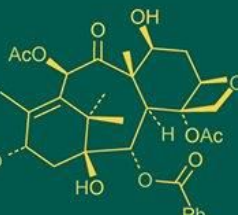
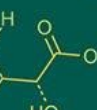
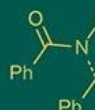


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The present status of fisheries resources of Rohtas district: At a glance

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Abstract

The present study was conducted to assess the fisheries resources, water and soil quality, and primary productivity of selected ponds in Rohtas district. The district possesses significant natural resources, including rivers, ponds, reservoirs, and canals, which provide substantial potential for aquaculture development. Among various locations, Tilouthu block was selected due to its comparatively higher fish production. Two ponds, namely Premchand pond and Kamtaram pond, were selected for detailed investigation. Water and soil samples were collected from multiple sites within each pond and analysed following standard procedures. Physico-chemical parameters of water such as temperature, transparency, pH, dissolved oxygen, total dissolved solids, alkalinity, and hardness were studied, along with biological parameters like phytoplankton and zooplankton abundance to estimate primary productivity. Soil parameters including structure, water holding capacity, organic carbon, nitrogen, phosphorus, and potassium were also evaluated. The overall fisheries profile of the district indicates moderate fish production with considerable scope for improvement. Despite the availability of adequate water resources, underutilization and lack of scientific management practices limit productivity. The study highlights the importance of maintaining optimal water and soil quality for sustainable aquaculture. Adoption of improved management practices, awareness programs, and strengthening of fisheries infrastructure can significantly enhance fish production and livelihood security in the region.

Keywords: Aquaculture, water quality, soil quality, primary productivity, fisheries resources, Rohtas district

1. Introduction

The district of Rohtas is located in the southwestern part of Bihar and is known for its rich natural resources, historical importance, and agricultural potential. The district derives its name from the famous Rohtasgarh Fort, which reflects its historical and cultural significance. Rohtas is endowed with diverse geographical features, including plains, hills, rivers, and forest areas, making it suitable for agriculture as well as fisheries activities. The district has considerable water resources in the form of ponds, tanks, canals, rivers, and reservoirs. The presence of the Sone River, along with its tributaries, provides a strong base for irrigation and aquaculture development. These water bodies serve as important resources for fish culture and contribute to the livelihood of rural communities. Fisheries in the district play a significant role in providing supplementary income, employment, and nutritional security to the local population. A large proportion of the population consumes fish and fish products, indicating a high demand for fisheries resources in the region. Rohtas district, with its predominantly rural population, is largely dependent on agriculture and allied activities. In addition to crop farming, fish farming is emerging as an important economic activity. The availability of natural and man-made water bodies offers immense scope for the expansion of aquaculture practices. However, the productivity of these water bodies largely depends on their ecological and environmental conditions.

Water is the primary requirement for fish survival, and its physicochemical characteristics determine the health and productivity of aquatic ecosystems. The success of aquaculture depends on maintaining a favourable environment for the growth of natural fish food organisms. The abundance and distribution of aquatic flora and fauna are influenced by the availability of essential nutrients in balanced quantities in the water body (Mahajan and Billor, 2014) ^[12].

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Water quality can be evaluated through the study of physical, chemical, and biological parameters, while anthropogenic activities may adversely affect aquatic ecosystems (Tiwari, 2015) ^[15].

Temperature is an important factor influencing the seasonal productivity of water bodies (Goldman & Wetzel, 1963; Verma & Srivastava, 2016) ^[6, 16]. Primary productivity forms the basis of aquatic food chains by providing energy and organic matter to higher trophic levels. Additionally, soil fertility plays a crucial role in determining the overall productivity of aquatic ecosystems (Mahajan and Billor, 2014) ^[12]. Therefore, the assessment of both water and soil quality is essential for sustainable fisheries management and enhanced fish production. In this context, the present study was undertaken to assess the fisheries resources of Rohtas district, analyse the physicochemical characteristics of water and soil, and estimate the primary productivity of selected ponds for improving aquaculture practices in the region.

2. Materials and Methods

The study was conducted in the Rohtas district. To study the available fisheries resources of the district, information was collected from the reports and official website of the Fisheries Department, Sasaram. To analyse water and soil quality and to estimate the primary productivity of the pond used for fisheries purposes, Tilouthu block was selected because this block has better fish production than other blocks of the district. Physico-chemical parameters of water quality such as temperature, transparency, total dissolved solids (TDS), pH, dissolved oxygen, free carbon dioxide, total alkalinity and total hardness were analysed. Under the biological parameter, primary productivity mainly daily concentration of phytoplankton and zooplankton were studied. Similarly, soil structure, water holding capacity, organic carbon, total nitrogen, phosphorus and potassium were studied to analyse soil quality. A total of two ponds were selected from Tilouthu block for sample collection i.e., Premchand pond and Kamtaram pond. Kamtaram pond, was used by the local community for fish culture as well as for various other purposes like bathing, washing of clothes and utensils, bathing of cattle etc. Primarily extensive fish farming method was practiced without adding any artificial food and fertilizer and after a culture period of 6 to 8 months the fishes were harvested. Premchand pond was well maintained pond and ideal pond for good fish production. Water and soil samples were collected from four different locations of each selected pond. Water temperature, transparency and pH were tested in the pond itself and water samples for other parameters (total dissolved solids, dissolved oxygen, free carbon dioxide, total alkalinity and total hardness) were collected and brought to the college laboratory. Similarly, soil samples were also collected from the selected location and brought to the college laboratory. For studying the soil sample, it was first dried in shade and stored in powder form. Physico-chemical and biological parameters of the collected soil and water samples were analysed using APHA (2005) ^[1].

3. Results and Discussion

The fisheries profile of Rohtas district presents a comprehensive overview of its demographic and geographical characteristics, which are crucial for planning and development of the fisheries sector. Established in 1972, the district headquarters is located at Sasaram, making it an

administrative and economic centre of the region. Geographically, Rohtas district is bounded by Buxar in the north, Jharkhand in the south, Aurangabad in the east, and Kaimur in the west. The district is administratively divided into three subdivisions, namely Dehri, Bikramganj, and Sasaram, which play a significant role in local governance and resource management. The total geographical area of the district is 3847.82 km², supporting a population of 2,450,748. Among them, the male population constitutes 1,283,485, while the female population is 1,167,263, resulting in a sex ratio of 918 females per 1000 males. The population density is relatively high at 636 persons per km², indicating pressure on land and water resources, which directly impacts fisheries activities. The literacy rate of the district is recorded at 73.37%, reflecting moderate educational development, which can influence the adoption of scientific fish farming practices. The major languages spoken in the region include Hindi, Bhojpuri, and Urdu, which are important for communication and extension services in fisheries development programs. The district also includes pathari (plateau) areas such as Nauhatta, Rohtas, and parts of Chenari, which may present challenges for water resource availability and aquaculture expansion. Administratively, Rohtas comprises 19 blocks, 346 panchayats, and 2088 villages, indicating a vast rural network where fisheries can serve as an important livelihood option. Furthermore, the district falls under two Lok Sabha constituencies, Sasaram and Karakat, which can influence policy support and developmental initiatives. Overall, the demographic pressure, moderate literacy rate, and diverse geographical features suggest both opportunities and challenges for fisheries development in Rohtas district. Proper utilization of water resources, awareness programs, and improved infrastructure can significantly enhance fish production and livelihood security in the region. The administrative and political structure of Rohtas district is further strengthened by its seven Vidhan Sabha constituencies, namely Chenari, Sasaram, Dehri, Nokha, Kargahar, Karakat, and Dinara. This political division plays an important role in regional planning and the implementation of fisheries and rural development programs. The sex ratio of the district remains 918 females per 1000 males, indicating a need for inclusive development strategies. The district receives an average annual rainfall of about 1046 mm, which provides substantial scope for inland fisheries through pond and reservoir-based aquaculture. The major crops grown in the region include paddy, wheat, and pulses, indicating that agriculture is the primary occupation, and fisheries can act as a supplementary income source for farmers.

The total land area of the district is approximately 390,736 hectares, out of which 242,832 hectares are under agriculture. Non-agricultural land accounts for 15,271 hectares, while forest land covers about 70,211 hectares. The availability of such diverse land resources offers opportunities for integrated farming systems, including fish farming. Irrigation plays a crucial role in fisheries development, with about 192,365 hectares of land being irrigated, while 50,467 hectares remain non-irrigated. These water resources can be effectively utilized for aquaculture expansion. Geographically, the district lies between latitudes 24°30'N to 25°25'N and longitudes 83°45'E to 84°22'E, providing a suitable climatic condition for fish culture. The major rivers flowing through the district are the Sone and

Karmanasha (likely referred to as “Cau” in the data), which serve as important natural resources for capture fisheries as well as culture-based fisheries. The total river length is about 112 km, contributing significantly to fish production potential. The district has an average fish production of around 12.50 thousand metric tonnes, while fry production is approximately 112 lakhs, indicating a developing aquaculture sector. The presence of 5 hatcheries supports seed production, which is essential for sustaining fish farming activities. Additionally, there are four important reservoirs in the district, namely Gijwahi, Mahadeva, Bhaishakhoh, and Sone Barrage (Indrapuri). These reservoirs provide vast water bodies suitable for large-scale fisheries development and stock enhancement programs. Fish consumption in the district is relatively low, with per

capita consumption around 5.1 kg, suggesting a gap between production and nutritional demand. Furthermore, the presence of 18 Matsyajivi (fishermen) cooperative societies indicates organized community participation in fisheries activities, although there is scope for strengthening these institutions. Overall, the district of Rohtas possesses significant potential for fisheries development due to its favourable rainfall, river systems, irrigation facilities, and existing infrastructure such as hatcheries and reservoirs. However, low fish consumption, underutilization of water bodies, and the need for improved management practices highlight key areas for intervention. Strengthening extension services, promoting scientific aquaculture, and enhancing cooperative structures can greatly improve fish production and livelihood security in the region.

Table 1: Physico-chemical and Biological Quality of Water.

Sl. No.	Physico-chemical Parameters of Water	Kamtaram Community Pond	Premchand Pond
1	Transparency (cm)	26	22
2	Temperature (°C)	26.8	27.6
3	TDS (mg/L)	237	268
4	pH	7.2	7.9
5	Dissolved oxygen (mg/L)	5.6	6.3
6	Free Carbon dioxide (mg/L)	3	2.8
7	Total alkalinity (mg/L)	118.54	152.36
8	Total hardness (mg/L)	91.61	114.29
9	Primary Productivity (mg C-3 d-1)	1182	1857

Table 2: Physico-chemical and Biological Quality of Soil.

Sl. No.	Physico-chemical Parameters of Water	Kamtaram Community Pond	Premchand Pond
1	Soil texture	Clayey	Clayey-loam
2	Water holding capacity (%)	68	77
3	Organic Carbon (%)	0.8	0.5
4	Total Nitrogen (mg/100 g of soil)	59	67
5	Phosphorus (mg/100 g of soil)	6	8
6	Potassium (mg/100 g of soil)	21	27

According to the result obtained in this study, the water temperature was 26.8-27.6 °C, which is good for fish culture. Khan *et al.* (2018) have also reported that, in view of good water quality management, the water temperature of 27.5-31.1 °C is good for fish culture. According to FAO (2006) ^[5], fish production is good when the water temperature range is within 27.6-30 °C. It is very important to have warm water for fish culture, but excessively warm water reduces the amount of dissolved oxygen and fishes die under the stress. Similarly, if the water is too cold, then the fishes reduce their feed uptake, due to which their growth is restricted, so it is necessary to maintain optimum temperature in the pond for getting good fish production. In this study the pH value found was 7.2-7.9. According to Boyd (1998) ^[3], pH 7.5-8.5 is considered ideal for fish culture. A pH value below 6.5 causes a number of problems in many fishes (Lloyd, 1992) ^[11]. The obtained value of dissolved oxygen was 6.1-7.3 mg/L which is suitable for fish culture. According to Ayyappan *et al.* (2011) ^[2] dissolved oxygen value of 5 mg/L or more is necessary for normal growth and reproduction of fish. This is also confirmed by the results of the study by Gupta and Gupta (2006) ^[8]. According to them, the value of dissolved oxygen in the pond should be more than 5 mg/L for fish culture. Similarly, the obtained values of other studied parameters (TDS, free carbon dioxide, total alkalinity, total hardness and primary productivity) were also found suitable for fish

culture. There was no significant variation found in the physico-chemical parameters of water and soil of the selected ponds. The presence of phytoplankton and zooplankton viz., Microcystis, Spirulina, Navicula, Pediastrum, Sphaerocystis, Spirogyra, Cyclotella, Ocellularia, Ceratium, Closterium, Cyclops, Diaptomus, Brachionus, Daphnia, Moina, Keratella etc., were also noticed in the ponds, which plays an important role in increasing the productivity of fishes. These are the natural diet of fishes. In zooplankton, mainly Cyclops, were the dominant group.

4. Conclusion

From the study it can be concluded that the Rohtas district has sufficient water resources for fisheries purpose. The physico-chemical parameters of water and soil of the selected ponds were found suitable for fish culture. The presence of phytoplankton and zoo-plankton indicates the availability of natural food for the fishes in the pond. However, more emphasis is required for understanding the socio-economic problems of farmer, promoting the adoption of modern aquaculture system, upgrading the infrastructure facilities and management policies for sustainable development of aquaculture sector in the district. To increase the aquaculture production of the district further, there is a need to explore underutilized water bodies.

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