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Short Communication

Impact of Azomite Supplemented Diets on the Growth, Body Composition and Endogenous Enzymes in Genetically Male Tilapia

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ABSTRACT

Present study was planned to evaluate the impact of different graded levels of azomite on the growth, feed utilization, body composition and Lipase enzyme activity in genetically male tilapia (GMT) fingerlings. Eight tanks were stocked with 10 fishes in each with average weight of 12.30g size. Four diets were formulated on the basis of 0.0% (control), 0.25%, 0.50%, and 0.75% of azomite. The fishes were fed twice daily, seven days a week for 49 days. Results indicated that weight gain and specific growth rate (SGR) of control fish was significantly lower than diets fed with different doses of azomite. Feed conversion ratio (FCR) was recorded as more efficient in 0.75% treatment as compared to rest of azomite levels. Significant differences (P≤0.05%) were found in fiber, protein, fat and ash contents among all treatments of azomite and the control. The lipase enzymes values were noted as highly significant (p<0.05) among different azomite levels used. There was a tendency in descending fashion noted in the values of lipase *i.e.* among 0.75%, 0.50% and 0.25% whereas it was the lowest recorded in control treatment. The study concluded that using azomite at 0.75% can act as a growth enhancer in GMT fingerlings.

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Authors' Contribution
NK designed the experiment. ARA executed the experimental work. ARA and JK analyzed the data and wrote the article.

Key words
Azomite, GMT, body composition, growth performance, specific growth rate, feed conversion rate, lipase.

Fish is a rich source of animal protein, contains higher unsaturated fatty acid contents, low levels of cholesterol (Arts *et al.*, 2001; Fawole *et al.*, 2007) and are preferred over red meats (Mozaffarian *et al.*, 2003; Foran *et al.*, 2005). The tilapia has been considered as one of the most important species of fish in tropical and sub-tropical aquaculture (FAO, 2007). It is currently ranked second only to carps in global production and is likely to be the most important cultured fish in the 21st century (Ridha, 2006). Tilapias are typically omnivore-fishes about which various reviews on research advances in natural food, feeding habits, food digestion, needs to protein, amino acid, fat, carbohydrate, mineral, vitamin, feeding and fertilization in culture of tilapia are presented. Feed stuffs have pronounced effect on fish growth, its nutritional values and adjunct qualities (Shioya *et al.*, 2011; Yang *et al.*, 2011; Khan *et al.*, 2014). Additionally, it determines lipid profile, mineral content of produced fish and the ultimately market response (Rasmussen, 2001; Izquierdo *et al.*, 2003).

Azomite is a natural kind of mineral that can be used in agriculture and a hydrated calcium, sodium alumino silicate product. As undersea volcanic sediment, azomite was mixed with a large amount of plant and animal residues and minerals. It is especially rich in rare earth elements. Previously few studies have been conducted on the use of azomite in aquaculture especially tilapia. One of the researcher reported better growth, enzymes activities and digestibility by adding 2.5, 5.0 g kg^{1} azomite in the diet of tilapia (*Oreochromis niloticus* and *O. aureus*) (Aijun *et al.*, 2009). The efficiency of feed utilization, digestive enzymes activities and serum non-specific immune function of grass carp (*Ctenopharyngodon idellus*) were also improved by the addition of 2.0 g kg^{1} azomite (Man-Zi *et al.*, 2011). Emerson and Hooge (2008) summarized 13 experiments concerning azomite in chicken production and found that adding 3–5g kg^{-1} azomite to the diet improved breast meat yield from 17.9% to 18.7% (P<0.001). As for plant cultivation, spreading azomite in soil improved the growth and quality of grapes (Yan *et al.*, 2006), promoted the accumulation of phenolic acid compounds and flavonols during grape growing (Chen *et al.*, 2007). Based on results from other animals, azomite was expected to have the ability to promote growth and enzymes activities in fish culture. So in this study, genetically male tilapia (GMT) was chosen as experimental animal to investigate the impact of azomite supplemented diets on the growth, body composition and endogenous enzymes. Further it could be used in environment-friendly feeds to enhance GMT culture.

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Materials and methods

Site, design and management: The study was conducted at Department of Fisheries and Aquaculture, University of Veterinary and Animal Sciences, Ravi Campus, Pattoki. The experiment was conducted in eight cemented rectangular tanks having dimension of (10 x 3 x 2.5'). Each treatment has two replicates and the design of the experiment was completely randomized design (CRD). The fish was procured from fish production ponds at UVAS Ravi Campus, Pattoki. Feed ingredients were collected from Chowburgi, Lahore. Fish feed ingredient area: Fish meal, 11%; soybean meal, 13%; rice polish, 16%; cotton seed meal, 10%; corn glutton, 18%; guar meal, 30%; vitamins and minerals, 2%; azomite, 0%, 0.25%, 0.50%, 0.75%.

There were four treatment groups; 0.0% (control), 0.25%, 0.50%, and 0.75% of azomite addition in treatments (T) T_1, T_2, T_3 and T_4, respectively. Eight tanks were stocked with 10 fishes in each with average weight 12.30g and each treatments group was replicated twice. Fish was regularly fed at the rate of 4% of its body weight twice a day. At the time of stocking, the morphometric characteristics of fish *viz.*, wet body weight and total length were measured and recorded. The fish were sampled on weekly basis using hand net for growth parameters (weight and length) and after measurement released back into their respective tank. At the end of feeding trial, proximate analysis, feed conversion ratio (FCR) and specific growth rate (SGR) were also calculated for each of the treatment.

FCR= feed given / weight gain

SGR= $(\ln W_f - \ln W_i) \times 100$ / Total No. of Days

Lipase enzymes activities: At the termination of research trial, three fish samples from each of the treatment including control were collected at random. Intestine were homogenized in chilled Tris-HCl separately and centrifuged at 6000×g at 4°C for 15 min and the supernatant was collected and stored at -4°C for further analysis (Ismat *et al*., 2013). One ml of sample (enzyme solution) was stirred in the presence of 3.5 ml phosphate buffer (pH 7) and 0.5 ml olive oil for 30 min at 37°C. Enzyme activity was stopped by adding 1 ml of acetic acid and added phenolphthalein indicator 2-3 drops in the mixture. Then mixture was titrated with NaOH of 0.5 or 0.1N till the light pink color obtained.

Physico-chemical parameters: Physico-chemical parameters *viz.*, dissolved oxygen, pH, electrical conductivity and water temperature, total dissolved solids and salinity were monitored and recorded on daily basis by using DO meter (YSI 55 Incorporated, Yellow Springs, Ohio, 4387, USA), pH meter (LT-Lutron pH-207 Taiwan) and electrical conductivity meter (Condi 330i WTW 82362 Weilheim Germany), respectively were measured in the morning and evening on daily basis.

Proximate analysis: The proximate analysis of fish and experimental diets was completed through Near Infra-Red Technology (Martinez *et al*., 2003; Iqbal *et al*., 2014, 2015).

Statistical analysis: Data was subjected to One-way ANOVA Technique under completely randomized design by using SAS 9.1 version statistical software. To determine significant differences ($P<0.05$) among the treatments means, Duncan's multiple range test was employed.

Results and discussion

In the present study, fish growth was enhanced significantly ($P<0.05$) with azomite supplemented feed as compared to the control diet. The highest final weight (33.49±0.43g) and weight gain percentage (166.07±0.09g), SGR (0.78±0.10) and lower FCR (2.22±0.11) values were observed in a diet containing 0.75% azomite diet. Increase in growth is related with higher feed intake and apparent protein utilization that showed similar change with final weight and weight gain% and their relationships with dietary azomite levels (Table I). Results of Aijun *et al*. (2009) are in line with our study who observed significant increase in weight gain rate and FCR was decreased significantly in tilapia by adding 0.25%-0.75% azomite compared with control. Further they also stated that adding 2.5, 5.0 g kg^{-1} azomite in the diet improved the growth and nutrient digestibility of tilapia (*Oreochromis niloticus* and *O. aureus*) (Aijun *et al*., 2009). According to the Man-zi *et al*. (2011) feed utilization improved by the addition of 2.0 g kg^{-1} azomite in grass carp (*Ctenopharyngodon idellus*). Emerson and Hooge (2008) summarized 13 experiments concerning Azomite in chicken production and found that adding 3-5g kg^{-1} azomite to the diet improved breast meat yield from 17.9% to 18.7% ($P<0.001$). Further, Tan *et al*. (2014) also used dietary levels of 2.0 and 4.0 g kg^{-1} azomite improved the growth performance and disease resistance of white shrimp.

The lipase enzymes study during current study revealed highly significant ($p<0.05$) differences among different azomite level diets (Table I). The highest value of the lipase enzyme was estimated in the pre-treatment (T0). Moreover, the values of lipase were decreases among the 0.75% (T3), 0.50% (T2), 0.25% (T1). The Value of control 0% (T4) was quite impressively higher as compared to azomite level diets (Table I). Aijun *et al*. (2009) reported that adding 2.5 and 5.0 g kg^{-1}Azomite in the diet improved the growth and digestive enzymes

Table I.- Effect of different concentration of azomite on weight, length, FCR, SGR and %age weight gain proximate analysis (DM) and lipase enzymes of genetically male tilapia.

	T0 (0%)	T1 (0.25%)	T2 (0.50%)	T3 (0.75%)	T_4 (Pre-test)
Initial weight (g)	12.30±0.56aa	12.15±0.77aa	12.05±0.91a	12.30±0.56aa	
Final weight (g)	20.75±0.35c	21.48±0.09cc	26.78±0.09b	33.49±0.43a	
Initial length (cm)	8.75±0.14b	9.10±0.28abb	9.38±0.09aa	8.75±0.20bb	
Final length (cm)	9.65±0.04bb	9.70±0.12bb	10.13±0.05a	9.53±0.02b	
FCR	4.33±0.02a	4.07±0.09b	3.01±0.02c	2.22±0.11d	
SGR	0.41±0.07bb	0.63±0.03a	0.78±0.10aa	0.78±0.10aa	
% weight gain	69.10±0.28c	111.36±0.06b	166.07±0.09a	166.07±0.09a	
Crude protein	54.92±0.08d	55.20±0.11c	56.08±0.09b	58.50±0.12a	47.50±2.12b
Crude fats	14.38±0.24c	16.06±0.07b	19.38±0.28a	13.96±0.09c	10.75±0.36b
Crude fiber	1.93±0.07d	7.89±0.07a	6.12±0.02b	3.23±0.15c	4.17±0.26a
Crude ash	11.95±0.05a	11.28±0.14b	8.11±0.03d	9.78±0.09c	9.64±0.04a
Phosphorus	0.93±0.06b	0.61±0.04c	0.82±0.07bb	1.04±0.04a	1.18±0.07c
Lipase	16.81±0.06a	15.29±0.34b	14.19±0.36c	13.15±0.28d	15.31±0.55bb

activities especially pepsin activity of tilapia (*Oreochromis niloticus* and *O. aureus*). Similarly, Man-Zi *et al*. (2011) also observed better feed utilization and digestive enzymes activities of grass carp (*Ctenopharyngodon idellus*) by the addition of 2.0 g kg^{-1} azomite. Further, Tan *et al.* (2014) also used dietary levels of 2.0 and 4.0 g kg^{-1} Azomite and reported improvement in the digestive enzyme activities of white shrimp.

The significant ($p<0.05$) difference were observed among the fish body composition fed with the different experimental diets Azomite as natural trace mineral (Table I). Similarly, Iqbal *et al.* (2014) observed significant ($p<0.05$) effect of feed on mineral composition of fish. Contrary to present study Aijun *et al.* (2009) observed non-significant differences in the content of crude protein, crude fat, crude ash and moisture of muscle among the 4 groups ($P>0.05$) by the addition of azomite in the diet of tilapia. Similarly, Khan *et al.* (2012) observed that similar feeding regimes do not affect the minerals content in major carps in different rearing system.

From the present study it is concluded that with the addition of azomite in feed genetically male tilapia (GMT) showed better growth performance and also significant effect on fish body composition. Further study is required to know optimum inclusion level of Azomite in feed for this fish species and its impact on other enzymes protease and amylase.

Statement of conflict of interest

Authors have declared no conflict of interest.

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