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Effect of Different Formulated Herbal Diets on the Proximate Composition of *Cyprinus carpio*

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Abstract

The effect of three herbal treated fishes on protein,carbohydrate and lipid composition of *Cyprinus carpio* were studied. Three herbal formulated diets (*Withania somnifera* (Ws) *Mucuna pruriens* (Mp) and *Asparagus racemosus* (Ar)) at four different concentrations, in three size groups of *C.carpio* showed a significant increase in protein, carbohydrate and lipid. The proximate composition of three different herbal formulated diets fed fishes with three size groups was compared. The protein content was maximum in size group A of *Asparagus racemosus* diet fed fishes. The maximum carbohydrate content was observed in size group B of *Withania somnifera* diet fed fishes and maximum lipid content was reported in size group C of *Mucuna pruriens* diet fed fishes.

Keywords: *Withania somnifera*, *Mucuna pruriens* and *Asparagus racemosus*, proximate composition.

Introduction

Aquaculture has emerged as a promising animal husbandry practice to meet the demand of dietary protein. So attention has been given for efficient supplementary fish feeds. Certain alternative growth promoting supplemented feeds can be utilized to provide the vital nutrients and energy needed for the growth of aquaculture. Common carp *Cyprinus carpio* is one of the most widely cultured and domesticated fish in the world especially in Asia and Central and Eastern Europe. This species is mostly reared in ponds under extensive or semi intensive management (Turan *et al.,* 2007). Nutrition and feeding are the most important factors, which influence the ability of fish to achieve its growth. The manipulation of feed could lead

to better utilization of nutrients thereby increasing feed efficiency (Thana Lakshmi *et al.,* 2005). In this study three plants namely *Withania somnifera, Asparagus racemosus* and *Mucuna prureins* were selected. The medicinal properties of these three plants had been reported by many investigators (Rai *et al.,*2001; Scartezzini and Speroni 2000; Matsuda *et al.,*2001).

Proper knowledge on the biochemical composition of fish finds application in several areas. Any information on the biochemical composition of fishes will be of immense use in assessing their nutritive values. Fishes provide calories with high quality proteins, which contain all essential amino acids in easily digestible form. The importance of understanding body composition during growth has long been accepted in production studies. Nutritionists working at the Weende Experimental station in Germany, in the nineteenth century, recognized that the components of foods which make a significant contribution to the energy supply of the animal could be characterized as three classes of compounds; proteins, fats and carbohydrates (John and Hardy, 2002). The composition of the fish depends also on the season, habitat and the type of food consumed by the fish. Moisture, fat, protein and minerals are the main components of fish meat and the analysis of the same is referred to as 'proximate composition' (Sankar, 2008). Fish are highly heterogeneous group with over 28,000 species.

Though many references are available on the nutritive value of many fishes, (Ackman, 1967; Sabry El-Serafy *et al.,* 2005), the effects of herbal treated fishes on the body composition of freshwater fishes are very scanty. Hence the present work is carried out to study the effect of three herbal treated fishes on the biochemical composition of *Cyprinus carpio.*

Materials and Methods

Asparagus racemosus, (Ar) is a climbing plant which grows in low jungles areas throughout India. In India, it is considered the women's equivalent to Ashwagandha. In Australia the herb is more often used to treat gastrointestinal disorders and as an external wash for wounds. It is believed to bring into balance all of the body's fluids. It nourishes and cleanses the blood. *Withania somnifera* (Ws) contains active ingredients like steroidal alkaloids, and lactones known as "*Withanolides*". Withaferin A and Withalide D are the two main withanolies contribute to the most of the biological actions of *Withania* (Matsuda *et al.,* 2001). *Mucuna pruriens* (Mp) common name is Cowitch, Cowhage, velvet bean, Cow-itch, Buffalo bean.

Experimental diets were formulated to contain different concentrations (0.5%, 1.0%, 1.5% and 2.0%) of *Withania somnifera root* powder, *Mucuna pruriens* seed powder and *Asparagus racemosus root* powder. Control diet was prepared without the herb.

The common carp, *Cyprinus carpio* were purchased from Fish Farmer's Development Agency (FFDA), Manimuthar. They were acclimated to the laboratory condition with aerated water for 2 weeks to assess their disease free health status. During the acclimation period, they were fed daily with the control diet without supplementation of the plant extract at 5% of their body weight. Healthy fishes of *Cyprinus carpio* grouped into three size groups such as size group A (1.18±0.35g), B (4.5±0.5g) and C (12.5±0.75) were subjected to three herbal formulated diets separately at different concentrations of 0, 0.5%, 1.0%, 1.5% and 2%. The experiments were conducted for 21 days. After the completion of the experiments, animals were sacrificed and oven-dried for further biochemical analyses. All the experiments were carried out in triplicates and conducted at room temperature.

Protein content was estimated by Lowry's method, Carbohydrate content was estimated by Anthrone method, Carrol *et al.,* (1956) and the crude lipid content present in the fish samples were estimated by following the method of Bragdon, (1950).

Results

Protein

Generally the carcass protein content of the experimental animals fed with different concentrations of Ar, Ws and Mp invariably showed an increase than that of the control fishes. Protein content in *C.carpio* belonging to size group A increased from 54.60±4.08%, to 66.65±3.69% when the concentration of *A.racemosus* was increased from 0.5% to 1.5% and 64.90±0.44%, when the fish was supplemented with 2% of Ar diet fed fishes (Fig 1). Similar trend was exhibited in size group B also. The maximum protein content of 62.28±1.92% was obtained when the fishes were fed with 1.5% of Ar diet and it reduced to 58.52±1.60% when the fish was supplemented with 2% of Ar diet (Fig 2). In size group C, the carcass protein content increased from 52.52±1.17% to 59.50±0.47% in Ar diet fed fishes from 0.5% to 2.0% concentration respectively (Fig 3).

Similarly the carcass protein content showed a significant increase, when the fish was supplemented with *W. somnifera* at 0.5% to 2%. Protein content in *C.carpio* belonging to size group A increased from 40.04±1.38% to 59.57±4.73% at 0% to 1.5% concentration (Fig 1).

At 2% it decreased to 43.31±2.80. Similar increase in protein content in Ws diet fed fishes from 45.43± 0.87 to 57.44±3.38% in 0.5% to 1.5% and it decreased to 43.09±2.65% when the fish was supplemented with 2% of Ws diet fed fishes (Fig 2) and 46.25±0.03% to 58.21±1.00% when the fishes was supplemented with *W. somnifera* from 0.5% to 2.0% concentration in size group C (Fig 3).

The results showed that the carcass protein content in *Cyprinus carpio* increased when the fish was supplemented with *M. pruriens.* Protein content in *C.carpio* increased from 40.04±1.38 to 48.21±0.96 in size group A when the fish was supplemented with *M.pruriens* at 0.5% to 2% (Fig 1). In the B size group of fishes the protein content showed a linear increase from 48.54±0.84% to 52.09±1.54% (Fig 2) and the same trend was exhibited in size group C also. The maximum protein of 55.19±0.97 % was exhibited by 2.0% concentration of Mp diet fed fishes in size group of C (Fig 3).

Lipid

The carcass lipid content of the experimental animals fed with different concentrations of Ar, Ws and Mp invariably showed an increase than that of the control fishes in three size groups of *C. carpio*. In size group A the lipid content increased from 7.62±0.20% to 7.97±0.12% from 0.5% to 1.5% concentration in Ar diet fed fishes (Fig 4). Similar trend was exhibited by size group B also. The lipid content increased from 8.31±0.19% to 9.03±0.22% from 0.5% to 1.5% concentration (Fig 5). In size group C the lipid content increased from 10.50 ± 0.06% to 10.09 ± 0.03 % in Ar diet fed fishes from 0.5% to 2.0% concentrations (Fig 6).

When the fish was fed with Ws diet at concentrations of 0 % to 2 %, the lipid content increased from 8.36±0.14% to 9.25±0.09% respectively in size group A (Table 2, Fig 4) and in size group B of Ws diet fed fishes it increased from 8.65±0.43% to 9.25±0.24% at different concentrations of 0 % to 2 % (Fig 5). The carcass lipid content increased from 9.36±0.18% to 9.68±0.25% from 0.5% to 1.5% concentration (Fig 6) in size group C.

The lipid content in *C. carpio* also showed a similar increase from 8.13±0.11 to 9.25±0.91% in size group A, when the fish was supplemented with *M. pruriens* at four different concentrations (Fig 4). In size group B it increased from 8.46±0.22% to 9.91±0.16% in Mp diet fed fishes from 0 % to 2 % concentrations respectively (Fig 5) and a linear increase from 9.37±0.37% to 10.91±0.46% in Mp diet fed fishes at four different concentrations (Fig 6).

Carbohydrate

The carcass Carbohydrate-content also showed a similar trend as that of protein content, When the fish was fed with three herbal formulated diet fed fishes in three size groups of *C. carpio*. In size group A the carbohydrate content increased from 6.32±0.47% to 12.1±1.85% from 0.5% to 1.5% concentration in Ar diet fed fishes (Fig 7). Similarly in size group B, the CHO content increased from 13.38±0.97% to 21.91±3.97 % when fishes were fed with *A. racemosus* in 0.5% to 1.0 %concentration (Fig 8). In size group C the Ar diet fed fishes showed the similar trend as that of size group C of lipid content. The carbohydrate content increased from 12.79±0.47% to 19.96±21.06±0.51% when fishes were fed with *A. racemosus* from 0.5% to 2.0% (Fig 9).

The results showed that the maximum carbohydrate content in Ws diet fed fishes in size group A was 9.28±1.81% in 0.5% concentration (Fig 7). In Ws diet fed fishes the content increased from 13.58±0.13% to 22.09±0.84% in 0.5% to 1.5 % concentration in size group B (Fig 8). The carbohydrate increased from 13.31±0.31% to 17.15±0.10% (Fig 9) in Ws diet fed fishes from 0.5% to 1.5% concentration in size group C.

The carcass carbohydrate content in *C. carpio* belonging to size group A increased from 13.30±0.86% to 20.90±0.31% when it was supplemented with *M. pruriens* from 0.5% to 2.0% concentration respectively (Fig 7). In Mp diet fed fishes the same trend followed as that of size group A. The carbohydrate content increased from 14.20±0.67% to 19.96±1.66 % in 0.5% to 2.0% concentration respectively (Fig 8) and in fed fishes C size grouped fishes the carcass carbohydrate content increased from 13.47±0.94% to 20.86±1.46% in 0.5% to 2.0% concentration respectively (Fig 9).

Figure 1: Effect of three herbal formulated diets on the protein composition in size group A of *Cyprinus carpio*

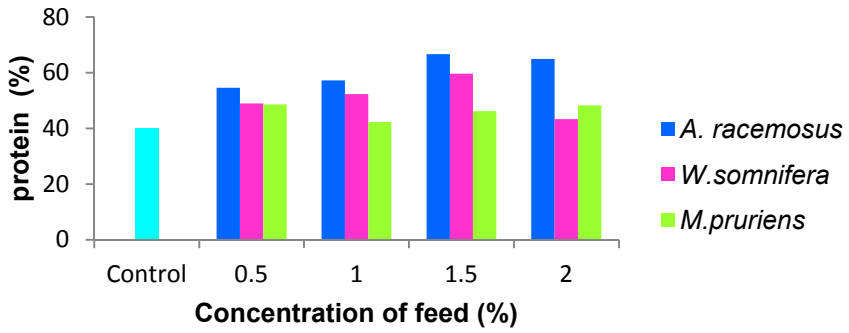


Figure 2: Effect of three herbal formulated diets on the Protein composition in size group B of *Cyprinus carpio*

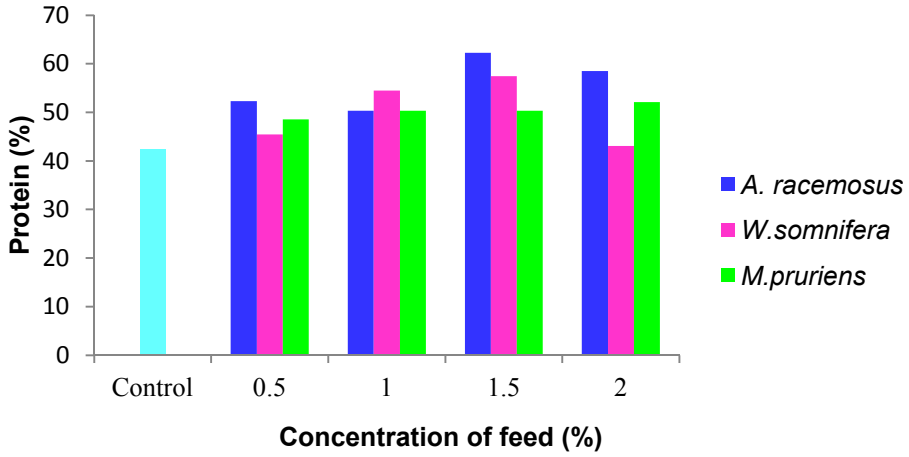


Figure 3: Effect of three herbal formulated diets on the Protein composition in size group C of *Cyprinus carpio*

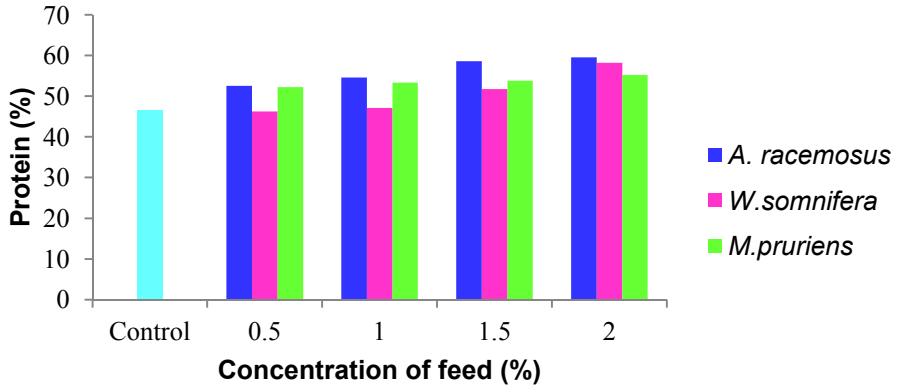


Figure 4: Effect of three herbal formulated diets on the Lipid composition in size group A of *Cyprinus carpio*

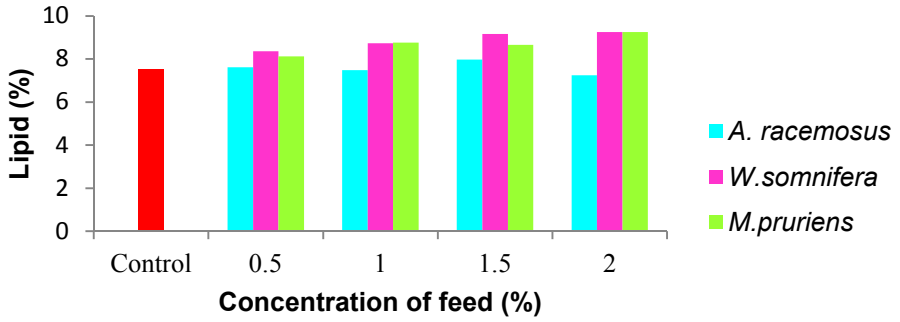


Figure 5: Effect of three herbal formulated diets on the Lipid composition in size group B of *Cyprinus carpio*

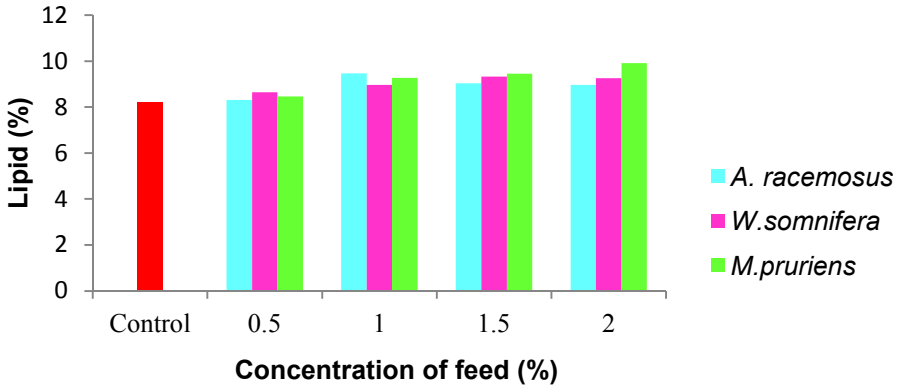


Figure 6: Effect of three herbal formulated diets on the Lipid composition in size group C of *Cyprinus carpio*

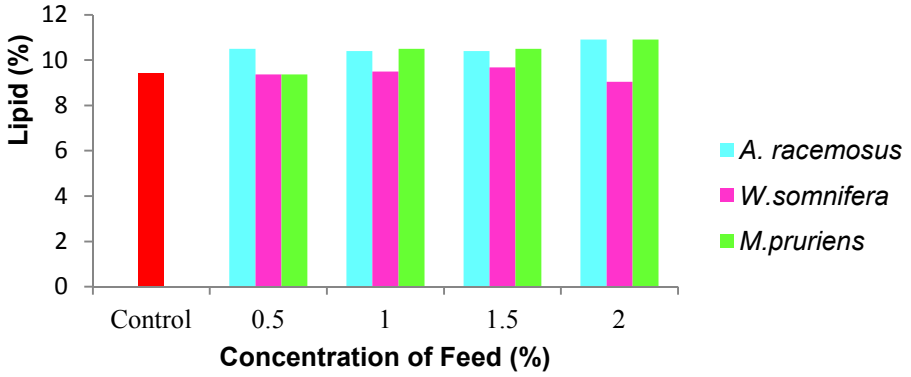


Figure 7: Effect of three herbal formulated diets on the Carbohydrate composition in size group A of *Cyprinus carpio*

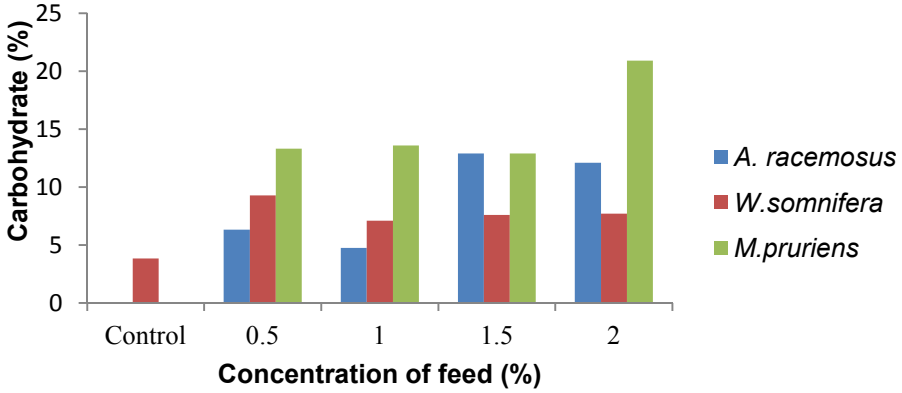


Figure 8: Effect of three herbal formulated diets on the Carbohydrate composition in size group B of *Cyprinus carpio*

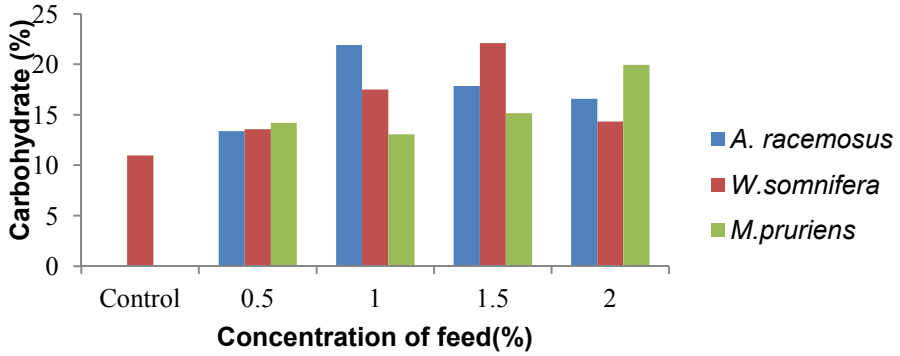
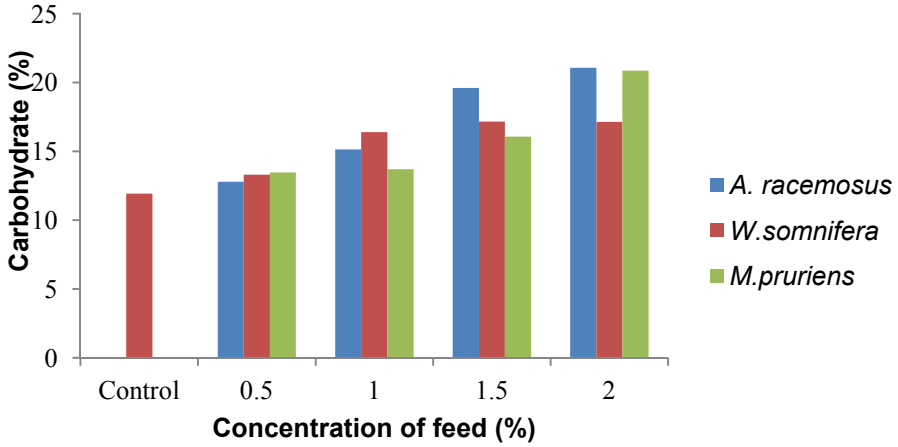


Figure 9: Effect of three herbal formulated diets on the Carbohydrate composition in size group C of *Cyprinus carpio*



Discussion

In the present study the maximum protein content (64.90±0.44%) was recorded in size group A of Ar diet fed fishes in 1.5% concentration. Similarly the maximum carbohydrate content 22.09±0.84% was observed in size group B of Ws diet fed fishes in 1.5% concentration. Carcass, protein and lipid contents of 1.0g, *L. rohita* fed with ICHN diets were from 48.00±1.98% to 51.37±1.78 from 11.41± 0.653% to14.87±0.726% (Venkadesh, 2004). Sudarmathi, 2005 reported that the maximum protein (46.20±4.34) was reported in 35% of protein diet and high lipid (8.25±1.26) and carbohydrate (11.86±1.02) content was also reported in 35% of protein diet when *C.carpio* was fed with three different concentrations of protein diet.

Pandian and Raghuraman (1972) reported that the feeding rate of several herbivores and carnivores are known to decrease with increasing protein content in feed. Munson *et al.* (1954) suggested that utilization of dietary protein lipids and Carbohydrate by fish depends on the size. These protein levels are similarly reported in Carps (Sen *et al.,* 1978). The inclusion of Green Tea, *Camellia sinensis* in fish diet up to 0.5 g/kg diet enhanced the protein contents in Nile Tilapia, *Oreochromis niloticus* (Mohsen Abdel-Tawwab, *et al.,* 2010). Mohammad and Abdel-Tawwab (2011) have demonstrated that total lipid increased significantly and total ash contents decreased significantly with increasing Caraway seed meal (*Carum carvi*)levels. In the present study the maximum lipid content (10.91±0.46%) was reported in size group C of Mp diet fed fishes.

Conclusion

The present studies revealed that, the body composition of fishes reared separately in three herbal formulated diets at four different concentrations, showed a significant increase in protein, carbohydrate and lipid. The protein content was maximum in 1.5% concentration of Ar diet fed fishes. The maximum carbohydrate content was observed in size group B of Ws diet fed fishes and maximum lipid content was reported in size group C of Mp diet fed fishes.

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