

## EFFECTS OF USING VARIOUSLY PROCESSED CULBAN GRAINS AS A PARTIAL SUBSTITUTE FOR SOYBEAN MEAL ON GROWTH OF *CYPRINUS CARPIO* L.

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### ABSTRACT

The objective of this study is to improve the nutritional value of Culban *Vicia peregrina* using four different methods: soaking in water for 12 hours, cooking for 40 minutes, roasting for 15 minutes, and germination for 7 days to reduce the effects of anti-nutritional. For 56 days, soybean meal was utilized to replace the grains treated by the abovementioned procedures by 40% ( T3, T5 T7 and T9) and 20% (T4, T6 and T8) in the diets for common carp *Cyprinus carpio* L., as well as a control diet comprising 30% of soybean meal (T1). The results of the statistical analysis showed the superiority of the fed fish the T7 significantly ( $P \leq 0.05$ ) in the criteria of TLW, TG and DWG. The fed fish outperformed the T4, T5 and T6 significantly in the criteria of RGR and SGR compared to the control diet (T1). The best FCR and FER were obtained in the T6 and T7, which differed significantly from the T1. With the exception of treatments T2, T7, and T9, the fed fish performed significantly better than all other treatments in the PPV criterion. It can be concluded in present study the substituting culban seeds heated or biologically (germination technique) processed could replace up to 40% of the soybean meal.

**Keywords:** soaking, cooking, roasting, *Vicia Peregrina*, carp  
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تأثير استخدام حبوب الكلبان المعالجة بطرائق مختلفة كبديل جزئي لفول الصويا على نمو الكارب الشائع

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المستخلص:

هدفت الدراسة تحسين القيمة الغذائية القيمة الغذائية لحبوب الكلبان *Vicia peregrina* Culban ، باستخدام اربعة طرائق بالنقع في الماء لمدة 12 ساعة و الطهي لمدة 40 دقيقة والتحميص لمدة 15 دقيقة والانبات لمدة 7 أيام لخفض الاثار السلبية لمضادات التغذية. إذ تم استبدال الحبوب المعاملة بالطرق المذكورة اعلاه بكسبة فول الصويا في علائق الكارب الشائع *Cyprinus carpio* بنسبة 40% (المعاملات T3 و T5 و T7 و T9 ) وبنسبة 20% (المعاملات T2 و T4 و T6 و T8) وعليقة سيطرة تحتوي على 30 % من كسبة فول الصويا (T1) و لمدة 56 يوما. بينت نتائج التحليل الاحصائي تفوق الاسماك المغذاة على T7 معنوياً ( $P \leq 0.05$ ) في معايير TLW و TWG و DWG . تفوقت الأسماك المغذاة على المعاملات T4 و T5 و T6 معنوياً في RGR و SGR مقارنة بعليقة السيطرة (T1). تم الحصول على أفضل قيمة لمعياري FCR و FER في المعاملتين T6 و T7 والتي اختلفت معنوياً عن عليقة السيطرة (T1) . ارتفعت صفة PER معنوياً عند تغذية الأسماك على المعاملتين T6 و T7 مقارنة بمعاملة السيطرة. تفوقت الاسماك المغذاة على جميع المعاملات معنوياً في معيار PPV ( باستثناء المعاملات T2 و T7 و T9) معنوياً عن معاملة السيطرة. يمكن ان نستنتج من الدراسة الحالية امكانية استبدال 40 % من كسبة فول الصويا ببذور الكلبان المعاملات وفق الطرق الفيزيائية (الحرارة) او الحيوية (تقنية الانبات).

الكلمات المفتاحية: النقع، الطبخ، التحميص، *Vicia Peregrina* , كارب

\*جزء مستل من اطروحة الدكتوراه للباحث الاول.

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## INTRODUCTION

Common carp *Cyprinus carpio*, one of the most important species, in culture fish that has numerous biological features suitable for culture (12). One of them, it is an omnivorous fish, means it chooses animal-based food, e.g., aquatic insects, worms, mollusks and zoobenthos, also zooplankton in the upper and middle of the water (13). Another characteristic for common carp fish is that their resistance is strong against environmental changes. Aquaculture production for farmed aquatic animals expanded on average at 5.3 % per year in the duration between 2001–2018, while the growth was 4 % in 2017 and only 3.2 % in 2018 (10). One of the most important legume crops in the world is soybeans. Soybean meal (SBM) is now the commonly used plant protein source in fish feeds and reaches 50% freshwater omnivorous fish species diet (23). SBM and soybean oil in many countries enter into feed formulation, for that it must be imported to meet the needs of the industry of animal feed. Increasing the cost of protein sources, their restricted availability and their unpredictability of their markets, makes researchers look for the need for alternative sources of protein in the fish feed industry (5). The genus vetch (*Vicia*) belongs to the Fabaceae family, about 200 species are known (15). Chiefly located in Europe, Asia and North America, extending to temperate South America and tropical East Africa. Culban *Vicia peregrina*, a pea is one species of the *Vicia* genus commonly and abundant in the southern Mediterranean of Turkey, contains of amino acids in Culban grains 1.08% methionine, 1.63% lysine and 0.64% tyrosine on a dry matter basis (6). Due to the presence of anti-nutritional elements like  $\beta$ -cyanoalanine, anavanine, protease inhibitors, lectine, tannins, vaccines and convicine, which adversely influenced the growth and food utilization for monogastric animals, high levels of vetch are not typically used in the diets of these animals(7). Many studies have been conducted to determine whether soaking vetch will increase its nutritional content; autoclaves, cooking and treatments with acetic acid and sodium bicarbonate (17). In previous study, the antinutritional factors in Culban *Vicia peregrina* grains reduced by physical and

biological processing (germination) and for all, most antinutritional agents (hydrogen cyanide, phytic acid, and trypsin Inhibitor in Culban grains lowered by roasting, germination and cooking by this improved the nutritional value of the grain. The chemical composition and metabolizable energy contents for culban contain 22.47% crude protein, 1.02% crude fat, 7.86% crude cellulose, 3.76% crude ash, 4.6% sugar, 33.78% starch and 2589.6 kcal apparent metabolic energy kg<sup>-1</sup> (8). Rambling vetch seeds contain small amounts of toxic compounds. (16).The objective of this study is to improve the nutritional and functional impacts of Culban grains on growth parameters and food utilization of common carp fish by reducing the antinutritional factors in Culban grains through various processes.

## MATERIALS AND METHODS

**Feeding experiment:** This study was carried out in the Fish Laboratory of the Department of Animal Production at the College of Agricultural Engineering Science / University of Duhok for a period of 56 days, Culban grains soaking for 12 hours, cooking for 40 minutes, roasting for 15 minutes and germination for 7 days( Table 1) which were chosen based on the percentage reduction attained by reducing the proportion of nutritional inhibitors (trypsin inhibitor and phytic acid) using thermal and biological treatments of Culban grains (1) as well as the outcomes obtained by Mohammad(17, 18) in terms of enhancing the nutritional value of common vetch *V. sativa*. The aforementioned supreme treatments are substituted 20 and 40% by soybean expensive meal to determine which substituting ratio are much more effective in improving the growth parameters of common carp *C. carpio* in plastic aquariums of 70 L. capacity for each treatment by three replicates. Common carp with an initial weight of  $28.5 \pm 1.5$  g. 27 plastic aquaria were distributed for nine treatments. Seven fish were placed in each aquarium before the experiment. The fish were adapted for three weeks in order to acclimatize to the aquarium environment. During the study period, the fish were fed with 3% of their wet body weight for the duration of the research carried out in the Fish Laboratory / College of Agricultural Engineering Science / University of Duhok.

The following is the treatment's label: The number one represents a control ( T1, 30% soybean meal) without Culban grains, while the T2 and T3 represent Culban grains soaking for 12 hours (40 % replacement) and 20% replacement, respectively. The T4 and T5

represent Culban seed cooking for 40 minutes (40 and 20% replacement) respectively, while T6 and T7 represent Culban grains roasting for 15 minutes (40% replacement), and T8 and T9 represent Culban grains germination 7 days (40 and 20% replacement) respectively.

**Table 1. Feed ingredients containing different percentages of Culban *V. peregrina* seeds treated by different methods as a partial substitute for soybean meal**

Diets Ingredients	Treatments								
	control	Soaking for 12 hours		Cooking for 40 minutes		Roasting for 15 minutes		Germination 7 days	
	(0%) T1	(20%) T2	(40%) T3	(20%) T4	(40%) T5	(20%) T6	(40%) T7	(20%) T8	(40%) T9
Fish Meal	10	10	10	10	10	10	10	10	10
Soybean meal	30	24	18	24	18	24	18	24	18
Culban seed	0	10.5	21	10.5	21	10.5	21	10.5	21
Yellow corn	18.5	14.5	10	14.5	10	14.5	10	14.5	10
Local barley	21	20.5	20.5	20.5	20.5	20.5	20.5	20.5	20.5
Wheat bran	18	18	18	18	18	18	18	18	18
Vit.-min. mix.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Salt food	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lime stone	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Bentonite	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

The ingredients of the diet, grinded, weighed, and mixed in a good way. Then a quantity of water was added to the mixture and whisked until it made a dough. The dough was converted to pellets by using a 2mm-die. After that, the pellets dried in the sun. The diets are put in packages and stored for use. Approximately 20-25% of the amount of water in the plastic aquariums is replaced daily with pure water.

#### Physical and chemical of reared water

In aquaculture, water quality is crucial. The best water quality is essential for the growth of fish since it lessens stress for the fish and

avoids the spread of diseases (12).The aquarium water temperature was kept between 24°C and 28°C and the amount of dissolved oxygen was recorded daily to be continuously more than 5-6 mg/L as well as pH is recorded daily to keep it around neutral conditions. So, these parameters are within the appropriate limits for warm-water fish growth.

**Chemical analysis:** Use of standard methods defined by the Association of Official Analytical Chemists for the major chemical components of diets and the edible portion of fish fed on different experimental diets (Table 2).

**Table 2. Chemical composition components for the experimental diets (% DM)**

Diets Criteria	Treatments								
	Contro l	Soaking for 12 hours		Cooking for 40 minutes		Roasting for 15 minutes		Germination 7 days	
	(0%) T1	(20%) T2	(40%) T3	(20%) T4	(40%) T5	(20%) T6	(40%) T7	(20%) T8	(40%) T9
Crude protein	26.4	26.5	26.7	26.1	25.8	26	25.8	26.4	26.2
Ether extract	3	2.9	2.8	3.4	3.1	3.3	3	3.1	3
fiber	3.5	3.2	3.5	3.8	4.8	4.5	4.1	4.3	4.7
Ash	3.6	4.7	4.4	4.1	4.2	4.3	4.3	4.4	4.4
(NFE)*	63.5	62.7	62.6	62.6	62.1	61.9	62.8	61.8	61.7
ME** (MG/KG)	14.7	14.5	14.5	14.6	14.4	14.5	14.4	14.5	14.4

\*Nitrogen-Free Extract. \*\* ME = (Protein x 18.5) + (Fat x 33.5) + (NFE x 13.8) .

**Growth criteria:** At the end of the experiment, the growth parameters are measured as Final Weight, Weight Gain (WG), Daily Weight Gain (DWG), Relative Growth Rate (RGR), Specific Growth Rate (SGR), Feed Conversion Ratio (FCR), Feed Efficiency Ratio (FER), Protein Efficiency Ratio (PER)

and Protein Productive Value (PPV) According to Al-Khshali and Saleh(3).

**Statistical analysis:** To identify significant differences between treatments, data were analyzed using one-way analysis of variance (ANOVA) followed by a general linear model (GLM) procedure at 0.05. Significant differences between treatment means were

tested using the Duncan method. Descriptive statistics were calculated for each parameter. All statistical analysis has been performed using SAS software.

## RESULTS AND DISCUSSION

**Growth parameters:** The results of the statistical analysis recorded in Table (3) showed the superiority of fish fed on the seventh ration containing Culban grains treated by roasting for 15 minutes instead of 40% of soybean meal significantly ( $P \leq 0.05$ ) in the final weight, weight gain criterion (g/fish) and the daily growth rate (g/fish/day) were 41.30, 11.85 and 0.211 respectively, compared to the control diet, which amounted to 39.89, 10.33 and 0.1844 for the above traits, respectively. No significant differences ( $P \leq 0.05$ ) were recorded between the different treatments for the control diet in the criteria of qualitative growth and relative growth except for the T8 (Table 3). Abdulhalim and Mohammad (1) showed that the roasting process comes in second place after germination in reducing the cyanogen content in the Culban grains. But cooking the seeds of *V. peregrina* for 40 minutes is also active like roasting to reduce cyanogen content to 60%. Vetch has a higher nutritional value after cooking. The techniques used by Daree *et al.* (9) study resulted in a significant drop in the percentage of Cyanoalanine, which reached nil (less than 0.006%), as well as positive impacts on the growth parameters of diet eight (30% cooking vetch). The cyanogen complex can be eliminated or depressed in large quantities of resources by soaking in water for 24 hours despite being heat resistant. This may be due to the fact that the grains which cooked also contain the essential sulphur amino acids in addition to arginine (9). According to Abdulhalim and Mohammad (1), soaking for 12 and 24 hours, respectively, caused the hydrogen cyanide content of crude common vetch to drop from 62.6 mg/kg to 12.35 and 8.45 mg/kg. Germinated has a significant impact on some antinutritional components and the nutritional digestibility of fish diet. For the mung bean *Phascolus aureus*, cowpea *Vigna catjang*, lentil *Lens culinaris* and chick pea *Cicer arietinum*, germination caused significant increases in protein and thiamine levels. Similarly, enzyme activities (phytase,

amylase and protease) increased significantly and reached a peak during the development of germination up to 72 hours. The germination inactiveness in improving nutritional value of Culban return to the presence of food inhibitors as tannins and phytic acid that form complexes with and hinder the work of digestion enzymes (17). Mohammad (18) found that germination of *Vicia sativa* for 5 and 7 days improved most growth parameters of common carp *Cyprinus carpio* L. and supreme over the crude *Vicia sativa* diet. Al-Chalaby (2) results showed that faba bean meal could be incorporated up to 24% in common carp diets of which agreed with a reduction of 20% soybean meal in the control diet without making concessions in growth or feed conversion ratio. Increasing the level of common vetch and Culban *Vicia peregrine* up to 45 and 40% in diet as substitute of soybean meal, using heat treatment to improve their nutritional values and applied in mirror carp and common carp diet respectively in successful manner (22). Aroyehun *et al.* (4) found that *Oreochromis niloticus* fish performance was affected by the amount of toasted mesquite seed meal in the diet. Toasted mesquite meal used as partial (10 -15 %) replacement of soybean meal in the diet fish did not make a negative change in the fish growth. Yanar *et al.* (22) reported that growth parameters and feed utilization were similar in all experimental groups and terminate Culban grains can be successfully used as an inexpensive plant protein source at minimum up to a level of 30% in tilapia fish diets without negative effects on fish performance. Mohammad (18) found that the treatment of common vetch by soaking and cooking led to the possibility of replacing soybean meal by 55 and 80%, respectively, in carp fish. The same researcher indicated that the treatment of common vetch by soaking and cooking made it possible to replace soybean meal in carp fish by 55 and 80 percent, respectively. According to results of Mohammad (18) fish fed a diet containing 45% germinated common vetch seeds for five days had significantly higher results for the following metrics than fish fed a control diet: final body weight, total gain weight, daily weight gain relative growth rate and specific growth rate.

**Table 3. Effect of partial replacement of soybean meal with Culban seed treated by different methods on growth criteria**

Criteria	Diets		Treatments						
	Control	Soaking for 12 h.		Cooking for 40 min.		Roasting for 15 min.		Germination 7 days	
	(0%) T1	(20%) T2	(40%) T3	(20%) T4	(40%) T5	(20%) T6	(40%) T7	(20%) T8	(40%) T9
Initial weight (g/fish)	29.5 ±0.91	28.5 ±0.57	28.6 ±0.17	28.5 ±0.70	28.9 ±0.86	29.6 ±0.33	29.4 ±0.44	29.2 ±0.53	28.8 ±0.65
Final weight (g/fish)	39.89* ±0.36 b	38.4 ±0.38 ed	38.91 ±0.27 cd	39.65 ±0.20 bc	38.75 ±0.41 d	40.17 ±0.26 b	41.30 ±0.20 a	37.63 ±0.2 e	38.11 ±0.23 de
Total weight Gain (g/fish)	10.33 ±0.91 abc	9.87 ±0.39 bcd	10.24 ±0.40 abc	11.13 ±0.88 ab	10.58 ±0.14 abc	10.56 ±0.24 abc	11.85 ±0.33 a	8.38 ±0.32 e	9.28 ±0.45 cd
Daily weight gain (g/fish/day)	0.1844±0.01 abc	0.176±0.07 bcde	0.183±0.007 abc	0.1988±0.01 ab	0.1889±0.002 abc	0.1886±0.004 abc	0.211±0.005 a	0.149±0.005 e	0.1657±0.008 cde
Specific growth rate	0.54 ±0.05 ab	0.53 ±0.02 ab	0.55 ±0.02 ab	0.59 ±0.05 a	0.57 ±0.003 a	0.55 ±0.01 ab	0.60 ±0.02 a	0.45 ±0.02 b	0.50 ±0.03 ab
Relative growth weight	35.18 ±4.26 ab	34.66 ±1.93 ab	35.73 ±1.57 ab	39.24 ±4.07 a	37.54 ±2.27 a	35.69 ±1.14 ab	40.30±1.74 a	28.71±1.64 b	3 2.29 ±2.34 ab

\* Different letters in the same column indicate a significant difference ( $P \leq 0.05$ ).

**Food intake, feed conversion ratio and feeding efficiency ratio:** According to the statistical analysis for food intake, the fish fed on the second and third diets, which contain Culban grains soaked 20 and 40%, as well as the fifth diet, which contains cooked Culban grains 40%, roasted Culban 20%, and eighth diet, which contains germinated Culban 20%, obtained 33.06, 33.21, 33.48, 33.48 and 34.36 g. of food per fish respectively (Table 4). The nutritional value of raw vetch grains leads to an increase in food intake due to improved palatability or removal of negative effects of nutritional inhibitors or toxic compounds that are a negative factor in fish appetite. The feed conversion ratio data revealed a significant reduction in the quantity of fish fed on the eighth and ninth rations, but no noticeable changes were found between the other

experimental rations and the control diet (Table 4). Roasting is the best treatment for removing anti-nutrition, and this was confirmed by the weight growth. The best value of the feed efficiency ratio criterion was reached in the T7, which differed significantly from all other experimental diets (Table 3). Fish fed on the T8 and T9, which contain grain sprouts, show a decline in this criterion. Studies on the impact of germination on dietary fiber in peas have revealed a significant increase in total dietary fiber of nearly 100% during germination. It was noted that alterations in the polysaccharides contained in the cell wall, such as cellulose and mannose, were the main cause of this rise in dietary fiber, which showed that the changes were brought on by an expansion of the plant's cellular structure during germination.

**Table 4. Effect of partial replacement of soybean meal with Culban grains on Food intake, FCR, FER, PER and PPV (Rate ± SE)**

Diets Parameters	Treatment									
	Control	Soaking for 12 h.			Cooking for 40 min.		Roasting for 15 min.		Germination for 7 days	
	(0%) T1	(20%) T2	(40%) T3	(20%) T4	(40%) T5	(20%) T6	(40%) T7	(20%) T8	(40%) T9	
Food intake (g./fish)	38.13 ±0.28 a	33.06 ±0.26 b	33.21 ±0.18 b	36.35 ±0.73 ab	33.48 ±2.58 b	33.48 ±0.74 b	36.05 ±0.55 ab	34.36 ±0.44 b	36.07 ±0.52 ab	
Feed Conversion Ratio	3.75 ±0.29 abc	3.35 ±0.13 bcd	3.28± 0.14 bcd	3.32 ±0.34 bcd	3.16 ±0.21 cd	3.17 ±0.09 cd	3.05 ±0.10 cd	4.11 ±0.17 a	3.91 ±0.23 a	
Feed Efficiency Ratio	27.06 ±2.24 bcd	29.88 ±1.18 ad	30.83 ±1.08 ab	30.73 ±2.91 abc	31.94 ±2.26 ab	32.38 ±0.59 ab	32.90 ±1.11 a	24.43 ±0.99 d	25.77 ±1.59 cd	
Protein Efficiency Ratio (PER)	1.51 ±0.037a bc	1.44 ±0.018 c	1.46 ±0.029 c	1.53 ±0.034 abc	1.49 ±0.033 bc	1.56 ±0.030 ab	1.58 ±0.004 a	1.43 ±0.003 c	1.44 ±0.035 c	
Protein Productive Value (%)	19.50 ±0.057 c	19.56 ±0.033 c	25.76 ±0.466 b	25.73 ±0.088 b	27.86 ±0.033 a	27.56 ±0.120 a	23.26 ±0.066 c	17.06 ±0.088 d	14.50 ±0.173 e	

\*Different letters in the same column indicate a significant difference ( $P \leq 0.05$ ).

**Protein efficiency ratio (PER) and protein productive value (PPV):** The lowering of the feed conversion ratio for the majority of treatments that included heat treatment of Culban grains and germination was a successful outcome. The results shown in Table 4 clearly show that the best food conversion ratio, or lowest value for this criterion, was obtained when fish were fed the seventh diet (20% roasted Culban), which was 3.5. This value was significantly lower ( $P \leq 0.05$ ) than the control diet, which was 3.75, and the T8 and T9, in which the germination technique was used, which were 4.11 and 3.91 respectively. No significant differences were recorded between the seventh treatment and the rest of the other experimental treatments. Within the same context, the value of the feeding efficiency ratio increased in the seventh treatment to reach 32.90%, and the fish fed on the control ration with a significant difference ( $P \leq 0.05$ ) to reach 27.06%, and the fish fed on the eighth and ninth ration, which amounted to 24.43 and 25.77 respectively. Fish fed the seventh diet had a Protein Efficiency Ratio of 1.85, which was significantly ( $P \leq 0.05$ ) higher than the diets that contained soaked grains (diets 2 and 3), as well as the germination of Culban grain (diets 8 and 9), which had values of 1.44 and 1.46, respectively. However, this ratio was not recorded. Significant variations from the other

experimental treatments were represent in Table 4. One of the most important criteria for assessing protein foods is the Protein Productive Value (PPV) criterion. According to the data in Table 4, the fish fed the fifth diet had the best value for this criterion, which was 27.86%, which differed significantly from the value recorded for the control diet (19.50%) and all other experimental diets except the sixth treatment. (27.56%) is that the best treatments for Culban are the fifth and sixth treatments, which enhance the value of this criterion by cooking for 40 minutes and roasting the beans for 15 minutes. The fish fed roasted vetch (seventh diet) performed significantly better in the Protein Efficiency Ratio (PER) criterion than fish fed germinated vetch and soaked vetch, but not significantly better than the control diet. Furthermore, the grains treated with roasting (T6 and T7) outperformed all other experimental diets, including the control, in terms of protein productive value. The decrease in the PER and PPV value of fish fed on germinated grains may be due to the soaked grains. The decrease in the value of PER and PPV for fish fed on germinated grains may be due to the lack of sulfur amino acid in addition to arginine, which may belong to soaking processor which have some conserves like losing soluble vitamins in water like vitamin C and B complex (21). Whereas Buyukcapar and

Kamalak(7) could not enter duce Culban which treated by autoclave (121 C°/15 min.) in mirror carp diet, while Prodanov *et al.*(22) increase percentage for the same grains to 30% after autoclaving and adding 1% lysine and methionine to all diets. The cyanogen's complex is heat resistant but can be removed or depressed in plenty resources by using water soaking for 24 hrs. may be our cooking process effect in grains contain of its essential sulphur amino acids in addition to arginine (9). Similar outcomes were in agreement with the study's finding that up to 30% of the common vetch in Nile tilapia (22), as well as Culban, was attributable to the heating process. Common vetch included antinutritional elements as  $\beta$ -cyanoalanine, canavanine, protease inhibitors, lectine, vaccination, and persuade, which significantly reduced growth and food utilization when used as ungerminated seeds (6). According to Mohammad (18) study, fish fed a diet containing 45 percent germinated common vetch seeds for five days had significantly higher results for the following metrics than fish fed a control diet: final body weight, total gain weight, daily weight gain relative growth rate and specific growth rate. The authors of this work concluded that roasting are the second treatment just after germination that reduce cyanogen content in Culban seed. But cooking the seeds of *V. peregrina* for 40 minutes is also active like roasting to reduce cyanogen content to 60%. The authors of present study found that germination is ever better treatment for reducing toxic cyanogen content in Culban seed, and germination for 7 days reduced cyanogen 100 % and 94% in 4-day germination in another study. The methods which were applied by Solomon *et al.* (20) found that toasting of the pea, *C. cajan* seed significantly reduced the anti-nutrients and increased most essential amino acid, protein and fiber in the seeds. The growth of fingerlings fed was significantly improved by the different inclusion levels of toasted *C. cajan* in the diets after 56 days. Mohammad (19) used common vetch *V. sativa* seed with a replacement rate of 26%, 55 and 80%, respectively as substitute of soybean meal. The results of the statistical analysis showed that there were significant differences on growth

parameters value as weight gain, relative and specific growth rate, feed conversion factor and protein efficiency ratio (PER) were all improved more than soybean meal. Ganzon-Naret (11) results indicate that boiled and autoclaved mung bean seed meal-based diets were the same as the control diet in enhancing the growth. however, According to the authors, boiled and autoclaved mung bean grain meals can be utilized as protein sources in practical diets to replace 30% of the protein in soybean meal without negatively affecting the growth of sea bass fish. Mohammad (18) concluded that germination is not effective in improving the nutritional value of vetch. Our result agrees with other research that used plant protein to replace the soybean in the fish diet and had a positive effect on the growth parameters of the fish (17,18,19).

### CONCLUSIONS

Regarding weight gain of common carp, the best effects came from in terms of total weight gain and daily weight gain, the fish fed the fourth and seventh diets outperformed the control diet significantly. We can conclude that roasting and cooking treatment improved the Culban grain value The best relative growth rate, specific growth rate feed conversion ratio and feed efficiency ratio criteria., were obtained when fish were fed on the fourth, fifth and seventh rations, which were significantly superior to the control ration and the possibility of replacing 40% of the soybean meal.

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