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Role of different Fertilizers in the Cultivation of *Azolla Microphylla*

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Abstract

Three different fertilizers were compared to study their efficiency in the growth of the floating fern Azolla microphylla. (Super phosphate, cow dung and vermicopost). The culture of Azolla was carried out for a year and the parameters like yield, pH, temperature etc were noted. In the present study Azolla gave a good yield in the pond fertilized by cow dung. It also showed that the plant grew well with a pH ranging from 6-7 and a temperature of about 29°C.

Keywords: *Azolla cultivation, growth, fertilizers, temperature.*

Introduction

Azolla has great potentiality and its use has been recognized mostly in the Far East countries and also in India. It has a variety of uses in various fields like poultry, live stock, in the production of biofertilizer and in the cultivation of rice. Making use of the natural symbiotic relationship between various species, the use of *Azolla* in integrated farming practices as a substitute for chemical fertilizer has been carried out. By this practice, *Azolla* can be used as a biofuel. This process also helps in the absorption of large amount of atmospheric carbon dioxide thereby reducing the threat of climate change[1]. Based on these properties *Azolla*'s value is gradually being recognized in the western countries which see *Azolla* as a potential source of high value products in pharmacy, bioplastics and nutraceutical industry.

Cultivation of *Azolla* depends on various factors such as climate, water and inoculums availability, pests, phosphorus and labour intensive management[2], the main criteria being water, as *Azolla* is extremely sensitive to lack of water. Wet mud surface and wet pit litters are the favourite place for *Azolla* growth as they exist in a free floating state in that area[3]. *Azolla* can be grown easily in a small strip of land with few centimeter depth as it provides good mineral nutrition and the roots are also not far from the soil.

Material and Methods

3 pounds of similar size (30 sq.ft) were taken up for the experimental study: The ponds were dug up to 10 inch depth and the bottom surface of the bed was made even and covered with silpauline sheets of 3m by 2m. Rich fertile soil was sieved properly and about 15 kg was spread out uniformly on the sheets. Shade dried cow dung (2kg) was dissolved thoroughly in 15 litres of water and was added to the pit along with 10-20g of superphosphate and 20g micronutrients. Pure culture of *Azolla* of about 1kg was inoculated in each pond. *Azolla* grew gradually and filled up the pond and each day about ½ kg to 1kg of *Azolla* was harvested. To maintain *Azolla* in a rapid multiplication phase 10 g of super phosphate and 500g of cow dung was added once in every 5 days. Micro nutrients were also added at periodic intervals.

For experimental studies super phosphate was added in the first pond, cow dung in the second and vermicompost in the third as fertilizers. The growth of *Azolla* was monitored and the yield was calculated on monthly basis.

While the culture of *Azolla* was taking place, certain parameters like pH, temperature, salinity etc were also recorded. pH was measured using a pH meter. Temperature was recorded using a thermometer.

Results and Discussion

The growth of *Azolla* was the highest in the pond in which cow dung was added as fertilizer (an average of 7kg per month). The next best yield was found in the third pond where vermicompost was added (average yield of 5.5kg per month). Super phosphate yielded the least harvest (3.7kg per month).

Average pH in pond I ranged from 6-7. II pond had a maximum pH of 7.2 and a minimum pH of 6. The pH in the third pond ranged from 7-7.3. Temperature record was maintained daily in the 3 ponds and the average temperature for each month was recorded. A maximum temperature of 29°C was observed in pond I in the month of May.

Discussion: In this study we were able to analyse the growth potential of *Azolla* using different fertilizers. Based on the results we can conclude that cow dung proved to be a best fertilizer. This point is more promising as cow dung is cheaply available and it is readily usable.

Water pH of 3.5-10 is favourable for the growth of *Azolla*

according to previous researchers. Similar results (optimum pH of 6-7) were recorded in our present study. 5.5 of water pH and soil pH of 6-7 support best growth[4,5]. Any variation in the pH leads to the formation of insoluble compounds which trap the available phosphorus thus making it unavailable for *Azolla*'s growth. According to Ferentino *et al* best growth was recorded at a pH range of 5-7 though it survived at a range of 3.5-10 and partial shade (50% sunlight), although the growth decreased with increasing shade[6]. 25-50% of sunlight was required for the normal growth of *Azolla*[7]. Biomass greatly reduced below 1500 lux in which the slight shade benefitted its growth in field condition.

Production of *Azolla* depends on various environmental constraints such as high temperature, low humidity, limited water availability and poor quality of water[8]. *Azolla* withstands a wide range of temperature depending upon its species and strain but is sensitive to very high temperature. Hence, they are grown as intercrop in paddy fields. Certain strains can tolerate high temperature and based on different studies, the temperature of 25°C is found to be optimum for its growth, where rapid multiplication takes place between 18-26°C[9].

The organic matter and nitrogen contents present in *Azolla* makes it a good green manure. When it decomposes it forms humus which increases the water holding capacity of the soil and promotes aeration. This also binds the soil together and makes the clayey soil more friable. In addition to these physical properties, it also helps in the nutrient cycle in the paddy fields where *Azolla* fixes nitrogen and absorbs nutrients from the soil and makes them available to plants. The slow release of these nutrients by *Azolla* makes the crop to grow well thereby increasing yield.

Conclusion

As a result of this study, it is proved that cultivation of *Azolla* gave a good yield with cow dung. This is a very important point as cow dung is cheaper and easily available than the other two fertilizers used. Hence it is commercially viable to use cow dung for *Azolla* cultivation.

Acknowledgement

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Table-1
Quantity of *Azolla microphylla* harvested (given in Kg on wet weight basis) using different fertilizers

Months	Super phosphate	Cow Dung	Vermi compost
March	4.000	7.230	6.340
April	3.560	6.100	5.850
May	3.420	6.150	4.950
June	3.530	6.750	4.500
July	4.200	8.200	5.800

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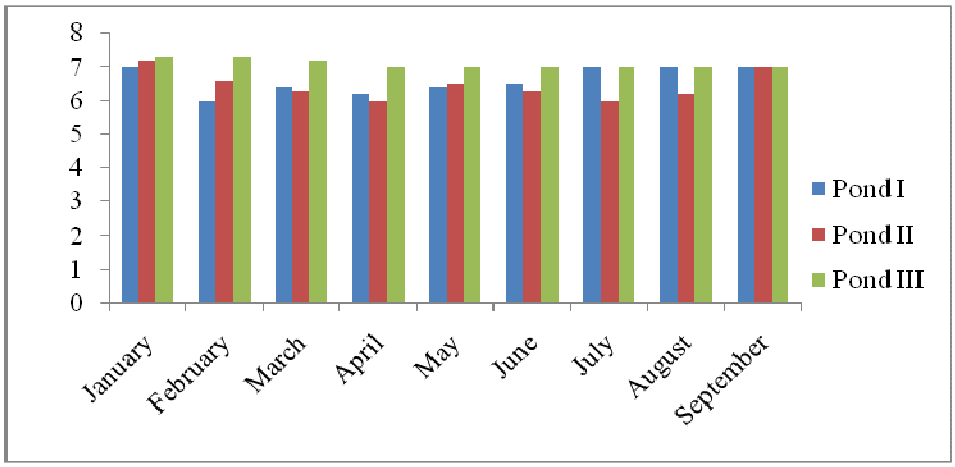

Figure-1
Average pH recorded in the 3 ponds

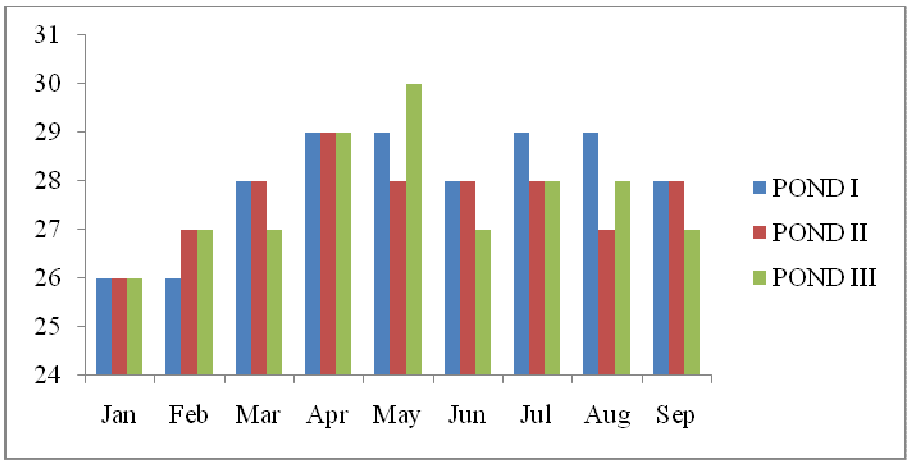

Figure-2
Average temperature recorded in the 3 ponds

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