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# POSIBILITY OF USING MEDICINAL PLANTS IN FISH DIETS: III- CRESSON SEEDS

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## ABSTRACT

To study the effect of dietary inclusion of graded levels (0, 1 and 2 %) of Cresson seed meal on Nile tilapia fry performance, a feeding experiment in plastic tanks was conducted in a wet lab. for 16 weeks. The obtained results revealed improving effect of this feed additive (Cresson seed meal, particularly at 1 %) on fish relative growth rate, its feed utilization (feed protein intake, protein productive value, protein efficiency ratio, energy retention). Also, fish carcass ether extract and energy content had increased by this treatment; so, it could be recommend the dietary inclusion of 1 % Cresson seed meal to improve Nile tilapia growth and feed utilization.

**Keywords:** Tilapia – Performance – Composition – Cresson.

## INTRODUCTION

Based on the existing efforts to promote sustainable aquaculture, environmental-friendly processed feeds should be addressed, developed and implemented (Frankic and Hershner, 2003). Because of the rapidly increasing of worldwide aquaculture, aqua feed's supply is less than its demand; so, many efforts are undertaken to overcome this gap. Among these efforts is evaluation of novel feed sources, such recycling some valuable spices and medical plants (El-Saidy and Gaber, 1997; Hassanen, 1998; Gaber, 2000; Logambal *et al.,* 2000; Abd Elmonem *et al.,* 2002; El-Komy, 2006 and Abd El-Hakim, 2008) whether to substitute one of the conventional feed stuffs in a diet or for their attractive or immunostimulatory effects.

Cresson (*Lepidium* sativum) seeds are recommended for the good health and reproduction. *Lepidium sativum* seeds showed the presence of allyl, 2-phenethyl and benzyl glucosinolates. Five new possible benzyl glucosinolate degradation products were detected and evidence is presented that benzaldehyde and benzyl alcohol could be secondary products formed thermally from isothocyanate and thiocyanate, respectively. Benzyl mercaptan and benzyl methyl sulphide also appear to be thermally produced (Gil and MacLeod, 1980). Garden cress (*Lepidium sativum*) is belonging to the family *Cruciferae*. The edible whole seed is known to have health promoting properties. Hence, it was assumed that these seeds can be a functional food or nutraceutical food. The whole meal had 22.5 % protein, 27.5 % fat, 30 % dietary fiber (DF), and 1193 mg % potassium. The most abundant amino acid was glutamic acid (19.3 %) and the essential amino acid; leucine was the highest (8.21 %) and methionine the lowest (0.97 %). The major fatty acid was linolenic acid (30.2%) and low amount of erucic acid (3.9%) was also present (Gokavi *et al.,* 2004). *Lepidium sativum* (Garden

Cress, Family: *Cruciferae*) showed statistically significant improvement in various parameters of pulmonary functions in asthmatic subjects. Also significant improvement was observed in clinical symptoms and severity of asthmatic attacks (Paranjape and Mehta, 2006). The present research aimed to evaluate the effect of graded dietary levels of Cresson on fish performance.

## MATERIALS AND METHODS

Feeding experiment was conducted to evaluate the dietary inclusion of dried seed meal of Cresson (*Lepidium* sativum) concerning growth performance, carcass composition and feed utilization of Nile tilapia, *Oreochromios niloticus,* fry for 16 weeks. The experimental system consisted of 9 plastic tanks (16 liter water), each tank was continuously supplied with a compressed air from an electric compressor (Shenzehe Company BS410). Dechlorinated tap water was used to change one third of the water in each tank every day. Water was aerated before be used for about 24 hours to remove chlorine.

**Experimental fish:** A group of Nile tilapia *O. niloticus* with an average initial body weight of 0.28 – 0.30 g was obtained from a private farm at Al-Hamoul, Kafr El-Sheikh governorate, Egypt, and transported to the wet lab., then maintained in these tanks for 2 weeks before the beginning of the experiment for acclimatization purpose. The fish were fed during the acclimatization period on the basal diet (30% crude protein) at a rate of 20% of the body weight daily, at 2 times daily. The experimental treatments were tested at three tanks (replicates) for each**.** Fish were stoked at a density of 7 fish / tank.

**Experimental diet:** Dried seed meal of Cresson (*Lepidium sativum***)** was added at levels of 0, 1 and 2 **%** to Nile tilapia fish diets. All feedstuffs used in the experimental dies were purchased from the local market. The basal diet No.1 was considered as a control. Composition and chemical analysis of the basal and experimental diets are presented in Table 1. The composition of the vitamins and minerals mixture is presented in Table 2.

**Experimental procedures:** The experiment continued for 16 weeks. During the experimental period, the fish were fed the experimental diets at a rate of 20% of the live body weight daily. The diet was introduced twice daily, at 8 a.m. and 2 p.m. The amount of food was adjusted weekly based on the actual body weight changes. Samples of water were taken from each aquarium to determine water quality parameters. Light was controlled by a timer to provide a 14 h light: 10 h dark as a daily photoperiod.

**Analytical methods:** Samples of water from each aquarium were taken to determine the water temperature, pH value, and dissolved oxygen (DO) concentration according to Abdelhamid (1996). Water temperature in degree centigrade was recorded every day by using a thermometer. The pH value of water was measured daily using an electric digital pH meter (Jenway Ltd, model 350-pH meter). Dissolved oxygen concentration was determined weekly using an oxygen meter model **(**d-5509**).**

**Table 1: Composition (%) and chemical analysis (% on dry matter bases) of the experimental diets.**

| Ingredient | Diet No. 1 Control | Diet No.2 *Lepidium sativum* (1%) | Diet No.3 *Lepidium sativum* (2%) |
|---|---|---|---|
| Fish meal | 7 | 7 | 7 |
| Soybean meal | 50 | 50 | 50 |
| Yellow corn | 23 | 22 | 21 |
| Wheat bran | 15 | 15 | 15 |
| Cresson % | 0 | 1 | 2 |
| Sunflower oil | 2 | 2 | 2 |
| Vitamins & minerals | 3 | 3 | 3 |
| Chemical analysis | | | |
| Dry matter (DM) | 90.01 | 89.87 | 89.93 |
| Crude protein (CP) | 29.61 | 29.91 | 29.31 |
| Ether extract (EE) | 4.94 | 5.02 | 5.05 |
| Ash | 4.74 | 4.61 | 4.56 |
| Crude fiber (CF) | 10.16 | 9.95 | 10.44 |
| Nitrogen free extract (NFE) | 50.55 | 50.51 | 50.64 |
| Gross energy (GE)* (kcal/100 g DM) | 420.96 | 425.63 | 421.10 |
| Protein/energy (P/E) ratio (mg CP/kcal GE) | 70.33 | 70.27 | 69.60 |
| Metabolizable energy (ME)** (kcal/100g) | 349.73 | 353.20 | 349.52 |

*GE (kcal/100 g DM) = CP x 5.64 + EE x 9.44 + NFE x 4.11 calculated according to (Macdonald *et al.*, 1973)

**ME (kcal/100g DM) = Metabolizable energy was calculated by using factors 3.49, 8.1 and 4.5 kcal/g for carbohydrates, fat and protein, respectively according to Pantha (1982).

**Table 2: Composition of the vitamins and mineral mixture* (calculated for each kg of the mixture) in the diet.**

| | |
|---|---|
| Vitamins: | |
| A | 5.714.286 IU |
| $D_3$ | 85.714 IU |
| E | 7.143 mg |
| $K_3$ | 1.429 mg |
| $B_1$ | 571 mg |
| $B_2$ | 343 mg |
| $B_6$ | 571 mg |
| $B_{12}$ | 7.143 µg |
| C | 857 µg |
| Biotin | 2.857 mg |
| Folic acid | 86 mg |
| Pantothenic acid | 1.143 mg |
| Minerals: | |
| Phosphorus | 28.571 mg |
| Manganese | 68.571 mg |
| Zinc | 51.429 mg |
| Iron | 34.286 mg |
| Copper | 5.714 mg |
| Cobalt | 229 mg |
| Selenium | 286 mg |
| Iodine | 114 mg |
| Inert essential agent: | |
| Starch | 57 g |
| Natural. H. | 29 g |
| $CaCo_3$ | Up to 1000 g |

*: Multi Vita Co. Animal Nutrition, 6 October city, 2nd

Determination of DM, CP, EE, CF, and ash in the diets and in fish body at the start and at the end of the experiment for different groups were carried out according to the methods of A.OA.C. (1990). At the end of the experiment, three fish were derived from each group (tank) for drying at 60ºC for 48 hours and then milled through electrical mill and kept at 4$^{o}$C until analysis.

**Growth performance and efficiency of feed and protein utilization:** The growth performance and feed utilization parameters were calculated according to the following equations:

**Average weight gain** (AWG, g/fish) = Average final weight (g)-Average initial weight (g)**.**

**Average daily gain** (ADG, mg/fish) = (Average final weight (g)-Average initial weight (g)) 1000 / Time (day).

**Survival rate** (SR %) = Total number of fish at the end of the experiment×100/total number of fish at the start of the experiment. **Relative growth rate** (RGR) = Average weight gain (g) / Average initial weight (g).

**Specific growth rate** (SGR, % / day) = 100 [ln $wt_1$- ln $wt_o$] /T.

**Where:** ln: Natural log. $Wt_o$: Initial weight (g), $Wt_1$: Final weight (g), and T: Time in days.

**Feed conversion ratio** (FCR) = Total feed consumption (g) /Weight gain (g).

**Protein efficiency ratio** (PER) = Body weight gain (g)/protein intake (g)**.**

**Protein productive value (**PPV %) = 100 [Retained protein (g)/protein intake (g)].

**Energy retention** (ER %) = 100 [Retained energy (Kcal) / Energy intake (Kcal).

**Statistical Analysis:** The data were statistically analyzed by using general linear models procedure adapted by SAS (1996) for users guide. Means were separated using Duncan's multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

**Water quality:** Water quality parameters measured (temperature, pH value and dissolved oxygen) did not differ among treatments (Table 3). Values of the measured criteria were within the normal-suitable ranges for rearing Nile tilapia fish (being 24 – 26 ºC, 7.5 – 8.5, and 5 – 6 mg/l, respectively) according to Abd El-hakeim et *al*. (2002) and Abdelhamid (2003).

**Table 3: Ranges of some water quality parameters of the experimental fish tanks.**

| Parameter | Treatment | | |
|---|---|---|---|
| | Control | *Lepidium sativum* (1%) | *Lepidium sativum* (2%) |
| Temperature, ºC | 24 - 26 | 24 - 26 | 24 - 26 |
| PH value | 7.5 – 8.5 | 7.5 – 8.5 | 7.5 – 8.5 |
| DO, mg/l | 5 - 6 | 5 - 6 | 5 - 6 |

**Growth performance:** Tables 4 and 5 illustrate the means of the tested growth performance parameters. The dietary inclusion of *Lepidium sativum* (particularly at 1 % level) improved each of final weight (FW), average weight

gain (AWG), and average daily gain (ADG) but not significantly (P≥0.05) as presented in Table 4. Yet, 1 % *Lepidium sativum* including diet significantly (P≤0.05) increased relative growth rate (RGR) and 2 % *Lepidium sativum* increased specific growth rate (SGR) significantly (P≤0.05) as given in Table 5. Meanwhile, there were no significant (P≥0.05) differences among treatments in the survival rate (SR). Abd Elmonem *et al*. (2002) reported significant improvements in growth performance and feed utilization in red tilapia fed diets containing 6% black seed meal or 3% roquette seed meal comparing with control. Similar results were obtained when Abd El-Hakim (2008) fed brood stock tilapia fish on licorice or ginger included diets that improved fry performance. Since addition at a level of 1% led to better final weight, gain, SGR, survival and feed conversion. Moreover, Attalla (2009a) mentioned also that feeding with a mixture of ginger (powder and oil extract) can promote all growth parameters and decrease mortality rate of Nile tilapia. These positive effects of most feed additives are due to their active pharmacological (medical) substances.

**Table 4: Means of fish body weights and gains as affected by the dietary additive.**

| Treatment | I W, g / fish | F W, g / fish | AWG, g / fish | ADG, mg / fish |
|---|---|---|---|---|
| Control | 0.20 | 2.0 | 1.79 | 14.98 |
| *Lepidium sativum* (1%) | 0.20 | 2.31 | 2.14 | 19.10 |
| *Lepidium sativum* (2%) | 0.20 | 2.24 | 2.04 | 18.21 |

**IW: initial weight, FW: final weight, AWG: average weight gain, ADG: average daily gain.**

**Table 5: Means of fish growth rates and survival rate as affected by the dietary additive.**

| Treatment | RGR | SGR, %/d | SR% |
|---|---|---|---|
| Control | $8.95^{b}$ | $206^{ab}$ | $100^{a}$ |
| *Lepidium sativum* (1%) | $10.70^{a}$ | $1.37^{b}$ | $100^{a}$ |
| *Lepidium sativum* (2%) | $10.20^{ab}$ | $2.16^{a}$ | $100^{a}$ |

***Means (in the same column) superscripted with different letters differ significantly (P≤0.05).**

**Feed utilization:** Addition of *Lepidium sativum* leaves meal significantly (P≤0.05) improved each of protein productive value (PPV), protein efficiency ratio (PER), and energy retention (ER) comparing with the control (0 % *Lepidium sativum*); yet, there were non-significant (P≥0.05) differences among treatments in feed intake, feed conversion ratio (FCR) or protein intake as presented in Table 6. El-Dakar (2004) and El-Dakar *et al*. (2004) found that 0.5% of either caraway or fennel seeds' meals, respectively gave the best palatability index, growth performance, feed and nutrients utilization, and profit index for tilapia fish comparing with the other addition levels and the control.Similar results were obtained when Abd El-Hakim (2008) fed brood stock tilapia fish on licorice or ginger included diets, that improved survival rate and led to better feed utilization (to produce 1000 fry). However, Dietary inclusion of medicinal plants (garlic, El-Saidy and Gaber, 1997; onion and garlic, Zaki and El-Ebiary, 2003; *Allium sativum* and *Thymus vulgaris,*

Attalla, 2009b) often increases fish performance, nutrients utilization, and chemical composition.

**Table 6: Means of feed utilization parameters by fish as affected by the dietary additive.**

| Treatment | Feed Intake, g/fish | FCR | Protein Intake, g/fish | PPV% | PER | ER % |
|---|---|---|---|---|---|---|
| Control | 12.75[a] | 7.01[a] | 3.77[a] | 19.43[b] | 0.47[b] | 29.95[c] |
| *Lepidium sativum* (1%) | 14.17[a] | 6.70[a] | 4.19[a] | 20.51[a] | 0.49[a] | 49.04[a] |
| *Lepidium sativum* (2%) | 13.72[a] | 6.72[a] | 4.06[a] | 20.90[a] | 0.50[a] | 46.21[b] |

***Means (in the same column) superscripted with different letters differ significantly (P≤0.05).**

**Carcass composition:** Tables 7 and 8 illustrate the data of proximate analysis of the fish before and after carrying out of the experiment, respectively. At the end of the experiment, the dry matter (DM) and crude protein (CP) percentages increased but the ether extract (EE) and ash contents decreased comparing with the analysis before the start of the experiment. However, the dietary inclusion of *Lepidium sativum* leaves meal significantly (P≤0.05) increased each of EE and energy content (EC) but decreased the DM content of the fish body (Table 8) comparing with the control (0 % *Lepidium sativum* leaves meal). Table 8 presents also a negative relationship between CP and EE. A negative relationship between crude proteins and crude fats in the chemical composition of Nile tilapia fish was reported before (Goda, 2002; Magouz *et al.,* 2002; El-Ebiary and Zaki, 2003 and Abdelhamid *et al.,* 2007).

**Table 7: Chemical composition (% on dry matter basis) of the experimental fish at the start.**

| Composition | % |
|---|---|
| DM | 18.75 |
| CP | 40.84 |
| EE | 25.81 |
| NFE | 16.21 |
| Ash | 17.14 |

**Table 8: Means* of chemical composition (% on dry matter bases) of Nile tilapia carcass as affected by the dietary treatments.**

| Treatment (No.) | DM % | Proximate analysis | | | |
|---|---|---|---|---|---|
| | | CP | EE | Ash | EC**, kcal /100g |
| Control | 27.66[a] | 56.90[a] | 15.54[b] | 10.67[a] | 554.8[c] |
| *Lepidium sativum* (1%) | 26.60[a] | 55.64[a] | 22.29[a] | 10.54[a] | 624.4[b] |
| *Lepidium sativum* (2%) | 20.91[b] | 57.83[a] | 21.48[a] | 10.70[a] | 648.8[a] |

***Means (in the same column) superscripted with different letters significantly (P≤0.05) differ.**

****EC: Energy content calculated according to Macdonald *et al.* (1973).**

## REFERENCES

Abd el-hakim, a. E. (2008). Effect of type of diet on productive and reproductive performance of nile tilapia reared on commercial scale. Ph. D. Thesis, fac. Of agric., fayoum univ.

Abd el- hakim, n. F.; bakeer m.n. And soltan m.a. (2002). Water environment for fish culture. Deposition no.: 4774, isbn: 977-298-228-5.

Abdelhamid, a. M. (1996). Field and laboratorial analysis in animal production. Dar annashr for universities, cairo, deposit no. 11318/1996, isbn: 977- 5526-04-1, 680 p.

Abdelhamid, a.m. (2003). Scientific fundamentals for fish production and management, 2nd rev. Ed., deposit no. 15733/2003, mansoura univ. Press.

Abdelhamid, a. M.; el-fadaly, h. A. And ibrahim, s. M. (2007). Integrated aquaculture by bearing ducks on earthen fish ponds. Engormix. Com. Aquaculture technical articles.

Abd elmonem, a. I.; shalaby, s. M. M., and el-dakar, a.y. (2002). Response of red tilapia to different levels of some medical plants by-products: black seed and roquette seed meals. Proc. 1st sc. Conf. Aqua., el-arish, 13-15 dec., pp: 247-260.

A.o.a.c. Association of official agricultural chemists (1990). Official methods of analysis. 15th ed. Published by the a.o.a.c., benjamin francklin station, washington. D.c., usa.

Attalla, r. F. (2009a). Growth response and physiological activities of the nile tilapia (*oreochromis niloticus*) fed basal diets supplemented with ginger (*zingiber officinale*) as natural growth promoters. Egypt. J. Aqut. & fish., 13 (4): 85-107.

Attalla, r. F. (2009b).influence of some feed additives on growth rates and physiological measurements of blue tilapia (*oreochromis aureus*). Egypt. J. Of aquatic research, 35 (2): 231-241.

Duncan, d.b. (1955). Multiple ranges and multiple f-tests. Biometrics, 11: 1-42.

El-dakar, a. Y. (2004). Growth response of hybrid tilapia, *oreochromis niloticus x oreochromis aureus*, fingerlings to diets supplemented with different levels of caraway seeds. J. Agric. Sci. Mansoura univ., 29 (11): 6083-6094.

El-dakar, a. Y.; shalaby, s. M. M., abd elmonem, a. I. And wahbi, o. M. (2004). Enhancement of growth performance of *oreochromis niloticus* using fennel seed meal as feed additive. J. Egypt. Acad. Soc. Environ. Develop., (b-aquaculture), 5 (2): 43-67.

El-ebiary, e.h. And zaki, m.a. (2003). Effect of supplementing active yeast to the diets on growth performance, nutrient utilization, whole body composition and blood constituents of mono-sex tilapia (*oreochromis niloticus*). Egypt. J. Aquat. Biol. & fish., 7(1): 127 – 139.

El-komy, h. M. A. I. (2006). Utilization of some non-conventional feedstuffs and food processing by-products in the diet of nile tilapia. Ph. D. Thesis, fac. Of agric., kafr el-sheikh univ.

El-saidy, d.m.s.d. And gaber, m.m.a. (1997). Effect of different levels of dry garlic meal supplemented to the diets on growth performances, survival and body composition of nile tilapia (*oreochromis niloticus*) fingerlings. Annals of agric. Sc., moshtohor, 35 (3): 1197-1209.

Frankic, a. And hershner, c. (2003). Sustainable aquaculture: developing the promise of aquaculture. Aquaculture international, 11: 517-530.

Gaber, m. M. (2000). Growth response of nile tilapia fingerlings (*oreochromis niloticus*) fed diets containing different levels of clove oil. Egypt. J. Aquat. Biol. & fish., 4 (1): 1-18.

Gil, v. And macleod, a. J. (1980). Studies on glucosinolate degradation in *lepidium sativum* seed extracts. Phytochemistry, 19 (7): 1369–1374.

Goda, a. M. A. (2002). The influences of n6/n3 dietary fatty acid ratio on growth performance and body fatty acid composition of nile tilapia (*oreochromis niloticus*). Vet. Med. J. Giza, 50(1): 33 – 45.

gokavi, s. S.; malleshi, n. G. And guo, m. (2004). Chemical composition of garden cress (*lepidium sativum*) seeds and its fractions and use of bran as a functional ingredient. Plant foods for human nutrition (formerly qualitas plantarum), 59 (3): 105-111.

Hassanen, g. D. I. (1998). Lupin seed meal compared with soybean meal as partial substitutes for fish meal in gilthead sea bream (*sparus aurata*) diets. J. Agric. Sci. Mansoura univ., 23 (1): 141-154.

Logambal, s. M.; venkatalakshmi, s. And michael, r. D. (2000). Immunostimulatory effect of leaf extract of *ocimum sanctum* linn. In *oreochromis mossambicus* (peters). Hydrobiologia, 430: 113-120.

Macdonald, p., edwards, r.a. And greenhalgh, j.f.d. (1973). Animal nutrition, 2nd ed., longman, london.

Magouz, f.i., mohsen, m. K. And gooda, a. H. (2002). Effect of including some biological feed additives in the diet on growth performance and feed efficiency of nile tilapia (*oreochromis niloticus*). Proc. 2nd conf. Foodborne contamination and egyptians' health, april 23 – 24, el-mansoura univ., pp: 329 – 339.

Pantha, b. (1982). The use of soybean in practical feeds for tilapia niloticus. M. Sc. Thesis. Univ. Of stirling.

Paranjape, a. N. And mehta, a. A. (2006). A study on clinical efficacy of *lepidium sativum* seeds in treatment of bronchial asthma. Iranian journal of pharmacology & therapeutics (ijpt), 6 (4): 330-335.

Sas (1996). Sas/stat guide for personal computer. Sas inst. Cary, n. C.

Zaki, m. A. And el-ebiary, e. H. (2003). Effect of incorporation of onion and garlic into diets on growth performance and body composition of mono-sex nile tilapia (*oreochromis niloticus*). Egypt. J. Aquat. Biol. & fish., 7 (1): 113-126.

**إمكانية استخدام النباتات الطبية فى علائق الأسماك:**
**3- بذور نبات حب الرشاد**

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لدراسة تأثير احتواء عليقة ذريعة أسماك البلطى النيلى على مستويات متدرجة (صفر، 1، 2 %) من مسحوق بذور حب الرشاد، افردت تجربة معملية فى أحواض بلاستك لمدة 16 أسبوعا لدراسة مدى تأثر أداء السماك بهذه المعاملات الغذائية، وخلصت النتائج المتحصل عليها الى أن العلائق المحتوية على مسحوق بذور حب الرشاد (خاصة المحتوية على 1 %) قد حسّنت معنويا من معدل النمو النسبي السمك، واستفادته الغذائية (استهلاك بروتين العلف، كفاءة البروتين الإنتاجية، معدل كفاءة البروتين، وتخزين الطاقة)، كما زادت معنويا من محتوى جسم السمك من الدهون والطاقة، لذا ينصح باحتواء علائق أسماك البلطى النيلى على 1 % من مسحوق بذور حب الرشاد لتحسين النمو والاستفادة الغذائية.

**قام بتحكيم البحث**

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