Assiut Vet. Med. J. Vol. 40 No. 79, October 1998

Dept. of Animal Production
Fac. of Agric. Assiut University

IMPACT OF POULTRY DROPPINGS SUPPLEMENTED WITH ASCORBIC ACID AND LIVE YEAST ON NILE TILAPIA (OREOCHROMIS NILOTICUS) PERFORMANCE

(With 5 Tables and 6 Figures)

By

S. Y. HUSSEIN

(Received at 30/9/1998)

تأثير زرق الطيور المضاف إليه حمض الاسكوربيك وخميرة البيره الحيه على إنتاجية البلطي النيلي

سمير يوسف حسين

أجريت هذه الدراسة على عدد ٢١٠ سمكة من اسماك البلطي النيلي لتقييم الأداء الإنتاجي لهذه السمكة والتي غذيت على علائق تحتوى على ٤ مستويات من زرق الطيور (١٠، ٢٠، ٣٠، ٤٠%) مضافا إليها ٣جم حمض اسكوربيك + ١٠% خميرة البيرة الحية لمدة ١٢ أسبوع.واستهدفت الدراسة تحديد تأثير إضافة هذه النسب من الزرق على النمو والتركيب الكيماوي لأنسجة الجسم وبعض مركبات الدم وكذلك هرمونات الغدة الدرقية فى مجاميع التجربة السبع مع توضيح الفروق بين المجموعات المعاملة والمجموعة المقارنة.وقد تم تقدير الزيادة فى وزن وطول الجسم وتم أيضا تقدير معامل الحالة (K value) وفى نهاية الدراسة تم تقدير تركيز الهيموجلوبين والهيماتوكريت وكذلك تركيزات كل من الجلوكوز ، البروتين الكلى ، الألبيومين ، الجلوبيولين ، نسبة الألبيومين الى الجلوبيولين ، الكوليستيرول ، اليوريا وهرمونات الغدة الدرقية (T3& T4) فى مصل الدم.وبعد ذبح الأسماك تم حساب معامل الكبد (HSI) وكذلك معامل الغدة الجنسية (GSI) . أوضحت النتائج أن إضافة حمض الأسكوربيك وخميرة البيرة الحية أدت الى تحسن معنوى ($P<0.05$) فى وزن الجسم ومعامل الكبد ($P<0.01$)وأنه لا توجد اختلافات بين المعاملات فى كلا من الزيادة فى الوزن ومعامل الكبد بين الأسماك التى غذيت على العلائق المحتوية على ١٠، ٢٠، ٣٠، ٤٠ % زرق طيور + ٣ جم حمض اسكوربيك + ١٠% خميرة بيرة حية وتلك التى غذيت على العليقة المقارنة. كذلك فان إضافة حمض الأسكوربيك وخميرة البيرة الحية لم تؤدى فقط الى تحسن معامل كلا من الكبد والغدة الجنسية بل أدت الى ايقاف التأثير المثبط الناتج عن زيادة إضافة نسبة زرق الطيور فى العليقة على هذه المكونات. وقد بينت نتائج التحليل الكيميائى لأنسجة

الأسماك أن استخدام العلائق المحتوية على كل من ١٠، ٢٠، ٣٠، ٤٠ % زرق مع ٣ جم حمض اسكوربيك + ١٠% خميرة بيرة حية ليس لها تأثير على البروتين الخام فى العضلات ولكن أدت الى انخفاض نسبة الرطوبة والدهن والرماد فى عضلات الأسماك المعاملة. ومن نتائج تحليل دم الأسماك اتضح أن إضافة حمض الأسكوربيك وخميرة البيرة الحية أدت الى زيادة تركيز الهيموجلوبين والجلوكوز والألبيومين وهرمون الغدة الدرقية (T3) بينما أدت الى نقص تركيز الكولسترول. هذا ولم يتأثر مستوى كل من الهيماتوكريت ، البروتين الكلى ، الجلوبيولين ، نسبة الألبيومين الى الجلوبيولين واليوريا. وعلى ذلك فان إضافة حمض الأسكوربيك وخميرة البيرة الحية فى الغذاء ربما تحسن من النمو وصورة الدم وهرمونات الغدة الدرقية عند إضافة نسبة عالية من زرق الطيور تصل الى ٤٠%. مما سبق يتضح أن تكاليف الغذاء لكل كيلو جرام نمو أوضحت أن استخدام زرق الطيور بنسب تصل الى ٤٠% + ٣ جم حمض اسكوربيك + ١٠ % خميرة بيرة حية يمكن أن تكون ذات قيمة اقتصادية مثلى ويمكن استخدام هذه العليقة فى تغذية اسماك البلطى النيلى تحت الظروف الشبه استوائية والسائدة فى جنوب مصر.

SUMMARY

In the present work, the effects and validity of poultry droppings (PD) addition to fish diet, supplemented with 3g ascorbic acid (AA) / kg diet and 10% live yeast (LY), on the production of *Oreochromis niloticus* were studied under different experimental conditions. Such effects were evaluated in terms of different parameters including growth performance, muscle composition, blood constituents and thyroid hormone levels. Fish diets containing four different levels of poultry droppings (10, 20, 30 and 40%) were considered and evaluated in comparison with the basal diet (the control). The dietary ascorbic acid (AA) and live yeast (LY) improved ($P<0.05$) body weight. Moreover, with the addition of 3gAA/kg diet and 10% LY the body weight gain and body length increment did not differ significantly ($P>0.05$) in fish fed the diets containing 10, 20, 30, and 40% poultry droppings in comparison with fish fed the control one. Also, AA and LY improved ($P<0.01$) HSI and slightly increased female GSI. Addition of AA and LY had no effect on crude protein in muscles whereas such addition reduced fat, moisture and ash percentages in muscles ($P<0.05$). AA and LY led to significant increase of hemoglobin, serum glucose, albumin and T_3 and decrease in serum cholesterol. While, PCV%, serum total protein, globulin, A/G ratio and urea-N levels were not affected. These findings were discussed and it is concluded that the addition of ascorbic acid (AA) and live yeast (LY) improved growth performance and

counteracted the increased percentage of poultry droppings added to fish diet. This make the diet with increased percentage of poultry droppings to be practically and may be one of the most suitable commercial diets for *Oreochromis niloticus* under subtropical environmental conditions prevailing in Upper Egypt.

Keywords: *Poultry droppings, ascorbic acid, live yeast, and Nile tilapia*

INTRODUCTION

The shortage of human dietary protein can be provided by fish protein, particularly in developing countries, where protein shortage is serious. However, this goal may be difficult due to the high cost of good quality fish meals which costs about 40-60% of the total operating costs in intensive aquaculture enterprises (FAO, 1983; Green, 1992 and Rodriguez-Serna et. al. 1996). The solution of this problem may be achieved by using untraditional rations with low cost. Several efforts were carried out to use local by-products in animal feeding to participate in facing feed shortage problems and at the same time to decrease feeding costs.

Within the last twenty years, a lot of tremendous research works have been carried out on usage of manure in fish feeding throughout the world especially in tropical and subtropical regions. The use of manure in fish farming was reviewed by Wohlfarth and Schroeder (1979) and Edwards and Hassal (1980).

The artificial fish feed is considered as a limiting factor for the productivity in extensive fish farming, but it is the backbone of intensive culture. So, reducing feed cost is a main concern of fish farmers. One of the possibilities to reduce feed cost is the utilization of non-protein energy sources to spare dietary protein (Shiau and Huang,1990 ; He Xiquine et al. 1993 and Hassanen, 1997), another way is to use cheaper, more readily available protein sources (Jia Lizhu et al., 1991; Hassanen, 1991 and 1997 and Kobeisy and Hussein, 1995).

Recently, poultry droppings are used as a nutrient source for tilapia production (Lovshin, 1980; Hopkins and Cruz, 1982; Hegazy, 1990; Green et al., 1990 and Green, 1992). Both the organic matter and the minerals of the manure contribute to the growth of the target animals (Rappaport and Sarig, 1978; Green, et al., 1989; Schroeder et al. 1990 and Subosa, 1992). Therefore, poultry by-product meal (PBM) can be

used for partial replacement of fish meal (Fowler, 1991). Generally, it is reported that the yield of tilapia increased with poultry droppings use (Burns and Stickney, 1980; Green et al.,1990; Milstein et al., 1991 and Green, 1992).

In Egypt, the artificial feed is expensive and unavailable for intensive fish farms. For this reason, some attempts were made to evaluate the inclusion of poultry droppings in fish diet. Moustafa (1988) concluded that the diet contained 25% poultry by-product is the most suitable and economical diet for feeding common carp under intensive fish farming. Hassan (1989); Fowler,(1991) and Hassanen,(1997) reported that the optimum diets should contain 10 and 20% PD and those contained 30% PD resulted in decreasing the growth performance of common carp, *Oncorhynchus tshawytscha* and *D. labrax,* respectively. In similar trend, Hegazy (1990) recorded that 20% PD was the optimum level to be included in *O. niloticus* diets since 30% PD impaired the productivity of the fish. Generally, most of the investigations concerning addition of poultry droppings (PD) to fish diets showed that the optimum percentage for inclusion was 20 - 25 % and the increase above this level led to negative effects on fish production.

In the recent years, a great concern is given to fish diets in order to be more balanced, economic and performed. Accordingly, attempts have been made to find out additive foods which could be formulated at economic costs for fish production. For this goal, it can be shown that ascorbic acid (AA) has an important role in increasing growth performance of the fish by improving its feed conversion. Also, it minimized the adverse effects of some stressors which may be consequently reduced the economical losses in fish production (Halver, 1985 and Hussein, 1995). Additionally, the live yeast (LY) is used as a microbial additive for protein source to improve growth performance of *Oreochromis niloticus* (Abd-El Halim et al., 1989 and Kobeisy and Hussein, 1995). Accordingly, the addition of ascorbic acid (AA) and live yeast (LY) may permit fish to grow rapidly and reduced the costs of the productivity. However, the usage of ascorbic acid and live yeast as food additives to poultry droppings containing diets did not receive any consideration.

Therefore, the objectives of the present study were to evaluate the effect of adding different poultry droppings levels on growth performance, muscle composition, some blood constituents and thyroid hormones (T_3 and T_4) parameters of *Oreochromis niloticus* with

supplementation of ascorbic acid and live yeast under subtropical environmental conditions prevailing in Upper Egypt.

MATERIALS and METHODS

Two hundred and ten healthy Nile tilapia (Oreochromis niloticus) were caught in summer season from River Nile in Assiut Governorate and transported immediately in appropriate tanks to the fish laboratory in the faculty of Agriculture, Assiut University. Fish were reared in equal aquaria with 180×60×70 cm with a water flow of 6L/h for two weeks in order to be adapted for the laboratory environmental conditions, then on the first day of the experiment, which lasted 12 weeks, the fish were weighed and the standard and total length were measured on an individual basis. Average body weight and body length were 42.44 ± 4.57 g and 13.24 ± 0.45 cm, respectively. The selected fish were divided randomly into 7 treatment groups of 30 fish each. The treatments were distributed as in Table1. Also, the chemical composition of the basal diet, dry poultry droppings (DPD) and live yeast are presented in Table 2.

The poultry droppings (PD), before mixing were completely dried to kill any organisms which may be present in PD to avoid any harmful effect on the fish or human being who consumed this fish. Rations were prepared by mixing the dry ingredients with the L-ascorbic acid (AA) (100g AA = 8 L.E.) at a level of 3 g / K g diet. Also, live yeast [400 g = 1.50 L.E.] mixed at a level of 10% and dried poultry droppings (DPD) with the corresponding level and prepared it as pellets (Table 1). Pelleted diets were stored in sealed black plastic bags at 10°C only for one week to avoid any deteriorations or losses (Waagbø et al., 1989 and Kobeisy and Hussein, 1995). The level of 3gL-AA/K g diet and 10% live yeast were recommended for tilapia by Anadu et al., (1990) and Kobeisy and Hussein, (1995), respectively. All treated groups were fed twice daily at a rate of 3% of the body weight. The amount of food offered was readjusted every week based on weight of the fish in each treatment. Fish in each experimental treatment were reared without any aeration or oxygen supplement. Average water temperature was 25.95 ± 1.74°C (measured three times daily). Body weight and body length were recorded weekly throughout the whole experimental period (12 weeks). Average body weight gain (g /fish),

DM, Mc Dowell, 1989). Vitamin B6 may act as a stimulator for growth hormone (GH). Tryfiates, (1986) recorded that GH concentrations in both pituitary gland and serum were low in vitamin B6 depleted rates. Indeed, vitamin B6 (Pyridoxal 5-phosphate, PLP) act as a coenzyme for dopa decarboxylase enzyme, and dopamine stimulates GH secretion. The low PLP levels limit the availability of active decarboxylase, thus causing low GH (Tryfiates, 1986). Dietary LY, may increase the level of B6 in red blood cells and consequently increase the O_2 affinity to hemoglobin (Mc Coy, 1986) i.e. high O_2 uptake. LY- induced high level of GH and O_2 uptake stimulates metabolism and growth of *O. niloticus*. These results are in agreement with those of Omar et al., (1989), Abd-El Halim et al. (1989) and Kobeisy and Hussein (1995) on the same fish (Oreochromis niloticus).

As regards, PD_{-10} and PD_{-20}, results of the present work are coincided with Moustafa, (1988); Hassan, (1989) and Hassanen,(1997) on carp and *D. labrax* and also with Hegazy,(1990) and Green, (1992) on tilapia,. However, these authors showed that the increasing of PD more than 20% (i.e.30%) resulted in decrease of the growth performance of the fish; a situation that did not recorde in the present work since the increased percent of PD gave results similar to those of the basal diet. Table 3 showed that the groups fed on PD more than 20% (30 and 40%) had no significant differences ($P>0.05$) on body weight and length. These findings may be due to the positive roles of AA and LY in improving the growth performance of *O. niloticus*.

Table 3 and Fig.2 showed that the hepatosomatic index (HSI) of the groups fed AA and LY were significantly higher ($P<0.01$) than that of control group. Moreover, there was no significant differences between the control group and those fed PD_{-10},PD_{-20} , PD_{-30} , and PD_{-40}. The increase of HSI in groups fed with AA and LY may be due to their vital effect on the size of the lymphoid organs coinciding with the highest liver weights as was recorded by Siegel, 1980 and Hussein, 1995.

The GSI of female fed AA, LY and PD_{-10} was insignificantly higher than that in control group (Table3). However, there was no significant difference between GSI of female fed PD_{-10}, PD_{-20}, PD_{-30}, PD_{-40} and control diet group. Males in all diet groups considered exhibited no significant GSI-differences. These findings can be interpreted in terms of AA and LY roles in metabolism and steroid hormonal synthesis associated with reproduction. Moreover, there are some explanations: maternal hemoglobin which is correlated with AA

and LY is used to cover the iron needed for oocytes (Mc Coy, 1986 and Waagbø et al., 1989), also, AA has a significant role on the steroid hormone synthesis which consequently influences the reproductive performance (Sandnes et al., 1983 and Levine and Morita, 1985). On the other side, the fish testicular activity was poorly represented since Perek and Snapir (1963) speculated that AA stimulated the testicular activity by an unknown mechanism. However, the specific function of AA and LY in endocrine tissues is still not yet fully understood and need further investigations.

Muscle composition:

As presented in Table 4, crude protein percentages in muscle were not affected in all experimental groups. On the contrary, Hassanen (1997) showed that the fish fed high levels of PD (30%) only had a significant ($P<0.05$) lower percentage of muscle protein. This appearent stability in muscle crude protein of groups fed high levels of PD (10, 20, 30 and 40%) may be due to the combination effects of AA and LY. Also, there were significant differences ($P<0.01$) in moisture, fat and ash percentages in muscles of all treated groups (Table 4). The muscle fat percentage decreased significantly ($P< 0.01$) in groups fed high levels of PD with AA and LY. These findings were similar to those of Abdel-Halim et al. (1989) and Kobeisy and Hussein (1995) who worked on the same species . However, Hassanen, (1997) reported that the fish fed high levels of PD (20 and 30 %) had high percentages of muscle fat and ash as compared with basal diet fed group. This contradiction exhibits the positive role of AA and LY in decreasing fat percentage in muscles. Also, the significant differences ($P<0.01$) in muscle fat percentage in the experimental fish were associated with the changes of serum cholesterol concentrations in the treated fish (Table 5). This decrease in fat percentage could be attributed to the corresponded increase of muscle protein content (Table 4), and different fat contents of these diets in comparison with the control one (Table 2; El-hamady, 1990). Similarly, the significant differences ($P<0.01$) in muscle moisture and ash contents in the treated fish may be due to corresponding changes in fat contents. These results are coincided with those of Pastoureaud (1991), Hussein and Daghash (1995) and Hassanen (1997).

Blood constituents:

a) Hematological parameters:

Table 5 and Fig.3 showed a significant increase ($P<0.05$) in hemoglobin (Hb) content of AA-fed group as compared with basal diet-fed group. No significant differences ($P>0.05$) in Hb content among PD_{10} -, PD_{20}-, PD_{30}- and PD_{40}- fed groups and the basal diet fed group. This is in disagreement with Hassanen,(1997) who showed that the increase of PD to 30% led to decrease of Hb content in *D. labrax* . Also, there was insignificant increase ($P>0.05$) in haematocrit (PCV%) concentration in fish fed with AA and LY. Also, there was no significant differences in PCV% of PD_{10}-, PD_{20}-, PD_{30} -and PD_{40}- fed groups as compared with the basal diet fish group. This improvement in Hb content attained to the effect of AA and LY where Halver (1985) and Fenster (1987) showed that AA improved absorption of iron in the gut and increased its binding capacity. Hilton (1984) stated that iron absorption was strongly promoted by AA and it had a vital role in the oxygen transport. The positive role of LY in improving Hb and PCV% may be due to the effect of yeast B-vitamins. Hughes-Jones and Wickramasinghe (1992) reported that Hb level decreases progressively as the degree of B_{12} deficiency increases. The increase of PCV,% in the present study may be due to the decrease of haemolysis as a result of a high B_{12} in yeast-treated fish. Hughes-Jones and Wickramasinghe (1992) stated that B_{12} deficiency resulted in a slight increase in the serum bilirubin level due to the intramedularly destruction of erythroblasts and partly from a mild degree of peripheral haemoloysis. He also added that injection of vitamin B_{12} (250 μg) increased hemoglobin concentration by 1g/wk within one week. Therefore, it could be easily concluded that the supplement of 3g AA/Kg and 10% LY to the diet led to optimization of hematological components and elimination of the negative effect of increasing PD level in the diet. Since, AA-LY- free PD diet may has a reductive effect on Hb and PCV,% of *Oreochromis nitoticus.*

b) Serum components

Blood serum components are presented in Table 5. The dietary AA and LY increased significantly ($P<0.01$) serum glucose concentration (Table5 and Fig.4) by about 24.90 and 13.80%, respectively ($P<0.01$). However, there was no significant differences in serum glucose content between $PD\text{-}_{10}$, $PD\text{-}_{20}$, and $PD\text{-}_{30}$ groups and control one. This improvement in serum glucose concentration may be due to AA and LY effects on absorption and metabolism in the treated

fish as recorded by Halver, 1985, Hussein, 1995 and Kobeisy and Hussein, 1995.

Serum total protein (TP) concentration was higher in AA and LY- fed groups (by about 7.50 and 6.90%) than in the control group (Table 5). On the other hand, there was no significant differences between the groups fed with PD-$_{10}$ to PD-$_{40}$. Such improvement was mainly due to the significant increase ($P<0.01$) in serum albumin concentration rather than globulin (Table 5). The increase in serum total protein concentration with AA may be attributed to the improvement of AA on loss of plasma proteins (Hargens et. al., 1974). Similar results were obtained by Waagbø et al. (1989) who reported that serum total protein and albumin of rainbow trout fed on 2g AA/Kg diet increased by 13.31 and 12.64%, respectively than control ones. In addition, the insignificant increase in serum TP concentration of LY-fed group may be due to LY-B6 (Mc Dowell, 1989) which is required for the synthesis of all L-amino acids (Tryfiates, 1986). In addition, B_6 is essential cofactor for the transaminases enzymes which are also known as amino transferases (Edwards and Hassall, 1980). Moreover, the metabolism of both methionine and cysteine, which are important in protein anabolism, are dependent on the availability of vitamin B_6 (Tryfiates, 1986). For this reason, the extremely physiological disturbance or even death in animals is thought to arise by a deficiency of vitamin B_6 (Edwards and Hassal, 1980). Also, the insignificant increase in serum TP concentration of AA and LY fed groups may be due to the increase of protein uptake by muscle and this result supports the higher growth rate in the treated groups with AA and LY than in control (Table 3 and Fig. 1).

Serum cholesterol concentrations were lower in fish receiving AA or LY (Table 5). Also, there was no significant differences in serum cholesterol levels between groups fed PD-$_{10}$, PD-$_{20}$, PD-$_{30}$ and PD-$_{40}$ as compared with group fed the control diet (Table 5). Although Hassanen (1997) showed that the serum total lipids of fish fed on 20% PD increased significantly as compared with the control ones. It is noticeable that these changes in cholesterol concentration meet by corresponding changes in fat content in the muscle (Table 4). In general, the results associated with AA role are in harmony with the findings of Fenster (1987). Lipid metabolism seemed to be affected with AA deficiency in rainbow trout, as indicated by the increase of liver lipids; it also decreased in the ovaries (Petersen et. al., 1983 and Haux, 1985). Similarly, John et al. (1979) mentioned that AA-deficient immature

rainbow trout showed increased circulating cholesterol levels. Moreover, Hung and Slinger (1980) mentioned that AA had a vital role on lipid metabolism where AA is involved with vitamin E in lowering tissue peroxidation. However, AA did not seem to have a direct stimulating effect on the oxygenase system. Hornig and Weiser, 1976 and Ginter, 1978 reported that marginal vitamin C-depletion led to a pronounced reduction in the activity of the rate-limiting step in cholesterol metabolism which consequently leads to an accumulation of cholesterol in tissues and serum. The main effect of LY on lipid metabolism is in full agreement with the findings of Kobiesy and Hussein 1995 for the same fish. In the same trend Scwarz and Mertz, 1959 showed that such effect may be due to that LY may act as a source of chromium. Recent evidences indicated that supplementation of chromium in the diet markedly decreased cholesterol (Bunting et al., 1994) with increased insulin efficiency (Subiyantno et al., 1994).

Serum urea-N levels were insignificantly lower in groups fed AA or LY and groups fed PD_{-10}, PD_{-20}, PD_{-30} and PD_{-40} as compared with group fed a control diet (Table 5). Such effect may be due to the role of AA stored in the anterior Kidney which may improve the renal function and lead to improve in the urea level in the blood as recorded by Halver, 1985.

Table 5 and Figs.5 and 6 showed a significant ($P<0.01$) increase in T_3 and less increase in T_4 levels for groups fed 3g AA/Kg diet and 10% LY compared with control one. However, the addition of AA and LY led to insignificant differences in T_3 and T_4 levels between the fish group fed basal diet and those fed PD_{-10}, PD_{-20}, PD_{-30} and PD_{-40} as shown from the same Table and Figures. On the contrary, Fowler (1991) showed that chinook salmon (Oncorhynchus tshawytscha) fed 30% PD had a significant ($P<0.05$) lower plasma T_3 and T_4. The significant increase of T_3 ($P<0.01$) and insignificant increase in T_4 levels in the treated fish groups (Table 5) are in agreement with the findings of Hussein, (1995) on the same fish. Also, Fenster, (1987) concluded that AA has a vital role in increasing the level of thyroid hormones. The role of LY on increasing T_3 and T_4 level may be through its vital effect on improvement of food digestion and consequently food utilization and its role as a stimulator of GH which in turn led to more secretion of T_3 and T_4. However, the insignificant increase of T_4 recorded may be due to the increase of T_4 uptake by blood and this result supports the higher

growth rate in the treated groups than in control ones (Table 3 and Fig. 1).

General Conclusion:

The obtained results of the present investigation indicate that the formulation which includes up to 40% poultry droppings (PD), 3g AA/ kg diet and 10% live yeast (LY) appears to provide a practical diet for *Oreochromis niloticus* and support normal growth, relative organ weights, hematological, serum characteristics and thyroid hormones (T_3 and T_4). The diet could improve the growth performance, muscle composition, some blood constituents and thyroid hormones (T_3 and T_4) of this fish comparatively low costs. However, the improvement of hemoglobin (Hb) and haematocrit (PCV%) in AA and LY - treated fish may suggest that dietary ascorbic acid and live yeast are useful in stress conditions particularly in case of oxygen deficiency or the other physiological stresses due to water pollution in intensive production and increasing of poultry droppings to high level (40%) without negative effect on the performance of *Oreochromis niloticus* under subtropical environmental conditions prevailing in Upper Egypt.

REFERENCES

Abd El-Halim, A., A. Nour; E. Omar and M. G. Abd El Latif (1989): Utilization of yeast (Sacchromyces cervisiae) in fish feeds. 2). Effect of different levels of active or inactive yeast on growth performance and feed utilization of Nile tilapia (Oreochromis niloticus L.), 2nd Alex. Conf. Fd. Sci. Tech. pp. 396-405.

Anadu, D. I.; O. C. Anozie and A. D. Anthony (1990): Growth responses of *Tilapia zilli* fed diets containing various levels of ascorbic acid and cobalt chloride, Aquaculture, 88: 329-336.

Association of Official Analytical chemists (1984): Official methods of analysis. 14 th ed. AOAC, Washington, DC.

Bunting, L. D.; J. M. Fernandez; D. L. Jr. Thompson; and L. L. Southern (1994): Influence of chromium picolinate of glucose usage and metabolic criteria in growing Holstein calves. J. Anim. Sci. 72: 1591-1599.

Burns, R.P. and R.R. Stickney (1980): Growth of *Tilapia aurea* in ponds receiving poultry wastes . Aquaculture, 20 : 117 - 121 .

De Silva, S. S. R. M. Gunasekora and A. Ataoattu (1989): The dietary protein requirement of young tilapia and an evaluation of the least cost dietary protein levels. Aquaculture, 80: 271-284.

Edwards,N.A.and K.A. Hassall (Eds.) (1980): Nitrogen metabolism and the biochemistry of amino acids In: Biochemistry and Physiology of the Cell, 2 nd edition, pp. 303-335, Mc Graw-Hall Book Company (UK) limited).

El-hamady,A.K.I. (1990): Nutritional and physiological studies on the sea bass (Dicentrarchus labrax) reared in cages. M. Sc. Thesis, Faculty of Agric. El-Azhar Univ., Egypt .

FAO (1983): Fish feeds and feeding in developing countries-UNDPL FAO, ADCP REP, 83 (13), pp 97.

Fenster, R. (1987): Vitamin C in fish nutrition. Roche seminar on vitamin nutrition in fish. Trondheim, August pp.5-13

Fowler, L.G. (1991): Poultry by-product meal as a dietary protein source in fall chinook salmon diets . Aquaculture, 99 : 309 – 321 .

Ginter, E. (1978): Marginal vitamin C deficiency, lipid metabolism and atherogenesis. Adv. Lipid. Res. 16: 167-220.

Green, B. W. (1992): Substitution of organic manure for pelleted feed in tilapia production. Aquaculture, 101: 213-222.

Green, B.W., R.P. Phelps, and H.R., Alvarenga (1989): The effect of manures and chemical fertilizers on the production of *Oreochromis niloticus* in earthen ponds . Aquaculture, 76 :37 – 42.

Green, B.W.; D.R. Teichert-Coddington and R.P. Phelps (1990): Response of tilapia yield and economics to varying rates of organic fertilization and season in two Central American countries .Aquaculture , 90 :279 – 290.

Halver, J. E. (1985): Recent advance in vitamin nutrition and metabolism in fish In: C. B., Cowe, A. M., Mackie and J. G. Bell, Nutrition and feeding in fish. Academic Press. INC London LTD: 415-429.

Hargens, A. R.; R. W. Millard and K. Johansen (1974): High capillary permeability in fishes. Comp. Biochem. Physiol. 48 A, 675-680.

Hassan, M. A. (1989): Studies on fish production use of poultry droppings and dried rumen liquer in feeds of common carp. (Cyprinus Caropio L). Ph. D. Thesis. Fac. of Agric. Alex. Univ.

Hassanen, G. D. I. (1991): The utilization of some unconventional protein by Nile catfish (Clarias lazera). J. Egypt. Ger. Soc. Zool. Vol. (6) A: 4962, June.

Hassanen, G. D. I. (1997): Nutritional value of some unconventional proteins in practical diets for sea bass (Dicentrarchus labrax) fingerlings. Egyptian J. Nutrition and Feeds 1 (Special Issue): 335-348.

Haux, C. (1985): Alerations in the plasma biochemical composition in juvenile rainbow trout (Salmo gairdneri) after administration of estradiol-17B. Dissertation, University of Goteborg, Sweden, 85 pp.

He Xiquine; Jia Lizhu; Yang Yunxia and Xu Guohuan (1993): Studies on the utilization of carbohydrate rich ingreadients and optimal protein energy ratio in Chinese bream, Megalobrama amblycephala yih Paper presnt at; Fifth Asian fish nutrition. Network workshop. Thailand.

Hegazy, M. R. (1990): Utilization of poultry droppings and dried rumen liquor in feeds of Nile tilapia (Oreochromis niloticus). Ph. D. Thesis. Fac. of Agric. Alex Univ.

Hilton, J. W. (1984): Ascorbic acid-Mineral interactions in fish. In Wegger, I., F. J. Tagwerker and J. Moustgaard (Eds). Ascorbic acid in domestic animals Proceedings. The Royal Danish Agricultural Society, Copenhagen.

Hopkins, K. and E.M. Cruz (1982): The I.C.L.A.R.M./ C.L.S.U. Integrated Animal- Fish Farming Project : Final Report. I.C.L.A.R.M. Technical Reports 5. International / Center for Living Aquatic Resources Management, Manila, Philippines, and Central Luzon State Univ. , Nueva Ecja, Philippines, 96pp. (cited by Green et. al. 1990) .

Hopkins, K.; P. Inocencio; and E.M. Cruz (1983): Water quality in integrated livestock- fish ponds. J. World Maricult. Soc., 14: 495 – 504.

Hornig, D. and H. Weiser (1976): Ascorbic acid and cholesterol: effect of graded oral intakes of ascorbic acid on cholesterol conversion to bile acids in guinea pigs. Experiential 32: 687-689.

Hughes-Jones, N. C. and S. N. Wickramasinghe (1992): Lecture Notes on Haematology. Blackwell Scientific Publications.

Hung, S. S. O. and S. J. Slinger (1980): Effect of oxidized fish oil on the ascorbic acid nutrition of rainbow trout (Salmo gairdneri). Int. J. Vit. Nutr. Res., 50: 393-400.

Hussein, S. Y. (1995): Influence of dietary ascorbic acid on growth performance, some blood constituents and thyroid hormones of *Orchromis niloticus* exposed to ambient ammonia. Assiut Journal of Agricultural Sciences, Vol. 26, No. 4: 299-323.

Hussein, S. Y. and H. A. Daghash (1995): Starvation and refeeding effects on performance and some blood metabolites of common carp (Cyprinus carpio L.). Proc. 5th Sci. Conf. Animal Nutrition, Vol. 1: 399-416 Ismailia, Egypt.

Jangaard, P. M.; R. G. Ackman and J. C., Spios (1967): Seasonal studies of the fatty acids composition of cod liver flesh, roe and milt lipids. J. Fish Res. Bd. of Canada 24(2): 613-627.

Jia Lizhu; Xiqin and Yang Yunxia (1991): Evaluation of partial replacement of fish meal soybean meal cake by alfalfa, Trifolium sp. in practical diets for Chinese blunt snout bream Megalobrama amblycephala fingerlings. In S. S. De Silva (Editor), fish nutrition Research in Asia proceedings of the Fourth Asian fish nutrition workshop Spec. Publ. No. 5, Asian fisheries society, Maniala, Philippines, pp. 119-123.

John,T.M.;J.C. George;J. W. Hilton and S. J. Slinger (1979): Influence of dietary ascorbic acid on plasma lipid levels in rainbow trout. Int. J. Vit. Nutr. Res., 49: 400-405.

Kitamura, S.; S. Ohara; T. Suwa; K. Nakagawa (1965): Studies on vitamin requirements of rainbow trout, *Salmo gairdneri*. I: On the ascorbic acid. Bull Jap. Soc. Sci Fisheries 31: 818-826.

Kobeisy, M. A. and S. Y. Hussein (1995): Influence of dietary live yeast on growth performance and some blood constituents in *Oreochromis niloticus*. Proc. 5th Sci. Conf. Animal Nutrition, Vol. 1: 417-425. Ismailia, Egypt.

Levine, M. and K. Morita (1985): Ascorbic acid in endocrine systems. Vitam. Horm., 42: 1-64. Mizoguchi, H. and J. Yasumasu, 1982. Archenterno information induced by ascorbate and α-Ketoglutarate in seaurchin embryos kept in SO_4-free artificial seawater. Dev. Bio., 93: 119-125.

Lovshin, L.L. (1980): Progress report on fisheries development in northeast Brazil, Res. Dev. Ser. No. 26, Int. Cener Aquaculture, Auburn Univ., AL, 15pp

Mc Dowell, L.R. (1989): Vitamins in animal nutrition comparative aspects to human nutrition, pp. 245, Academic Press.

McCoy, E. E. (1986): General vitamin B_6 metabolism in humans. In: Dolphin, D, Poulson, Avramovic, O. (Eds.), Vitamin B_6, Pyridoxal Phosphate, Chemical, Biochemical and Medical Aspects, part B, pp. 573-600, John Wiley & Sons, Inc., USA.

Milstein, A.; A. Alkon; Y.Avnimelech; M.Kochba; G. Hulata and G. Schroeder (1991): Effects of manuring rate on ecology and fish performance in polyculture ponds . Aquaculture, 96 : 119 – 138.

Moustafa, B. A. A. (1988): A study on some by-products in fish rations. Ms. Sc. Faculty of Agric. Suez Canal Univ.

Omar, E. A.; A. M. Nour and A. R. Abou Akkada (1989): J. Agric. Sci. Mansoura Univ. 14; 1469-1476. (Cited by Abd El Halim et. al. 1989).

Oni, S. K.; T. Y. Olyemi and J. D. Adegboye (1983): Comparative physiology of three ecologically distinct freshwater fishes, Alestes nurse Ruppelly, Synodontis schall Broch. and Schneider and *Tilapia zilli* Gervais. J. Fish Biol. 22: 105-109.

Pastoureaud, A. (1991): Influence of starvation at low temperatures on utilization of energy reserves, appetite recovery and growth character in sea bass (Dicentrarchus labrax). Aquaculture, 99, 167-178.

Perek, M. and N. Snapir (1963): Seasonal variation in semen production of different breeds of cocks and the effect of vitamin C supplementation upon the semen of white rocks. Brit. Poult. Sci. 4: 19-26.

Petersen, I. M.; O. Sand and B. Korsgaard (1983): A time course study of the effect of repetitive doses of estradiol-17B on serum glucose and lipids, liver glycogen and some carbohydrate metabolizing enzymes in liver of male flounder (Platichthys flesus L) Comp. Biochem. Physiol 74 B (3): 459-466.

Rappaport, U. and S. Sarig (1978): The results of manuring on intensive growth fish farming at the Ginosar station ponds in 1977 . Bamidgeh, 30 (2) : 27 – 36 .

Rodriguez-Serna, M.; M.A.Olvera-novoa and C. Carmona-Osalde (1996): Nutritional value of animal by-product meal in practical diets for Nile tilapia (Oreochromis niloticus L.) fry. Aquaculture Research, 27: 67 – 73.

Sandnes, K.; K. Julshamm and O. R. Breakkan (1983): Interrelationship between ascorbic acid and trace elements in ovarian development in fish: In: Tagweker, F. J. and Moustgaard, J. (Editors). Ascorbic acid in domestic animals. 213-224. Workshop skjoldenaesholm, September, 1983.

SAS, (1987): SAS/STAT Guide for personal computer (Version 6 End.). SAS INST., Cary, N. C.

Schroeder, G.L.; G. Wohlfarth; A. Alkon; A. Halevy and H.Krueger (1990): The dominance of algal-based food webs in fish ponds receiving chemical fertilizers plus organic manures . Aquaculture, 86 : 219 – 229 .

Schwarz, K. and W. Mertz (1959): Chromium III and glucose tolerance factor. Arch. Biochem. Biophys. 85: 292.

Shiau, S. Y. and S. L. Huang (1990): Influence of varying energy levels with two protein concentrations in diets for hybrid tilapia (Orechromis niloticus X O. aurea) reared in sea water. Aquaculture 91: 143-152.

Siegel, H. S. (1980): Physiological stress in birds. Bio. Sci. 30: 529-534.

Steel, R. G. and J. H. Torrie (1980). Principle and Procedures of Statistics, A Biometrical Approach (2 nd Ed.). Mc Graw-Hill Book Co., New York.

Stoskopf, M. K. (1993): Fish Medicine, (1st ed.). pp. 113-131, W. B. Saunders Company Harcoutr Brace lovanovish, Inc.

Subiyatno, A.; D. N. Now and W. Z. Yang (1994): Plasma metabolite responses to glucose infusion in dairy cows supplemented with chelated chromium. J. Dairy Sc. (Submitted).

Subosa,P.F. (1992): Chicken manure, rice hulls, and sugar- mill wastes as potential organic fertilizers in s hrimp (Penaeus monodon Fabricius) ponds.Aquaculture,102:95 – 103 .

Tryfiates, G.P. (1986): Pyridocal Phasphate and metabolism. in D. Dolphin, R. Poulson and O. Avramovil (Eds.), Vitamin B_6, Pyridoxal Phosphate. Part B, pp. 422-447. John Willy & sons, Inc. USA.

Tseng, W.Y. and K.L. Chan (1982): The reproductive biology of the rabbit fish in Hong Kong. J. World Maricul Soc. 13 : 313-321.

Waagbø, R.; T. Thorsen and K. Sandnes (1989): Role of dietary ascorbic acid in vitellogenesis in rainbow trout (Salmo gairdneri). Aquaculture, 80: 301-314.

Wohlfarth,G.W. and G.L.Schroeder (1979): Use of manures in fish farming a review. Agricult.Wastes,1(4):279–299.

Table 1: L-ascorbic acid, live yeast and poultry droppings levels used in the experimental treatments.

Parameters	Treatments						
	1	2	3	4	5	6	7
1-L-ascorbic acid (g/Kg diet).	0.0	3.0	0.0	3.0	3.0	3.0	3.0
2- Live yeast (%)	0.0	0.0	10	10	10	10	10
3-Poultry droppings (%)	0.0	0.0	0.0	10	20	30	40

Table 2: Chemical composition of the basal diet (BL), dry poultry droppings (DPD) and live yeast (LY)

Component	Basal diet	Poultry droppings	Live yeast
1-Moisture(%)	11.83 ± 0.04	8.81 ± 0.14	71.50 ± 0.39
2- Crude protein (%)	29.95 ± 0.76	23.03 ± 0.27	14.75 ± 0.88
3- Crude fat (%)	3.28 ± 0.04	0.93 ± 0.10	5.23 ± 0.06
4- Ash (%)	13.17 ± 0.14	27.33 ± 0.29	7.50 ± 0.00

Table 3: The average body gain, length, relative organ weights and survival rate of *Oreochromis niloticus* fed different levels of poultry droppings supplemented with ascorbic acid (AA) and live yeast(LY)

Treatment / Parameter	Basal diet(BL)	Basal diet + ascorbic acid	Basal diet +live yeast	Basal diet + ascorbic acid + live yeast +Poultry droppings 10%	20%	30%	40%
1-Average body gain (g/fish)	1.36 ^{b} ± 0.61	1.83 ^{a} ± 0.49	2.21 ^{a} ± 0.86	1.61 ^{b} ± 0.51	1.58 ^{b} ± 0.59	1.68 ^{b} ± 0.69	1.33 ^{b} ± 0.47
2-Average length Increment (mm)	0.82 ^{a} ± 0.30	1.07 ^{a} ± 0.40	1.39 ^{a} ± 0.38	1.18 ^{a} ± 0.46	1.24 ^{a} ± 0.52	1.41 ^{a} ± 0.63	0.95 ^{a} ± 0.30
3-Condition factor (Cf)	1.70 ^{a} ± 0.07	1.74 ^{a} ± 0.04	1.79 ^{a} ± 0.08	1.76 ^{a} ± 0.05	1.76 ^{a} ± 0.07	1.80 ^{a} ± 0.06	1.71 ^{a} ± 0.07
4- Survival (%)	95 ^{a}	100 ^{a}	100 ^{a}	100 ^{a}	95 ^{a}	95 ^{a}	90 ^{a}
5-Hepatosomatic Index (HSI)	2.71 ^{bc} ± 0.27	3.35 ^{a} ± 0.35	3.18 ^{a} ± 0.29	2.78 ^{bc} ± 0.42	2.73 ^{bc} ± 0.43	2.83 ^{abc} ± 0.37	2.33 ^{c} ± 0.40
6-Female GSI	1.34 ^{a} ± 0.47	1.99 ^{a} ± 0.72	2.18 ^{a} ± 0.92	2.72 ^{a} ± 0.45	1.82 ^{a} ± 0.76	1.13 ^{a} ± 0.56	1.69 ^{a} ± 0.10
7- Male GSI	0.58 ^{a} ± 0.09	0.60 ^{a} ± 0.11	0.65 ^{a} ± 0.15	0.49 ^{a} ± 0.16	0.43 ^{a} ± 0.05	0.42 ^{a} ± 0.10	0.56 ^{a} ± 0.09

- Means within rows differ ($P < 0.05$) when superscripts differ

Table 4: Muscle composition of *Oreochromis niloticus* fed different levels of poultry droppings (PD) supplied by ascorbic acid (AA) and live yeast (LY).

Treatment / Parameter	Basal diet (BL)	Basal diet + ascorbic Acid	Basal diet + live yeast	Basal diet + ascorbic acid + live yeast +Poultry droppings 10%	20%	30%	40%
1- Moisture (%)	75.60 ^{a} ± 0.18	74.83 ^{bc} ± 0.35	74.53 ^{bc} ± 0.29	74.21 ^{c} ± 0.26	74.85 ^{bc} ± 0.17	74.73 ^{bc} ± 0.09	75.21 ^{ab} ± 0.13
2- Crude protein (%)	74.79 ^{a} ± 0.51	75.36 ^{a} ± 0.33	75.02 ^{a} ± 0.43	75.38 ^{a} ± 0.28	75.35 ^{a} ± 0.82	74.23 ^{a} ± 1.36	74.24 ^{a} ± 0.85
3- Crude fat (%)	6.00 ^{ab} ± 0.24	5.44 ^{c} ± 0.37	5.28 ^{c} ± 0.21	6.45 ^{a} ± 0.46	5.54 ^{b} ± 0.23	6.08 ^{ab} ± 0.47	4.30 ^{c} ± 0.30
4- Ash (%)	18.58 ^{a} ± 0.29	18.17 ^{a} ± 0.30	18.50 ^{a} ± 0.69	16.58 ^{b} ± 0.19	16.92 ^{b} ± 0.10	16.67 ^{b} ± 0.41	18.67 ^{a} ± 0.30

Means within rows differ ($P<0.05$) when superscripts differ

Table5: Influence of poultry droppings levels on some blood constituents of *Oreochromis niloticus* supplemented with ascorbic acid (AA) and live yeast (LY).

Treatment / Parameter	Basal diet (BL)	Basal diet + ascorbic acid	Basal diet + live yeast	Basal diet + ascorbic acid + live yeast +Poultry droppings 10%	20%	30%	40%
a)Haematology:							
1-Hemoglobin (g/dl)	6.74 ^{b} ± 0.99	8.46 ^{a} ± 0.74	7.75 ^{a} ± 0.49	7.35 ^{ab} ± 0.13	7.17 ^{ab} ± 0.25	6.37 ^{b} ± 0.58	6.35 ^{b} ± 0.27
2-Haematocrit PCV(%)	30.50 ^{a} ± 5.11	38.50 ^{a} ± 2.50	35.75 ^{a} ± 5.22	30.75 ^{a} ± 3.90	32.50 ^{a} ± 2.25	27.75 ^{a} ± 3.97	27.00 ^{a} ± 1.73
B)Serum components							
1-Glucose (mg/dl)	116.2 ^{bc} ± 8.30	145.1 ^{a} ± 9.86	132.2 ^{a} ± 10.52	91.3 ^{d} ± 12.12	97.0 ^{dc} ± 10.63	94.2 ^{dc} ± 14.19	84.0 ^{d} ± 5.90
2- T. Protein (g/dl)	3.33 ^{c} ± 0.06	3.59 ^{bc} ± 0.17	3.56 ^{bc} ± 0.13	3.79 ^{ab} ± 0.30	3.50 ^{bc} ± 0.10	3.93 ^{a} ± 0.19	3.56 ^{bc} ± 0.15
3- Albumin (g/dl)	1.69 ^{c} ± 0.06	1.91 ^{ab} ± 0.07	1.89 ^{abc} ± 0.04	2.11 ^{a} ± 0.04	1.86 ^{bc} ± 0.08	1.97 ^{ab} ± 0.12	1.94 ^{ab} ± 0.09
Globulin (g/dl)	1.61 ^{a} ± 0.10	1.73 ^{a} ± 0.12	1.62 ^{a} ± 0.12	1.68 ^{a} ± 0.33	1.63 ^{a} ± 0.15	2.02 ^{a} ± 0.29	1.62 ^{a} ± 0.11
5-A/G ratio	1.07 ^{a} ± 0.10	1.19 ^{a} ± 0.15	1.11 ^{a} ± 0.09	1.37 ^{a} ± 0.20	1.20 ^{a} ± 0.14	1.09 ^{a} ± 0.27	1.21 ^{a} ± 0.11
6-Cholesterol (mg/dl)	111.1 ^{a} ± 21.46	106.1 ^{a} ± 11.58	109.0 ^{a} ± 10.34	120.5 ^{a} ± 20.46	128.1 ^{a} ± 12.18	125.5 ^{a} ± 6.44	130.3 ^{a} ± 12.34
8- Urea-N (mg/dl)	9.21 ^{a} ± 0.98	7.93 ^{a} ± 0.71	6.49 ^{a} ± 0.91	6.13 ^{a} ± 1.19	8.68 ^{a} ± 1.28	6.96 ^{a} ± 1.53	6.75 ^{a} ± 1.89
C- Hormones							
1- T_3 (ng / ml)	0.70 ^{b} ± 0.22	1.38 ^{a} ± 0.15	1.90 ^{a} ± 0.30	1.38 ^{a} ± 0.44	0.65 ^{b} ± 0.08	0.68 ^{b} ± 0.10	0.68 ^{b} ± 0.17
2- T_4 (u g%)	1.32 ^{a} ± 0.22	1.53 ^{a} ± 0.21	1.58 ^{a} ± 0.36	1.60 ^{a} ± 0.20	1.66 ^{a} ± 0.30	1.72 ^{a} ± 0.21	1.54 ^{a} ± 0.32

Means within rows differ ($P < 0.05$) when superscripts differ

Fig.1 . Effect of poultry droppings on body gain of O.niloticus supplemented with ascorbic acid and live yeast.

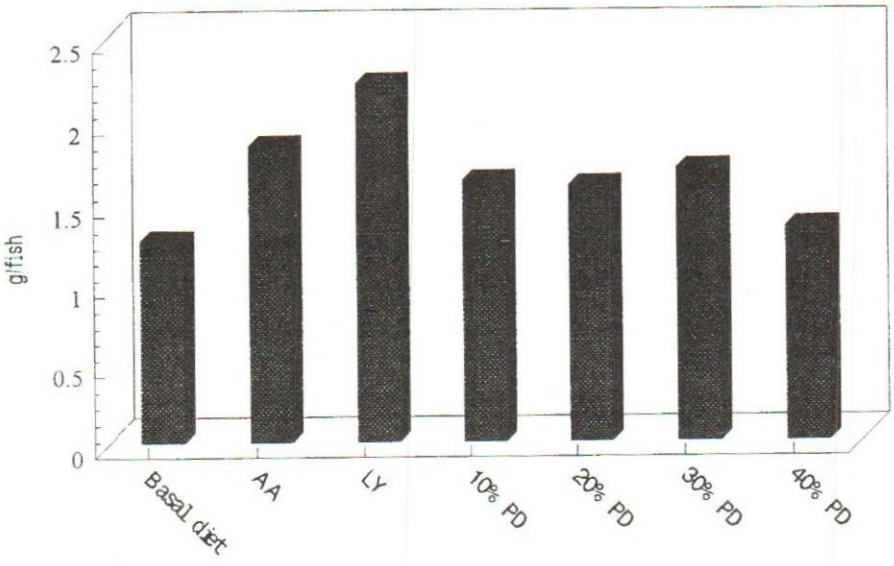

Fig.2 . Effect of poultry droppings on hepatosomatic index of O.niloticus under supplementation of ascorbic acid and live yeast.

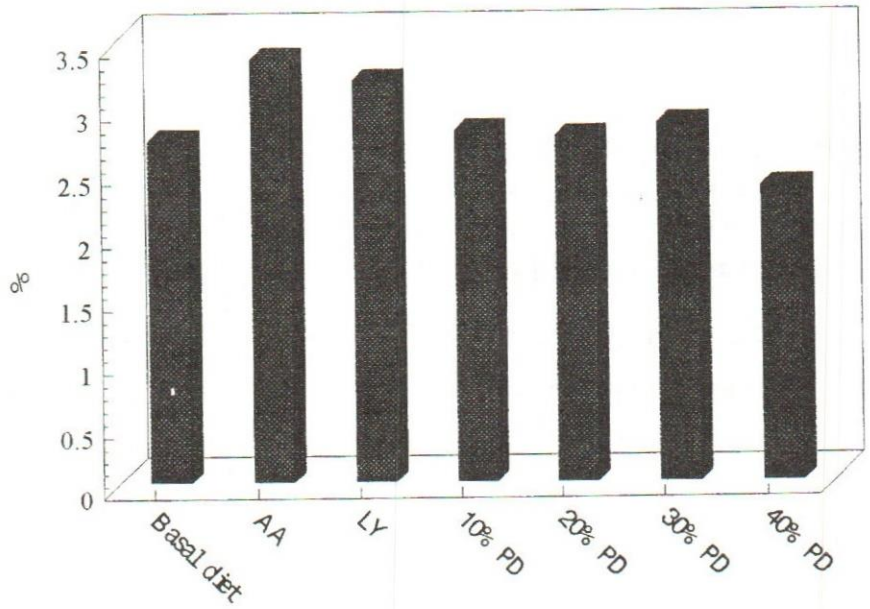

Fig.3 . Effect of poultry droppings on hemoglobin levels of *O.niloticus* under supplementation of ascorbic acid and live yeast.

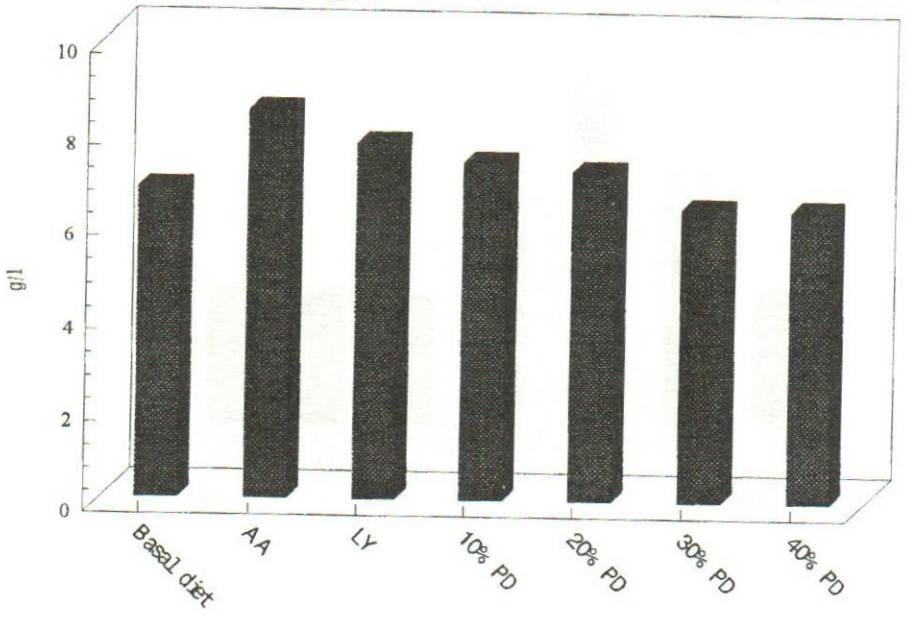

Fig.4 . Effect of poultry droppings on glucose levels of *O.niloticus* under supplementation of ascorbic acid and live yeast.

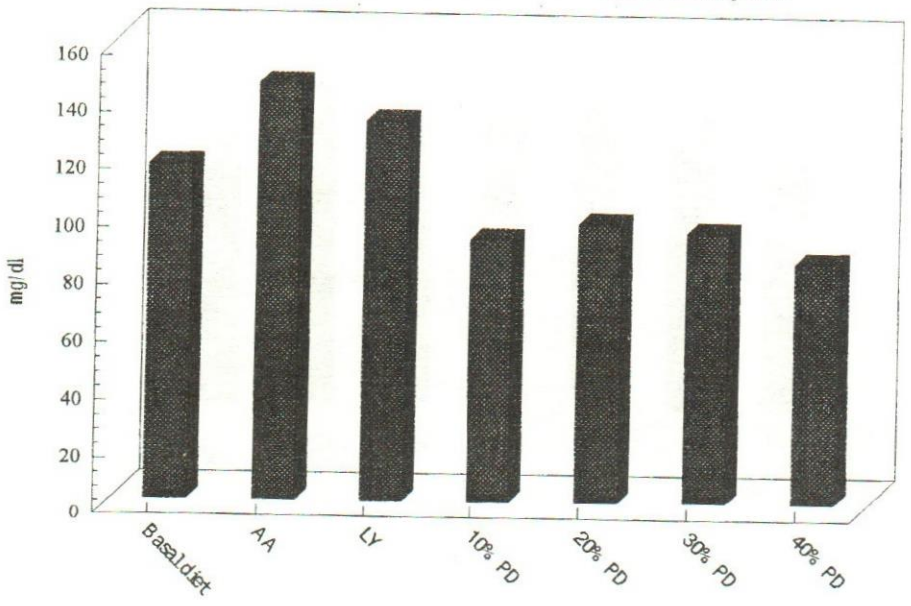

Fig.5 . Effect of poultry droppings on T3 levels of *O.niloticus* under supplementation of ascorbic acid and live yeast.

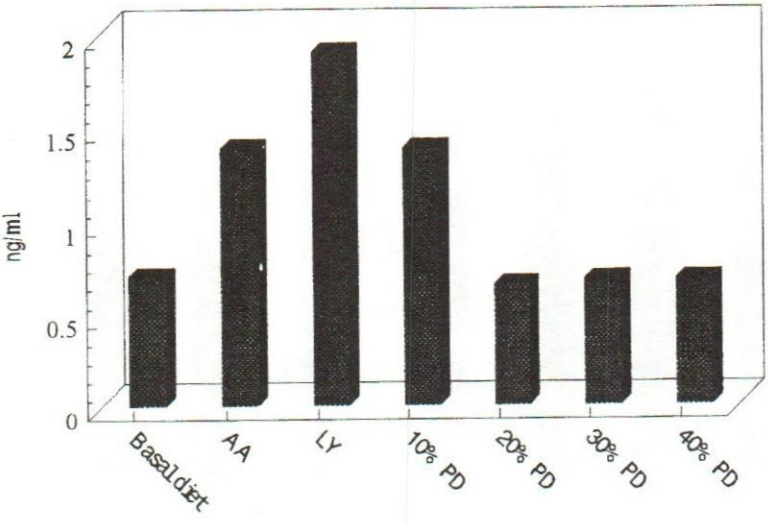

Fig.6 . Effect of poultry droppings on T4 levels of *O.niloticus* under supplementation of ascorbic acid and live yeast.