Preliminary study on the effect of dietary black seed (Nigella sativa) on growth and blood glucose of common carp (Cyprinus carpio) fingerlings

Research · November 2015

DOI: 10.13140/RG.2.1.4828.3606

CITATIONS
2

READS
368

2 authors:

Adel Al-Dubakel
University of Basrah
78 PUBLICATIONS **180** CITATIONS
SEE PROFILE

Majdi Faisal Majeed
University of Basrah
28 PUBLICATIONS **33** CITATIONS
SEE PROFILE

Preliminary study on the effect of dietary black seed (*Nigella sativa*) on growth and blood glucose of common carp (*Cyprinus carpio*) fingerlings

[1]A.Y.Al-Dubakel; [2]B.H.Al-Mhawe ;[3]M.F.Majeed and [2]L.W.Shaeyal

Department of Fisheries and Marine Resources, College of Agriculture, University of Basrah, Basrah, Iraq[1]

Department of Pathology, College of Veterinary Medicine, Basrah University, Iraq[2]

Department of Histology & Anatomy, College of Veterinary Medicine, Basrah University ,Iraq[3]

E-MAIL: [1]aaldubakel@yahoo.com ; [3]Majdy2006ad@yahoo.com

Summary

It is common nowadays to use natural food additive to increase fish growth , activity and immunity .We study the effects of different levels (0 , 1 and 3%) of black seed (*Nigella sativa*) on growth and blood glucose of common carp (*Cyprinus carpio*). The protein content of the experimental diets were 31.16 , 48.80 and 49.33 % for the three diets respectively while total energy was 441.61 , 464.61 and 475.72 kcal/100g respectively . Nine plastic tanks (30-L) were used in three replicates for each treatment to stock ten fish having the same initial weight (34.63 ± 6.51 gm/fish) in each. Fish were fed for satiation once daily, six days a week for 56 days.The results showed that the diet containing 1% black seed improved un-significantly (P>0.05) growth rate compared with control and diet containing 3% *N. sativa*. Blood glucose of common carp was significantly differ (P<0.05) in control and diet B in comparison to diet C, which accomplish the highest value 120.88 mm/dl.

Keywords: Blood glucose, *Cyprinus carpio,* growth , fish ,*Nigella sativa*.

Introduction

Using chemical compounds especially antibiotics and hormones may cause unfavorable side effects, hence the cumulative effect of these compounds induced different effects on human health, (Ali *et al*.,2005) .Therefore using a natural feed additives has been important to minimize these adverse effects (Aboul-Foutoh *et al*., 1999 ; Abd El-Latif *et al*., 2004) .

Recent studies in humans and fish demonstrate the potential immunostimulatory effect and antibacterial and antifungal properties of garlic (*Allium sativum*), black seed (*Nigella sativa*) and Biogen (Khalil *et al*. 2001, Diab *et al*. 2002, 2008). *Nigella sativa* is a spicy plant, and it is a member of the Ranunculaceac Family(Atwa, 1997). *Nigella sativa*) is known as "Habbat Al Barakah" or "Blessed Seed" among the Middle East countries since it is a cure for many diseases. It is a medicinal plant used as a natural remedy for a variety of illnesses (Meral *et al*., 2004).Also Black seeds are used in folk (herbal) medicine all over the world for the treatment and prevention of a number of diseases and conditions that include asthma, diarrhoea and dyslipidaemia (Ali and Blunden, 2003).Black seed has been shown to enhance the function of natural killer cells and T cell immunity through the production of cytokines and interleukin 1, 2 and 3 (Haq *et al*. 1995, Mahdi 1993). It can inhibit microbial growth and has antihelminthic activity (Agarwal *et al*. 1997). These seeds found to increases hormonal secretion for the thyroid hormone and insulin and the aqueous and oil extracts of the seeds possess antioxidant, antiinflammatory, anticancer, analgesic and antimicrobial activities. (Gali-Muhtasib *et al*. ,2006).These effects was not fully demonstrated in fish .

The objective of this study was to evaluate the effect of adding medical plant supplementation *Nigella sativa* meal on growth performance, and blood glucose of common carp (*Cyprinus carpio*).

Materials and methods

The fingerlings of common carp (*Cyprinus carpio*) obtained from the Fish Farm of Basrah University. The average weight and length of fish was

(34.63 ± 6.51)gm and (22.12 ± 6.02) cm respectively .Fish transported to the laboratory by plastic containers with the same pond water where water. temperature was 17 ºC .The fish stocked in open water system consist from nine plastic tanks (30 L) occupied with water pump ,three tanks per treatment with 5 fish each randomly distributed, during the accumulation period (10 days) fish fed for satiation with control diets once daily. The experiment lasted 56 days where fish weighted biweekly with the same feeding regime accept of type of diet. Five times a week, fish excrements were siphoned and 50% of tank water level was replaced to avoid ammonia and nitrite accumulation. Semi-purified ingredients were used to prepare the experimental diets (Table 1), three experimental diets (A,B and C) were formulated to contain 0 (control), 1 or 3 % of Black seeds. Chemical composition of diets were analyzed after manufacturing according to AOAC ,(1990) .Blood glucose was determined with ACCU-Check – active apparatus of fish blood taken from caudal peduncle at the end of growth feeding experiment ,concentration was presented as mm/dl. The measurements of growth performance such as average weight gain (AWG), average daily gain (ADG), specific growth rate %/day (SGR) and survival rate % (SR) were calculated according to Khalil (1997) as follows :-

AWG(g/fish)=[Average final weight(g) – Average initial weight(g)].

ADG(g/fish/day) = [AWG(g)/experimental period(d)].

SGR(%/day)=[ln final body weight–ln initial body weight]100/experimental period(d)].

The obtained numerical data analyzed statistically using SPSS (2008) for one-way analysis of variance.

Table (1): Ingredients composition percentage of the experimental diets

Ingredients	Diet		
	A	B	C
%Casein	45	45	45
%Starch	40	40	40
%Sunflower oil	8	8	8
%Vit.& mineral premix	4	4	4
%Cellulose	3	2	0
%Black seed	0	1	3
Total	100	100	100

Results

Chemical composition of the used in the experimental diets are presented in Table (2).The results indicated that the protein content of the three diets were 31.16, 48.80 and 49.33 % respectively, where diet B (1%) and C (3%) contain higher protein and significantly different (P<0.01) than control diet (0%) . Similar result found for moisture content but higher moisture found in control diet and significantly difference (P<0.05) from diets B and C, while high lipid in diet C and carbohydrate in diet A were recorded which significantly different (P<0.01) between the three diets, whereas energy content was high in diet C followed by B then A and both significantly different (P<0.05) between with diet C. Ash content was not significant (P>0.01) among diets containing different Black seeds levels. The effect of Black seeds on the weight of *C.carpio* by the end of the experiment (56 days) revealed non-significant differences (P>0.01) of diet C in comparison to the control (Table 3) while diet B was different significantly from period two (14days) from both. Table 4 showed that diet B was significantly different (P<0.05) and superior than diet C in all parameters in which the later was

resemble to the control, where its Average weight gain , Average daily gain and Specific growth rate were 11.6 , 0.20 g/fish and 0.44 % /day respectively. The survival rate was 100% in all treatments with no significant differences (P>0.01) between treatments. Blood glucose of common carp fed different experimental diets (Table 5), were significantly different (P<0.05) between control and diet B in comparison to diet C, which accomplish the highest value 120.88 mm/dl, while it was 67.66 and 75.33 mm/dl in diets A and B respectively.

Table (2): Chemical proximate analysis of the experimental diets

Compound	Diet		
	A	B	C
%Moisture	11.23 a ±0.085	10.53 b ± 0.184	10.59 b ± 0.417
%Crude protein (%N x 6.25)	31.16 a ±0.233	48.80 b ±0.481	49.33 b ± 0.339
%Lipid	8.16 a ±0.071	7.06 b ± 0.009	9.15 c ± 0.495
%Carbohydrate	47.80 a ± 0.913	32.19 b ± 0.801	29.55 c ± 0.521
%Ash	1.65 a ±0.382	1.42 a ±0.035	1.38 a ± 0.042
Total Energy(kcal/100gm)	441.61 a ± 12.981	464.61 a ± 10.410	475.72 b ±11.202

Table (3): Weight of common carp fed different experimental diets during different periods.

Period (Day)	Fish weight (gm)		
	Diet		
	A	B	C
0	29.40 a ±4.22	39.94 a ± 7.41	34.55 a ± 3.69
14	31.42 a ±4.09	44.84 b ±8.13	38.17 a ± 3.20
28	33.63 a ±6.45	46.86 b ± 7.05	40.33 a ± 4.00
42	34.44 a ± 5.89	47.84 b ± 6.45	41.75 a ± 4.85
56	36.70 a ±5.86	51.20 b ±5.94	43.32 a ± 4.47

Table (4): Growth performance parameters of common carp fed different experimental diets.

Parameters	Diets		
	A	B	C
Experimental period(day)	56	56	56
Initial weight (IW), g/fish	29.4a ±4.22	39.94a ±4.22	34.55a ±4.22
Final weight (FW), g/fish	36.7a ±4.22	51.2b ±4.22	43.32a ±4.22
Average weight gain (AWG), g/fish	7.3a ±1.64	11.26b ±1.47	8.77a ±0.78
Average daily gain (ADG) g/fish	0.13a ±0.03	0.20b ±0.03	0.16a ±0.01
Specific growth rate (SGR),%/day	0.40a ±0.03	0.44a ±0.13	0.40a ±0.01
Survival rate (SR), %	100a ±0.00	100a ±0.00	100a ±0.00

Table (5): Blood glucose of common carp fed different experimental diets.

Diet	Blood sugar (mm/dl)
A	67.66 a ± 11.90
B	75.33 a ± 28.90
C	120.88 b ± 20.00

Discussion

Use natural feed additive is becoming useful for fish feeding rather than classic chemical feed additives due to the accumulative effect of the chemical components induced deterrent effects on human health (El-Dakar *et al*., 2008).

Results showed that protein content was high in diets containing Black seeds, this was in agreement with Khalafalla and Mohsen, (2006) who found that these seeds were rich in protein, poor in ash ,while it had a moderate ether extract ,which explain the non-significant differences in energy content between different diets . Data indicated that no significant differences in the initial fish weight among different experimental diets, which denoted that there are standardized at the start of the experimental treatments. The significant differences of diet B with other treatments in fish weight were agreement with Abd Elmonem *et al*., (2002) who found that adding black seed *(Nigella sativa)* at levels 0, 3, 6 and 9 % gave a positive response of growth performance and SGR at low levels of Red tilapia diets, also that level 5% of black seed was improve growth performance and SGR than 10% level in the diets of Nile Tilapia (Khalafalla and Mohsen, 2006) .The same results reported by Abdelhamid *et al*., (2005) who studied the effect of different levels of black seed (0, 25, 50, 75 and 100%) of Nile tilapia , they found that low level (25%) of NSM was significantly ($P<0.05$) improved of FW, AWG, ADG and SGR compared with the other fish groups . These results were confirmed the results obtained by Abou-Zeid (1998), who found that *Nigella sativa* seeds promoted growth of Nile tilapia because of its digestive stimulating effect through their aromatic substances or essential oils . Survival rate was improved and all treatments showed no mortality all

the experimental period, it reported that Black seed (*Nigella sativa*) enhance T cell immunity and production of cytokines (Haq *et al.* 1995), natural killer cell and compliment (Mahdi, 1993). It also inhibit some microbe and has anti-helmintic activity against nematodes and cestodes (Agarwal *et al*. 1997). *Nigella sativa* extract has positive effect on leukocytes (Mona *et al*. 2002). Diab *et al*. (2008) argued that it could increase the survival rate and the resistance of fish to some infectious diseases and may enhance the growth performance especially after prolonged application.The present study indicated a positive relation between blood glucose of common carp and Black seed ratio, the same finding recorded in the study of Sebeae,(2006) but in rats, Hassanin and Hassan (1996) showed that when adult male rats treated with 1%, 2% and 10% *Nigella Sativa* in basal diet a sharp increase in blood glucose levels occurred, they stated that these seeds had no hypoglycemic effect. Moraes *et al.* (2003) found that plasma glucose levels were significantly higher in the high fat diet, diet C in the present study contain high levels of fat.While other studies revealed decrease the blood glucose ,in mice and rabbits by *N. sativa* ((Badry *et al*.,1998 ;Meral *et al*.,2004) .It was also established that treatment of rats with the seed extract for up to 12 weeks has been reported a decrease in plasma concentrations of cholesterol, triglycerides and glucose (Ali and Blunden ,2003). Most authors concluded that fish behave like diabetic mammals with respect to blood glucose Hepher, (1988), he mentioned that blood glucose increased in common carp 450 times within an hour after feeding and did not return to its normal values even after five hours. It is concluded that *N. sativa* L. feeding treatment improve growth of common carp at low doses, but increase blood glucose.

References

Abdelhamid, A. M. , M. F. I.Salem and A. E.Tolan. 2005. Utilization of black seed meal
(*Nigella sativa)* in Nile tilapia *(Oreochromis niloticus)* diets. J. Agric., Res. Tanta Univ.,31(3): 403- 419 .
Abd El-Latif, S. A., A. T.El-Yamany and A. F.Edaly. 2004. Evaluation of using different levels and sources of medicinal herbs in growing Japanese quail diets. Egypt. J. Nutr. AndFeed, 7(1) : 69-81 .
Abd Elmonem, A., S.M.M.Shalaby and El Dakar, A.Y. 2002. Response of red tilapia to different levels of some medicinal plants by-products black seed and roquette seed meal.

Proceeding, of the 1st Scientific Conference on Aquaculture 13-15 December 2002, El Arish, Egypt.

Aboul-Foutoh, G. E., S. A.Allam, E. I.Shehata and S. N.Abd El-Azeem. 1999. Effect of some medicinal plants as feed additives on performance on growing sheep . Egyptian J. Nutrition and Feeds , 2:79 .

AbouZied, R.M. 1998. Evaluation of some medicinal plants as a feed additive in diets of Nile tilapia (*Oreochromis niloticus*). M.Sc., Faculty of Agriculture, El-Fayoum, Cairo University.

Agarwal R., M. Kharya and R.Shrivastva.1997. Antimicrobial and antihelmenthic activities of the essential oil of *Nigella sativa*. Indian J. Exp. Biol., 17: 1264 – 1265.

Ali,B.H.and G.Blunden.2003. Pharmacological and toxicological properties of *Nigella sativa*.
Phytother Res.17(4):299-305.

Ali, M. F. , M. S.Saleh , N. M.Eweedah and S. A.Mahmoud. 2005. Effect of using chamomile
(*Mtricaria chamomilla*) flowers as feed additives on performance of growing lambs underdesert farming systems . Egyptian J. Nutrition and Feeds , 8 (2) : 127-137 .

AOAC 1990. Official methods of analysis of the association of official analytical chemists. 15th edn, Association of official analytical chemists, Virginia, USA.Atwa, A.M. 1997. Evaluation of the nutritive value of black seed meal (*Nigella sativa*) diets of Nile tilapia (*Oreochromis niloticus*, Trewavas) M.Sc., Faculty of Agriculture, Alexandria University.

Badary,O.A.,O.A.Al-Shabanah,M.N Nagi,A.M.Bekairi and M.A.El-Mazar 1998.Acute and sub- chronic toxicity of thymoguinone in mice. Drug-Development Research, 44(2-3):56-61.

Diab ,A. S., M. A.Salah, J.George, A. H.Yasser and F. M.Mohamed 2002.Effect of Some Local
Immunostimulants on the Survival, Growth Performance and challenge infection of *Oreochromis niloticus.*

Diab ,A. S., M. A.Salah, J.George, A. H.Yasser and F. M.Mohamed .2008. Effect of garlic, black seed and Biogen as immunostimulants on the growth and survival of Nile tilapia, *Oreochromis niloticus* (Teleostei: Cichlidae), and their response to artificial infection with *Pseudomonas fluorescens*. African Journal of Aquatic Science, 33(1): 63-68.

El-Dakar,A. Y., G.D.Hassanien, S.S.Gad and S.E.Sakr 2008.Use of Dried Basil Leaves as a
Feeding Attractant for Hybrid Tilapia, *Oreochromis niloticus* X *Oreochromis aureus*,
Fingerlings. Mediterranean Aquaculture Journal, 1(1); 35- 44.
Gali-Muhtasib ,H., N. El-Najjar and R. Schneider-Stock 2006. The medicinal potential of black seed (*Nigella sativa*) and its components.Advanced in Phytomedicine,2:133-153.
Haq A., M.Abdullatif, P.Lobo, K. Khabar, K.Sheth and S.Alsedairy 1995. *Nigella sativa* effect on human lymphocytes and polymorphonuclear leucocytes phagocytic activity. Immunopharmacol., 30 (2): 147 – 155.
Hepher, B. 1988. Nutrition of pond fishes. Cambridge Univ. press. 338 pp.
Hassanin, N.I. and Hassan. F.M. (1996) A preliminary study on the effect of *Nigella sativa* L. seeds on hypoglycemia. Vet. Med. J. Giza,44: 699-708.
Khalafalla ,M. M.E. and M. K. Mohsen 2006. Influence of some medicinal plants supplementation as a feed additives on growth and feed utilization in diets of Nile Tilapia (*Oreochromis niloticus*) fingerlings.
http://www.eulc.edu.eg/eulc/Libraries/StaffPapers/StaffPaper.
Khalil, F. F. 1997 . Effect of Aflatoxin B_1 (Af B_1) contaminated diets with and without urbason on performance of Nile Tilapia fry. Egyptian J.Nutrition and Feeds,1:351-368.
Khalil R., B.Nadia Mahfouz and M. Soliman .2001. Effect of Biogen and Levamisol Hcl on the immune response of cultured *Oreochromis niloticus* to *Aeromonas hydrophila* vaccine.
Beni-Suef Vet. Med. J., Egypt, XI (2): 381-392.
Mahdi H. 1993. Effect of *Nigella sativa L.* on the immune system in cirrhotic patients. MDSc,
Fac. Med., El-Azhar University, Egypt.
Meral,I., N. Donmez,B. Belge and M. Kanter .2004. Effect of *Nigella sativa* L. on heart rate and some haematological values of alloxan-induced diabetic rabbits. Scand. J. Lab. Anim. Sci. No. 1(31):49-53 .
Mona Z., G.Rakha, M.Osfor, F.Bayumi and M.Saad 2002. Some clinicopathological and microbiological changes with hypercholestrimia in sheep and a trial of treatment with *Nigella sativa* and Titanium ascorbate. Bull. NRC., Egypt.
Moraes, R.C.; Blandet, A.; Birkenkamp, D.K.; Tirard, J.; Orntoft, T.F.; Gertler, A.; Durand, P. ; Naville, D. and Begeot, M. (2003) Study of the alteration of gene expression in adipose tissue of diet induced obese mice by

microarray and reverse transcription-polymerase chain reaction analyses.

Endocrinology. 144:11, 47734782.

Sebeae,M.E.2006.Effects of energy and protein levels in diets and some medicinal plants on plasma insulin and glucose levels in rats.Ph.D. Thesis,Al-Azhar University, Egypt.

Spss 2008.Spss statistics 17.0 Release 17.0.0 .http://www.winwrap.com/.

مجلة جامعة ذي قار للبحوث الزراعية ، المجلد ١، العدد (٢) ٢٠١٢

دراسة أولية حول تأثير الحبة السوداء (*Nigella sativa*) الغذائية على النمو ومستوى سكر الدم في اصبعيات الكارب الشائع (*Cyprinus carpio*)

[1]عادل يعقوب الدبيكل و[2]بتول حسين المهاوي

و[3]مجدي فيصل مجيد و[2]لقاء وحيد شيال

قسم الأسماك والثروة البحرية، كلية الزراعة، جامعة البصرة، البصرة، العراق[1] ; قسم الأمراض، كلية الطب البيطري جامعة البصرة، العراق[2] ; قسم الأنسجة والتشريح، كلية الطب البيطري، جامعة البصرة، العراق[3]

E-mail: *[1]aaldubakel@yahoo.com ; Majdy2006ad@yahoo.com*

الخلاصة

أن استخدام الإضافات الغذائية في علائق الاسماك من المواد الطبيعية لاغراض مختلفة منها زيادة النمو والنشاط وتحسين مناعة الأسماك اصبح شائعا في السنوات الاخيرة.تم دراسة تأثير مستويات مختلفة (٠ و١ و ٣%) من الحبة السوداء (*Nigella sativa*) على النمو ومستوى سكر الدم في اصبعيات اسماك الكارب الشائع (*Cyprinus carpio*) .كانت نسبة البروتين في العلائق التجريبية 31.16 و 48.80 و % 49.33 **للعلائق الثلاث على التوالي بينما كانت الطاقة الكلية** 441.61 **و** 464.61 **و**475.72 **كيلوسعرة/١٠٠ غم على التوالي.استخدمت تسعة أحواض بلاستيكية سعتها ٣٠ لتر بواقع ثلاث مكررات لكل معاملة وضعت فيها عشرة اسماك وزنها الابتدائي (** 34.63 ±6.51 **غم/سمكة) .غذيت الأسماك لحد الإشباع وجبة واحدة يوميا لمدة ستة أيام في الأسبوع خلال ٥٦ يوما .أظهرت النتائج أن العليقة الحاوية على ١% حبة سوداء ادت لتحسن معدل النمو مقارنة بعليقه السيطرة وعليقة ٣% وكانت الفروقات معنوية (P<0.05) في معدل الوزن النهائي والزيادة الوزنية وغير معنوية (P>0.05) في معدل النمو النوعي ولم تسجل اية وفيات خلال فترة التجربة . اختلف سكر الدم معنويا (P<0.05) بين عليقه السيطرة والعليقة الثانية مقارنة بالعليقة الثالثة التي وجد فيها أعلى قيمة لسكر الدم التي بلغت** 120.88 dl/mm.

الكلمات المفتاحية:سكر الدم ،*Cyprinus carpio* **،النمو، الأسماك ،***Nigella sativa*.