ABSTRACT OF THE PROJECT

Water quality is the first most important limiting factor in fish culture which is normally governed by a number of parameters including color, odor, temperature, pH, DO, BOD, TDS, EC, transparency, acidity, alkalinity and hardness. Each of these parameters has a standard value for fish culture. A guiding principle of fish culture is that water quality and hence efficient production are a direct consequence of good water chemistry. Therefore, the maintenance of good water quality is essential for healthy fish culture. The majority of fish culture throughout the world is conducted in ponds.

Study area

The experiment was conducted in a commercial fish farm of AVANIGADDA REAGION .Krishna dt, AP state. The farms contain concrete and earthen ponds. The farm has a water channel constructed through it which serves the purpose of controlling flood and depends largely on water from reservoir for fish production. Water sample used for this study were collected from two earthen ponds on the farm.

Pond1

Pond 2

Fig 1:- Images of studied ponds

Study period

Water samples were collected for physicochemical analysis from Different area sampling ponds from 15/05/2022 to 16/07/2022 at weekly interval.

Table 1 : Water Quality Tolerance by Species

Species	Temp °F	Dissolved Oxygen mg/L	pH	Alkalinity mg/L	Ammonia %	Nitrite mg/L
Baitfish	60-75	4-10	6-8	50-250	0-0.03	0-0.6
Catfish/Carp	65-80	3-10	6-8	50-250	0-0.03	0-0.6
Hybrid Striped Bass	70-85	4-10	6-8	50-250	0-0.03	0-0.6
Perch/Walleye	50-65	5-10	6-8	50-250	0-0.03	0-0.6
Salmon/Trout	45-68	5-12	6-8	50-250	0-0.03	0-0.6
Tilapia	75-94	3-10	6-8	50-250	0-0.03	0-0.6
Tropical Ornamentals	68-84	4-10	6-8	50-250	0-0.03	0-0.5

CHAPTER 1:- MATERIALS AND METHODS

Water samples were collected for physicochemical analysis from two sampling ponds from 15 Aug 2018 to 15 Feb 2019 interval. Simple random sampling method was used for the primary data collection. Three different points from each pond were identified for random sampling. Samples were analyzed for some parameters namely temperature, pH, salinity, dissolved oxygen (DO), transparency, alkalinity and hardness. Water temperature, pH, salinity and transparency of pond water were measured by thermometer, pH meter, salinity meter and Secchi disc respectively, where titration methods were used for the measurement of alkalinity and hardness and D.O.. After the laboratory analysis, all the findings were integrated and presented in tables and charts and put in the report.

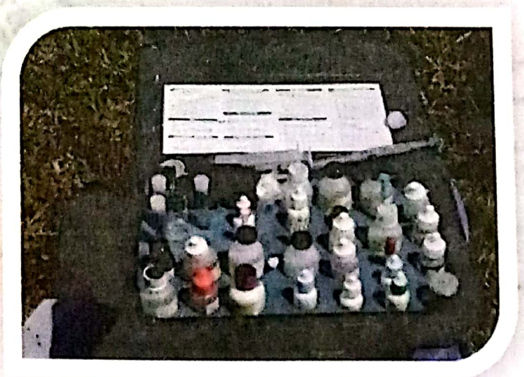

Fig 2:-Water quality testing kit

CHAPTER 2.PHYSICAL PARAMETERS OF WATER

COLOUR

In natural water, colour is due to the presence of humic acids, fulvic acids, metallic ions, suspended matter, plankton, weeds and industrial effluents. Colour is removed to make water suitable for general and industrial applications and is determined by visual comparison of the sample with distilled water.

Visual comparison: About 20ml of the sample and 20ml of distilled water were taken in two separate wide mouthed test tubes. The results were tabulated (as clear, greenish, greyish, brownish, blackish, etc) by comparing the colour of the sample with distilled water.

ODOR:

Odor of water is due to the accumulation of excretory wastes and organic and inorganic loads and also due to pollution. The odor of the investigated pond water was smelt by nose. The odor of an ideal pond water is not fishy or odorless (Das,1997).

TEMPERATURE

Impinging solar radiation and atmospheric temperature brings about spatial and temporal changes in temperature, setting up convection currents and thermal stratification. Temperature plays a very important role in wetland dynamism affecting the various parameters such as alkalinity, salinity, dissolved oxygen, electrical conductivity etc. In an aquatic system, these parameters affect the chemical and biological reactions such as solubility of oxygen, carbon-di-oxide-carbonate-bicarbonate equilibrium, increase in metabolic rate and physiological reactions of organisms, etc. Water temperature is important in relation to fish life. The temperature of drinking water has an influence on its taste.

Apparatus required: Thermometer- 0.1° C division.

Procedure: Temperature measurement is made by taking a portion of the water sample (about 1litre) and immersing the thermometer into it for a sufficient period of time (till the reading stabilizes) and the reading is taken, expressed as °C.

TRANSPARENCY (LIGHT PENETRATION)

Solar radiation is the major source of light energy in an aquatic system, governing the primary productivity. Transparency is a characteristic of water that varies with the combined effect of colour and turbidity. It measures the light penetrating through the water body and is determined using Secchi disc.

Apparatus required: Secchi disc, a metallic disc of 20cm diameter with four quadrats of alternate black and white on the upper surface. The disc with centrally placed weight at the lower surface, is suspended with a graduated cord at the center.

Procedure: Transparency is measured by gradually lowering the Secchi disc at respective sampling points. The depth at which it disappears in the water (X_1) and reappears (X_2) is noted. The transparency of the water body is computed as follows:

$$\text{Transparency (Secchi Disc Transparency)} = (X_1 + X_2)/2$$

Where, X_1 = Depth at which Secchi disc disappears

X_2 = Depth at which Secchi disc reappear

Turbidity (NTU) = (Nephelometer readings) (Dilution factor*)

If the turbidity of the sample is more than 40 NTU, then the sample is diluted and the dilution factor is accounted in final calculations.

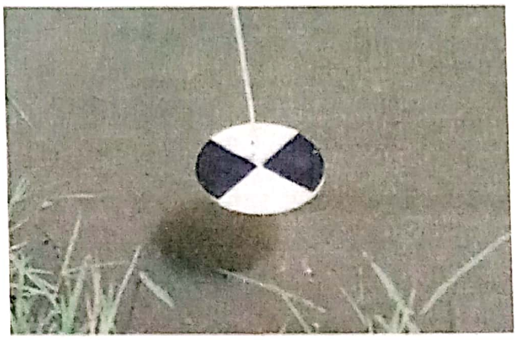

Fig:5 Secchi disc

CHAPTER 3:- CHEMICAL PARAMETERS OF WATER

pH:

PH or the concentrations of hydrogen ions (H+) present in pond water is a measure of acidity or alkalinity. The pH scale extends from 0 to 14 with 0 being the most acidic and 14 the most alkaline. PH 7 is a condition of neutrality and routine aquaculture occurs in the range 7.0 to 9.0 (optimum is 7.5 to 8.5). Exceedingly alkaline water (greater than pH 9) is dangerous as ammonia toxicity increases rapidly. At higher temperatures fish are more sensitive to pH changes.

It is an important chemical parameter to consider because it affects the metabolism and other physiological processes of culture organisms. A certain range of pH (pH 6.8 —8.7) should be maintained for acceptable growth and production. But in semi- intensive culture, re-optimum range is better maintained between pH 7.4 — 8.5. pH 7 is the neutral point and water is acidic below pH 7 and basic above pH 7. pH changes in pond water are mainly influenced by carbon dioxide and ions in equilibrium with it. PH can also be altered by a) Organic acids, these are produced by anaerobic bacteria ("acid formers") from protein, carbohydrates and fat from feed wastes, b) Mineral acids such as sulfuric acid (acid-sulfate soils), which may be washed down from dikes during rains and c) Lime application.

Like DO, a diurnal fluctuation pattern that is associated with the intensity of photosynthesis, occurs for pH. This is because carbon dioxide is required for photosynthesis and accumulates through nighttime respiration. It peaks before dawn and is at its minimum when photosynthesis is intense. All organisms respire and produce Carbon dioxide CO_2 (continuously, so that the rate of CO_2 production. Depends on the density of organisms. The rate of CO_2 consumption depends on phytoplankton density. Carbon dioxide is acidic and it decreases the pH of water. Also, and carbonate would decrease. The consumption of CO_2 during photosynthesis causes pH to peak in the afternoon and the accumulation of CO_2 during dark causes pH to be at its minimum before dawn.

Method employed : Electrometric method

Apparatus required: Glass electrode, reference electrode (mercury/calomel or silver/silver chloride) and pH meter.

Procedure:.

The pH is determined by measuring the Electro Motive Force (E.M.F) of a cell comprising an indicator electrode (an electrode responsive to hydrogen ions such as a glass electrode) immersed in the test solution and the reference electrode (usually a mercury/calomel electrode). Contact between the test solution and the reference electrode is usually got by means of a liquid junction, which forms a part of reference electrode. E.M.F of this cell is measured with pH meter, that is a high impedance voltmeter calibrated in terms of pH. The electrode is allowed to stand for 2 minutes to stabilize before taking reading for reproducible results (at least ±0.1 pH units).

Salinity:

Salinity is the measure of all the salts dissolved in water. Salinity is usually measured in parts per thousand (ppt or ‰). The average ocean salinity is 35ppt and the average river water salinity is 0.5ppt or less. This means that in every kilogram (1000 grams) of seawater, 35 grams are salt. Because the water in estuaries is a mix of fresh water and ocean water, the salinity in most estuaries is less than the open ocean. Bottom water almost always contains more salt than surface waters.

The salinity of water is an important measure of water quality because different species of animal and plant life survive in different ranges of salinity. Even a small change in salinity could cause stress, or even death, to these organisms and could have a devastating effect on the local, and wider, ecosystem.

Sources of salinity in freshwater include urban and rural runoff from industry, sewage, agriculture and stormwater. Clearing of vegetation can also cause raised levels of salinity due to a resultant rise in the water table. Areas within the tidal limit of rivers that flow into the sea will experience fluctuations in salinity between low and high tide. In estuaries there is usually a gradual alteration in salinity, as freshwater entering the estuary from tributaries meets the seawater moving in from the ocean.

Apparatus required: Refractometer

Procedure: At first the refractometer calibrated with a blank (distilled water) and then the sample water is placed on prism. The salinity of sample is noted from ppt meter.

Alkalinity:-

Alkalinity is an aggregate property of the water sample which measures the acid-neutralizing capacity of a water sample. It can be interpreted in terms specific substances only when a complete chemical composition of the sample is also performed. The alkalinity of surface water is due to the carbonate, bicarbonate and hydroxide content and is often interpreted in terms of the concentrations of these constituents. Higher t×he alkalinity, greater is the capacity of water to neutralize acids. Conversely, the lower the alkalinity, the lesser will be the neutralizing capacity.

Alkalinity of sample can be estimated by titration with standard H_2SO_4 or HCI solution. Titration to pH 8.3 or decolourisation of phenolphthalein indicator will indicate complete neutralization of OH^- and 1/2 of CO_3^{2-}, while to pH 4.5 or sharp change from yellow to orange of methyl orange indicator will indicate total alkalinity.

To detect the different types of alkalinity, the water is tested for phenolphthalein and total alkalinity, using Equations:

Phenolphthalein alkalinity (mg / L) as caco3 = A× normlity of acid×50000/ ml of sample

Total alkalinity (mg/L) as caco3 = B ×normality of acid ×50000/ml of sample

Where,

A = titrant (mL) used to titrate

B = titrant (mL) used to titrate

N = normality of the acid (0.02N H_2SO_4 for this alkalinity test)

50,000 = a conversion factor to change the normality into units of $CaCO_3$

Once PA and TA are determined, then three types of alkalinities, i.e, hydroxides, carbonates and bicarbonates can be easily calculated from the table:

Table 3 : Calculation of Alkalinity of samples

Result of Titration	OH alkalinity as $CaCO_3$	CO_3 alkalinity as $CaCO_3$	HCO_3 alkalinity as $CaCO_3$
PA = 0	0	0	TA
PA < 1/2TA	0	2PA	TA - 2PA
PA = 1/2TA	0	2PA	0
PA > 1/2TA	2PA – TA	2(TA - PA)	0
PA = TA	TA	0	0