



## Effect of different levels of cow manure on phytoplankton productivity in culture

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### Abstract

It is generally accepted that algae provide for a healthy addition to both human and animal diets. Organic fertilisers are natural compounds that have a tendency to hasten the creation of phytoplankton or other tiny organisms on which many fish feed more quickly. This in turn helps the fish grow and reproduce more quickly. The purpose of this investigation was to investigate the physicochemical characteristics, nutritional and phytoplankton dynamics in cow manure at five different concentrations. The purpose of this investigation was to investigate the physicochemical characteristics, nutritional and phytoplankton dynamics in cow manure at five different concentrations. In the current study, the concentration of cow manure was too low, which resulted in a low phytoplankton count. This was due to the fact that the water was polluted, and the cow manure concentration was too high. The number of phytoplankton was low because there were not enough nutrients in the water; but, the concentration of cow manure was adequate, and there was sufficient water volume and seeds for phytoplankton, thus the number of phytoplankton was high.

**Keywords:** Phytoplankton, cow manure, Physico-chemical parameters

### Introduction

There is a long and illustrious history behind the practise of utilising organic fertilisers in tropical semi-intensive aquaculture. They have the potential, after being introduced into ponds, to ultimately improve fish production through soluble and/or particulate pathways. This potential exists due to the fact that they have the ability. The release of soluble nitrogen (N) and phosphorous (P) stimulates the growth of algae, which can then be consumed by fish either directly or after being processed intermediately by zooplankton or microbes. In either scenario, the eating of algae is good for the environment because of the positive effects it has on the food web. (the accumulation of debris) (Colman and Edwards, 1987) [Citation needed] <sup>[3]</sup>.

Analysis of aquatic ecosystems in India has been carried out using either chemical or biological methods (Vijayan *et al.* 2018). This monitoring has been carried out. <sup>[19]</sup>. According to Tamizhazhagan *et al.* (2016), the expansion of industry and the acceleration of urbanisation have both led to the establishment of polluted zones that discharge potentially harmful substances into the environment around them. These zones can be identified by their presence of a high concentration of pollution <sup>[18]</sup>. According to Tamizhazhagan and Pugazhendy (2015), the most prevalent cause of water pollution in developing nations is waste from houses and factories that is dumped untreated into waterways such as streams or ponds. This is the most common cause of water pollution in developing countries <sup>[17]</sup>.

The study of plankton has proven to be very interesting due to the fact that plankton are organisms that are not overly complicated and can be found in almost every environment on the planet. This is because they are able to live in habitats that contain a wide variety of temperatures, pressures, and other conditions that can affect their survival. A significant feature of the landscapes of high latitudes and an important

category of freshwater ecosystems are lakes and ponds that are relatively shallow and have clear water. These types of bodies of water can be found in both freshwater and marine environments. Despite the fact that there is a limited number of water column resources that may be easily consumed, the zooplankton biomass and abundance in ponds are frequently more substantial and greater than in deeper lakes with equivalent low chlorophyll 'a' levels (Swaddle and Thomas, 2001). This is the case even though deeper lakes have higher chlorophyll 'a' levels. <sup>[16]</sup>. In shallow water ecosystems, besides phytoplankton, there are a few other primary sources of carbon that need to be taken into mind. These sources of carbon are just as important as phytoplankton. The highly developed benthic ecology of microbial mats is one of the most distinctive qualities of lakes and ponds found at high latitudes, as stated by Davis (1997). This is one of the most distinguishing characteristics of lakes and ponds located at high latitudes <sup>[4]</sup>.

The demand for fish and products that are produced from fishing has been steadily increasing over the past few decades, leading to an expansion in the industry. The direct application of fertiliser, which increases the creation of phytoplankton, which is a natural food item for fishes (Chakrabarti and Jana, 1998), is one of the most frequent tactics for increasing fish output in ponds. Directly applying fertiliser has been shown to increase the production of phytoplankton, which in turn has been shown to increase fish output. <sup>[2]</sup>. For the purpose of keeping production consistent along the low coast According to Gupta and Noble (2001) and Majumdar *et al.* (2002), the process of utilising animal wastes for the goal of fertilising ponds is a procedure that is commonplace in a vast number of countries <sup>[7, 10]</sup>.

The use of cow dung as a fertiliser in freshwater fish culture ponds is a time-honored aquaculture activity that dates back

at least a year. Since its inception, this method has consistently produced a wide range of commendable outcomes, which continue to this day. Fertilising the ponds with cow manure is the most effective method that has been developed so far for making up for or providing the critical nutrients required to increase the natural productivity of the ponds through the generation of aquatic biota, which are either directly or indirectly responsible for providing food for fish. This is because cow manure is rich in nitrogen, which is essential for the growth of aquatic biota, which in turn is essential for the growth of fish. (Knud-Hansen, 1998) [Knud-Hansen] The name "Knud-Hansen" [9].

Determining the optimum amounts of administration and the after-effects of hyper administration are two of the challenges that aquaculture practitioners are currently confronting in the industry. In a study that was conducted in 1992, Muhammad Javed and his colleagues found that boosting the primary productivity of fish ponds through the use of both organic and inorganic fertilisers that came from a range of different sources was able to significantly boost the production of farmed fish. [11]. The introduction of live feeds into culture systems results in an overall improvement in the quality of the larvae, fingerlings, and fry that are generated by those systems. Because of this, using manures as a strategy to improve live feed production in ponds and, consequently, the development of fry and fingerlings is the most effective method that is now accessible. The usage of adequate feeds that are also cost-effective is the primary factor that determines the level of success that is achieved by aquaculture practises in the modern world. The cultivation of phytoplankton and zooplankton is the fundamental purpose of this study. Cow dung will be used as a source of nutrients; however, the amounts of cow dung used will be limited to those that are regarded ideal.

The use of organic and inorganic fertilisers is the major means by which the quantity of primary producers is enhanced. To encourage an abundant growth of zooplankton, insect larvae, and other forms of creatures that fish take as food, organic fertilisers, such as the manure from cattle, pigs, and poultry, as well as biomass slurry, compost, and other animal wastes, work as a category or composite for the aim of cultivating an environment that is conducive to the growth of these organisms. Therefore, in order to accomplish the goal of preserving the essential stability of the food chain in fish ponds, it is common practise to make use of a variety of various kinds of fertilisers. Within the context of the pond's ecological system, this serves to ensure that there is a healthy equilibrium between the amounts of plant and animal matter.

Because the goal of scientific management is to produce fish at a low cost, the emphasis should be placed, on the one hand, on the extent to which natural food is utilised via the use of inorganic or organic fertilisers, and, on the other hand, on the improvement of natural food utilisation through the use of polyculture (Essa *et al.* 1988) [6].

## Materials Method

### Collection of sample and sampling period

The water sample was collected every other week between the hours of 9 and 11 in the morning from a variety of locations between December 1 and December 15, 2022.

### Plankton sampling and analysis

The sample culture and the plankton samples were collected using a plankton net with a mesh size ranging from 200 to 300. The analysis required the collection of a 1ml subculture sample from each sample of the organic fertiliser, such as cow manure (10g, 20g, 30g, 40g, 50g), as well as a control as T1 – 10g, T2 – 20g, T3 – 30g, T4 – 40g, and T5 – 50g and Control.

### Physico-chemical parameters

The majority of the analysis was carried out during a span of five days, beginning when the samples were collected. In the laboratory, the following measurements are taken: temperature, pH, free carbon dioxide (FCO<sub>2</sub>), dissolved oxygen (DO), electric conductivity (EC), chloride, phosphate, sodium, magnesium, and calcium (APHA 1995) [1].

### Collection of sample

The investigation was carried out by frequently surveying in the winter of 2018, and over fifty phytoplankton samples of fresh water plankton were gathered with the assistance of phytoplankton and a net with a mesh size of two hundred to three hundred metres from the very river of front and back between the bridge, pond of Kandaswami Kandar's College, Velur of Namakkal districts. Various types of plankton were collected using a variety of distinct methodologies. Flora was gathered with the use of a pipette, hands from the collection sites, and sites themselves. Every single sample of plankton that was taken was cultivated in cow manure that had been used before. Kandaswami Kandar's College in Velur was home to the investigation, which took place in the Department of Zoology there.

### Plankton identification

Under the microscope, one drop was extracted from each sample using a small pipette. This drop was placed on a slide together with a cover slip. Diagrams were made using a camera digital approach.

The experiment was conducted using bell jars made of glass on a scale of six. Every one of the jars has a capacity of 5 litres. The duration of the trial was for a total of 15 days, and samples were collected every two weeks. The first five jars each contained a different amount of cow dung in the following proportions: 10 grammes, 20 grammes, 30 grammes, 40 grammes, and 50 grammes. The sixth jar served as a control and was not used. On the first day of the study, each of the six jars was filled with 5 litres of water containing plankton samples. This was done on the first day of the investigation. A sufficient amount of oxygen was introduced into the jars. On metal racks that had adequate ventilation, the entire assembly was left undisturbed for a period of time. After a lag phase of five days, the sampling finally got underway. Microscope examination was performed on the samples that were obtained. The plankton abundance in the original volume was then computed using the formula:  $N = A \times 100 \times C / V \times F \times L$

N= number of plankton cells or unit per litre of original,

A= total number of plankton counted,

C= volume of final concentrate of the samples in millilitre,

V= volume of a field in cubic millimetre

F= number of fields counted

L= volume of original water in litre

## Result

**Table 1:** Physico-chemical parameters of culture period in 15 days (December-1 to 15 (2022) of four times interval

Parameters/ Samples	Control	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>	T <sub>5</sub>
Temperature (°C)	20.11±2.68	25.5±1.55	24.38±0.68	23.25±0.95	22.49±1.31	21.00±1.76
p <sup>H</sup>	7.58±0.73	7.39±0.25	7.11±0.57	7.91±0.26	8.12±0.40	8.85±0.43
Electrical Conductivity	150.0±6.08	148.72±5.23	143.52±4.33	152.65±7.69	141.32±5.79	143.17±3.25
DO (mg/l)	9.95±2.22	9.85±3.82	9.20±5.35	9.56±4.68	7.21±3.22	6.26±2.48
FreeCO <sub>2</sub> (mg/l)	3.62±0.16	3.24±0.34	3.73±0.88	3.69±0.85	4.37±0.24	3.65±0.11
Calcium (mg/l)	14.28±0.23	11.66±0.11	12.51±0.48	13.25±0.74	10.21±0.43	9.32±0.78
Chloride (mg/l)	16.22±0.9	14.58±0.67	15.81±0.19	12.43±0.28	11.45±0.95	10.35±0.84
Magnesium (mg/l)	13.59±0.30	12.92±0.65	14.13±0.73	15.66±0.48	10.76±0.09	11.23±0.01
Sodium(mg/l)	16.57±0.11	18.29±0.24	17.12±0.39	19.20±0.61	15.23±0.91	13.73±0.32
Potassium (mg/l)	5.83±0.98	4.29±0.43	3.28±0.33	5.26±0.88	2.12±0.56	1.55±0.02

**Table 2:** Number of Phytoplankton in culture period for 15 days (December-1 to 15 (2022) of four times interval

No of days/Samples	0 day	5 <sup>th</sup> day	10 <sup>th</sup> day	15 <sup>th</sup> day
Control	50	78	107	123
T <sub>1</sub>	48	261	557	1169
T <sub>2</sub>	36	448	736	1152
T <sub>3</sub>	57	612	939	1337
T <sub>4</sub>	52	219	521	653
T <sub>5</sub>	61	182	306	526

## Discussion

The diversity and density of phytoplankton species can vary depending on a number of parameters, including the amount of nutrient composition, Physico-chemical characteristics, climate patterns, and hydrodynamics of lake water (Naqqiuddin *et al.*, 2013; Normawaty *et al.*, 2013). These aspects were studied by Naqqiuddin *et al.* and Normawaty *et al.* [12, 13].

According to the findings of our research, the average water temperature ranged from 20.11 to 25.5 degrees Celsius, the pH of the water ranged from 7.11 to 8.85, the electrical conductivity of the water ranged from 141.17 to 152.65, the oxygen content of the water ranged from 6.26 to 9.95 milligrammes per litre, the carbon dioxide content of the water ranged from 3.24 to 4.37 milligrammes per litre, the magnesium content of the water ranged from 10.

Because phytoplankton communities are sensitive to changes in their environment, the overall phytoplankton biomass and the presence of many different phytoplankton species are employed as indicators of the quality of the water. Therefore, it is necessary to determine the appropriate amount of cow dung to add to the system so that it can support healthy growth of plankton without compromising the water's quality in any way. The influence that fertiliser has on the generation of plankton has been the subject of a great deal of research (Hossain *et al.*, 2006 [8]). There is a correlation between the type of manure and the productivity of phytoplankton because manure provides nutrients that are essential for primary production. Fish ponds can benefit greatly from the addition of chicken, goat, rabbit, sheep, cattle, or horse manure to their environment. Ammonia-rich manures, such as those produced by livestock, can be beneficial to plant growth. If an excessive amount of poultry droppings are put to a pond, leading to pollution without discrimination, then the droppings may be harmful to the aquatic life there. The provision of suitable quantities of critical nutrients for phytoplankton production is the primary goal of pond manuring (Steinberg *et al.*, 2006 and Wang, 2000) [15, 20], as stated in both of these scholarly

works. Fertilisation, also known as manuring, is a practise that is commonly used in fishponds for the creation of natural fish. This practise is widespread because it is essential for the practise of sustainable aquaculture and because it helps reduce the amount of money spent on pricey feeds and fertilisers, which account for more than half of the total input cost (Edwards, 1980 and Oribhabor and Ansa, 2006). [5, 14].

According to the results of our research, using five different concentrations such as T<sub>1</sub> (10 grammes), T<sub>2</sub> (20 grammes), T<sub>3</sub> (30 grammes), T<sub>4</sub> (40 grammes), and T<sub>5</sub> (50 grammes), we found that the average phytoplankton count increased from the fifth to the fifteenth day. On the fifth day, the average count was T<sub>1</sub>-261, T<sub>2</sub>-557, T<sub>3</sub>-612, T<sub>4</sub>-219, and T<sub>5</sub>-182, while on the tenth day it was T<sub>1</sub>-557, T<sub>2</sub>

## Conclusion

The current study found that the concentration of cow manure was too high in the water, which caused the count of phytoplankton to be low; however, the concentration of cow manure was too low, which caused the count of phytoplankton to be low because there was a lack of nutrients; however, the concentration of cow manure was correct in terms of water volume and seeds for phytoplankton, which caused the count of phytoplankton to be high.

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