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Graded Levels of Potato Peels Effects as Partial Replacement for Corn in Dite of Common Carp (*Cyprinus carpio)*

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Abstract: The study seeks to investigate the performance of the *cyprinus carpio* fed different graded levels of processed potato peels (PP). The different of potato peel in the different experimental diets were 0, 15, 30, 45 and 60% of Corn in fish diets (all diets were iso-nitrogenous and iso-caloric. During experimental period diets were fed to common carp *(cyprinus carpio)* 6 days/week at 3% of live body weight through 12 weeks experimental period. 300 fingerlings were randomly distributed to five treatment each treatment had triplicate. Highest increase in daily body weight gain was (2.82 g) of the fish group was achieved (PP30)this was followed by the fish fed diet with(PP60%) of the PP(2.34g) while the level increase in body weight (1.21 g) was always obtained in the fish fed diet with control (PP0). similarity the best specific growth rate was obtained in the fish fed (PP30) this was followed by (PP 45) while the least increase in specific growth rate (SGR%) was observed with (0PP%) control diets , the highest increase in intake was (312.02 g)of the fish was achieved with diet (PP30%) while the leant intake in feed intake (251.03 g) was obtained in the fish fed control diet. No significant differences were observed between the control and treatment groups in (FCR %). The results revealed that *cyprinous carpio could* tolerate up to 60% level of inclusion of potato peal as alternative source of corn in their diets. The results tack the same trend also in carcass composition with CP and EE deposition in fish muscles.
Key words: Potato peels, Corn, Common Carp (C*yprinus carpio)*.

Introduction

In Egypt, during the last few decades, there was shortage in ingredients sources rather than the continuous existence and increase their prices, feeding stuffs such as yellow corn, which used as an energy source in aquaculture diets. Nutrition costs are the most expensive component and it representing around 40-60% of the operating cost depending on the intensity of production[1]. Thus a dietary energy requirement of fish species (yellow corn) is of fundamental importance and affect on growth performance, survival rates and yield of fish as well as economics gain. Additionally, the high costs and/or fluctuating quality of in ingredients lead to identify a new alternative should be low price by products used in fish rations. [2]reported that, Nile catfish *(clarias lazera)* has able to utilize diet containing up to 66% unconventional protein supplement. Therefore, attempts have been carried out to search for alternative untraditional low price by products such as potato peels.

In Egypt , the yield of potatoes crop was 1984013 tons in 1999 and the waste was determined to 12.2% [3]. The metabolizable energy content of PP is 3.2 Kcal /g which is comparable with that of corn being 3.47 Kcal

/ g . [4] Potato processing is a very specialized field which can, not be described briefly . The aspects our dealing with the following ; belling potatoes for processing , processing of potato chips, frozen French fries, dehydrated mashed potato as granules or flex and potato starch flour. Potato waste meal (potatoes, potato pulp and belling)is a product produce by drying and grinding of culls of potato trimming, pulp, peeling and off-color parts of French fries and potato chips. The present study aimed to investigate the possibility of using the low price potato by-products (potato peels) as energy source instead of the high price common source, yellow corn on common *(Cyprinus carpio*) fingerlings.

Materials and Methods

Experimental design:

The experimental work of present study was carried out in private fish farm , EL-Sharquia, Egypt. The experiment was conducted to evaluated the effect of replacing the energy source of yellow corn (YC) by potato peel as by– product (PP) in common crop *(Cyprnus carpio)* diets

Collection and acclimation of experimental fish:

Three hundred mono-sex fingerlings of the *(Cyprnus carpio)* of the same bloodstock (mean weight about 50.0 g) obtained from the hatchery of the central laboratory for aquaculture research, Abassa, Abo-Hammad, El-Sharquia , Egypt were acclimatized to laboratory condition for 15 days. During the time of acclimatization fish were fed an a commercial pellet diet (30% CP) twice per day

Preparation and formation of experimental diet:

The peels obtained from peels potatoes washed probably and sun dried for ten days placed on prsterilzied white dray and covered with wire-mesh , after which they were winnowed and sieved to get rid of any foreign materials. Then the peels were mixed into a fine powder and sieved through a 0.5 mm mesh screen proximate analysis of the peels obtained showed in Table 1.

Table (1): Proximate analysis of potato by-product peels (PP)

Nutrient content	Composition (DM%)
Moisture	8.44
Crude protein (CP)	4.66
Ash	4.53
Ether extract (EE)	4.06
Crude fiber (CF)	3.71
* Nitrogen free extract (NFE)	74.60

*Nitrogen free extract (NFE) =100-(CP+EE+CF+Ash)

Other raw ingredients of the experimental diets were fishmeal, soybean meal, wheat bran, rice bran, sunflower oil, vit. and min. starch and potatoes peels. These diets were designated PP0 (control), PP15, PP30, PP45 and PP60, respectively. All experimental diets were isonitrogenous (25% CP) and isocaloric (3300 ME/kg diet)

Experimental set-up:

The design utilized fifteen concerted pounds each pond (1x4x1.5m) containing 6m of water (triplicate pond per diets) at a density 20 fish in each pond . After two weeks of acclimatization fish were divided into control and four treatments. The fish were starved over night to empty their appetite and reception for the new diets.

A Total of 24 fish were randomly selected and unread in determining initial carcass proximate composition. For the experimental trials, 20 fish were weighed using Mattels Toledo PB602 Top loading balance and introduced

into such of the experimental concrete pounds. The average initial weight for individual was about 50g . The experimental lasted for 12 weeks. The fish were fed (3%body weight) twice daily at 8 and 17 h. Mean water quality parameters during the experimental period were 6.19±0.02, 26.67oC±0.18, 22.6±0.018mg/l, 2.04±0.05 mg/l and 5.67±0.09 mg/l for PH, temperature, alkalinity, carbon dioxide and dissolved oxygen, respectively

Determination of indices of growth and feed utilization Determination of indices of growth performance and feed utilization:

At the end of the experimental period fish in each experimental pond were collectively weight weekly for the determination of growth rates, growth performance and geed efficiency parameter were calculated the following equation.

Weight gain (WG) = W1-W0.

Specific growth rate (SGR%/day) = [(Ln W1− Ln W0)/T] × 100.

Where, Ln = natural log, W0 = Initial body weight (g), W1= Final body weight (g) and T= Time (day). N.E. Feed conversion ratio (FCR) = feed intake (g)/body weight gain (g).

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

Protein productive value (PPV%) = 100 (protein gain/protein intake).

Energy retention (ER%) = 100 (gross energy gain/gross energy intake).

Survival rate (SR%) = 100 × (fish No. at the end/ fish No. stocked at the beginning)

Statistical analysis:

At the end of each experiment, five fish were randomly sampled from each pond and slaughtered. Statistical analysis was performed using the Analysis of variance [5] multiple Range Test to determine differences between treatments means at significance rate of $P < 0.05$. The standard errors of treatment means were also estimated. All statistics were carried out using Statistical Analysis System [6] program.

Results

Experimental Diets:

Chemical composition and ingredient diets were showed in table2. All the diets were iso-nitrogenous and iso-caloric. CP ration were 24.56, 25.06, 25.88, 25.26 and 25.57% in control (PP0%), (PP15%), (PP30%), (PP45%) and (PP60%), respectively. While the growth energy in the experimental diets were 446.35,441.01, 439.71, 434.96 and 431.96 in control (PP0%), (PP15%), (PP30%), (PP45%) and (PP60%), respectively

Growth performance:

WG performance and SGR at the end of the feeding trials are presented in (Table 3). IW were near constant about 50 g in all the experimental diets as there was no significant differences ($P>0.05$) among the control (PP0%) and the treatments groups, (PP15%), (PP30%), (PP45%) and (PP60%). PP30% had the highest percentage WG (287.2g) and this was significant different ($P<0.005$) from the body weight gain of the rest groups (PP0,PP15,PP45 and PP60%) , while the group of fish fed (PP0) record the least weight gain (185.71g). Similarly, inPP30had the highest SGR value (0.84) which was significantly higher than ($P< 0.05$) than other group (PP0%, PP15%, PP45 % and PP60% which were 0.74, 0.76, 0.46 and 0.77, respectively.

Food utilization indices:

The highest feed intake($P<0.05$) was in PP30% (312.02 g) compared with (251.03, 2.65.63, 280 and

284 g) in treatments groups PP0%, PP15%, PP45 % and PP60% , respectively. PP45 and PP60 respectively follow by PP15. On the other hand the groups of fish diet PP0 had least feed intake (Table4). FCR for the five experiment diets were (1.39, 1.4, 1.35, 1.53 and 1.50) in control (PP0%) and the treatments groups, (PP15%), (PP30%), (PP45%) and (PP60%), respectively. No significant differences (P>0.05) for all the group of fish in FCR. The highest PPV (3.89g) with in control PP0% than rest groups (PP15%), (PP30%), (PP45%) and (PP60%), which were 2.45, 2.18, 2.76 and 1.17, respectively. while the lowest PPV value was (1.17) in PP60%. However, no significantly different were observed in SR Among the control and other treatments groups (Table 4).

Composition of fish carcass :

The proximate composition of experimental fish carcass at beginning and end of the fish feeding trials are presented in (Table5). There was no significant difference among the fish fed the control other treatments group in protein and lipids content of carcass composition. The highest DM control (28.42) and the lowest ash content (27.19) Compared with the other treatments groups PP15%, PP30%PP45% and PP60%.

Discussion

Proximate analysis for PP in the present experiment is relatively lower in CP 4.66% than that obtained by [3,7] which were7.94% and 8 % respectively and EE (4.06) lower than observed [3,7] 29.6% and 6 %, respectively. the variation in chemical analysis of PP in this study and previous studies [8,3,7] related to the procedures , manufacturing process and potato quality which reflecting on the [3,7] composition of PP.

It was noticed that the replacing levels of YC by PP up to 30% the highest value compared with other treatments on FI but the higher replacing levels (45 and 60%) significantly (P<0.05) decreased the FI for carp fish [8,3] with Nile tilapia, *O. niloticus,* reported that, replacing levels of YC by PP up to 50% did not significantly affect FI. With regard to FCR and PPV, results of Table (4) showed that, the best ratios of FCR and PPV were obtained by fish fed the PP0% (control) FCR and PPV values. While [9] observed that, in rainbow trout (*Oncorhynchus mykiss*) using dietary potato protein concentrate in diets from 0 to 51%, FCR values were significantly decreased the growth performance.

Generally, results obtained in the present study showed that, partial replacement of YC by PP in carp diets up to 60% did not have effect on FCR and this indicated the possibility of incorporating the lowest PP as a partial replacement of the high price YC in carp diets with an improvement in feed utilization parameters the same trend observed by [8] when used PP up to50%.

The results revealed that the nutritional quality of potato peel meal an determined by growth performance parameters were adequate and is terms on survival rate (SR), so potato peels can be successfully incorporated in the diet of cultured fish on level mortality was observed in the experimental ponds during the feeding period (P<0.05) [10].

The final body weight and growth rates were highest in fish fed the PP30 diet, However , no significant difference were detected between PP15,PP45,PP60 and the control diet . [11] founded that when used sweet potato peels (SPP) meals as a cheaper replacement of maize in *clarious gariepinus* which were formulated to level of SPP meal replacing 0, 25, 50 and 75 % of maize for 6 weeks. The highest (PWG) was recorded in fish fed diet 25% SPP meals followed by a consistent decrease in PWG with increasing inclusion of SPP meals. Diet containing 25, 50 and 75% SPP meals performed better than the control experiment. [12] found that with mixed-sexed fingerlings of *cyprinus corpio* fed different levels of processed SPP 0, 5, 1,15, 20 and 25% reduced performance by the fish was observed.

The most common difficulties observed when alternative source of feed stuff are used in fish diet in acceptance and palatability by the type fish . similar were obtained by [13]. However, in their present study , the fish avidly consumed the experimental diets. The highest feed intake was recorded with fish fed the PP30 diet followed by other diets. Feed conversion ratio of fish fed different experimental diets showed nearly the name with non significant differences detected between different level of potato peels inclusion.

Results of the proximate composition of the fish carcass revealed no evidence of excessive protein or fat deposition in the in carcass fish is usually correlated to dietary level similar results was e relatively similar to those obtained by[8] who found that increasing the inclusion level of PP up to 50% in tilapia diets did not significantly changed the protein content but the higher inclusion levels (60, 70 or 80%) significantly decreased protein and ash contents of tilapia bodies. Shouqi et al., [9] reported that, CP content of the fish decreased ($P<0.05$) as dietary potato protein concentrate increased from 0 to 51% in rainbow trout (*Oncorhynchus mykiss*) diets. Also, [9]cleared that, incorporation of potato protein concentrate in diets of rainbow trout significantly increased ash contents of fish bod.

Conclusion

Improved the growth performance of fish fed diets containing PP meal inclusion showed that fish production can be increased by substituting PP for yellow corn in the diet of *cyprinus carpio* at 15, 30, 45 and 60% respecting. However, weight gain, feed conversion is to be considered substitution level of 30% of PP for corn which refelected on cost effective and nutritionally a better choice. There are numerous feedstuffs available which may used in fish feed manufacturer but their nutrient composition, cheaper, cost and availability should be considered in selecting feed stuffs for each species. So, the cost, the problem of handling the processing method and storage would also affect the selection of feed stuffs for fish diet preparation.

Table 2: Feed ingredients and proximate chemical analysis of experimental diets.

Ingredients	D1 (control (0%)	D2 (15%)	D3 (30%)	D4 (45%)	D5 (60%)
Fish meal	8	8	8	8	8
Soybean meal	44	43.37	42.94	43.54	42.38
Yellow corn	30	25.5	21	16.5	12
Wheat bran	5.05	4.87	5.46	4.59	5.66
Rice bran	6.1	6.48	6.05	6.22	6.13
Sun flower oil	4.85	5.28	5.55	5.65	5.83
Vit.& min.[1]	1	1	1	1	1
Starch	1	1	1	1	1
Potatoes peels	0	4.5	9	13.5	18
total	100	100	100	100	100
Proximate analysis (determined on dry matter basis)					
Dry matter	88.25	88.84	89.12	89.2	88.58
CP	24.56	25.06	25.88	25.26	25.57
EE	7.55	7.95	7.93	7.82	7.58
CF	4.57	5.11	5.38	5.69	5.91
ASH	7.15	6.85	7.17	7.65	7.96
NFE[2]	56.57	55.03	53.64	53.58	52.98
Gross energy	446.35	441.01	439.71	434.96	431.96
P/E ratio	5.5	5.68	5.88	5.81	5.92

vitamin & mineral mixture/KG premix : vitamin D3 , 0.8 million IU; A, 4.8 million IU; E, 4g ; K, 0.8 g; B1 , 0.4 g; Riboflavin, 1.6 g; B6, 0.6g, B12, 4 mg;pantothenic acid, 4 g; nicotinic acid, 8g; folic acid, 0.4 g biotin,20 mg , Mn , 22g ,Zn, 22g ; Fe, 12g ; cu, 4g ; I, 0.4g, selenium, 0.4g g and Co, 4.8mg

.Nitrogen free extract (NFE)= 100-(CP + EE + CF + Ash)

Table 3: mean growth performance indices of common carp *(cyprinus carpio)* fed different levels of dietary potato peels meals for 12 weeks.

Diets		Body weight gain(g/fish)		weight gain (g)	specific growth rate (SGR)
		initial weigh	final weight		
PP0%	Mean	50.125 a	235.83 b	185.71 b	0.74 b
	SR	0.075	1.3221	1.33697	0.02
PP 15%	Mean	49.95 a	245.58 b	195.63 b	0.76 b
	SR	0.31225	0.92485	0.76947	0.025
PP30%	Mean	50 a	287.29 a	237.29 a	0.84 a
	SR	0.23452	0.91511	0.91288	0.022
PP45%	Mean	50.075 a	237.41 b	187.33 b	0.76 b
	SR	0.24281	2.2701	2.05389	0.01
PP60%	Mean	49.95 a	247.31 b	197.36 b	0.77 b
	SR	0.29011	7.69122	7.74249	0.04

**n= 20 fish per pond , volume parentheses are standard error of mean value.

Table 4 :mean value of feed utilization indices of common carp *(Cyprious carpio)* fed different levels of dietary potato peel meal for 12 weeks.

Diets		Food intake (g)	FCR	PPV	SR
PP0%	Mean	251.03 c	1.39 a	3.89 a	90 a
	SR	4.70293	0.039	0.56567	0.08248
PP 15%	Mean	265.63 bc	1.40 a	2.45 ab	90.75 a
	SR	7.91774	0.056	0.79193	0.65742
PP30%	Mean	312.02 a	1.35 a	2.18 b	90 a
	SR	15.1839	0.077	0.4072	0.08248
PP45%	Mean	280.44 b	1.53 a	2.76 ab	92.5 a
	SR	6.59661	0.035	0.36921	2.5
PP60%	Mean	284.36 b	1.50 a	1.17 c	90 a
	SR	6.99443	0.113	1.4	4.08248

**n= 20 fish per pound (value of two triplication) , volume parentheses are standard error of mean value
FCR= Feed conversion ratio
PPV= Protein production ratio
SR= Survival rate

Table 5: proximate composition of carcass of common carp *(cyprious carpio* fed different potato peel meal for 12 weeks.

Diet Designation		Proximate composition DM%			
		DM	CP	EE	ASH
Initial carcass composition		29.5	40.4	16.3	20.45
PP 0%	Mean	28.42 a	56.85 a	17.38 a	27.19 b
	SE	0.356	0.336	0.55696	0.40103
PP15%	Mean	25.30 b	56.1 a	18.63 a	28.7 a
	SE	0.423	0.541	0.43613	0.24995
PP30%	Mean	25.8 b	56.18 a	17.44 a	28.50 ab
	SE	0.953	0.394	0.87969	0.4797
PP45%	Mean	26 b	56.32 a	17.56 a	28.24 ab
	SE	0.154	0.150	0.912	0.113
PP60%	Mean	27.36 ab	55.26 a	17.23 a	28.49 ab
	SE	0.843	0.209	0.86196	0.43775

References:

1. FAO (Food and Agriculture Organization of the United Nations), 2014. Global Aquaculture Production 1950–2012. FAO, Rome, Italy (http://www.fao.org/fishery/statistics/global-aquaculture- production/en) Volume 16 Issue 5, 501-505.
2. Hassanen, G. D. I. (1991): The utilization of some unconventional protein by Nile catfish (Clarias lazera). J. Egypt 3-
3. Ghazalah, A. A., Gomaa, I. A. and Hyam D. Tonsy, D. (2002): The use of date stone meal (DSM) and potato by-product meal (PBM) as non-conventional energy feed sources in Nile tilapia (Oreochromis niloticus) diets. The 1st Scientific Conference of the Egyptian Aquaculture Society, El-Arish, North Sinai, Egypt. Ger. Soc. Zool., 6:49-62.
4. NRC. (1993): Nutrient requirements of fish,114 pp. National Research Council, Washington, DC.
5. Duncan, D., 1955. Multiple range tests and multiple Ftests. Biometrics, 11: 1-42
6. SAS (1996): SAS Procedure Guide "version 6.12 Ed". SAS Institute Inc., Cary, NC, USA.
7. El-Tawil, M. E. (2001): Studies on some nutritional and managerial trials to improve the growth capacity of broiler chickens. M.Sc. Thesis, Fac. Agric., Zagazig University.
8. Soltan, M. A. (2002): Using of tomatoand potato by-products as nonconventional ingredients in Niletilapia, *Oreochromis niloticus* diets.Annals of Agric. Sci., Moshtohor,40(4):2081-2096.
9. Shouqi, X., Jokumsen, A. and Sq, X.(1997): Replacement of fish meal bypotato protein concentrate in dietsfor rainbow trout, Oncorhynchusmykiss (Walbaum): growth, feedutilization and body composition.Aquaculture Nutrition, 3:65-69.
10. Soltan, M. A. Abdella, M.M., Abou-Seif R.A and. Hassan M.S (2005) Using Of Tomato And Potato By-Products As Partial Replacement For Soybean Meal And Yellow Corn In Practical Diets For The Common Carp, Cyprinus Carpio. Egyptian J. Nutrition and Feeds 8(2):257-272.
11. Oyin Olukunla (2006). Neutralize potential of sweat potato peel meal and root replacement volume for maize in diet of African catfish (oreochromis nilotious) advanced fry. J. food tech 4(4) : 289-293.
12. Moien Faramarzi , Mohamed levhkarboloki , saeedkioalvandi and farnazIranshahi (2012) influence of different levels of sweat potato peels on growth and feeding carpio (cyprinidae). primerican-Eurasion J .agric&Enuirob . Sci,12(4):449-455.
13. Domingues ,P.,N.O.Sykan , A.sammerfield and J.P. Andrade,2003. Effect of feeding live or frozen prey on growth,survival and the life cycle of the cuttlefish sepia officinal in (linnaerr , 1758). Aquacult . Internet 11 : 397—410.

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