertility as well as production is already being practiced by traditional farmers and aquaculturists in the culture systems bordering the Cochin Backwaters and the Vembanad Lake. However, this is done without any scientific estimation of the actual requirement and hence the desired results are not always obtained.

In the present investigation soil samples were collected from different seasonal and perennial prawn culture fields during the premonsoon and monsoon seasons (Fig. 1). The samples were estimated for their lime requirement during both the seasons.

No comprehensive prccedure for determining the liming rate was available till recent times. According to Boyd (*Alabama Univ. Bull.*, 459, 1974) the lime, requirement is the amount of liming material needed to neutralize the acidity of bottom muds and increase the total hardness and total alkalinity to at least 20 mg/l. Therefore liming is indicated if either the total hardness or total alkalinity of the pond waters is below 20 mg/l.

The estimation of lime requirement for fish ponds is usually based on exchange acidity. However, in some tropical areas like India, Philippines *etc.* the soil in the brackishwater regions is prevalent with acid sulphate. In order to estimate the lime requirement correctly in such type of soils, the potential acidity is also to be analysed in addition to the exchange acidity. The

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Table 1. *Total lime requirement based on exchange and potential acidity*

Station No.	Pre monsoon			Monsoon		
	Exchange acidity	Potential acidity	Total* (tons/ha)	Exchange acidity	Potential acidity	Total* (tons/ha)
1	2	3	4	5	6	7
1.	0.448	54.24	54.73	1.120	31.02	32.14
2.	1.512	very high	very high	0.784	55.30	56.08
3.	0.896	95.73	96.62	0.560	29.77	30.33
4.	0.280	74.45	74.73	0.056	34.03	34.08
5.	0.224	53.18	53.40	0.056	33.18	33.23
6.	1.400	52.12	53.52	2.016	44.67	46.68
7.	5.040	57.43	62.47	1.904	51.05	52.95
8.	3.752	55.31	59.06	2.072	55.30	57.37
9.	1.344	77.64	78.98	3.528	72.32	75.85
10.	1.008	75.51	76.52	3.360	68.06	71.42
11.	1.456	75.51	76.96	0.840	29.77	30.61
12.	0.784	76.58	77.36	0.560	31.54	32.10
13.	1.568	76.58	78.15	2.128	76.69	78.82
14.	1.400	75.51	76.91	2.016	77.78	79.79
15.	0.560	73.40	73.96	1.400	55.30	56.70
16.	0.728	74.50	75.23	1.232	51.05	52.28
17.	3.024	44.67	47.69	1.288	85.06	86.34
18.	2.800	52.12	54.92	1.680	87.25	88.93
19.	3.248	51.05	54.29	1.568	88.11	89.67
20.	3.192	55.31	58.50	1.904	89.32	91.22
21.	0.168	12.76	12.93	**	18.29	18.29
22.	0.168	10.63	10.79	**	17.43	17.43
23.	0.112	11.70	11.81	**	17.86	17.86
24.	0.784	65.94	66.72	**	46.79	46.79
25.	0.616	63.82	64.43	**	44.67	44.67
26.	0.840	64.68	65.52	**	47.65	47.65
27.	1.008	63.82	64.83	0.056	51.05	51.10
28.	1.400	74.45	75.85	0.672	42.54	43.21
29.	1.232	75.58	77.81	0.504	44.67	45.17
30.	1.120	74.45	75.57	0.560	38.28	38.84
31.	0.840	85.09	85.93	0.504	63.82	64.32
32.	0.728	84.03	84.76	0.448	64.94	65.42
33.	1.680	82.96	84.64	0.560	59.56	60.12
34.	2.856	21.27	24.12	**	19.14	19.14
35.	2.800	29.78	32.58	**	17.01	17.01
36.	2.912	26.59	29.50	**	21.27	21.27
37.	3.308	42.54	45.85	0.840	42.54	43.38
38.	3.640	44.67	48.31	1.624	43.06	44.68
39.	2.968	43.60	46.57	0.224	34.03	34.25
40.	3.304	69.10	72.40	0.840	80.83	81.67
41.	3.920	63.82	67.74	2.016	85.09	87.10
42.	3.192	59.45	62.64	1.400	89.34	90.74
43.	5.040	85.09	90.13	1.120	61.68	62.72
44.	5.600	86.15	91.75	0.840	59.56	60.40
45.	5.488	80.23	85.72	0.560	65.03	65.59

Table 1. (Contd.)

1	2	3	4	5	6	7
46.	3.864	42.54	46.40	0.840	59.56	60.40
47.	3.920	52.12	56.04	1 120	61.62	62.74
48.	2.576	42.54	45.11	1.008	64.03	65.03
49.	3.304	10.63	13.93	**	12.76	12.76
50.	3.752	12.76	16.51	**	14.88	14.88

* The lime requirement is calculated by considering the weight of soil of 15 cm depth per hectare.

** The stations showed no lime requirement by the exchange acidity method.

total lime requirement is calculated by adding both the values together. The lime requirement based on exchange acidity was estimated in the present study following the method developed by Pillai and Boyd (*Aquaculture*, 46: 157–162, 1985) and the potential acidity following the method by Boyd (*Water quality management for pond fish culture*, Elsevier, 1982).

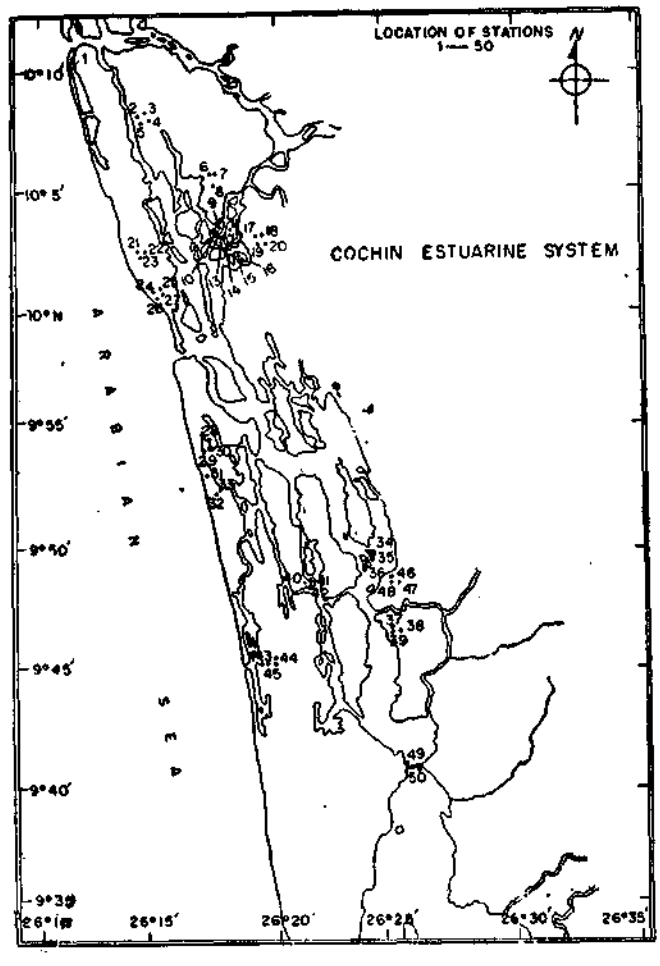

Fig. 1. Location of sampling stations.

Table 1 gives the lime requirement for the soils in the different stations based on exchange acidity as well as potential acidity and also the total lime requirement. By the exchange acidity method, during premonsoon, it varied from 0.112 to 5.6 tonnes of lime per ha in Narakkal (St. 23) and Thuravoor (St. 33) respectively. However, during monsoon, the requirement of lime was found to be less with eleven stations recording nil, and a maximum of 3.528 tonnes of lime/ha being observed in Chenoor (St. 9).

The lime requirement based on the potential acidity showed considerable variations in different stations. During the premonsoon period the values ranged from 10.63 tonnes/ha in Narakkal (St. 22) to 95.73 tonnes/ha in St. 3. During monsoon the values were 17.01 tonnes/ha in St. 35 to 89.34 tonnes/ha in St. 42.

The total lime requirement calculated by adding both the exchange acidity and potential acidity values ranged from 10.79 (St. 22) to 96 (St. 3) tonnes/ha during the premonsoon season. During the monsoon the range was from 12.76 to 91.22 tonnes/ha at St. 50 and St. 20 respectively.

From the present study it is evident that some soils around the Cochin estuarine area have acid sulphate problem. The lime requirement is found to be very high in these regions. Generally high liming rates are associated with low pH values. But in the present investigation most of the stations recorded pH values above 6.0 Statistical analysis showed no relationship between pH and the liming rates. This is due to the collection of soil samples submerged in water during both the seasons Though the submerged samples showed high pH values (above 6.0) their potential acidity is high and requires higher liming rate. In such cases the high pH values are misleading. This explains the high potential acidity in soil samples even with normal pH during the present study.