مجلة جامعة مصراتة للعلوم الزراعية
Journal of Misurata University for Agricultural Sciences
المجلد الثالث العدد الأول ديسمبر 2021م
المؤتمر العلمي الثاني للعلوم الزراعية – إنتاج حيواني
ISSN 2708-8588

Investigate Date Seeds as a Feed Ingredient on Growth Performance and Some Biochemical Parameters of Nile Tilapia (*Oreochromis niloticus*) Fingerlings

***Keri Alhadi Ighwela**
Al - Asmarya University - Faculty of Education - Department of Biology

Ragab Farag Al-Kazaghly
Al - Asmarya University - Faculty of Science - Department of Zoology

*Keri_gwallah@yahoo.com

Abstract

The present study was carried out to investigate date seeds as a feed ingredient in growth performance and some biochemical parameters of the Nile tilapia (*O. niloticus*) fingerlings with an average weight of 34.53 ± 0.14 g for 12 weeks. At the end of the experiment, growth performance measurement and blood samples were collected to determine blood glucose, total protein, cholesterol, and triglycerides in blood serum. The results showed that: it can use date seeds in the diets of tilapia fish, without any effect. Although, the weight gain, weight gain ratio, standard growth rate (SGR) and protein efficiency ratio (PER) of fish fed the diet containing date seeds were lower than the control diet (wheat bran-based diet); whereas the value feeds conversion ratio (FCR) of the Nile tilapia was higher in group fish fed on diet contained date seeds compare to the control group. Additionally, the blood sugar, total protein, cholesterol, and triglyceride were lower obtained from fish fed on date seed (90.33±1.43, 1.61±0.04, 78.50±2.23 and 43.00±1.51, respectively) compared with control, however in the normal range. Thus, further work is straightway needed to improve the quality of date seeds for tilapia, using proper processing and treatment techniques.

Key words: Date seeds- Nile tilapia- Growth performance- Biochemical parameters.

1. Introduction

Date palms are considered as one of the most important foods in many countries around the world, especially in the Arab countries which produce 70% of the world's dates according to statistics of the Arab Organization for Agricultural Development, 2012. Libya, as an Arab country, has more than 9 million date trees and 400 species according to reported by the Libyan ministry of Agricultural (2014) which are produced 151163.04 tonnes of date palm and considered now to be the 5th producing country of dates in the Arab countries (FAO, 2016). The fruit part of the date palm is fruity and has one seed or stone (raw materials), which represents a major environmental problem. Although, in some countries such as Libya, date seeds and fibers are used as food for domestic farm animals (Ighwela, 2019). Moreover, some studies evaluated the chemical composition and nutritive value of mainly have been conducted on the use of wasted dates and seeds for animal feed such as broilers (Ali J. *et al*. 2018) and Calves (El Hag and El Khanjari 2000) and goats (Al- Suwaiegh. 2005) and fish (Ighwela *et al*, .2011). Fish nutrition is represented 50-60 % of the total production costs in fish farming (Abdulraheem *et al*., 2012). Several studies have been conducted on the use of

ISSN 2708-8588

feed ingredients in fish diets with varying results. For example, studies on the Nile tilapia (Belal and Al Jasser 1997, Azaza *et al.,* 2009, Mathew *et al*, 2020) revealed that date seeds could be used as a nutritional source for these fish. It is evident, therefore, that more research is needed to settle this dispute especially the effect of date seeds on blood serum in these fishes. In addition, the analysis of biochemical parameters could help to identify target organs of toxicity as well as the general health status of fishes (Abdul Naveed, 2011). Therefore, the current study was conducted to further investigate the use of date seeds as feed ingredients of the Nile tilapia (*Oreochromis niloticus*) fingerlings and their effect on some biochemical parameters.

2. Material and Methods

2.1. Experimental feed components

The Feedstuffs or diets in the present study contained wheat flour (WF) as an energy source and as a binder (20%), fish meal (FM) as the supplementary protein source (40 %), corn oil (CO) as the source of fatty acids (3%), wheat bran (WB) as control (30 %) and date seeds (DS) as trail (30%). FM, WF, CO and WB were obtained from a local supplier, while date seeds were obtained from our family palm farm at Zliten, Libya and vitamins and mineral premixes from the veterinary pharmacy. All dietary ingredients were finely ground, mixed and dry pelleted in a laboratory pellet mill through 1.5 mm dies. These pellets were dried in a drying oven for 48 hours at 50°C; the dry pelleted diets were broken into small pieces and packed into plastic bags before being frozen at 2°C. When needed the diets were thawed to room temperature, and fed to the fish.

The proximate analysis of the ingredients and experimental diets are given in table 1 and table 2 respectively for moisture, crude protein, crude fat, carbohydrate (by calculation), crude fiber, and total ash content in triplicate. The methods of analysis were performed as described in AOAC (1990).

Table (1) Proximate analysis of the ingredients (%).

Ingredients	Dry matter %	Crude protein %	Crude fat %	Crude fiber %	Ash %	Carbohydrate (NFE) %
Wheat bran	90.50	16.91	03.76	07.06	07.60	55.17
Date seed	92.42	03.48	06.35	13.20	01.85	80.74
Fish meal	92.50	71.70	04.15	00.54	08.51	07.60
Wheat flour	95.00	10.80	01.50	01.30	01.20	80.20

Table (2) Proximate analysis of the experimental diets (%).

Proximate analyses	Wheat bran (Control)	Date palm seed
Crude protein %	35.9	33.20
Crude lipid %	8.09	9.58
Total carbohydrate (NFE) %	36.88	37.27
Ash %	20.51	22.05

2.2. Experiment animals (fishes)

A total number of 90 Nile tilapia (*Oreochromis niloticus*) fingerlings used in the present

ISSN 2708-8588

study was obtained from Ain kaam fish farm, Libya and then transported to the Aquatic laboratory of collage of science Al-Marghib University. They were acclimated to laboratory conditions for two weeks. Fish fingerlings were counted, weighed and placed randomly in six glass aquaria (40 W X 80 L X 40 H cm). The glass aquaria were provided with continuous aeration from an air compressor. Each aquarium has 15 fishes with three replicates per treatment. During the experiment, fish were fed twice daily (09:00 and 17:00 h) at the rate of 2.5% of their body weight. Fish in the growth experiment were weighed every four weeks, and experiments were run.

2.3. Growth performance analysis of fish

Weight gain, weight gain ratio, average daily gain (ADG), standard growth rate (SGR), feed conversion ratio (FCR), protein efficiency ratio (PER) and survival ratio (SR) were determined according to Jauncey and Ross (1982) as following:

Total weight gain = Final body weight - Initial body weight

Weight gain ratio = Final body weight - Initial body weight / Initial bodyweight ×100

Average daily gain (ADG) (g/fish day^{-1}) = total weight gain / duration period

Standard growth rate (SGR) = (final body weight - initial body weight) x l00 / number of days

Feed conversion ratio (FCR) = feed consumed (g) / wet weight gain of fish (g)

Protein efficiency ratio (PER) = total weight gain (g) / protein intake (g)

Survival ratio (SR) = (final no. of fish / initial no. of fish) ×100

2.4. Blood chemistry analysis

After the 12 weeks feeding trial, another experiment was carried out to investigate the changes in blood sugar, total protein, triglyceride and cholesterol levels of Nile tilapia (Oreochromis niloticus) fingerlings. Blood sugar were measured by glucose oxidase method, total protein in serum was determined by the Biuret method, cholesterol and triglycerides by Colorimetric method. All these parameters according to (Chawla, 2003)

2.5. Statistical analyses:

The data obtained from the present study were analysed using analysis of variance (ANOVA). Ducan's multiple tests was used to verify the significance of the mean differences among treatments.

3. Results and Discussion

There were no significant differences in water quality parameter between the treatments during experimental period. The average values of some physicochemical parameters of water quality in the experimental glass aquaria analyses were as follows: 25 °C for temperature, 7.81 for pH, 500 mg L-1 for chloride, Ms/cm, 1920 for electrical conductivity, 1152 for total dissolved solids (T.D.S), and 6.9 mg•l^{-1} for dissolved oxygen (DO). These parameters within the acceptable range for Nile tilapia growth

(Stickney 1979) and agreement with the results of Mabrouk *et al* (2011) and Ighwela, (2017).

The results of the present study showed that Nile tilapia accepted the diet from the first day of the study without any significant differences between all treatments ($p < 0.05$), and also did not show any signs of disease on fish during the study period.

The average body weight of the experimental fish Nile tilapia (Oreochromis niloticus) for every four weeks is presented in Table (3). At the beginning of the experiment, the initial weight of the fish was near-constant (34.53 ± 0.14 g) in all the experimental diets as there was no significant difference among all groups ($P < 0.05$). Similarly, there were no differences between the average body weight in fish fed on date seeds at week 4 compared with the control diet, while at week 8 the fish fed on a diet containing date seeds had a lower fish body weight than control diet ($P<0.05$), and a similar trend was observed at week 12.

Table (3) Average body weight (g) of Nile tilapia fingerlings fed on experimental diets during 12weeks.

Period (week)	Control	Date seed
Initial body weight (gm)	34.55±0.12	34.48±0.04
4 weeks (gm)	37.33±0.07	36.06±0.12
8 weeks (gm)	40.72±0.12	38.73±0.05
12 weeks (gm)	42.26±0.11	40.67±0.04

Table 4 shown the growth performance of Nile tilapia fingerlings fed the experimental diets for 12weeks. The growth performance indicators were measured: the weight gain, weight gain ratio, standard growth rate (SGR) and protein efficiency ratio (PER) of fish fed the diet containing date seeds were lower than control diet (wheat bran-based diet), but the feed conversion ratio (FCR) of Nile tilapia was higher fed on diet contained (30%) date seeds were (2.08) compared with control diet (1.67) which fed on the wheat bran-based diet. The present results are in agreement with the finding of Belal and Al-Owafeir (2009) who found that growth performance, including SGR % for Nile tilapia, fed the control diet are similar to fish fed date seeds fed at level 30 in test diet, and also similar results have been reported by El-Sayed et al., (2006) and Labib *et al* ., 2012 who noted that PER was significantly affected ($P<0.05$) by increasing date seeds levels in Nile tilapia diets. In addition, these results are compatible with the study of Mabrouk et al., (2011) reported that the growth and feed efficiency of Nile tilapia (*Oreochromis niloticus*) which fed on dried, wet dates and date seeds. The ability of fish to utilize date seeds may be due to differences in fish species (Osman *et al*., 1995), and /or the chemical composition of date seeds (Belal and Jasser, 1997).

مجلة جامعة مصراتة للعلوم الزراعية
Journal of Misurata University for Agricultural Sciences
المجلد الثالث العدد الأول ديسمبر 2021م
المؤتمر العلمي الثاني للعلوم الزراعية – إنتاج حيواني
ISSN 2708-8588

Table (4) Growth performance of Nile tilapia fingerlings fed on experimental diets for 12weeks.

	Control (wheat bran)	Date seeds
Initial body weight (g/fish)	34.55± 0.12	34.48 ±0.04
Final body weight (g/fish)	42.26 ±0.11	40.67 ±0.04
Average daily gain	0.09	0.07
Total weight gain (g)	7.71	6.19
Weight gain ratio	22.32	17.95
Standard growth rate (SGR)	3.87	2.36
Feed conversion ratio (FCR)	1.67	2.08
Protein efficiency ratio (PER)	1.66	1.49

The mortality and survival ratio of Nile tilapia fingerlings fed on experimental diets for 12 weeks are summarized in table (5). During the experiment, no feed-related mortality was observed during the experiment period (12 weeks). While there was mortality recorded (80%) in fish fed the diet containing date seeds.

Table (5) Mortality and survival ratio of Nile tilapia fingerlings fed on experimental diets for 12 weeks.

	Control (wheat bran)	Date seeds
Initial number of fish	45	45
Mortality	00	09
Final number of fish	45	36
Survival ratio (SR)	100	80

Results of biochemical analysis of blood at the end of the experiment are shown in Table (6). Measurement of blood sugar and total protein in serum or plasma is of considerable diagnostic value in fish, as it relates to general nutritional status (Schaperclaus *et al*., 1992). The blood sugar concentration showed a significant ($P < 0.01$) decrease in fish fed on diets contained date seeds (90.33±1.43) compared with the control diet (127±1.77). Similar results have been also observed in another study by Montoya-Mejia et al, (2017) and they noted that increasing the blood sugar level in the blood indicated the improvement of the dietary value of the diet. This can be partially explained by the hydrolysis of date seeds meal that produced small particles (simple sugar) easily assimilated by tilapia (Ighwela *et al,* 2014),

The total protein in blood serum showed significant difference between groups and these results was similar to Ighwela *et al,*(2014) who fed Nile tilapia by some waste plant seeds.

Cholesterol and triglycerides are lipids found in all body tissues and transported in the blood plasma. In addition, triglycerides are used to evaluate nutritional status, lipid

metabolism, and their high concentrations may occur with glycogen storage disease (Yang and Chen, 2003). In the present experiment, the cholesterol content in blood was significantly decreased in fish fed on diets contained date seeds (78.50±2.23) compared with control (134.33±1.36). Moreover, the concentration of triglycerides was significantly decreased in fish fed on diets contained date seeds (43.00±1.51) than those of control (70.67±1.36). These findings are in agreement with Lochman and Gatlin, 1993, and they noted that increasing the triglyceride level in the blood indicates the improvement of the nutritional value of the diet.

The results of biochemical parameters in our study are in the normal range according to a comment by Hrubec and Smith, (1999) on blood chemistry values in Rainbow Trout, Channel Catfish, Hybrid Tilapias, and Hybrid Striped Bass. moreover, Nile tilapia utilize complex sugars more efficiently than simple sugars and suggested that the date seeds may also contain amylase inhibitors or other ant nutrients that would reduce their utilization by tilapia according to suggests by El-Sayed *et al*., (2006).

Table (6) Blood parameters of Nile tilapia fingerlings fed on experimental diets for 12 weeks.

	Control (wheat bran)	Date seeds
Blood sugar	127±1.77	90.33±1.43
Total protein	2.45±0.06	1.61±0.04
Triglycerides	70.67±1.36	43.00±1.51
Cholesterol	134.33±1.36	78.50±2.23

4. Conclusion and Recommendation

From the previous results, it could be concluded that the diet containing 30% date seeds as a dietary source in the formulation of Nile tilapia diet have positive improvement effects on Nile tilapia fingerlings performance. Therefore, it is recommended to use date seeds as a feed ingredient for tilapia feed and other fish to obtain a more economical feed and higher growth performance diet.

References

Abdul Naveed, P., Venkaeshwarlu., & Janaiah, C. (2011). Biochemical alteration induced by triazophos in the blood plasma of fish, *Channa punctatus* (Bloch). Annals of Biological Research, 2 (4): p. 31-37.

Abdulraheem, I., Otubusin, S. O., Agbebi, O. T., Olowofeso, O., Alegbeleye, W. O., Abdul, W.O., Adeyemi, K., Ashley-Dejo, S.S., & Nathaniel, B. (2012). The growth response of *Clarias gariepinus* hatchlings to different dry feeds. Journal of Agricultural Science, 4 (10): p. 75-80.

Al- Suwaiegh, S.B. (2015). Effect of Substitution of Date Pits in Concentrate Feed on Growth Performance and Nutrients Digestibility of Ardi Goats. Asian Journal of Animal Sciences, 9: p 110-118.

Ali J. H., Nihad A. A., Ali M. A., & Yasser J. J. (2018). The Effect of Partial Replacement of Maizeby Date Pits on Broiler Performance. Journal of Pure and Applied Microbiology, June 2018. Vol. 12(2), p. 807-813.

AOAC. (1980). Official methods of analysis.13th ed. Association of official analytical Chemists, Washington, D.C.

AOAD (Arab Organization for Agricultural Development). (2012). Arab Agricultural Statistics Yearbook (Khartoum: AOAD), http://www.aoad.org/Agricultural_ Statistical_Book_Vol32.pdf.

Azaza, M.S., Mensi, F., Kammoun, W., Abdelouahab, A., Brini, B., & Kraiem, M. (2009). Nutritional evaluation of waste date fruit as partial substitute for soybean meal in practical diets of juvenile Nile tilapia, *O. niloticus.* Aquaculture Nutrition Journal. 15 (3): p. 262–272.

Belal, I. E. H., & Al-Owafeir, M. A. (2009). Incorporating date pits (Phoenix dactylifera) and their sprouts in semi-purified diets for Nile tilapia (*Oreochromis niloticus*). Journal of the World Aquaculture Society. 35 (4) p. 452-459.

Belal, I. E. H., & Al-Jasser, M. S. (1997). Replacing dietary starch with pitted date fruit in Nile tilapia, *Oreochromis niloticus*. feed. Aquaculture. Research Journal. 28, p. 385-389.

Chawla, R. (2003). Practical clinical biochemistry (methods and interpretations). 3th ed. Jaypee Broth_ers. New Delhi, India.

El Hag, M. G., & Ekhanjari, H. H. (2000). Date and sardines as potential animal feed resources. www.fao.org/ag/aga/agap/war/warall/u870b/u875b0a.htm

FAO, (2016). FAOSTAT. Food and Agriculture Organization of the United Nations, Rome, Italy.

Hrubec, T.C. & Smith, S.A. (1999). Differences between plasma and serum samples for the evaluation of blood chemistry values in Rainbow Trout, Channel Catfish, Hybrid Tilapias, and Hybrid Striped Bass. Journal of Aquatic Animal Health.11: p. 116 - 122.

Ighwela, K. A., Metwally, M. A. A. & Abol-Munafi, A.B. (2011). Biochemical Studies on the Use of Some Waste Plants for Feeding of Nile Tilapia (*Oreochromis niloticus)*. Proceedings of the 9th Asian Fisheries and Aquaculture Forum (9AFAF) 21st - 25th April 2011Shanghai Ocean University, Shanghai, China, p: 65-84.

Ighwela, K. A., Aziz B. A., & A.B. Abol-Munafi. (2014). Evaluation of Apparent Digestibility Coefficients of Different Dietary Maltose Levels in Nile Tilapia *(Oreochromis niloticus)* Fingerlings. Research Journal of Pharmaceutical, Biological and Chemical Sciences, 5 (2): p. 1014- 1018.

Ighwela, K. A. (2017). Study of Some Ecological Properties of Ain Kaam Water and its Relation to Development of Fish Wealth in Libya. The First Economic Conference on Investment and Development in Al- Khoms 25st - 27th December 2017 Al- Khoms, Libya. (ECIDIKO 2017). p. 1 -8.

Ighwela, K. A. (2019). Study of chemical composition and correlation between the seeds of two date palm cultivars grown in Libya. Journal of Misurata University for Agricultural Sciences. 1(1): p. 67 – 71.

Jauncey, K., & B. Ross. (1982). A Guide to Tilapia Feeds and Feeding. University of Sterling, Scotland.

Labib, E.H., Gaber, M. M., Omar E. A., Zaki, M.A., & Nour, A. M. (2012). Effect of partially replacing corn meal by date stone on growth performance in Nile tilapia (*Oreochromis niloticus*) fingerlings, diets supplemented with Digestarom. Open Access Scientific Reports. 1 (10): p. 1-5.

Mabrouk, H.A., Zaki, M.A., Nour, A. M., & Labib, E. H. (2011). Effect of partial replacement of dried, wet cull dates and date pits instead of yellow corn, supplemented with feed additives on growth performances of Nile tilapia (*Oreochromis niloticus*). Egypt Journal of Aquaculture, Biology and Fish. 15 (2): p. 207-224.

Mathew, R. T., Alsaqufi, A. S., & Al-Ngada, R. S. (2020). Evaluation of date (Phoneix dactylifera) seed powder as dietary additive for nile Tilapia, *Oreochromis niloticus*. Animal Nutrition and Feed Technology. 20 (2): p. 231 – 242.

Montoya-Mejia, M., Garcia-Ulloa, M., Hernandez-Llamas, A., Nolasco-Soria, H., & RodriguezGonzalez, H., (2017). Digestibility, growth, blood chemistry, and enzyme activity of juvenile *Oreochromis niloticus* fed isocaloric diets containing animal and plant byproducts. Revista Brasileira De Zootecnia-Brazilian Journal of Animal Science 46 (12): p. 873-882.

Schaperclaus, W., Kulow, H., & Schreckenbach, K. (1992). Fish Disease. A.A. Balkema, Rotterdam, the Netherlands.

Stickney R. R. (1979). Principles of warm water aquaculture. Wiley International Science, New York.

مجلة جامعة مصراتة للعلوم الزراعية
Journal of Misurata University for Agricultural Sciences
المجلد الثالث العدد الأول ديسمبر 2021م
المؤتمر العلمي الثاني للعلوم الزراعية – إنتاج حيواني
ISSN 2708-8588

دراسة نوى التمر كمكون علف على أداء النمو وبعض المعايير البيوكيميائية لإصبعيات البلطي النيلي (*Oreochromis niloticus*)

خيرى الهادى غويله* **رجب فرج الكازاغلى**
الجامعة الأسمرية – كلية التربية – قسم الأحياء الجامعة الأسمرية – كلية االعلوم – قسم علم الحيوان
*Keri_gwallah@yahoo.com

الملخص

أجريت الدراسة الحالية لاختبار نوى التمر كمكون غذائي في أداء النمو وبعض المتغيرات البيوكيميائية لإصبعيات البلطي النيلي بمتوسط وزن 0.14 ±34.53جم لمدة 12 أسبوع. في نهاية التجربة تم قياس معدلات النمو و جمعت عينات الدم لتحديد نسبة سكر الدم والبروتين الكلي والكوليسترول والدهون الثلاثية في مصل الدم. أظهرت النتائج أن: أنه يمكن استخدام نوى التمر في علائق أسماك البلطي حيث لم تؤثر سلبيا ومع ذلك كانت الزيادة في الوزن ، ومعدل النمو القياسي ، ونسبة كفاءة البروتين للأسماك التي تغذت على النظام الغذائي المحتوي على نوى التمر كانت أقل من المجموعة الضابطة (العليقة المحتوية على نخالة القمح). بينما كانت نسبة تحويل القيمة الغذائية للبلطي النيلي أعلى في مجموعة الأسماك التي تم تغذيتها على العليقة المحتوية على نوى التمر مقارنة بالمجموعة الضابطة. بالإضافة إلى ذلك ، تم الحصول على نسبة أقل من سكر الدم ، والبروتين الكلي ، والكوليسترول ، والدهون الثلاثية من الأسماك التي تم تغذيتها على نوى التمر (90.33±1.43, 1.61±0.04, 78.50±2.23 and 43.00±1.51 على التوالي) مقارنةً بالضابطة ، ولكنها في المدى الطبيعي . ومع ذلك ، هناك حاجة إلى مزيد من العمل لتحسين جودة نوى التمر لتغذية اسماك البلطي ، باستخدام تقنيات المعالجة والمعالجة المناسبة.

الكلمات المفتاحية: نوى التمر – البلطي النيلي – معدلات النمو – المعايير البيوكيميائية.