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THE EFFECT OF ADDITION OF PROPIONIC ACID STABILISED FERMENTED FISHERY WASTE AS BIO-FERTILIZER IN THE CULTURE OF ORNAMENTAL FISH - GUPPY (*POECILLA RETICULATA*)

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ABSTRACT

The economic as well as ecological impact of unconsumable or trash fish waste is very significant. The discarded and deteriorated fish waste can be recycled as potential source of highly nutritional animal feeds especially as fish food. The effect of different levels of propionic acid (0.25, 0.5 & 1.0 ml/100g) on the Total Heterotrophic Bacterial (THB) Count, mycotic flora, p^H, carbohydrate, protein, and amino acid concentration of fermented fish waste was estimated. Results of the present study revealed that addition of 0.5 to 1% propionic acid to the fishery waste was effective in controlling the growth of mould and fungus during the fermentation process. Addition of a fermented product as bio-fertilizer, augmented the growth in terms of body length in ornamental fish *Poecilia reticulata*. The survival data showed that the acidified fermented product don't have any toxic effect on the guppy fish (*Poecilia reticulata*). From this study, it is clear that, the preparation of fermented fish silage using propionic acid as preservative is a good supplementary source of fertilizer/food for ornamental fish culture. It can be utilized as organic bio-fertilizer in aquaculture especially in homestead aquaculture activities like freshwater ornamental fish and/or food fish cultivation.

(Key words: Fishery waste, fermentation, Guppy, propionic acid, Total Heterotrophic Bacterial Count, Mycotic Flora, *Poecilia reticulata*)

INTRODUCTION

Fermentation has been applied to fish for many years (Han-Ching *et al.*, 1992) and represents a low level (artisanal) and affordable (neither capital nor energy intensive) technology for tropical developing countries. Fermented fishery products are susceptible to spoilage through mould or bacterial decay, insect infestation or fragmentation. Various chemical preservatives have been used to prevent spoilage when silages are exposed to air, thus enhancing the aerobic stability of silage. Of the short chain fatty acids, propionic acid has the greatest antimycotic activity. During acid silaging of poultry and fish offal propionic acid was effective in suppressing yeasts and moulds (Mahendrakar *et al.*, 1991). At present, large amounts of fishes were discarded from various fishing activities/industries and have been creating a lot of ecological problems. Under these circumstances, an attempt was made to transform the fishery waste into a stable feed ingredient or as a bio-fetilizer. The growing interest in aquarium fishes has resulted in steady increase in aquarium fish production the world over and at present it is the sunrise industry in the aquaculture sector. The objective of the present study is to investigate the effect of addition of

different levels of propionic acid as a preservative agent in the fermentation process of fishery waste and also to study the efficacy of the fermented product as bio-fertilizer in the culture of ornamental fish, Guppy (*Poecilia reticulata*).

MATERIALS AND METHODS

Samples of fishery wastes were collected from Sakthikulangara Fishing Harbour, Kollam. Propionic acid was added to the fish waste at varying levels 0.25, 0.5, 1.0 (w/w) and designated as T1, T2, T3. In each treatment, minced fish waste was mixed thoroughly with 10 % w/w jaggery (Cane sugar) as fermentable sugar and placed in uniform sized plastic bottles and placed the lids air tight. A control (C) was maintained without addition of propionic acid. p^H of the fermented materials was determined on weekly basis. Soluble protein was estimated following Lowry's method (Lowry *et al*; 1955). Glucose/Carbohydrate estimation was done by Anthrone method (Jayaraman, 1992). Free amino acids were determined by Ninhydrin method (Yemm & Cocking, 1995). Pour Plate Method (APHA, 2005) was used to estimate the Total Heterotropic Bacterial (THB) and Mycotic Count and results were expressed in Colony-forming units (*cfu*/mL). An indoor experiment was conducted to study the effects of fermented organic material as bio-fertilizer source on the growth of guppy (*Poicela reticulata*) in an outdoor rearing system. Commercially available fish feed was added to tanks. Fermented fish waste as bio-fertilizer was applied to the treatment tanks at 1g $week^{-1}$. No water was exchanged during the whole experimental period. Fishes were harvested using a hand net and total body length of fishes was recorded. The growth experiment was terminated on 60^{th} day. The survival rate was calculated from the number of fishes survived.

RESULTS AND DISSCUSSION

Presence of propionic acid lowered the pH to an acid range which further reduces the possibility of mycotic growth. In present study, the decrease in protein revealed the dissociation of proteins during the process of fermentation. Degradation of nitrogen components proceeds during storage and is manifested an increase in free amino acid and peptides. These substances increased the pH in the reaction mixture. The present study revealed that the free amino acid content was increased with increase in addition of propionic acid concentration. Proteins are hydrolyzed to free amino acids, thus making silage the most available amino acid source for protein biosynthesis (Espe *et al*., 1992). The reduction in the protein content from the initial value showed the degradation of most of the protein into amino acids, which was indicated by the final increase in the concentration of amino acids. The carbohydrate was effectively utilized by the bacteria as the final concentration decreased from the initial. Results of the present study revealed that addition of 0.5 to 1% propionic acid to the fishery waste was effective in controlling the growth of mould and fungus during the fermentation process. Treatment, T_3 which has the highest concentration of propionic acid (1%) showed the least count in mycotic biota. In the case of mycotic biota, there is not much difference between 0.5 and 1% level of propionic acid inclusion.

The result of the present study revealed that the addition of fermented fish waste to the water column improved the growth performance in terms of body length gain in *Poicilia reticulata*. The growth data indicated that the fermented fish product with 1% level of propionic acid added to the water column doesn't have any growth inhibition in *Poicilia reticulata*. Zynudheen *et al*. (2008) studied the effort of dietary supplementation of fermented fish silage on egg production in Japanese quail. The fermented product may provide nutrients, minerals, vitamins or even lactobacillus to the

fish culture system. Survival rate was not affected by the addition of fermented fish waste to the water column. 90% and 95% survival rates were recorded in the control and treatment tanks respectively. The fish survival data of the present study revealed that the addition of propionic acid at 1% level does not have any toxic effect on *Poecilia reticulata*.

CONCLUSION

The results of the present study revealed that a stable fermented product can be prepared by the addition of preservative, proponic acid at an inclusion level of 0.5-1% to the fermenting fish waste. Addition of fermented product as bio-fertilizer augmented the growth in terms of body length in ornamental fish *Poecilia reticulata*. The fish survival data of the present study indicated that a fermented product prepared by the addition of 1% propionic acid level to fish waste doesn't have any toxic effect on the guppy fish (*Poecilia reticulata*). Effective utilization of fishery waste for the preparation of fermented products and its use as potential bio-fertilizer is a rational approach in ornamental fish culture. Application of the fermented fish silage as a supplementary fish feed/fertilizer can reduce the operational cost. This approach can be adopted by the self-help groups to generate income using the locally available recourses in a sustainable way.

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