Journal of the Indian Fisheries Association
22,1992, 83-87

SOIL QUALITY OF BHILWARA DISTRICT (RAJASTHAN) IN RELATION TO PISCICULTURE

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ABSTRACT

The present paper deals with the physico-chemical data of 13 rainfed and drainable dry bundhs of Bhilwara district, Rajasthan (India). All the dry bundhs studied showed a slightly alkaline pH ranging from 7.5 to 8.5. Electrical conductivity ranged from 2 to 8 millimhos/cm. Organic carbon in sediment fluctuated from 0.30 to 0.75%. Nitrogen, phosphate and potassium levels were fairly good, at 30 to 50 and 24 to 36 mg/100 g of soil respectively. Based on these data it was inferred that these dry bundhs were highly productive and suitable for freshwater fish culture.

India is a vast country with diverse topographical climate and hydrological features from region to region. Rajasthan State covers an area of one tenth of the entire Indian territory. The fresh water fisheries potential of India has been estimated as 1.5×10^6 tonnes per annum, of which the contribution of Rajasthan is approximately 1% (Purohit, 1978). Having taken the idea of this meagre potential a few soil parameters were monitored and compared with soil quality standards suitable for fish culture. Although the soil and water status of Rajasthan is very conducive for quality fish production, so far no study has been made in relation to fisheries in Bhilwara District and, therefore, 13 dry bundhs from Bhilwara District were selected for soil investigation in the year 1984-1985.

The topography of the land has a great role to play in the location of dry bundhs. A typical dry bundh is a seasonal pond having a vast catchment area in red laterite soil with a sluice gate which facilitates breeding operation.

Bhilwara (Lat.25°50′ to 26°03′ N and Long. 74°01′ to 75°23′ E) is one of the importan districts where dry bundhs are very successful in fish seed production. The total water spread area available in the district for fish farming is 3000 ha. Out of that, 1500 ha is A - Class (more than 200 ha.), 1000 ha is B - Class (between 30-200 ha.) and 500 ha is C - Class (less than 30 ha.) (Purohit, 1978). The objective of the present study was to ascertain the soil quality of these dry bundhs.

The study was conducted in the shallow regions of 13 dry bundhs (Table I) of Bhilwara District in the month of September, 1984. The catchment area of these dry bundhs ranged from 1 to 16 km^2. The water spread area at full tank level (FTL) was 100 to 400 ha, while the dead storage level (DSL) was between 2 and 10 ha. Soil samples were collected, dried and crushed in porcelain mortar; while crushing pebbles, concretions, root and rock pieces were avoided. The crushed soil was screened through a 2 mm sieve and analysed for pH, conductivity, organic carbon, nitrogen, phosphate and potash following standard methods prescribed by International Bureau of Soil Sciences (Piper, 1947).

Prior to multifarious development of aquatic resources, it is necessary to know the water and soil quality of these water bodies for higher production and better growth of culturable organisms. Soil plays an important role in determining the fertility of fish ponds.

pH of soil influences inorganic transformation of soluble phosphate and controls the absorption and release of ions of essential nutrients at soil water interface. Slightly alkaline pH has been considered favourable for fish

ponds (Schaeperclaus, 1933). Alikunhi (1957) observed that in India water on acid soil was generally less productive for fish than on alkaline soil. The pH of all dry bundhs remained on the alkaline side ranging from 7.3 to 8.2. A soil pH range of 6 to 8.5 is considered conducive for fish farming (Alikunhi, 1957) and it is evident that the soil pH values of all the dry bundhs are falling under the optimum range (Table I).

Soil is the main source of nitrogen supply to the pond through the decomposition of organic matter. The amount of nitrogen available in ponds is, in general, sufficient for growth of phytoplankton except in case of soils with very poor inorganic matter (Banerjee and Banerjee, 1963).

The levels of nitrogen, phosphate and potassium in the soils of dry bundh were fairly

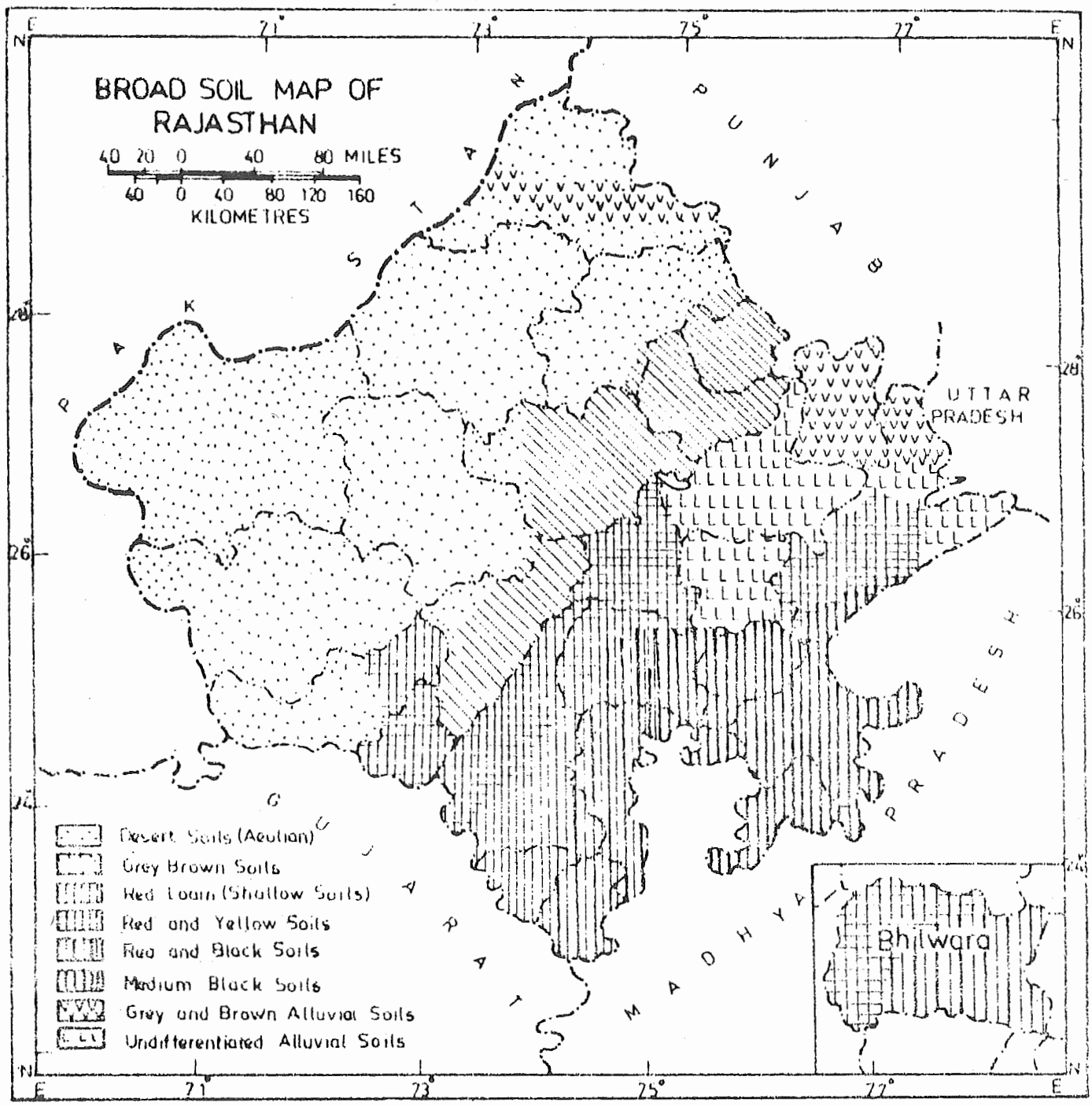

Fig. 1 : *Map of Rajasthan indicating the quality of soil at different locations.*

Table I : *Soil characteristics of Dry bundhs (Bhilwara)*

Name of dry bundh	Soil Colour	pH	Conductivity milli mhos/cm	Organic carbon (%)	Nitrogen (mg/ 100g)	Phosphate (mg/100g)	Potash (mg/100g)	N.P.K. status	N.P.K. range	Quality of soil
Chaman pura	Red and Yellow	8.2	6.40	0.60	45	6	33	N-M P-M K-M		Alkaline with higher conductivity
Kaglodia	Red and Yellow	8.1	3.20	0.60	47	9	36	N-M P-H K-M	Nitrogen L=40mg/ 100g	Normal alkaline
Salriak hurd	Red and Black	8.2	8.00	0.60	46	6	33	N-M P-M K-M	M=40-75mg/ 100 g H-75mg/ 100 g.	Alkaline with higher conductivity
Zadol	Red and Yellow	8.2	7.20	0.30	33	6	30	N-L P-M K-M		Alkaline with higher conductivity
Balsaria	Red and Black	8.2	2.60	0.35	30	6	24	N-L P-M K-M		Normal alkaline
Amli-I	Red and Black	7.9	3.32	0.45	42	6	30	N-M P-M K-M	Phosphate L=0 - 3 mg/100 g	Normal alkaline
Amli-II	Red and Yellow	7.8	2.16	0.60	48	3	30	N-M P-L K-M	M=3-7.5 mg/ 100g	Normal alkaline
Gadri-keheda	Red and Black	8.1	2.56	0.45	43	6.6	27	N-M P-M K-M	H = 7.5mg/ 100g	Normal alkaline
Rainvas	Red and Yellow	7.3	2.24	0.35	30	3	24	N-L P-L K-M	Potash L=0.225mg/ 100 g	Normal alkaline
Sardar-pura	Red and Yellow	7.7	2.00	0.35	31	8.4	24	N-L P-H K-M	M=22.5-45.0 mg/ 100 g	Normal alkaline
Chapri	Red and Black	8.1	2.80	0.75	50	3	36	N-M P-L K-M	H=45mg/ 100 g	Normal alkaline
Mahua-khura	Red and Black	7.7	3.20	0.35	31	7.2	24	N-L P-N K-M		Normal alkaline
Jugpura	Red and Black	8.2	4.00	0.30	35	6	27	N-L P-M K-M		Normal alkaline

H = High M = Medium L = Low

good being 30 to 50; 3.0 to 9.0 and 24 to 36 mg/100 g respectively as against the prescribed levels of 50 mg/100 g and above, 6 mg/100 and above, and 25 mg/100 and above, respectively.

Soil phosphorus affects the pond productivity to a great extent both in organic and inorganic forms. Michael (1969) mentioned that the laterite red and black soils are deficient in their phosphate budget and need adequate phosphate fertilization. Saha *et al.* (1971) reported that under alkaline conditions phosphorus showed a positive correlation with fish production because in acidic medium it combined with aluminium and iron, and thus formed insoluble compounds. Further, in alkaline medium phosphates combined with calcium to form the soluble compound, calcium phosphate (Banerjee and Ghosh, 1970).

In most of the fish culture ponds potassium is one of the essential nutrients but not as a limiting factor. Schaperclaus (1961) described that potassium is absorbed in the mud during winter and released during summer. But, Mollah *et al.* (1979) concluded that potassium fixed in minerals is not always exchangeable. In general, all the required nutrients were found to be available in suitable ranges in all the bundhs studied.

In the present study the electrical conductivity values varying from 2.002 to 8.00 millimhos/cm indicate the suitability of the soil for fish culture practices.

The present study revealed organic carbon values at the dry bundhs studied to fluctuate between 0.3 and 0.75%. Banerjee (1967) has observed organic carbon contents and C/N ratio in a number of culture ponds. Organic carbon values less than 0.5% may be considered as low, while its concentration in soil at levels of 10.5% or more is considered indicative of the fertility of the soil (Prakash, 1991). Banerjee (1967) mentioned that ponds having 0.5 to 1.5% organic carbon in their soils were good for fish production. Thus, in an overall way the present study indicates that the chances of success for pisciculture in the soils of Bhilwara District, Rajasthan is good.

We are thankful to Dr.V.R.P.Sinha, Director, Central Institute of Fisheries Education, Versova, Bombay, for permiting us to publish this paper.

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