

COLOUR ENHANCEMENT POTENTIAL AND ANTIBACTERIAL ACTIVITY OF ALLIUM SATIVUM SUPPLEMENTED FEED IN POECILIA VELIFERA

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Abstract: *Allium sativum* bulb (Garlic) renowned as a folkloric medicine attributed with richness of phytochemicals, minerals and vitamins expected as native to Central Asia and north eastern Iran. In captive conditions the ornamental fishes lacking the natural consumption of vegetation subjected to thrive in artificial environment with low nutritional feed subjected to retarded growth, diseases and faded colour. These hindrances can be tackled by administration of various plant products. In this scenario, a comparative study made in *Poecilia velifera* (yellow molly) by providing (commercial feed) CF and TD₁ (*A. sativum*) for a duration of 45 days. The in vivo antibacterial efficacy of feed in tissues (gut & gill) of the experimental fishes along with water samples from aquaria provided positive result for TD₁. The total bacterial load in the water, gut as well as the gill of CF fed group was 57x10⁴ CFU/ml, 37x10⁴ CFU/ml & 25x10⁴ CFU/ml while for TD₁ it was 13x10⁴ CFU/ml, 11x10⁴ CFU/ml, 8x10⁴ CFU/ml. The quantitative estimation of carotenoids estimated was 7.32µg/g wet weight in control and 13.18µg/g wet weight for TD₁. Thereby arrived at the conclusion that garlic supplemented feed (TD₁) implemented better anti-bacterial activity along with promoting growth and colour compared to CF (commercial feed)

Keywords - *Allium sativum*, *Poecilia velifera*, antibacterial, efficacy, carotenoids, bacterial load.

I. Introduction

Ornamental fishes with their kaleidoscopic appearance reduces stress and pressure experienced by the entire humanity irrespective of their age limits, accounted for their increasing demand. Among the species currently involved in trade operations, the livebearer Yellow molly (*P. velifera*) in the genera *poecilia* able to sustain in well aerated and vegetation rich slightly brackish water with a temperature range of 25°C to 30°C. Proper feeding schedules with sufficient nutrients augment carotenoid synthesis prevent diseases [1,2&3]. The market value of fishes depends on healthiness as well as the colour hue directly linked with the carotenoid production with a dominant role in different physiological functions [4].

Ornamental fish rearers with an impulse to acquire immense profit administered pigment enhancers with antibiotics ensued drastic environmental hazards. Stress elements accompanied with improper medications emanated antibiotic resistant strains [5&6]. The prevailing situation can be tackled by effective supplementation of garlic feed. Disease resistant brightly pigmented fishes through balanced dietary enrichment of plant materials should be generated [7]. On account of the limited application of medicinal plants in the field of aquarium fishes our work aimed to study the effect of dietary incorporation of garlic feed in promoting antibacterial activity and skin colour.

II. Materials and methods

The indoor study carried out in two glass aquaria having a capacity of 30L. The yellow molly fishes (*P. velifera*) bought from Achu's aquarium, Kollam district, Kerala acclimatized for two weeks, fed with 3% of commercial feed twice a day. Five fishes randomly introduced into the respective tanks labelled as CF and TD₁ whose proximate analysis carried out by standard methods denoted in Table-1. The fishes were maintained with standard water quality parameters [8] collected and sacrificed after 45 days to assess the bacterial load in the gill, gut and water samples by serial dilution method [9] with bacterial morphological characters [10]. The total carotenoid content in the muscle of fishes calculated by pigment extraction method using Spectrophotometry [11].

III. Results and Discussion

The hydrological parameters of water were well monitored during the experimental period with water temperature variance from 24°C-25°C. The pH fluctuated between 7.2-8.4, dissolved oxygen between 4.5 mg/l to 4.8 mg/l with a total hardness ranged from 96-118 mg/l of CaCO₃ while the level of ammonia, nitrite and nitrate values were feeble to detect. The proximate analysis (Table 1) of feed per 100 gm of CF & TD₁ revealed the composition of moisture, crude protein, crude fibre, crude lipid, ash and NFE.

Table-1 showing the proximate chemical analysis of feed in 100 g

Feed parameters	CF	TD ₁ (1.5g garlic)
Moisture %	12.2	11.0
Crude fibre %	2.8	2.1
Crude fat %	3.5	1.3
Crude protein %	27.8	31.8
Ash %	13.9	13.63
NFE %	39.8	40.17

The results revealed that water quality parameters hydrological supported the perfect rearing of the selected fish yellow molly of *poeciliidae* family. Moreover, the prepared feed ingested faster than the commercial feed demonstrated its palatable nature. The reduced

bacterial load in the gut, gill and water of TD₁ fed fishes clarified the anti-bacterial activity of garlic feed will be due to the secondary metabolites associated with plants [12&13], certainly prevent the diseases incurred by microbes [14] also disclosed by sterile disc diffusion method [15&16]. Thus it can be inferred that the garlic with its presence of phytochemicals obstruct the bacterial growth in TD₁ compared to CF shown in Table-2 with morphological appearance in Table-3.

Table-2 showing the microbial load (CFU/ml) in the aquaria, gut and gill of CF & TD₁

Feed	Water(CFU/ml)	Gut(CFU/ml)	Gill(CFU/ml)
CF	57X10 ⁴	37X10 ⁴	25X10 ⁴
TD ₁	13X10 ⁴	11X10 ⁴	8X10 ⁴

Table-3 showing the morphological features of bacterial colonies isolated from water, gill and gut of CF & TD₁ fed fishes.

Bacterial species	Margin	Colony shape	Size	Opacity	Elevation	Surface	Color	Texture
1	Undulate	Irregular	1mm	Opaque	Raised	Smooth	White	Sticky
2	Entire	Round	2mm	Transparent	Raised	Smooth	White	Not viscous
3	Undulate	Round	2mm	Transparent	Raised	Rough	Yellow	Sticky
4	Entire	Round	1mm	Opaque	Raised	Smooth	Light Yellow	Viscous
5	Undulate	Irregular	3mm	Opaque	Raised	Rough	Buff	Non sticky
6	Entire	Round	2mm	Transparent	Flat	Smooth	Brown	Sticky
7	Entire	Round	1mm	Transparent	Raised	Dull	White	Non sticky
8	Entire	Round	2mm	Opaque	Raised	Smooth	White	Viscous
9	Undulate	Irregular	1mm	Transparent	Flat	Smooth	Buff	Brittle
10	Entire	Round	2mm	Opaque	Raised	Smooth	Yellow	Sticky
11	Entire	Round	4mm	Transparent	Raised	Smooth	White	Brittle
12	Entire	Round	3mm	Transparent	Flat	Smooth	Yellow	Not viscous
13	Undulate	Irregular	3mm	Opaque	Raised	Rough	White	Brittle
14	Entire	Round	1mm	Transparent	Raised	Smooth	Yellow	Not viscous
15	Entire	Round	2mm	Opaque	Flat	Dull	Buff	Sticky
16	Entire	Round	3mm	Opaque	Raised	Smooth	Creamy	Non sticky
17	Undulate	Irregular	1mm	Transparent	Flat	Rough	red	Sticky

The carotenoids extracted yielded best result of 13.18 µg/g wet weight in TD₁ containing garlic than CF with 7.32 µg/g wet weight thereby agrees the application of china rose (*Hibiscus rosasinensis*), marigold petal (*Tagetes erecta*), a combination of carrot (*Daucus carota*), china rose petal (*Hibiscus rosasinensis*), marigold petal (*Tagetes erecta*) and rose petal (*Rosa sinensis*) and a mixture of coriander, Mint and Amaranth leaves improved skin colour in goldfish (*Carassius auratus*) [17], red sword tail [18], *Amphiprionocellaris* [19] and goldfish [20] support the colour enhancing ability of garlic. Thus it can be inferred from the conducted study that the incorporation of garlic feed definitely stimulates the physiological functions in a vertebrate group like fishes [21] and supports the folkloric remedy to treat diseases in animals, humans and fishes [22]. The aggrandized level of hue in TD₁ occurred due to the ingested carotenoids [23].

IV. Conclusion

From the study conducted it can be concluded that garlic supplementation in ornamental fish feed, being environment friendly, need to be promoted in future to reduce the bacterial load with vibrant pigmentation in ornamental fishes.

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