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Growth promoter effect of peppermint (*Mentha piperita*) on rohu (*Labeo rohita*)

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Abstract
The present study was carried out to understand the effect of dietary peppermint (*Mentha piperita*) on growth performance of *Labeo rohita*. A control diet without incorporating peppermint and test diets incorporating *Mentha piperita* at 0.5%, 1%, 1.5% and 2% kg/feed were fed in triplicate group for 90 days. Fish growth was assessed in terms of weight gain, specific growth rate and food conversion ratio. Results indicated that all the growth parameters were significantly increased ($p<0.05$) in T_4 where fish fed with 2% peppermint incorporated diet. Dietary incorporation of *Mentha piperita* in all concentrations stimulated fish appetite compared to control group and could be recommended as a safe growth promoter for enhancing fish growth and production.

Keywords: Peppermint, *Labeo rohita*, growth, medicinal herbs

1. Introduction
Globally aquaculture production has become the rapid growing food production sector. It provides high-quality animal protein with total global production increasing from 63.6 million tonnes in 2011 to 66.63 million tonnes in 2012 [1]. For high production people are started to incorporate antibiotic growth promoters in feed. But due to its negative impacts (residual accumulation in fish tissue, emergence of antibiotic resistant microbes) natural compounds are more acceptable to the public. The herbal immunostimulants which have been reported to enhance efficiency of feed utilization and animal productive performance [2].
Peppermint (*Mentha piperita*) is a cross between water mint and spearmint. It is indigenous to Europe and the Middle East, but now available in many regions of the world. The active component is menthol and contains other components such as menthone and carboxyl esters, particularly menthyl acetate. Dried peppermint typically has 0.3–0.4% of volatile oil containing menthol (7–48%), menthone (20–46%), menthyl acetate (3–10%), menthofuran (1–17%) and 1, 8-cineol (3–6%). It has been considered as an immunostimulant and appetite activator [3]. The present investigation was undertaken to study the effect of dietary peppermint (*Mentha piperita*) on growth performance of Indian major carp, rohu (*Labeo rohita*).

2. Materials and Methods
2.1 Diet and experimental design
Peppermint (*Mentha piperita*) was purchased from Herbal Seeds and Spices Stores (An enterprise of Spices Board, Uttarakhand) and used for diet preparation. Control diet (0% peppermint) was prepared by using common ingredients such as ground nut oil cake, wheat flour, soya flour, fish meal, tapioca flour, vitamins and minerals (Table 1). Herbal diets (T_1, T_2, T_3 and T_4) were prepared using the same composition of ingredients to which 0.5%, 1%, 1.5%, and 2% respectively of peppermint powder were added. The extruded pellets were dried under sunlight. The diets were analyzed for proximate composition according to the method outlined by the Association of Official Analytical Chemists [4] (Table 2).
A total of 225 rohu fingerlings of size 9.5±1 g were obtained from fish farm, College of Fisheries, Mangalore. After 15 day's acclimatization in 1000L fibre glass tank and fed with basal diet. Fish were distributed randomly at the density of 15 fish/500-L fibre tank and they were fed with respective diets at 5% of the body weight for twice a day. Water was exchanged once in two days. Basic water quality parameters were analyzed weekly. Water temperature

(24 ^{0}C-25.5 ^{0}C), pH (7.8-8.2), dissolved oxygen (4.9-6.2 mg/l) and ammonia (<0.05mg/l) maintained during the experimental period.

2.2 Estimation of growth parameters

Growth parameters such as weight gain, specific growth rate and feed conversion ratio were determined according to the standard formula [5].

Weight gain = Final fish weight (g) - initial fish weight (g)

$$\text{Specific growth rate} = \frac{\text{In final weight (g)} - \text{in Initial weight (g)}}{\text{No. of days}} \times 100$$

2.3 Statistical analysis

Analysis of variance (ANOVA) was used at 5% significance level to test for significant differences between various treatments. Differences among means were tested using Duncan Multiple Range test.

3. Result

Dietary peppermint has positive effect on fish growth compared to those fed with control diet only. Weight gain was higher in T_4 (10.98 ± 0.260g) (Fig. 1) and there was no significant differences ($p>0.05$) observed in T_2 (8.26 ± 0.213g) and T_3 (8.39 ± 0.121 g) treatments. Similarly, highest specific growth rate was observed in T_4 (0.37 ± 0.010%/day) (Fig. 2) and lowest specific growth rate was observed in control group where fish fed with only basal diet (0.28 ± 0.009%/day). Better feed conversion ratio was observed in T_4 (1.48 ± 0.010) (Fig. 3) and no mortality was observed in all fish groups during the experimental periods.

4. Discussion

Medicinal herbs contain potent bioactive substances, which may influence digestive process by enhancing or impairing enzyme activity and improving digestibility of nutrients [6]. In this study, herbal dietary supplementation of peppermint significantly ($p<0.05$) improved weight gain, specific growth rate and feed conversion ratio. All the growth parameters were increased in T_4 where fish fed with 2% peppermint incorporated feed diet. Similarly, feeding of *Mentha pipperita* diet at 5 g/kg feed to *Lates calcarifer* triggered appetite and led to a significantly improved weight gain, specific growth rate and feed conversion ratio [7].

Caspian white fish fry fed diets enriched with different levels of *Mentha piperita* (control, 0%, 1%, 2% and 3%) for 8 weeks showed dose-related growth increment and at 3% fish fed peppermint enriched diets has shown the highest increments of Caspian white fry growth could be due to its effects on gastrointestinal tract [8]. According to [9] there was a good feed conversion rate at 1.5% inclusion level of *M. piperita* in the diet of tambaqui, which showing plant's characteristic of stimulating fish appetite. Similar observations are reported in ginger [10]. Supplementation of ginger at 5 and 10 g/kg feed was most favourable for the growth and survival of Asian sea bass. *Tinospora cordifolia* in all concentrations promoted weight gain, feed conversion ratio, gross conversion efficiency and specific growth rate in Amur carp fingerlings [11]. Garlic supplemented pellet at 15 g per kg garlic pellet for four week's period to catla had shown significant effect ($p<0.05$) on fish growth [12].

Table 1: Ingredients of experimental diets

Ingredients (g/100g)	Control (T_0)	T_1	T_2	T_3	T_4
Ground nut oil cake	40.00	40.00	40.00	40.00	40.00
Soya flour	22.00	22.00	22.00	22.00	22.00
Fish meal	10.00	10.00	10.00	10.00	10.00
Wheat flour	25.00	24.50	24.00	23.50	23.00
Tapioca flour	2.00	2.00	2.00	2.00	2.00
Vitamin and minerals	1.00	1.00	1.00	1.00	1.00
Peppermint powder	0.00	0.5	1.00	1.50	2.00

Table 2: Proximate analysis of basal diet and peppermint incorporated diets

Ingredient	Protein	Fat	Fibre	Ash	Moisture	NFE
Control	32.26±0.05	7.49±0.01	4.94±0.01	7.55±0.09	32.26±0.05	39.02±0.14
T_1	33.1±0.26	7.36±0.00	5.39±0.01	7.48±0.01	32.26 ±0.05	37.94±0.02
T_2	33.26±0.02	7.56±0.00	5.37±0.00	7.29±0.00	32.26 ±0.05	37.78±0.02
T_3	32.69±0.52	7.46±0.03	5.42±0.01	7.41±0.00	32.26 ±0.05	38.14±0.46
T_4	32.84±0.04	7.53±0.01	5.36±0.00	7.44±0.01	32.26 ±0.05	37.81±0.04

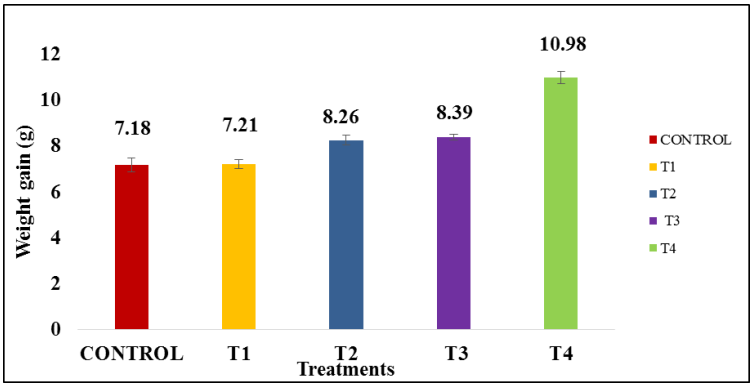

Fig 1: Mean weight gain (g) of *Labeo rohita* recorded under control group and different treatments

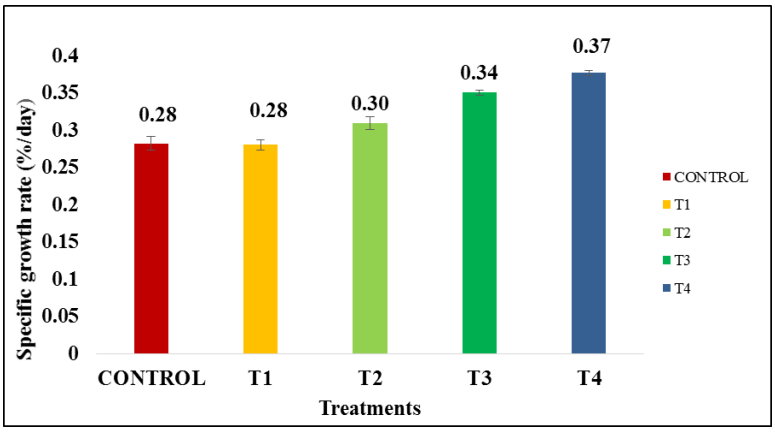

Fig 2: Mean specific growth rate (%/day) of *Labeo rohita* recorded under control group and different treatments

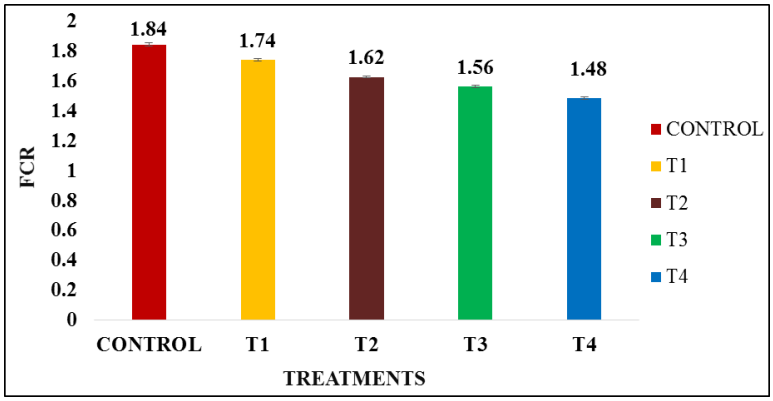

Fig 3: Mean FCR of *Labeo rohita* recorded under control group and different treatments

5. Conclusion

Herbs and medicinal plants are good growth promoters than synthetic growth promoters. They are cheap, safe, eco-friendly and did not cause any negative impacts on the fish body. The above study revealed that, peppermint (*Mentha piperita*) is a good appetizer and showed dose-dependent growth increment in rohu. Further studies should be conducted to understand the digestive mechanism of peppermint.

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