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INCORPORATION OF *ENTEROMORPHA PROCERA* AHLNER AS NUTRITION SUPPLEMENT IN CHICK'S FEED

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ABSTRACT

Fresh water alga, *Enteromorpha procera* was used as nutrition supplement for broiler chicks. Four concentrations of algal material at 5%, 10%, 15% and 20% were mixed with commercial feed of chicks (starter and finisher feed). Feeding experiments were performed for ten weeks. Biochemical parameters (ash, carbohydrate, fat, protein and water content) of liver of chicks fed on different algal compositions as well as control feed were also examined. It was observed that the birds which were fed on higher concentration i.e. (20%) of algal feed showed best results in terms of quality and quantity of meat. The mortality rate was only 10%.

Key words: Algae, Broiler chicks, *Enteromorpha procera*, Feeding trials, Nutrition supplement.

INTRODUCTION

Algae have played an important role as a feed supplement into poultry diet due to their high carbohydrate, protein and mineral content (Chekol *et al*., 1974; Chapman and Chapman 1980; Ali *et al*., 2001; 2005; Ali and Abid, 2006). Algae as feed supplement such as *Chara fragilis*, a freshwater filamentous alga, was used poultry birds and significant results were obtained (Ali *et al*., 2001). *Spirogyra ellipsospora* (Ali *et al*., 2005) and *Cladophora glomerata* (Ali & Abid, 2006) were formulated as a feed ration to poultry birds in order to achieve a low cost feed. Sewage grown *Euglena* and *Synechocystis* were used as ingredients in broiler feed. They gave better growth of the broiler (Lincoln & Hill 1980). Similarly sewage grown algae were tested in Israel with the aim of replacing soybean protein used in broiler mash (Mokady *et al*., 1982; Lipstein and Hurwitz 1980). Bratova and Ganovski (1983) utilized *Cystoseira barbata*, *Ulva lactuca* and *Zostera nona* as supplement for chicken and found better growth as compared to commercial feed. Abril and Berclay 1998 determined that algae based feed enriched the poultry meat due to the presence of docosahexanoic acid.

Besides, poultry, some algae have also formed a valuable supplement to the ration of sheep, cow and other domestic animal and also used as a source of food for human consumption (Chapman & Chapman 1980). *Eenteromorpha procera* is selected for this study because it grows easily in the climate of Sindh, and this has been supplemented to broiler chick's feed, as broiler chicks require least time period for their normal and complete growth. Secondly, broiler production is rapidly increasing year by year.

MATERIALS AND METHODS

Enteromorpha procera was collected from Lang Lahorni, Bund Murad Khan of Hub River, Haleji lake, Kalri lake viz. Chull (inlet), Suneri, Ali-Bar, Boat-Club, Chilya (outlet), Jampir, River sand. The algal material was brought to the laboratory, washed thoroughly and repeatedly to remove mud, sand, small animals and other epiphytes. Then it was dried in shade over netted tables for few days. After drying it was macerated or cut into pieces of suitable size for use.

Experimental birds

Broiler chicks variety FS 99 were selected for study as they grow quickly.

Sample size

One-day-old, uniform in size and of the same colour, 50 broiler chicks approximately 54 – 60 gm each were selected. Out of them, 10 chicks were kept separately as control birds for each experimental flock. These chicks were fed entirely on normal chick feed and the remaining 40 birds were fed on different concentrations of algal material. Each concentration consisted of ten replicates.

Preparation of Experimental feed concentrations

Different concentrations were prepared by mixing alga to the normal poultry feed in four different concentrations, i.e., Supplement 1 (5% alga + 95% normal chick feed); Supplement 2 (10% alga + 90% normal

chick feed) ; Supplement 3 (15 % alga + 85% normal chick feed) and Supplement 4 (20% alga + 80% normal chick feed) and control (100% normal chick feed). The feeding material was stored in paper bags.

Feeding Experiments

Feeding was started with 50 birds. Forty birds were kept separately as test birds and ten birds were kept as control birds. All the experimental birds were fed on "starter" and "finisher" feeds. During the first-four weeks all the birds were fed with starter feed, while for the last six weeks with finisher feed. During ten weeks weight of test and control chicks was recorded from the initial day to the last day of 10^{th} week of feeding.

Biochemical composition of liver of experimental chicks was analyzed in the laboratory for their basic nutrient composition. The liver of chicken was oven dried, then ground in an electric grinder. Thereafter, the liver was obtained in a powder form. The powdered samples were used for the estimation of water, ash, fat, protein and carbohydrates by the method of (A.O.A.C., 1970).

Statistical Analysis

Data were analysed by SPSS ver. 12.0 computer software using one-way ANOVA and BONFERONI's Multiple Comparison Test by (SPSS, 2004).

RESULTS AND DISCUSSION

Feeding Experiments

The weight gain by the chickens was found to be correlated with the amount of *Enteromorpha procera* supplentation in commercial feeds (Fig. 1). Higher was the rate of algal supplementation, larger was the rate of growth of chickens. It may be concluded that supplementation of *E. procera* mostly favours 20% algal concentration, which is similar to that reported for *Spirogyra ellipsospora and Chara fragilis* (Ali *et al.,* 2005). In contrast to present findings, Lincoln and Hill concluded that concentration up to 10% gave better results. On the other hand, Ross & Dominy (1990) evaluated that there were no significant differences observed in growth of control and test chicks on algal supplementation.

Mortality

Mortality rate was only 10% when chicks fed on *E. procera* added commercial feeds. Present findings are contrary to the findings of Powell *et al*. (1961), Ali *et al*., (2001, 2005) and Ali and Abid (2006) in which they opined that there is no evidence of toxicity in their studied algae. It is also interesting that in control birds and test birds overall mortality rate was equal which is in contrast to the findings of Fangsuf and Berlow (1953) who found that the mortality rate was low when chicks were fed algal-supplented feed as compared to the control birds.

Biochemical composition of liver of chicks

Ash

Ash contents in the liver of chicks were usually highest in 10% and 15%, followed by 20% and 5% algal feed respectively and comparatively lowest in control chicks (Table 1).

Carbohydrates

Carbohydrate contents were significantly higher in the liver of test chicks fed on 20%, 15%, 10%, 5% concentrations respectively than the control chicks (Table 1).

Fats

Fat contents in the liver were higher in test chicks as compared to the control chicks and different concentration of test chicks showed insignificant difference (Table 1).

Protein

Protein contents in the liver of chicks fed on 20% and 15% *E. procera* and control chicks showed insignificant differences but higher than 10% and 5% concentrations (Table 1).

Water

Water contents were significantly higher in the liver of chicks which fed on 15% algal feed as compared to 20%, 10%, 5% and control chicks respectively (Table 1). It may be concluded that the chicks which were fed on *Enteromorpha procera* (10% and 20%) as supplement feed showed higher amount of ash, fats, water, protein and

carbohydrates in their liver as compared to control chicks. On the other hand, there was no significant difference in the protein content of liver of chicks fed on 20% and 15% *E. procera* and control chicks. In view of the absence of any negative impact of *E. procera* on health of chicks, *Enteromorpha* feed as supplement to poultry may further be evaluated at large scale.

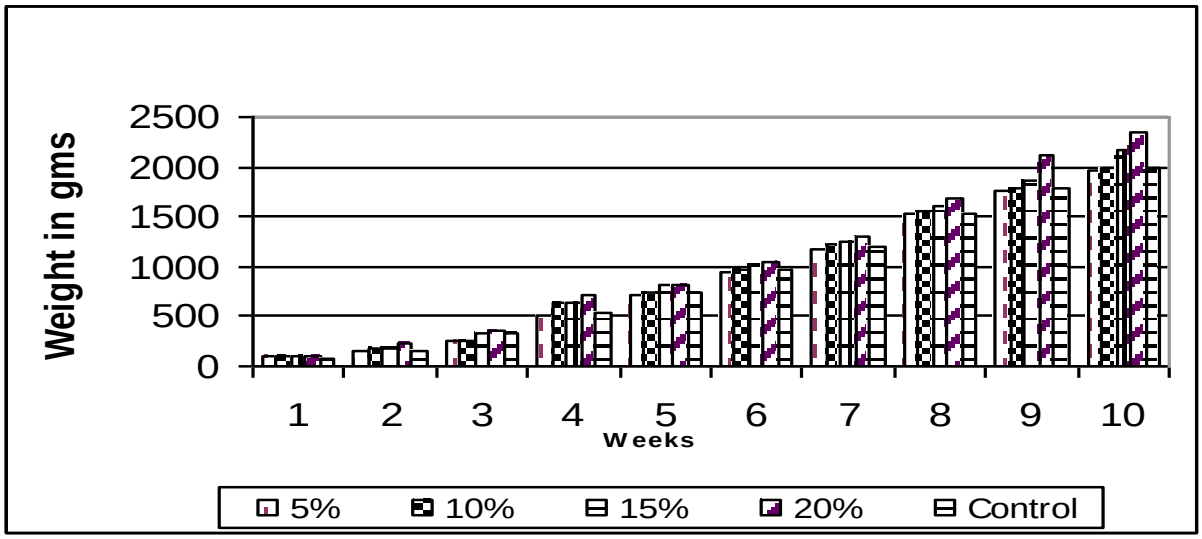

Fig.1. Effect on broiler weight by feeding *Enteromorpha procera* supplement.

Table 1. Biochemical composition of Liver of Broiler Chicks fed on *Enteromorpha procera* supplement

ONE WAY					**BONFERONI'S MULTIPLE COMPARISON TEST (BMCT)**			
Biochemical Contents	Df	Ss	Ms	F-Value	Feeds		Rank	Mean ± S.E.
Ash	5	125.60	24.61	544.28***	Enteromorpha procera	5%	4	04.50^{c} ± 0.212
					Enteromorpha procera	10%	1	05.79^{a} ± 0.111
					Enteromorpha procera	15%	2	05.72^{a} ± 0.224
					Enteromorpha procera	20%	3	04.67^{b} ± 0.001
					Broiler Control		5	04.00^{d} ± 0.382
CHO	5	2444.22	450.20	7510.12***	*Enteromorpha procera*	5%	4	23.93^{c} ± 0.395
					Enteromorpha procera	10%	3	28.95^{b} ± 0.411
					Enteromorpha procera	15%	2	29.12^{a} ± 0.666
					Enteromorpha procera	20%	1	29.01^{a} ± 0.220
					Broiler Control		5	19.36^{d} ± 0.112
Fats	5	12.90	02.89	130.24***	*Enteromorpha procera*	5%	3	02.43^{a} ± 0.020
					Enteromorpha procera	10%	2	02.69^{a} ± 0.011
					Enteromorpha procera	15%	1	03.34^{a} ± 0.022
					Enteromorpha procera	20%	4	02.23^{a} ± 0.086
					Broiler Control		5	00.81^{c} ± 0.076
Protein contents	5	88.574	17.01	284.96***	*Enteromorpha procera*	5%	5	31.36^{b} ± 0.280
					Enteromorpha procera	10%	4	33.31^{b} ± 0.340
					Enteromorpha procera	15%	2	39.70^{a} ± 0.481
					Enteromorpha procera	20%	1	40.30^{a} ± 0.294
					Broiler Control		3	38.90^{a} ± 0.367
Water contents	5	00.82	0.33	04.41***	*Enteromorpha procera*	5%	4	32.13^{c} ± 0.340
					Enteromorpha procera	10%	3	34.49^{b} ± 0.242
					Enteromorpha procera	15%	1	35.80^{a} ± 0.212
					Enteromorpha procera	20%	2	34.91^{b} ± 0.181
					Broiler Control		5	27.19^{d} ± 0.245

***=P<0.001, Means sharing the same letter do not differ significantly P>0.05

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