



Effect of peppermint (*Mentha piperita*) on growth performance and survival rate of common carp

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Abstract

Mentha piperita was used as supplement diet for common carp *Cyprinus carpio* to check its effect on fish. Total 60 fingerlings were purchased from Govt. fish hatchery Bahawalpur, Punjab, Pakistan. After 3 days of adjustment of fish in aquarium, fingerlings were divided into four equal groups named as group A, B, C and D. There were 15 fishes in each aquarium. Experiment duration was of 3 months, from May 2018 to August 2018. All fishes were fed twice daily @ 4 % of their body weight. Fish feed was supplemented with different percentages of *Mentha piperita* Peppermint leave to observe the feed efficiency and growth rate. Different percentages of peppermint leave were 0.00 %, 10%, 20% and 30% with groups name A, B, C and D respectively. Growth parameters including body weight, weight gain, body length increased significantly in all groups when compared with control group but specific growth rate and body resistant ratio significantly increased during experiment. Growth rate and resistance for mortality was high in group D (30%). The results showed that feed with *Mentha piperita* reduced the mortalities and improved the P value (0.05>) significantly, also enhanced the survival rate, weight gain and feed conversion ratio of treated groups over the control group. This study concluded that growth parameters like body weight and survival rate of *Cyprinus carpio* increased significantly by feeding a feed containing 30% *Mentha piperita*. Hence, this work is very helpful to the field of aquaculture and important for the fisheries industry in Pakistan.

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Introduction

Cyprinus carpio is a freshwater fish species and a prominent member of the class Osteichthyes order Cypriniformes and the family Cyprinidae. *C. carpio* has worldwide distribution in freshwater bodies such as lakes, streams, rivers and pools. It is very versatile freshwater fish and is widely distributed in eutrophic waters of Europe, Asia, and Middle east, but however, in North America, Canada and Australia (Faramarzi *et al.*, 2012). *C. carpio* is of great commercial value that is why it is widely cultured as a fish for food both over their native and introduced range. It is quite useful for domestic culture courtesy of being omnivorous and also because of the fact that it's all varieties breed freely throughout the year in confined waters (Shahbazi and Heidari, 2015). Animal or plant originated immunostimulants contain various bioactive compounds which can really advance immune responses and disease resistance (Bairwa *et al.*, 2012). As per the current research and information, many studies have focused on the administration of dietary medicinal herbs and their extracts as potential immunostimulants in aquaculture and eventually positive results reported on growth routine, feed consumption, chemical body structure, immune response as well as disease resistance of various fish species (Hoseinifar *et al.*, 2016). *Mentha piperita*, commonly called Peppermint, is a perennial herb and a prominent member of the Labiatae family and amongst the world's agedtherapeutic herbs. (Iscan *et al.*, 2002). Ancient and traditional medications usually involve the use of plant extracts, usually in aqueous solutions, courtesy of their wide therapeutic values (Zhang *et al.*, 2002).

At present, aquaculture maladies the board should focus on discovering condition cordial techniques equipped for enhancing oceanic welfare and among them sustenance added substances are of prime significance. (Lin *et al.*, 2008).

The wide utilization of *M. piperita* in old and contemporary customary meds, its various gainful consequences for warm blooded creatures and our past information of its valuable impacts on fish have

persuaded us to investigate its natural potential on the organic exercises of *C. carpio*.

Objectives

The Objectives of present work was to find about effects of peppermint (*Mentha piperita*) on growth Performance and Survival Rate of common carp.

Materials and methods

The present study is about the effect of *Mentha piperita* on growth performance and survival rate of *Cyprinus carpio*. It was performed at ShujaAdad district Multan, Punjab, Pakistan. A total 60 experimental juvenile of *Cyprinus carpio* were purchased from Govt. fish hatchery, Bahawalpur Punjab, Pakistan and transferred at the experimental site. Groups arranged for experiment are shown in table 1.

Mentha piperita was collected from the fields of Research center ShujaAdad and was identified by analysis of leave and stem structure (Pauli, 2006). Some locally available ingredients such as rice polish were also selected from market to prepare low-cost fish feed. Four feeds, Feed B, Feed C, and Feed D containing 10%, 20%, 30% *Menthapiprta* respectively and Feed A without *Mentha pipritawere* prepared. Fish feed was supplemented with different percentages of Peppermint with rice polish to observe the feed efficiency and growth rate. Different percentages of Peppermint used as supplement are given in following table. Collected leaves of *Mentha piperita* were washed and dried in open area without sunlight then grounded properly, according to (table 3.1) all collected dietary ingredients were grounded and mixed. For preparation of fish feed, mixed ingredients were put into the manually operated machine (Pellet Machine Model SYSLG-30-IV China). Pellets were dried in sunlight and store in polythene bags. All fish were fed twice daily @ 4 % of their body weight supplemented with prepared feed pellets. Feed was given in the morning at 7:00 AM and in the evening at 6:00 PM. In present study we used total four aquaria. In each aquarium 15 fingerlings were placed randomly. To maintain the DO level, aerator

(air pump) supplied air continuously in all glass aquaria. pH was measured with pH meter and temperature measured with thermometer on daily basis. Each fingerling was individually weighed at the start of experiment by Tripe Beam Balance for initial data and stocked in each aquarium and quantity of diet was adjusted accordingly. Experimental duration was 90 days from May to August. Data for growth efficiency (weight, weight gain, feed, SGR, FCR, Fish length) was collected after every 30 days. Weight was measured after every 30 days for all fishes in control and experiment groups by using digital weight balance.

Weight gain by fish was also recorded after every 30 days by using formula

Weight gain = Final weight – Initial weight (recorded for previous 30 days ago)

Specific growth rate for each fish was calculated after every 30 days by using following formula

SGR= $\frac{\{\text{LN (Final weight)}\} - \{\text{LN (Initial weight)}\}}{\text{Total days}} \times 100$

LN = Natural log

Feed conversion ratio was calculated after every 30 days by using following formula

FCR= feed given / weight gain

Fish length was calculated by using common scale marked in centimeters.

Results

Body weight

Body weight (g) of fish *C. carpio* increased significantly in groups (C), and (D) as compared with group (A) and (B) during 1st 30 days but maximum weight was recorded in group (D) treated with 30% of peppermint supplement with feed. In the next 30 days weight was increased significantly in groups (B), (C), and (D) as compared with group (A). Maximum weight was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed. And in the last 30 days weight was also increased significantly in groups (B), (C), and (D). Maximum weight was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed (Table 4).

Table 1. Groups arranged for experiment.

Group A (Control)	Group B
15 <i>Cyprinus carpio</i>	15 <i>Cyprinus carpio</i>
Peppermint leaves extract (0.00%)	Peppermint leaves extract (10%)
Group C	Group D
15 <i>Cyprinus carpio</i>	15 <i>Cyprinus carpio</i>
Peppermint leaves extract (20%)	Peppermint leaves extract (30%)

Table 2. Different percentages of Pepper mint (*Mentha piperita L*) feed supplement applied to fish *Cyprinus carpio*.

Groups	Peppermint leaves (%)	Rice polish (%)	Total Feed
A	0.00	100	100
B	10.0	90	100
C	20.0	80	100
D	30.0	70	100

Body Weight Gain

Body weight gain (g) by fish *C. carpio* increased significantly in groups (B), (C), and (D) as compared with group (A) during 1st 30 days but maximum weight gained by group (D) treated with 30 % of peppermint supplement mixed with feed. In 2nd

measurement of next 30 days weight gain was increased significantly in groups (B), (C), and (D) as compared with group (A). And in last 30 days weight gain was also increased significantly in groups (B), (C), and (D) as compared with group (A) and Maximum weight gained was recorded in group (D)

treated with 30 % of peppermint supplement with feed (Table 5).

Feed

Feed given in (grams) to fish *C. carpio* was increased significantly in groups (C), and (D) when compared with group (A) and (B) during 1st 30 days period. Maximum feed was given to group (D) treated with 30 % of peppermint supplement mixed with feed. In

the next 30 days feed was increased significantly in groups (B), (C), and (D) as compared with group (A). Maximum feed was given to group (D) treated with 30 % of peppermint supplement with feed. At in the last 30 days, feed was increased significantly in groups (B), (C), and (D) as compared with group (A). Maximum feed was given to group (D) treated with 30 % of peppermint supplement mixed with feed (Table 6).

Table 3. Physico-chemical parameters maintained in specific range.

Parameter	Range	Mean values
pH	7.5-8.0	7.80
Dissolved oxygen	6-7mg/l	6.34mg/l
Temperature of water	20-28 °C	23 °C
Total Dissolved solids	150-250 mg/l	200

Specific Growth Rate

Specific growth rate of fish *C. carpio* increased significantly in groups (B), (C), and (D) as compared with group (A) during 1st 30 days period but maximum Specific growth rate was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed. (In next 30 days specific growth rate

was decreased significantly in groups (B), (C), and (D) as compared with group (A). And in last 30 days specific growth rate was decreased significantly in all groups (A), (B), (C) and (D). Minimum specific growth rate was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed (Table 7).

Table 4. Mean weights of *Cyprinus carpio* fingerlings in A-D groups with different concentrations.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Weight (Grams)			
		Day 0	Day 30	Day 60	Day 90
A	0.00	3.26±0.01	7.66±0.01	15.35±0.04	26.41±0.05
B	(90%, 10%)	3.26±0.01	7.75±0.01*	16.38±0.06*	28.32±0.11*
C	(80%, 20%)	3.25±0.02	8.34±0.02*	17.45±0.07*	32.53±0.13*
D	(70%, 30%)	3.25±0.01	9.38±0.01*	22.48±0.07*	36.48±0.08*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

Feed Conversion Ratio

Feed conversion ratio of fish *C. carpio* was decreased significantly in groups (C), and (D) when compared with group (A) and (B) during 1st 30 days period. Minimum feed conversion ratio was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed. At the next 30 days, feed conversion ratio was increased significantly in groups (A), (B) and (C) as compared with group (D). Minimum feed conversion ratio was recorded in

group (D) treated with 30 % of peppermint supplement mixed with feed. And in the last 30 days measurement, feed conversion ratio was increased in groups (A) and (B) as compared with groups (C) and (D). Minimum feed conversion ratio was recorded in group (C) and (D) treated with 20 % and 30 % of peppermint supplement mixed with feed respectively. Minimum feed conversion ratio was recorded in group (D) and it was significant (Table 8).

Table 5. Mean weight gain of *Cyprinus carpio* fingerlings in A-D groups with different concentrations.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Weight Gain		
		Day 30	Day 60	Day 90
A	0.00	4.40±0.01	7.69±0.02	11.06±0.04
B	(90%, 10%)	4.48±0.02*	8.63±0.06*	11.95±0.15*
C	(80%, 20%)	5.10±0.01*	9.11±0.06*	15.08±0.19*
D	(70%, 30%)	6.13±0.01*	13.11±0.07*	16.48±0.16*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

Fish Length

Length (cm) of fish *C. carpio* was equal in start of the trail in all groups A, B, C, D. At the 1st 30 days measurement, Length was increased significantly in groups (A), (B) and (C) but maximum length was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed. The next 30 days measurement, length was increased significantly

in groups (A), (B) and (C) as compared with group (A). Maximum length was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed. In the Last 30 days measurement, length was increased significantly in groups (C) and (D) as compared with group (A) and (B). Maximum length was recorded in group (D) treated with 30 % of peppermint supplement mixed with feed (Table 9).

Table 6. Feed in grams provided to *Cyprinus carpio* fingerlings in A-D groups.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Feed (Grams)			
		Day 0	Day 30	Day 60	Day 90
A	0.00	0.33±0.01	0.77±0.02	1.54±0.01	2.64±0.01
B	(90%, 10%)	0.33±0.02	0.77±0.01	1.64±0.02*	2.83±0.02*
C	(80%, 20%)	0.32±0.02	0.83±0.02*	1.74±0.02*	3.25±0.02*
D	(70%, 30%)	0.32±0.01	0.94±0.02*	2.25±0.01*	3.65±0.02*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

Discussion

The growth of aquaculture industry doesn't correlate to the fast developing of the aquaculture sector. This significant profitable sector requires more research for the conducts of diseases and drug application (Aklakur *et al.*, 2015). The purpose of research is to manage disease happening in farmed fishes and a maintainable production. Utilization of herbal materials, plant material was prepared by heating in Europe and Asia. The peppermint extracts, amounts have been choose for this work for the rapid growth of larvae of fish (Pauli, 2006). Aqua culturists necessitate to develop technologies by nourishing them with supplementary diets supplemented with growth promoters and give food to additives and multiuse of

them can be gained from plant extracts. Present results exposed that peppermint extracts encourage growth of *Cyprinus carpio*. Both WG and SGR were improved in a dose dependent mode in fish fed enriched diet, respect to the values found of control fish. Such results concur with previously obtained on fry Caspian white fish (Adel *et al.*, 2015). Numerous effects of peppermint could be involved in the rise of fish growth. Fish fed peppermint extracts usually feed very well although further studies should be carried out to reveal if the extracts stimulate the fish appetite. Furthermore, peppermint extracts could perk up the accessibility of nutrients in the fish specimens, digestibility and foremost to a higher protein synthesis, as it has been recommended for other plant

extracts (Talpur *et al.*, 2014). Our works with peppermint extracts, according to most studies carried out with medical herbs, have indicated the

great importance of using the suitable dosage to obtain positive effects on the animals.

Table 7. Specific growth rate of *Cyprinus carpio* fingerlings in A-D groups.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Specific Growth Rate		
		Day 30	Day 60	Day 90
A	0.00	2.85±0.01	2.58±0.02	2.33±0.01
B	(90%, 10%)	2.88±0.02	2.69±0.01*	2.40±0.01*
C	(80%, 20%)	3.14±0.01*	2.80±0.02*	2.56±0.02*
D	(70%, 30%)	3.53±0.01*	3.22±0.02*	2.69±0.02*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

Herbal growth promoters such as pepper mint supplement have been used in diet for increasing growth efficiency in fish. Observations related to different growth parameters showed that fish fed with pepper mint supplement mixed diet showed more growth rate as compared with control group that was lacking of feed additive. Moreover, the survival of fish

was 100 percent in all groups including non-treated group. Fishes treated with pepper mint supplement are also active and healthy (Kour *et al.*, 2004). The mean body weight of fish at 30, 60 and 90 days of age showed that addition of feed with various levels of pepper mint supplement were significantly different from control group (P <0.05).

Table 8. Feed conversion ratio for *Cyprinus carpio* fingerlings in A-D groups.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Feed Conversion Ratio		
		Day 30	Day 60	Day 90
A	0.00	0.07±0.01	0.10±0.02	0.14±0.01
B	(90%, 10%)	0.07±0.02	0.09±0.01	0.14±0.02
C	(80%, 20%)	0.06±0.01	0.09±0.02	0.12±0.02*
D	(70%, 30%)	0.05±0.01*	0.07±0.01*	0.11±0.01*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

This is due to the digestibility efficiency increased by pepper mint added in the fish diet, its professed benefits are many related to digestive complaints, and it has a relaxing effect on the stomach, and can also be an appetite stimulant (Barbarestani, *et al.*, 2017). Weight gain by fish *Cyprinus carpio* in the experiment was significantly increased as compared to control group. The weight gain may be increases due to increase activity of enzymes and breakdown of the food by the action pepper mint supplement as additive our study is compatible with the (Sambhu and Jayaprakast *al.*, 2001) who also reported increase

in weight gain in prawns by using herbal feed additive. Present study is also similar with (Bhavan *et al.*, 2013) who reported increase in weight gain by prawns by using Piper nigrum as a growth promoter in prawns. Feed intake in our study also increased. Increase in feed intake is indication of good health of fish. Increase in feed intake may be also due to action of pepper mint and increased digestibility of food our study also compatibles with previous studies (Nath *et al.*, 2013) reported increase in feed intake in broiler by using different combinations of growth factors in which black pepper is also include. Specific growth

rate Increase during the experiment. Increase in specific growth rate is indication of gain of weight by specimen. In our study weight is also increased our study is compatible with (Matiullah *et al.*,2016) who

reported increase specific growth rate in his experiment by using black pepper as growth promoter in fish *Lebeorohita*.

Table 9. Mean length of *Cyprinus carpio* fingerlings in A-D groups with different concentrations.

Groups	Concentration (Fish Feed + Peppermint Supplement)	Length (cm)			
		Day 0	Day 30	Day 60	Day 90
A	0.00	4.34±0.01	7.25±0.01	10.36±0.05	12.45±0.12
B	(90%, 10%)	4.34±0.02	7.37±0.02*	10.63±0.06*	13.46±0.13*
C	(80%, 20%)	4.33±0.01	7.43±0.02*	11.58±0.13*	15.49±0.17*
D	(70%, 30%)	4.35±0.01	8.50±0.09*	13.35±0.20*	16.48±0.26*

Values with (*) are significantly different from control group, (*) having P value (0.05>), ANOVA = Mean ± Standard error.

Feed conversion ratio also increases during the experiment which is indication of utilization of feed by specimens. When feed utilization increases fish also gain weight and length.

The increase in feed conversion ratio may be due to pepper (Morgan and Overholt, 2005) previous study of also reported increase in feed conversion ratio in fish tilapia. Fish gain significant length during experiment as compared to control group. Gain in fish length is useful for the growth of fish. In this experiment fish gain length which is indication of good growth. Our study is compatible with who reported increase in fish length by using different growth promoters.

In our study Pepper mint supplement in fish diet show significant increase in growth parameters such as weight, weight gain, feed conversion ratio, specific growth rate and fish length. Biomass is improved significantly in our study which is good indication of fish health and growth. Pepper mint is also important in the survival of fish it decreases the mortality and also important in control of diseases and pathogens.

Conclusion

Mentha piperita is used widely in herbal medicine and believed to be effective in strengthening the immune system. Growth parameter like body weight of *Cyprinus carpio* increased significantly by treating

with 30% *Mentha piperita*. In rigorous culture system highest growth of *Cyprinus carpio* at feeding level of 4% wet body weight was obtained. In intensive rearing Two-time feeding of *Cyprinus carpio* was originate enough lacking any unfavorable impact on fish growth. Best survival rate of *Cyprinus carpio* was shown at the rate of 30% *Mentha piperita*. All water parameters found within optimal range during experiment and it supported fish growth.

It has a very soothing effect on the stomach and also strong appetite stimulant. By comparing with other Feed concentrations of *Mentha piperita* leave extract, 30% leave extract supplement diet proved to be healthy diet for *Cyprinus carpio*. Although, fish appearance justifies the effect of diet without measuring. *Mentha piperita* can be used at Farm level, as fish diet supplement for growth and survival due to its unique properties. Present study represents these effects and we can summarize the conclusion more specifically.

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