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CLADOPHORA GLOMERATA (L.) KUTZING AS FEED SUPPLEMENT TO BROILER CHICKS

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ABSTRACT

Algal material *Cladophora glomerata* (L.) Kutzing was used as feed supplement for broiler chicks. After necessary processing, four concentrations at 5%, 10%, 15%, and 20% w/w of algal material were mixed with commercial feed of chicks (starter and finisher feed). Feeding experiments were performed from the day old chicks to 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 studied. It was observed that the birds which were fed on medium concentrations (10%-15%) of algal feed showed best results in terms of quality and quantity of meat. *Cladophora glomerata* showed best growth at 15%. Mortality rate was zero because not a single chick died. On the other hand chemical analysis of chicks liver showed higher amount of carbohydrates at 15%. Water and ash contents were higher in liver at 10%-20% algal supplement as compared to control. Whereas, there were no significant differences in fat contents of liver in control and algal supplements.

Keywords: Algae, *Cladophora glomerata*, feeding trials, broiler chicks.

INTRODUCTION

On account of overwhelming increase in human population and war against hunger in the underdeveloped and the developing countries, food has become the main problem for mankind and directed the attention towards many alternate and unconventional sources of food groups. Plant life in aquatic environment is very rich and can play an important role. Therefore, utilization of these resources have taken place over hundred of years. Algae as a possible source of food for animal and human consumption have received increasing attention during the last three decades (Vincent, 1969; Kihlberg 1972; Waslien *et al*., 1970; Waslien and Steinkraus, 1980; Gopalkrishnan and Morley, 1991; Lorenz and Cysewski, 2000).

Algae have attracted the attention of scientists because of their vegetable nature and due to their high carbohydrates, protein, fat and mineral contents (Chekol *et al*., 1974). Algae also formed a valuable supplement to the ration of sheep, cows, poultry and other domestic animals (Chapman and Chapman, 1980). Cattle fed on algal protein have exhibited 50% higher yield than cattle which grazed on grasslands (Kihlberg, 1972). The milk fish known as "bangos" in the Philippine, a fish species without teeth, lives upon freshwater algae like *Cladophora, Lyngbya* and *Enteromorpha* species (Tilden, 1937).

Algae offer an appealing solution to the world's food shortage, because of their growing time with which they can grow at faster rate or the ability to grow at higher temperature. Unlike conventional crops the artificial production of micro-algae could be carried out in continuous culture vessels (Borowitzka and Borowitzka, 1988).

The algal species *C. glomerata* is selected for this study because the bulk of this species grows easily in the climate of Sindh, and this has been supplemented to broiler chick's feed, as broiler chicks require least time period of about 6-8 weeks for their normal and complete growth. Secondly, broiler production is rapidly increasing year after year as evidenced by the increased production of broilers from 4 million in 1971 to 24 million in 1979, and galloping rise in the price of mutton has not only increased the demand of broiler but the broiler meat has come within the easy reach of the average citizen as well, who has considered the meat more as a luxury than necessity (Gopalkrishnan and Morley, 1991)

MATERIALS AND METHODS

Filamentous fresh-water alga *Cladophora glomerata* (L.) Kutzung 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 (Fig. **1**). 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 shades over netted tables for few days. After drying it was macerated or cut into pieces of suitable size for use.

Test birds

Broiler chicks variety FS 99 were selected for study due to the following reasons:

They grow quickly from a hatch weight of 35 to 40 gm to a weight around 2kg or more within ten weeks. They can produce meat in least possible time as compared to other meat producing animals. They are the quick mean of converting feed into meat. Chickens are excellent laboratory animals which have been extensively employed in most of the nutritional research.

Sample size

A-day-old, uniform in size and of the same color, 50 broiler chicks from the same parents flock weigh approximately 54 – 60 gm each were selected. Out of them, 10 chicks were kept separately as control birds. 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 Test feed concentrations

Different concentrations were prepared by mixing alga as supplement 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 experimental chicks was analyzed in the laboratory for their basic nutrient composition.

Chemicals used were of reagent grades and utilized without further purification. All solvents were anhydrous and of highest purity, utilized as such. The liver of chickens was oven dried, then ground in an electric oven. Thereafter the liver was obtained in a powder form. Finally these powdered samples were used for the estimation of water, ash, fat, protein and carbohydrates by the method of AOAC (1970a). Data were analysed by SPSS ver. 9 computer software using ONE WAY ANOVA and BONFERONI's Multiple Comparison Test (SPSS, 1999).

RESULTS AND DISCUSSION

Feeding Experiments

The present findings in different algal supplements (5%, 10%, 15%, 20%) along with commercial feeds (broiler starter and broiler finisher) showed best growth in 15%(2380gm) followed by 10%(2338.40gm), 5%(2286.40gm) and 20%(2287gm) respectively (Fig. 2). It was also noted that from first to tenth week feeding period the weight of the chicks in control was not very good as compared to test chicks (Fig. 2). In contrast to the present findings Lincoln and Hill (1980) concluded that concentration up to 10% gave better results, while Ross and Dominy (1990) observed non-significant differences in the growth of control and test chicks.

Mortality

Mortality rate was zero because no death occurred when *C. glomerata* was fed to chicks, may be due to non-toxic effect of algal supplement. Similarly, Powell *et al*. (1961) also found non-toxic effect of algal feeding in human.

Biochemical composition of liver of chicks

Ash

Ash contents in the liver of chicks were usually highest in 10% - 20% algal feeds as compared to control chicks (Table 1).

Carbohydrates

Carbohydrate contents were relatively higher in control chicks than test chicks except that of 15% *C. glomerata* feed which showed significant amount of carbohydrate in the liver of chicks (Table 1).

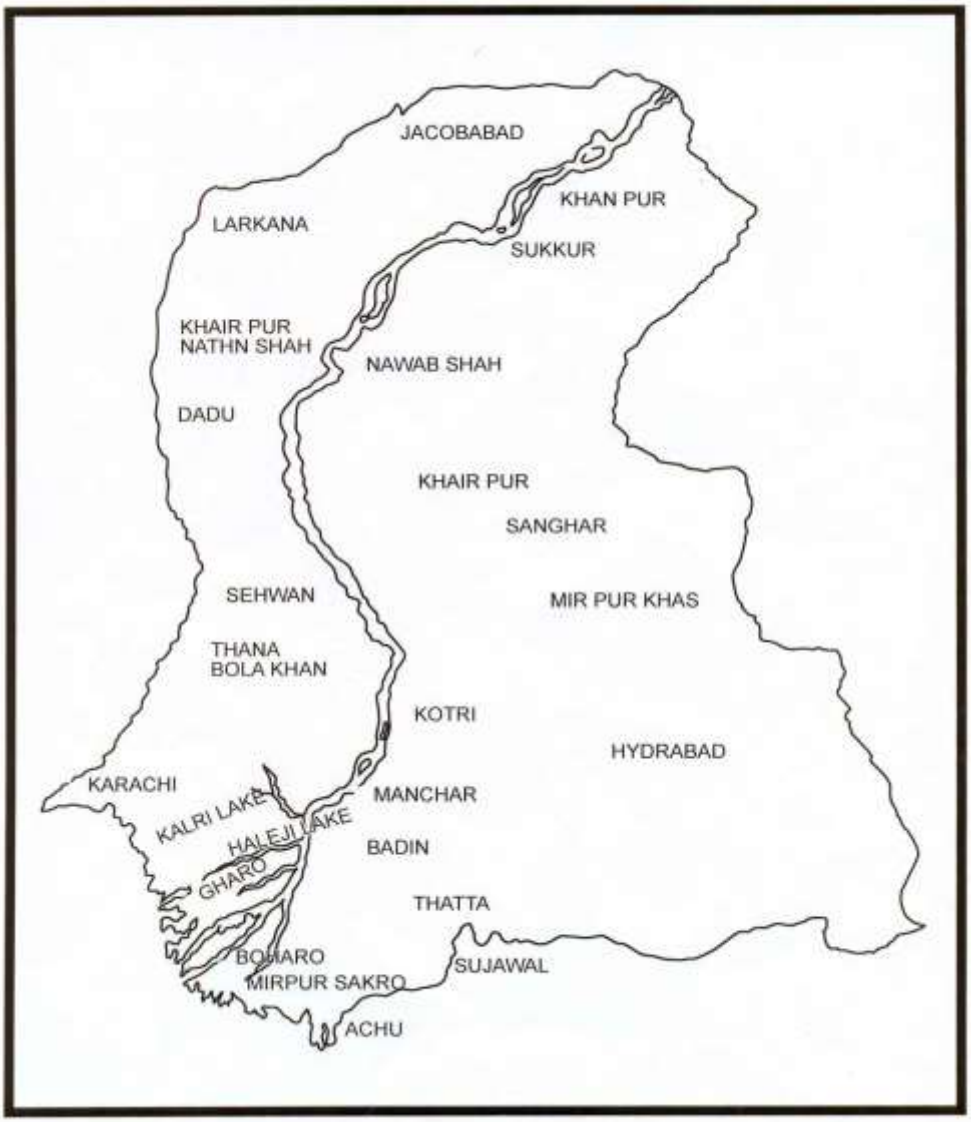

Fig.1. Map of Sindh showing collection points.

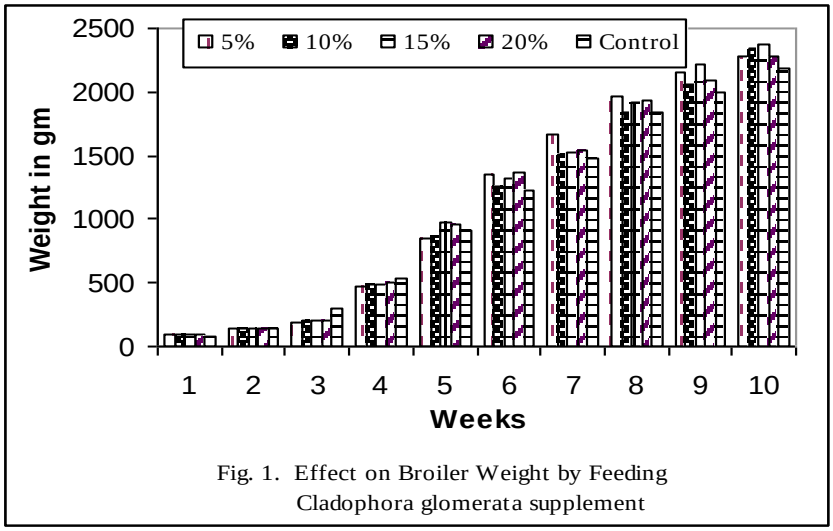

Fig. 1. Effect on Broiler Weight by Feeding Cladophora glomerata supplement

Table 1. Biochemical composition of Liver of Broiler Chicks fed on *Cladophora glomerata* supplement

ONE WAY ANOVA					BONFERONI'S MULTIPLE COMPARISON TEST (BMCT)			
Biochemical Contents	Df	Ss	Ms	F-Value	Feeds		Rank	Mean ± S.E.
Ash	5	155.73	30.72	751.23***	C*ladophora glomerata*	5%	4	05.26^{d} ± 0.121
					C. glomerata	10%	3	05.79^{c} ± 0.233
					C. glomerata	15%	2	05.89^{b} ± 0.345
					C. glomerata	20%	1	05.99^{a} ± 0.110
					Broiler Control		5	04.00^{e} ± 0.396
CHO	5	2533.15	523.11	6921.24***	*C. glomerata*	5%	2	30.65^{b} ± 0.591
					C. glomerata	10%	5	25.68^{c} ± 0.979
					C. glomerata	15%	1	31.33^{a} ± 0.581
					C. glomerata	20%	4	25.88^{c} ± 0.221
					Broiler Control		3	29.12^{ab} ± 0.042
Fats	5	05.50	01.08	080.81***	*C. glomerata*	5%	2	02.50^{b} ± 0.010
					C. glomerata	10%	4	02.39^{b} ± 0.012
					C. glomerata	15%	3	02.41^{b} ± 0.020
					C. glomerata	20%	1	03.24^{a} ± 0.001
					Broiler Control		5	00.81^{c} ± 0.040
Protein contents	5	640.44	125.30	4150.54***	*C. glomerata*	5%	4	30.29^{d} ± 0.420
					C. glomerata	10%	3	32.45^{c} ± 0.319
					C. glomerata	15%	5	30.01^{d} ± 0.491
					C. glomerata	20%	2	35.69^{b} ± 0.420
					Broiler Control		1	38.90^{a} ± 0.344
Water contents	5	28.11	5.45	344.14***	*C. glomerata*	5%	2	31.30^{b} ± 0.156
					C. glomerata	10%	1	33.69^{a} ± 0.233
					C. glomerata	15%	3	30.26^{c} ± 0.144
					C. glomerata	20%	4	29.30^{c} ± 0.230
					Broiler Control		5	27.19^{d} ± 0.012

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

Fats

Fat contents in the liver usually showed insignificant differences between test birds and control birds with the exception of birds which fed on 20% *C. glomerata* which showed higher amount as compared to other feeds (Table 1).

Protein

Protein contents in the liver of control birds were higher than the test birds (Table 1).

Water

Water contents were higher in the liver of chicks which were fed on 10% - 15% algal feeds as compared to control birds (Table 1).

It may be concluded that the birds which were fed on algal supplements (10%-20%) showed good amount of ash and water contents as compared to control birds. On the other hand, this is very surprising that only 15% and 20% *C. glomerata* showed best amount of protein, carbohydrates and fats respectively. On the basis of chemical contents, it is clearly indicated that *C. glomerata* has higher amount of carbohydrates and hence alga may be commercially utilized as a cheap and valuable source of protein which could further be utilized in feed as supplement to poultry industry.

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