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Utilization tow extracts of pomegranate (*Punica granatum*) peel on growth performance and serum biochemical parameters of the common carp (*Cyprinus carpio*) fingerlings

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ABSTRACT

The purpose of this research was to investigate how common carp (*Cyprinus carpio*) fingerlings' growth performance, survival rate, chemical composition, and serum biochemical were influenced by pomegranate (*Punica granatum*) peel powder and its extracts (aqueous and alcoholic). A commercial meal with ~35% crude protein was supplemented with 0.5 and 1% of raw pomegranate peel (RPP), aqueous (PPW), and alcohol (PPA), respectively (three replicates for each treatment). Fish were stocked in aquariums (60 x 40 x 50 cm) at a density of 15 fingerlings per group, and they were fed twice daily for 70 days. The results for specific growth rate (SGR) showed that, excluding RPP0.5 and PPW0.5, as well as for feed conversion (FCR) and protein efficiency (PER), all groups ($P<0.05$) outperformed the control group (C). Near-infrared spectroscopy (NIR) measurements revealed that protein improved in the RPP1, PPA0.5, and PPW1 groups ($P<0.05$), whereas fat was improved in the RPP0.5 and PPA1 groups ($P<0.05$). Ash did not change significantly ($P>0.05$). PPA showed a significant difference ($P<0.05$) for AST, however, RPP0.5 and PPW1 did not demonstrate a significant difference ($P>0.05$) for ALT or ALP compared to the control (C). Regarding kidney efficiency, it was found that RPP, PPA, and PPW were preferable to urea, uric acid, and creatinine. Summary of findings: pomegranate peel enhanced growth as well as chemical composition and biochemical serum parameters when added at a rate between 0.5 and 1%.

INTRODUCTION

Addressing the issues that prevent aquaculture's sustainability is critical given the ongoing rise in demand for it as a low-cost source of food chain security, and the safety of fish as food is a crucial aspect of safeguarding consumers **(Mchazime & Kapute, 2018)**. In addition to some vitamins (A, D, B6, B12, etc.) and minerals like iron, zinc, iodine, selenium, potassium, sodium, etc., fish is a good source of proteins and fats that contain fatty acids, the most well-known of which are omega-3, particularly icosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) **(Chowdhury *et al.*, 2017)**. In order to achieve maximum production per unit area, fish farmers must raise stock density. However, this practice stresses fish, increases the risk of infectious disease transmission, degrades fish health, and impairs their immune systems, especially in intensive farming systems **(Zaki *et al.*, 2020)**.

There are common mistakes in aquaculture which include an imbalanced diet, decreased growth, inadequate feed conversion, and stress. Fish diets frequently contain antibiotics. These substances do, however, have negative side effects. The World Health Organization (WHO) has so encouraged researchers to look for low-cost, safe, and efficient