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Research Paper

Characterization of *Prawn Pond* in Around Bhimavarm, West Godavari District, A.P. India

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Abstract- *The Physico and Chemical characteristics of water and soil in Aquaculture pond are investigated in the month of june and july (Khariff season) before seedling with a view to optimize the conditions for prawn productivity. Water and soil samples are collected from Dosanapudi village, Veeravasaram Mandal of West Godavari District in Andhra Pradesh. The soil samples are analyzed in with respect to color, plasticity, nitrogen, phosphorous, potassium, sodium, organic carbon, heavy metals and electrical conductivity. Similarly water samples are analyzed with respect to color, turbidity, total solids, salinity, nitrates, calcium, Ammoniac. Nitrogen, phosphorous, chlorides, sulplhates, free CO_2 and heavy metals.*

Keywords: pH**,** *Prawn Pond,* Nitrogen, Water, Physico -Chemical characteristics.

Introduction

Indian aquaculture has been evolving from the level of subsistence activity to that of an industry. This transformation has been made possible with the development and standardization of many new productions and associated techniques of input and output systems. In recent years aquaculture has created enthusiasm and interest among entrepreneurs especially for prawn farming in coastal areas. Prawn farming is capital intensive activity and uncontrolled mushrooming growth of it has lead to the outbreak of diseases and attributed environmental issues calling for closure of the farms [1-4]. In this context, the techno-economic requirements for establishment of prawn and fish farms and its successful operation has to be taken into consideration. So the present study deals with the analysis of water and soil samples collected from Prawn Pond before seedling in June and July months i.e. Khariff season. The main objective of present study is to determine the physico chemical and mineral properties of water and soil samples of Aqua culture pond.

Availability of quality water is always a limiting factor in commercial prawn production. Quality of water is a reflection of the quality of pond bottom sediment. For aquaculture the pond water quality has to satisfy the requirements for existence and growth of aquatic life [3,5]. Soil and Water quality determine not only how well the organisms grow in an aquaculture operation, but also whether or not they could survive in that habitat.

Material and Methods

Soil and water samples are collected from Dosanapudi village, Veeravasaram Mandal in West Godavari District of Andhra Pradesh. It was one of the oldest trade centers of British East India Company. Veeravasaram station is located on Bhimavaram-Narsapuram branch line. West Godavari District is having 17 km. of coastal line and river Godavari passes through it. From the district nearly Rs.1000 crores of fish is exported to foreign countries and various places in the country [20]. The area under aqua tanks in the district is about 23,200 hectares which is on the increase due to further excavation of tanks.

To adopt the scientific way of Prawn rearing in Veeravasaram Mandal, the soil and water samples are collected during Khariff season in the month of July. In West Godavari District, Prawn farming is carried out in two seasons i.e. Khariff season and Rabi season. Khariff season starts in the month of June-July and it ends in the month of December-January. Water and soil samples are collected from the prawn pond at 6 different places before seedling. All the 6 samples are mixed to make a composite sample and brought to the lab for analysis.

The soil and water samples are analyzed in with respect to color, plasticity, nitrogen and phosphorous by spectrophotometer, potassium and sodium, by fame photometer, organic carbon, heavy metals by atomic adsorption spectrophotometer, Turbidity by nephelo/Turbidity Meter pH and electrical conductivity by pH meter and Conductivity meter respectively

Table 1: Analysis of Water Sample of Prawn Pond before and After Seedling in Khariff Season

S. No.	Parameter	Before	After
1.	pH	7.12	8.16
2.	Electrical conductivity	0.002600 ohm	0.001726 ohm
3.	Turbidity	24.2 NTU	6.2NTU
4.	Total solids	1936 mg/L	11660 mg/L
5.	Salinity	384 mg/L	5462mg/L
6.	Nitrates NO_2	26 mg/L	128 mg/L
7.	Calcium as Ca	105.6 mg/L	105.6 mg/L
8.	Ammonical Nitrogen	7.84 mg/L	36.5 mg/L
9.	Phosphorous as PO_4	0.82 mg/L	1.26 mg/L
10.	Chlorides	738.4 mg/L	552.0 mg/L
11.	Sulphates	85.44 mg/L	544.3 mg/L
12.	Free CO_2	0.90 mg/L	1.30 mg/L
13.	Lead	0.008 ppm	0.028 ppm
14.	Cadmium	0.006 ppm	0.008 ppm
15	Mercury	<0.001 ppm.	<0.001 ppm
16.	Nickel	<0.01 ppm.	<0.01 ppm
17.	Palladium	0.008 ppm.	<0.01ppm

Table 2: Analysis of Soil Sample of Prawn Pond before and After Seedling in Khariff Season

S. No.	Parameter	Before	After
1.	pH	7.88	7.28
2.	Electrical conductivity	0.000278 ohm	0.000368 ohm
3.	Nitrogen	6.42%	6.18 %
4.	Phosphorous	4.12%	3.88%
5.	Potassium content	1.64%	1.36%
6.	Sodium Content	2.18%	2.04%
7.	Organic Carbon	4.98%	5.46%
8.	Lead	0.08 ppm.	0.14ppm
9.	Cadmium	0.012 ppm	0.018ppm
10.	Mercury	<0.001 ppm.	<0.001ppm
11.	Nickel	<0.01 ppm.	<0.01ppm
12.	Palladium	0.002 ppm.	0.05ppm

Results and Discussion

Pond Construction: The type of Pond preparation and construction depends on various parameters. The Pond preparation to be adopted before stocking is based on the type of culture and its intensity and the nature of the culture pond.

Rectangular ponds are suitable mainly from the harvesting point of view. The average depth of the pond is 2 M. which is maximum limit for Prawn Pond. The length and breadth of the prawn pond are 1000 M. and 60 M. respectively which are ideal for Prawn pond. This depth of the ponds helps in maintaining required temperature for carrying photosynthesis by Autotrophs and promoting the growth of Photo and Zooplankton [11,13].

Appropriate water supply and drainage systems have to be designed keeping in view the water resources and topography of the area. The water is supplied from the canals of River Godavari which is abundant in this area. Drainage system is also effectively designed. The site in which pond is constructed is easily approachable and the site is free from seepage and floods.

pH of water sample: pH of pond water is influenced by many factors, including pH of source waters, acidity of bottom soils, prawn culture inputs and biological activity. The most common cause of low pH is acidic bottom soil [6]. Liming can be done to reduce soil acidity. The most common cause of high pH is high rate of photosynthesis by dense phyto-plankton blooms [20-23]. The pH range, recommended for fresh water prawns, is 6.5 to 9.5 [17] as the pH of pond water, in the present study is falling within the recommended range, the water is suitable for prawn culture (Kanal et al. 2007). The pH of the prawn pond water samples increased from 7.1 to 8.16 which indicates the high acidic character which is due to the addition of chemical additives applied to aquaculture ponds with an objective of better production.

Turbidity of water sample: Turbidity can inhibit light penetration, reduce oxygen levels and make it difficult for prawn and other living things to survive. In the present study, turbidity is measured before seedling and after seedling and turbidity decreased as the prawn cultivation is completed by summer. The acceptable value is <80 for fresh water aquaculture ponds. But this value should be less than 10 NTU in the initial days because turbidity >10 NTU in initial days, causes stress to prawns. If the turbidity range falls in between 10-100 NTU after few weeks, it reduces feeding rates. In order to solve this problem 300-500 pounds

of gypsum or superphosphate can be applied per hectare, otherwise a combination of 100 pounds of cotton seed meal and 40 pounds of superphosphate can also be applied. This work should be carried out during the rainy season. Before applying chemical methods the first step is to reduce turbidity is to eliminate sediment sources such as run offs from non-vegetated areas.

Salinity of water sample: Salinity is the total concentration of all dissolved ions in the water and is measure in mg/L or ppm. Fresh water species have limited range of tolerance to salinity fluctuations (stenohaline). In fresh water ponds high salinity may have an adverse effect on the growth and survival of prawn, ultimately affecting the yield of the crop [(11-13)]. In the present study the salinity of water is moderately high (ideal concentration is 0.02 ppt). Hence care has to be taken to monitor this parameter. The source of water for the pond is the feeder of River Godavari Canal and a bore well dug near the culture pond. Salinity levels increased from pre seedling stage to post seedling stage which may be due to the introduction of saline water and chemicals.

Nitrates in water sample: In the present study the nitrate content in the water samples is very high and it is increased from pre seedling to post seedling stage. These values should be lowered otherwise; they will affect the cultured species

Ammonical nitrogen in a water sample: Ammonia in ponds is produced from the decomposition of organic wastes resulting in the breakdown of decaying organic matter such as algae plants, animals and uneaten foods. In the present study the ammonical nitrogen is high. High concentration of ammonical nitrogen causes an increase in pH and ammonia concentration in the blood of the fish which can damage gills, red blood cells, affect osmoregulation, reduce oxygen carrying capacity of blood and increases oxygen demand of tissue. The proper measures such as flushing the pond with the fresh water aerating the pond and reducing stock density can be taken to control the content of ammonical nitrogen.

Phosphorous as phosphate in water sample: Phosphorous is found in the form of inorganic and organic phosphates in natural waters. Inorganic phosphates include

orthophosphates and polyphosphates while organic forms are originally bound as phosphorous. Phosphorous is a limiting nutrient for the aquatic plants and algae. It is not very important for the growth of prawns. In the present study, phosphorous content is high and pond is considered as eutrophic. The increase in Phosphate content from pre seedling to post seedling may be due to excess of insecticides and fertilizers which is not needed. The increase favors algae growth, algae bloom which causes stress to prawns. The phosphorous content in the prawn pond can be controlled by using fewer amounts of insecticides and fertilizers.

Free carbondioxide as CO_2: CO_2 in the present study is very low. CO_2 levels below 10 mg/L is well tolerated by prawn although sensitivity of the gas varies from species to species. It varies with the respiratory and photo synthetic activity of animals and plants. The concentration of CO_2 is very low in the present study and CO_2 is increased from pre seedling to post seedling stage.

As the sample is collected during day time, low levels of CO_2 in water can be attributed to high rate of photosynthesis by autotrophs. This data is correlating with the alkaline pH of the water. This suggests that the water in the culture pond is of good quality and ideal for primary production.

Heavy metals in the water samples

Lead: Lead comes from deposition of exhausts from vehicles in the atmosphere, batteries, waste from lead ore mines and lead smelters. As the pond is away from the industrial areas, traffic zones and mines the water samples do not contain high level of lead content. The traces of lead are observed in the present study which will not cause any toxicity to the prawns which are cultured in the pond.

Cadmium: Traces of cadmium are observed in the present study. As the pond is away from electroplating, nickel plating, smelting engraving operations, the prawns are not affected by the toxicity of cadmium. Care should be taken while using fertilizers and sewage sludge should not be allowed to pass near the pond area.

Nickel: Nickel is also present in traces and it will not affect the aquaculture as it is moderately toxic. As the area of the pond is away from metal processing units, it will not enter into aquatic environment.

Mercury: Traces of Mercury are present in the present study. It is highly toxic to aquatic life and human. Mercury remains in inorganic form until the environment becomes favorable (low pH, low dissolved O_2 and high organic matter. In the present study dissolved O_2 and pH are within the normal range and thus not providing any pre-set conditions for heavy metal toxicity.

Analysis of Soil Samples

Colour: Colour is one of the most noticeable character of soil. It is related to the organic matters content, climate, soil

drainage and soil mineralogy. Soils exhibit a variety of colours. The variations in the soil colour may be due to carbon substances, iron compounds, silicon, lime and other organic substances. The present soil in the study is black in colour. The black colour of soil indicates high aeration, high available nitrogen and high fertility.

Plasticity of the soil: The present soil of the prawn pond is black cotton soil exhibiting the behavior of clay soils. These soils have extremely large surface area. They have fine pores, poor drainage and poor aeration. They have highest water holding capacity. It is a store house for aeration and nutrients. Hence it is suitable for aquaculture.

pH of the soil samples of pond: A wide range in pH was found in soils of aquaculture ponds. The pH range of present soil is 7.9 which indicates the basic nature of soils. It is ideal for prawn production. These soils are associated with much greater rates of soil respiration.

Soil Organic Carbon content: The present soil samples are black in colour and they are high argillaceous with a high proportion of calcium, magnesium, carbonates and iron but low in phosphorous, nitrogen and organic matter. Ponds with greatest production of prawn and intensively managed ponds will have high organic carbon above range of 2.5% and it is increased from pre seedling to post seedling stage. The high concentrations of organic carbon were associated with oxygen depletion of bottom soiland excessive bloom of microbes in the soil. It is very important to find out the organic carbon content, otherwise excessive amounts of organic matter will accumulate in bottom soils and cause anaerobic conditions at the soil water interface. This may affect the nitrogen fixation by microorganisms and consequently affect production of water body.

Phosphorous content in soil sample: Phosphorous is the most needed nutrient in ponds. Phosphorous is an important constituent of biological systems and it is recognised nutrient for Pond fertilization. Phosphorous is critical for proper development of Phytoplankton and Phytoplankton is considered to be basic building block of aquatic productivity. The present pond soil shows good productivity range of phosphorous. This will promote the growth of phytoplankton and Zooplankton which in turn serve as food t higher tropic levels link prawn and fish.

Potassium content in a soil sample: Potassium is one of the nutrients for organisms. Generally relatively small amounts of potassium are needed in fish and prawn ponds. Potassium is readily absorbed by plant tissues and it is particularly effective in stimulating the growth of aquatic flora. During rapid plant growth potassium from water and soil is stored in tissues to be released later in another season. Potassium is released from the bottom soil. 1 ppm of Potassium is the recommended concentration in aquaculture and in the present study the data shows that the soil had adequate quantity of potassium ideal for plant growth.

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