

Multiple research studies such as Abdel Rahman et al. (2020) and Liua et al. (2018) have found that adding vitamin C to fish feed can improve both developmental and immunological responses. Ibrahim et al. (2020) found that the final body weight, total weight gain, daily weight gain, and specific growth rate in Nile tilapia showed an exponential rise in the three experimental groups that received vitamin C supplementation when compared with the control group that did not receive vitamin C supplementation. However, the differences in feed intake, FCR, and PER across the experimental groups were not statistically significant.

Similarly, Xu et al. (2022) found that maintaining an appropriate quantity of vitamin C in the diet significantly enhanced the growth performance of Coho salmon post-smolts. But the amounts of dietary vitamin C didn't have any major effect on the ability to survive Coho salmon post-smolts. In addition, the specific growth rate of fish enhanced but the FCR dropped when they were fed with varying concentrations of vitamin C supplemented diets. The variables HIS, VSI, and CF did not have any *substantial impact when exposed to varying doses of vitamin C*. Padua et al. (2015) demonstrated that feeding *O. niloticus* with Aquate FishTM® supplemented diets had a greater survival rate; however, there was no difference in weight gain or specific growth rate. In contrast to the current findings, previous research conducted by Simic and Karel (1980) and Gao et al. (2012) found that the consumption of dietary vitamin C led to a reduction in feed intake and slower growth in fish. This was attributed to the alteration of the diet flavour and odour resulting from the deterioration of dietary lipids.

The vitamin C requirements of fish are influenced by several factors such as age, size, species, and conditions of rearing (Dawood and Koshio, 2016). Research on the vitamin C supplemented feed specifications for several fish species indicates that fish require 20~50 mg/kg of feed to meet their demands (NRC, 2011). In the current study, the addition of vitamin C to the diet of *Catla catla* resulted in a considerable enhancement in their growth performance compared to the control group. This may be caused by the vitamin C induced overexpression of growth hormone levels, improved intestinal health, and improved fish gut absorptive surface (Abdel Rahman et al., 2018). Faramarzi (2012) stated that the greater rate of development and weight gain seen in Nile tilapia when given vitamin C supplements can be attributed to the acceleration of protein synthesis.

Vitamin E refers to a group of eight naturally occurring lipophilic substances. The most biologically active form of vitamin E is α -tocopherol, which has an important role in normal metabolic functioning and biological processes (Combs and McClung, 2017). Fish are unable to produce all the biologically functional kinds of vitamin E on their own and therefore need external sources in their diet to obtain it (Peng and Gatlin, 2009). Inadequate diets that lack vitamin E can result in stunted growth, poor production of RBC, muscular weakness, darker skin, exudative diathesis, skin depigmentation, liver fat deterioration, and mortality (NRC, 2011).

Multiple research studies including Lu et al. (2016) and Bae et al. (2013) have documented that the application of dietary vitamin E supplementation improves the growth performance of fish. The present study demonstrates that the addition of vitamin E to the diet for a period of 30 days leads to a substantial enhancement in body growth and biomass. The results of this study agree with the findings of Taveekijakarn et al. (1996) who observed that a certain dosage of vitamin E stimulated the growth of aquatic animals. Similarly, He et al. (2017) found that catfish fed with a vitamin E supplemented diet significantly increased growth parameters such as mean weight gain, daily mean growth, and PER compared to those fed with the control diet. Furthermore, the greatest results were observed in fish receiving a diet supplemented with 100 mg/kg of vitamin E.

Saheli et al. (2021) reported that raising the dietary vitamin E concentration had a significant positive effect on the weight gain rate, specific growth rate, and protein efficacy ratio in Caspian trout. The greatest values were observed in Caspian trout fed with a diet supplemented with 78.8 mg/kg of vitamin E. In contrast, the FCR showed a linear and exponential reduction as the vitamin E concentration increased. The lowest FCR value was observed in fish that were fed a diet supplemented with 78.8 mg/kg of vitamin E. Rohani et al. (2023) found that adding vitamin E to the fish diet significantly increased their growth indices including weight gain and specific growth rate, when compared to fish fed with a control diet. In the same manner, feed utilisation markers such as FCR and PER were considerably increased without any noticeable differences in the control group.