

EFFECTS OF FEED ADDITIVES GARLIC AND ONION ON GROWTH OF MRIGAL (*CIRRHINUS MRIGALA*) FINGERLINGS

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ARTICLE INFORMATION

Article History:

Received: 29th August 2022

Accepted: 20th September 2022

Published online: 4th October 2022

Author's contribution

AA conceptualization, IM methodology, MA, analysis, TK, FJ collected material, MI compiled the data, ST, AH reviewed the article.

Key words:

Fish, Garlic, Onion, Phytoadditives, Growth, Feed, *Cirrhinus mrigala*, supplements.

ABSTRACT

The purpose of this study was to see how dietary garlic and onion powder effected on *Cirrhinus mrigala*. Feed additives such as garlic and onion are used. *Cirrhinus mrigala* was fed garlic and onion supplementary meals containing 2.5 percent of their body weight for a total of 60 days. The initial body weight and length of *Cirrhinus mrigala* fingerlings were respectively $18.48 \pm 0.139\text{g}$ and $10.17 \pm 0.123\text{cm}$. When garlic and onion were fed together, the effect of garlic and onion on *Cirrhinus mrigala* growth performance was examined. Final weight was 29.37 ± 0.071 and final length was $13.2 \pm 0.022\text{cm}$, indicating that feed consumption was enhanced based on growth performance. The current findings showed that dietary garlic or onion powder, given alone or in combination, might increase mrigal (*Cirrhinus mrigala*) survival, growth, and feed consumption. Based on the findings, it can be concluded that feeding a food supplement (onion and garlic) to fish, either alone or in combination, enhanced their growth performance.

1. INTRODUCTION

Fodder additives derived from medicinal plants or plant extracts are known as phytoadditives (Gabor et al., 2010). Essential nutrients for body metabolism are provided by feed additives. Dietary supplements are one of the most frequent strategies used in fish farms to increase weight gain, feed efficiency, and disease resistance in cultured fish. It is hoped that using them would provide the same results as using antibiotics (Gabor et al., 2010). Plant products such as herbs (Akrami et al., 2015). Garlic (*Allium sativum*) is a member of the Liliaceae family. It is used in old-style medicine and also as a spice (Valenzuela-Gutierrez, 2021). It contains huge amount of calcium, phosphorus, carbohydrates, as well as few other nutrients. Garlic also contains a number of beneficial compounds, includes iodine salts that are good for the circulatory system (Iqbal et al., 2001).

The silicates are good for the skeletal and circulatory systems, and Sulphur salts that are good for cholesterolemia, the skeletal system, and liver disease management (Iqbal et al., 2001). Garlic includes a variety of vitamins, including vitamin A, vitamin B complex, and linoleic acid (Dragon, 2008). Allicin is most significant components present in garlic, and it possesses anthelmintic properties (Corzo-Martínez et al., 2007). Garlic helps in disease management, notably bacterial and fungal infections (Suh et al., 1999). Garlic plays important role to improve fish health (Saleh et al., 2015).

Onion (*Allium cepa* L.) which is also *Liliaceae* family member (Mousavi et al., 2016). Onion had a huge amount of free and glycosidically bound quercetin also oxidized quercetin byproducts (Griffiths et al., 2002; Romanov et al., 2017). Onion contains antibacterial, antioxidant, plus anti-cancer properties and it inhibits endogenous lipogenesis while increasing lipid catabolism (Kumari, 2007). In addition, onion extract was found to be one of the most efficient dietary supplements for improving

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weight increase in young olive flounder, *Paralichthys olivaceus*, in a prior study (Cho et al., 2012).

2. MATERIALS AND METHODS

Mrigal (*Cirrhinus mrigala*) fingerlings were acquired from a commercial fish farm and hatchery in Multan, for this study. The fingerlings were acclimated in glass aquaria at the Fisheries Research and Training Institute in Multan Nutrition Laboratory. The fingerlings were fed a basal diet at this time. Following acclimatization, the fingerlings were divided into four groups, each with 30 fish. The average body weight was 18.36 ± 0.09 g, with a length of 10.24 ± 0.04 . Garlic and onion powder were obtained at a local market of Multan. The fingerlings were fed at a rate of five percent of their body weight twice a day. Four different experimental diets were prepared.

The first group, T1, was fed commercial fish as only source of nutrition, with no supplements. T2 was the second group, which received commercial fish feed with 5% garlic as a dietary supplement. T3 was the third group, which consisted of commercial fish feed with 5% onion as a dietary supplement. T4 was the fourth group, which consisted of commercial fish feed with 2.5 percent garlic and onion as dietary supplements, respectively. This study lasted for 60 days.

The conclusion of the feeding experiment final fish length as well as weight were recorded several growth parameters such as %WG, % LG, %ADWG, %ADLG were calculated.
Percentage Weight gain (%WG) = $\frac{W2(g) - W1(g)}{W1(g)} \times 100$

Percentage length gain (%LG) = $\frac{L2(cm) - L1(cm)}{L1(cm)} \times 100$

Specific growth rate (SGR) = $\frac{100(\ln W2 - \ln W1)}{T(\text{days})}$

Average daily Weight gain (ADWG) = $\frac{WG(g)}{T(\text{days})}$

Average daily length gain (ADLG) = $\frac{LG(cm)}{T(\text{days})}$

Where W1 and W2 are the initial and final weight of fish, L1 and L2 are initial and final length of fish, and T is total number of days of experiment. W= the weight of the fish in gram (g), L= the total length of the fish in centimeter (cm).

Statistical analysis

One-way ANOVA followed by post- hoc test (Fishers Least Significant Difference Test)

3. RESULTS AND DISCUSSION

At the start of experiment average initial body weight and length of mrigal fingerlings were 18.48 ± 0.139 g and 10.17 ± 0.123 cm respectively. The average final weight of fish in treatment 1 was 24.36 ± 0.059 g, whereas fish in treatments 2,3, and 4 had average final body weights of 27.1 ± 0.089 g, 28.47 ± 0.077 g, and 29.37 ± 0.071 g,

respectively, at the end of the trial. For all of the groups tested, the fish survival rate was 100 percent. For 60 days, mrigal fish were fed this feed additive garlic and onion alone and in combination.

Table 1. Growth activity of mrigal fed on diets supplemented with garlic and onion alone and in combination for 60days

Parameters /groups	Control group (T1)	Garlic (T2)	Onion (T3)	Garlic+ Onion (T4)
Initial weight	18.48 ± 0.138	18.21 ± 0.208	18.45 ± 0.232	18.30 ± 0.0203
Initial length	10.17 ± 0.123	10.28 ± 0.203	10.24 ± 0.0124	10.19 ± 0.0204
Final weight	24.36 ± 0.095	27.1 ± 0.089	28.47 ± 0.077	29.37 ± 0.071
Final length	12.04 ± 0.016	12.66 ± 0.026	12.85 ± 0.022	13.2 ± 0.022

Experimental values are expressed as mean $\pm$ standard error of mean (n=15). Values with the *in the same row are statistically different ($P \leq 0.05$).

Table 2. Effect of dietary supplement on mrigal percentage body weight gain (%WG)

Parameters /groups	percentage body weight gain (%WG)
Control group (T1)	31.87 ± 0.059
Garlic (T2)	$51.47 \pm 0.0737^*$
Onion (T3)	$54.65 \pm 0.0441^*$
Garlic+ Onion (T4)	$60.70 \pm 0.4217^{**}$

Table 3. Effect of dietary supplement on mrigal percentage body length gain (%LG)

Parameters /groups	percentage body length gain (%LG)
Control group (T1)	18.61 ± 0.174
Garlic (T2)	24.12 ± 0.172
Onion (T3)	26.72 ± 0.188
Garlic + Onion (T4)	$30.81 \pm 0.14^*$

Table 4. Effect of dietary supplement on mrigal specific daily growth rate (SGR)

Parameters /groups	Average Daily weight gain
Control group (T1)	0.4373 ± 0.0645
Garlic (T2)	$0.6563 \pm 0.0784^*$
Onion (T3)	$0.7131 \pm 0.0492^*$
Garlic+ Onion (T4)	$0.7795 \pm 0.0442^*$

Table 5. Effect of dietary supplement on mrigal average daily body weight gain (ADWG)

Parameters /groups	Average Daily weight gain
Control group (T1)	0.8404±0.135
Garlic (T2)	1.269±0.157
Onion (T3)	1.431±0.112

Table 6. Effect of dietary supplement on mrigal average daily body length gain (ADLG)

Parameters /groups	Average Daily weight gain
Control group (T1)	0.2675±0.024
Garlic (T2)	0.3400±0.048
Onion (T3)	0.3729±0.049
Garlic + Onion (T4)	0.4300±0.050*

Probiotics, prebiotics, phytogenics, organic acids, essential oils, and minerals are all examples of feed additives. To increase feed conversion efficiency and fish development rate, new nutritional supplements are introduced to fish feed. Herbs and spices are reported to help in growth. Principles of growth performance and feed utilization indices reveal an improvement in growth and feed utilization for every fish group fed garlic or onion powder at all inclusion stages in the current study as likened to the control fish group. When compared to the control group, *Cirrhinus mrigala* fed supplemental nutrition alone or in combination showed a significant increase in percentage weight gain and percent length gain. These findings are in agreement with of (Ozório [et al. 2012](#)).

Many researchers have documented, Garlic in fish diets has been shown to improve development and feed utilization in a range of fish species, including African catfish, *Clarias gariepinus* (Agbebi [et al.](#), 2013); rainbow trout, *Oncorhynchus mykiss* (Agbebi [et al.](#), 2013); swordtail, *Xiphophorus helleri* (Kalyankar [et al.](#), 2013). Garlic includes Allicin that enhances the function of the intestinal microflora, therefore increasing absorption plus energy consumption, according to (Khalil [et al.](#) 2001). This would result in increased fish growth Apines. The brown-marbled grouper, *Epinephelus fus-coguttatus*, found that growth boosting potentials of an onion stem-based diet resulted are improvement in bodyweight (Aly [et al.](#), 2010). The existence of cysteine sulfoxide (CSO), by S-propenyl-CSO being a main S component, is responsible for the majority of onions' beneficial benefits. Sulfur-containing compounds, such as methyl sulfonate methane (MSM), have immunomodulating properties.

4. CONCLUSION

Based on the findings, it can be concluded that feeding a food supplement (onion and garlic) to fish, either alone or in combination, enhanced their growth performance. As a result, it is suggested that these dietary supplements, which are inexpensive and locally available, could be included in aqua feed to promote development.

5. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

REFERENCES

- Agbebi, O. T., Ogunmuyiwa, T. G., & Herbert, S. M. (2013). Effect of dietary garlic source on feed utilization, growth and Histopathology of the African catfish (*Clarkias Gabrielinos*). *Journal of Agricultural Science*, 5(5), 26-34.
- Akrami, R., Gharaei, A., Mansour, M. R., & Galeshi, A. (2015). Effects of dietary onion (*Allium cepa*) powder on growth, innate immune response and hemato-biochemical parameters of beluga (*Huso huso* Linnaeus, 1754) juvenile. *Fish & Shellfish Immunology*, 45(2), 828-834.
- Aly, S. A., & Mohamed, M. F. (2010). Echinacea purpurea and *Allium sativum* as immunostimulants in fish culture using Nile tilapia (*Oreochromis niloticus*). *Journal of Animal Physiology and Animal Nutrition*, 94(5), 31-39.
- Cho, S. H., & Lee, S. M. (2012). Onion powder in the diet of the olive flounder, *Paralichthys olivaceus*: effects on the growth, body composition, and lysozyme activity. *Journal of the World Aquaculture Society*, 43(1), 30-38.
- Corzo-Martínez, M., Corzo, N., & Villamiel, M. (2007). Biological properties of onions and garlic. *Trends in Food Science & Technology*, 18(12), 609-625.
- Dragon, S., Gergen, I., & Socaciu, C. (2008). Alimentatia Functionala cu componente bioactive natural in sindromul metabolic Ed. Timisoara Eurostampa, 314, 200-202.
- Gabor, E. F., Şara, A., & Barbu, A. (2010). The effects of some Phyto additives on growth, health and meat quality on different species of fish. *Animal Science and Biotechnologies*, 43(1), 61-65.
- Griffiths, G., Trueman, L., Crowther, T., Thomas, B., & Smith, B. (2002). Onions—a global benefit to health. *Phytotherapy Research*, 16(7), 603-615.
- Iqbal, Z., Nadeem, Q. K., Khan, M. N., Akhtar, M. S., & Waraich, F. N. (2001). In vitro anthelmintic activity of *Allium sativum*, *Zingiber officinale*,

- Curcubita mexicana* and *Ficus religiosa*. *International Journal of Agriculture and Biology*, 3(4), 454-457.
- Kalyankar, A. D., Gupta, R. K., Bansal, N., Sabhlok, V. P., & Singh, D. (2013). Effect of garlic (*Allium sativum*) against *Aeromonas hydrophila* and health management of Swordtail, *Xiphophorus helleri*. *Journal of Environmental Science Sustainability*, 1(2), 41-48.
- Khalil, R. H., Nadia, B. M., & Soliman, M. K. (2001). Effects of Biogen and Levamisol Hcl on the immune response of cultured *Oreochromis niloticus* to *Aeromonas hydrophila* vaccine. *Beni-Suef Veterinary Medicine Journal*, 11, 381-392.
- Kumari, K., & Augusti, K. T. (2007). Lipid lowering effect of S-methyl cysteine sulfoxide from *Allium cepa* Linn in high cholesterol diet fed rats. *Journal of Ethnopharmacology*, 109(3), 367-371.
- Mousavi, E., Mohammadiazarm, H., Mousavi, S. M., & Ghatrami, E. R. (2016). Effects of inulin, savory and onion powders in diet of juvenile's carp *Cyprinus carpio* (Linnaeus 1758) on gut micro flora, immune response and blood biochemical parameters. *Turkish Journal of Fisheries and Aquatic Sciences*, 16(4), 831-838.
- Ozório, R. O., Portz, L., Borghesi, R., & Cyrino, J. E. (2012). Effects of dietary yeast (*Saccharomyces cerevisia*) supplementation in practical diets of tilapia (*Oreochromis niloticus*). *Animals*, 2(1), 16-24.
- Romanov, D. V., Divashuk, M. G., Kirov, I. V., & Khrustaleva, L. I. (2017, June). Cytogenetic study of onion (*Allium cepa*) by physical mapping of ESTs. In *VII South-Eastern Europe Symposium on Vegetables and Potatoes*, 1326, 173-180.
- Saleh, N. E., Michael, F. R., & Toutou, M. M. (2015). Evaluation of garlic and onion powder as phyto-additives in the diet of sea bass (*Dicentrarchus labrax*). *The Egyptian Journal of Aquatic Research*, 41(2), 211-217.
- Suh, H. J., Lee, J. M., Cho, J. S., Kim, Y. S., & Chung, S. H. (1999). Radical scavenging compounds in onion skin. *Food Research International*, 32(10), 659-664.
- Valenzuela-Gutiérrez, R., Lago-Lestón, A., Vargas-Albores, F., Cicala, F., & Martínez-Porchas, M. (2021). Exploring the garlic (*Allium sativum*) properties for fish aquaculture. *Fish Physiology and Biochemistry*, 47(4), 1179-1198.