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Total and Partial Substitution of White Corn *Sorghum bicolor* Germinated for Three defferent periods and adding Mixture of (Probiotic+Diet Enzymes) by Yellow Corn *Zea mays* in Common Carp *Cyprinus carpio* L. Diets

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Abstract

This study was carried out in the laboratories of fish and animal resource center-Agricultural Research Directorate for the period between 1/3-26/5/2015 to study the effect of total and partial substitution of white corn (WC) *Sorghum bicolor* germinated for different period and additive mixture of probiotic & diet enzymes of yellow corn (YC) *Zea mays* in common carp *Cyprinus carpio* L. diets. The fish fed on experimental diets contained two levels of substitution germination WC with three different periods and not germination with 0.5% mixture of probiotic+diet enzymes (50% and 100%) from YC. A 11 experimental diets were formulated, diets 1 and 2 used raw WC without germinate at two substitution levels of 50% and 100% respectively of YC, diets 3 and 4 use WC germinates for 24 hour at two substitution levels of 50% and 100% respectively of YC, diets 5 and 6 use WC germinates for 48 hour at two substitution levels of 50% and 100% respectively of YC, diets 7 and 8 use WC germinates for 72 hour at two substitution levels of 50% and 100% respectively of YC, diet 9 and 10 use WC without germinates add (0.5% mixture of probiotic + diet enzymes) at two substitution levels of 50% and 100% respectively of YC and diet 11 (control without white corn). The results of statistical analysis showed that a benefit of using diets which containing white corn which germinated for 48h (T_5 and T_6) and the diets which add 0.5% mixer of probiotic + diet enzymes (T_9 and T_{10}) for all parameters at substitution 50% and 100%.

Keyword: White Corn, Germinated, Probiotic+Diet Enzymes, Yellow Corn, *Cyprinus carpio* L.

الإحلال الكلي والجزئي للذرة البيضاء *Sorghum bicolor* المنبتة بثلاث فترات مختلفة مع إضافة مزيج (المعزز الحيوي+الأنزيمات العلفية) بالذرة الصفراء *Zea mays* في علائق أسماك الكارب الشائع *Cyprinus carpio* L

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الخلاصة

أجريت التجربة في مختبرات مركز الثروة الحيوانية والسمكية–دائرة البحوث الزراعية للفترة من 3/1–2015/5/26 لدراسة تأثير الإحلال الجزئي والكلي للذرة البيضاء *Sorghum bicolor* المنبتة بثلاث فترات

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مختلفة مع إضافة مزيج (المعزز الحيوي+الأنزيمات العلفية) بدل الذرة الصفراء *Zea mays* في علائق أسماك الكارب الشائع .*Cyprinus carpio* L. غذيت الأسماك على علائق مختبرية تحوي مستوين أحلال الذرة البيضاء (50% و100%) المنبتة بثلاث فترات وبدون أنبات مع إضافة 0.5% من مزيج المعزز الحيوي+الإنزيمات العلفية بالذرة الصفراء. صنعت 11 عليقة مختبرية، العليقة الأولى والثانية أضيفت الذرة البيضاء الخام بدون أنبات بمستوين إحلال 50% و 100% على التتالي عن الذرة الصفراء، العليقتان الثالثة والرابعة أضيفت الذرة البيضاء المنبتة 24 ساعة وبنفس مستوى الإحلال، العليقتان الخامسة والسادسة أضيفت الذرة البيضاء المنبتة 48 ساعة وبنفس مستوى الإحلال، العليقتان السابعة والثامنة أضيفت الذرة البيضاء المنبتة 72 ساعة وبنفس مستوى الإحلال، العليقتان التاسعة والعاشرة أضيفت الذرة البيضاء الخام بدون أنبات مع إضافة 0.5% مزيج (المعزز الحيوي+الإنزيمات العلفية) وبنفس مستوى الإحلال والعليقة الحادي عشرة للمقارنة بدون ذرة بيضاء. أظهرت النتائج الإحصائية أفضلية العلائق الحاوية على الذرة البيضاء المنبتة 48 ساعة (T_5 وT_6) والعلائق المضاف إليها 0.5% مزيج المعزز الحيوي+الإنزيمات العلفية (T_9 وT_{10}) لجميع المعايير المدروسة وبمستوين الإحلال 50% و 100%.

Introduction

Nutrition and food stuff which used in fish rearing were considered the main reasons for increasing the production cost in fish agriculture industry, there were many attempts to decrease the cost of formulate fish diets by decreasing protein concentration or substitution one or more of the ingredient by agricultural products like yellow corn *Zea mays* which were the most agricultural produce use as energy source in fish and poultry diets [1]. This feedstuff is in ported, high production costs are the main constraint of fish and poultry production in West Africa [2]. However it's necessary to search for some feed ingredient to alternative for yellow corn. For this reason, will needs to found another alternative which have cheap cost like of white corm *Sorghum bicolor* were used due to, because the same contain for energy and amino acids [3]. White corm *S. bicolor* was the fifth most important crop in the world after wheat, rice, corn and barley [4]. Unfortunately, white corn *S. bicolor* have some Anti-Nutritional Factors (ANF) called tannin which made a limited to use in fish and poultry diets [5 and 6]. These compound maybe interact with the digestible function because of the ability of tannin to connect with protein and digestible enzymes and make sediment or clot [7 and 8], leading to decrease the digestible and absorption of nutritional constituent [9]. Beside, [10] found that granule of starch in white corn shared with the protein to cover the digestible enzymes and currently block its effect. The use of white corn with high contain of tannin in fish nutrition maybe have negative effect in growth performance which lead to decrease weight gain [11 and 12], and decrease the food conversion and efficiency ratio [13]. There was possibility to partial or total substitution of yellow corn which have little level of tannin lieu compared with white corn without negative effect on weight gain and food conversion rate by germination operation which maybe decrease or riddance of tannin effect and increase the digestible of nutritional compound [14], and decrease the fiber and fat contain [15]. The aim of the present study was to investigate the effect of total and partial substitution of white corn *Sorghum bicolor* germinated for three period different and add mixture of (probiotic + diet enzymes) by Yellow Corn *Zea mays* in Common Carp *Cyprinus carpio* L. Diets.

Materials and Methods

Experimental fish and maintenance conditions

This study was carried out for 87 days between 1/3-26/5/2015 in the laboratory of Animal and Fish Resources Center-Agricultural Researcher Directorate. The common carp *C. carpio* L. fingerlings obtained from a local fish dealer were acclimatized in rectangle metallic tanks in the laboratory conditions for 5 days and fed with a mixture of commercial diets and 5% protein concentrated. The fishes sterilize by saline solution (3%) for 3 minutes to riddance of parasite and bacterial infection. The feeding trial was conducted in glass aquarium and fish were acclimated for 10 days (including rearing system, diets formulate and the time of food intake). A total of 264 fingerlings (18.7± 0.82g) were randomly distributed in 33 glass aquarium at the rate of 8 fish per glass aquarium, three replicates for each experimental diet. Each glass aquarium was supplied with air pump water from a deep tube well with continuous aeration. All the fish were fed three time daily at a fixed feeding rate of 3% of body weight per day for 87 days. The quantity of feed given was readjusted every 15th day

after weighing the fish. To determine the feed consumption, any leftover feed was collected 4 h after each feeding and weighed after oven drying. Water of the aquarium was partially changed to approximately 50% per day for water aforetime to riddance chloride and have the temperature degree of the laboratory. Daylight-balanced by fluorescent discharge lamps maintained a 12 h light/12h dark photoperiod for 87 days of feeding trial. Dissolve oxygen, temperature degree and pH were used measured to water quality (at 8 AM and 2 PM).

Formulation the diets

The local white corn required for the trial was obtained from local market in Baghdad. The dry corn white were sowed in wet smooth weft piece and allowed to germinate for 24, 48 and 72 hour. Germinated seedlings were then oven dried.

The ingredient grinds each one alone by grinder and mixed together to homogenized. Diets were formulated in 11 treatments (14.71%-14.95% CP) and energy (1464.18-1467.7 k cal), germinated white corn added after three period (24, 48 and 72 hour) and without germination with tow levels of substitution (50% and 100% of yellow corn), the different treatments include Table- 1.

1. T1 : raw white corn without germination at substitution levels of 50% of yellow corn (10% for total diet).
2. T2 : raw white corn without germination at substitution levels of 100% of yellow corn (20% for total diet).
3. T3 : white corn germinated for 24 hour at substitution levels of 50% of yellow corn (10% for total diet).
4. T4 : white corn germinated for 24 hour at substitution levels of 100% of yellow corn (20% for total diet).
5. T5 : white corn germinated for 48 hour at substitution levels of 50% of yellow corn (10% for total diet).
6. T6 : white corn germinated for 48 hour at substitution levels of 100% of yellow corn (20% for total diet).
7. T7 : white corn germinated for 72 hour at substitution levels of 50% of yellow corn (10% for total diet).
8. T8 : white corn germinated for 72 hour at substitution levels of 100% of yellow corn (20% for total diet).
9. T9 : white corn without germination with (0.5% mixed of probiotic + diet enzyme) at substitution levels of 50% of yellow corn (10% for total diet).
10. T10 : white corn without germination with (0.5% mixed of probiotic + diet enzyme) at substitution levels of 100% of yellow corn (20% for total diet).
11. T 11: control without white corn.

The different crud compound was added in the designed formula which limited as stepwise before homogenized using put water with mixer, water add as stepwise with observation to be homogeneous with crud compound to be dry dough. Each diet were chopped to 12 inch size to formulate filament at 1.5 m, the filament spread underfoot and exposure to sun shine with turning down until dry, each diet were then stored in nylon sack with mark a signal and reserved on -4 C^{o}. Dry matter (DM), ash, crude fiber (CF) and ether extract (EE) were analyzed according to Association of Official Analytical Chemists [16] procedures. Crude protein (CP) was determined by the Kjedahl method, as nitrogen (N) × 6.25. Nitrogen non extract (NNE) was calculated as: NNE = 1,000-CP-CF-Ash-EE, fractions being expressed as g/kg [17].

Metabolizable Energy (ME) was calculated by an indirect method [18].

ME (MJ) = protein×18.8+fat×33.5+NFE×13.8, where nutrient contents are expressed in % DM. Table- 3 Tannin estimated in the white corn before and after germination according to [19] Table- 2.

Table 1- Diets component for experimental diets (Dry matter basis %)

Ingredient	Substitution ratio% for yellow corn	*Animal Protein concentration	Soy-bean meal	yellow corn	Local barley	Soft wheat bran	White corn	**Vit and Salt	***Multi-Enzyme and Probiotic
Raw white corn	T1 50%	10	25	10	20	23	10	2	0
	T2 100%	10	25	0	20	23	20	2	0
White corn germination for 24h	T3 50%	10	25	10	20	23	10	2	0
	T4 100%	10	25	0	20	23	20	2	0
White corn germination for 48h	T5 50%	10	25	10	20	23	10	2	0
	T6 100%	10	25	0	20	23	20	2	0
White corn germination for 72h	T7 50%	10	25	10	20	23	10	2	0
	T8 100%	10	25	0	20	23	20	2	0
White corn + Multi-Enzyme & Probiotic	T9 50%	10	25	10	20	23	10	1.5	0.5
	T10 100%	10	25	0	20	23	20	1.5	0.5
Control without white corn	T11	10	25	20	20	23	0	2	0

* Animal Protein concentration used which product from Provemy Jordon company, Metabolism 2200 K. caloric, protein 50%, fat 6%, fiber 2.5%, Ca 7%, lysine 3% and mithuonin+Sistine 2.5%.
** Vitamin and salt used which product Superavate Jordon company, vit. A 220 UI/Kg, vit. D3 60 UI/kg, vit. E 600 mg/kg, vit. B_1 60 mg/kg, vit. B_2 140 mg/kg. vit. B_6 80 mg/kg, vit. B12 400 mg/kg, vit. K3 50 mg/kg, vit. Biotin 2 mg/kg, nicine 600 mg/kg, Cu 200 mg/kg, Ca 6.5%, P 2.6, Na 2.3% Mn 1.6 mg/kg, Zn 1200 mg/kg, Fe 1 mg/kg, I 20 mg/kg, Co 3 mg/kg, Se 5 mg/kg,
*** The mixture used of Multi-Enzyme & Probiotic (LABAZYME Company) included:

1. *Lactobacillus acidophilus* (more than 2.75×10^{10} CFU)
2. *Streptococcus faecium* (more than 8.25×10^{10} CFU)
3. *Bacillus subtilis* (more than 1.1×10^{10} CFU)
4. Protease (more than 2.750 CSU)
5. Amylase (more than 5.500 SLU)
6. Cellulase (more than 27.5 FPUI)

Table 2- The chemical analysis and tannin ratio for YC and in experiment diets

The type of corn	Moister	Crud Protein (CP)	Ether Extract (EE)	Crud Fiber (CF)	Ash	NFE	Tannin Ratio
Yalow Corn	11.7	8.8	4.1	3.2	3	69.23	0.0179%
Raw WC	12	11.5	3.2	2.8	2.4	68.14	0.159%
WC Gr. 24h	12.6	11.9	3.4	2.6	2.2	67.32	0.0193%
WC Gr. 48h	12.9	12.1	3.5	2.4	2.1	67.06	0.0182%
WC Gr. 72h	12.8	10.8	3.6	2.5	2.3	68.07	0.0180%
Multi-Enzyme & Probiotic	11.2	12.8	3.7	1.9	2.3		%0.0181

Table 3- Chemical composition for experimental diets (calculated by dry matter basis %)

Ingredient	Substitution ratio% for yellow corn	Nutrition constituents for diets						*Metabolic Energy KJ/Kg
		Moisture	Crud protein	Ether Extract	Fiber	Ash	NFE	
Raw WC	T1 50%	6.23	25.48	5.21	6.51	5.47	57.33	1444.71
	T2 100%	6.79	25.83	5.11	6.61	5.80	56.65	1438.56
WC germination for 24h	T3 50%	6.29	26.02	4.91	6.62	5.68	56.77	1437.09
	T4 100%	6.33	25.61	5.14	6.39	5.73	57.13	1442.05
WC germination for 48h	T5 50%	6.52	26.72	5.09	6.56	5.37	56.26	1449.24
	T6 100%	6.75	26.08	4.98	6.51	5.33	57.10	1445.11
WC germination for 72h	T7 50%	6.89	26.28	5.12	6.38	5.51	56.71	1448.18
	T8 100%	7..02	26.37	5.28	6.65	5.74	55.96	1444.88
WC + Multi-Enzyme & Probiotic	T9 50%	7.01	25.43	5.18	6.79	5.66	56.94	1437.38
	T10 100%	6.61	25.25	5.11	6.84	5.91	56.89	1430.97
Control without WC	T11	7.00	25.62	5.21	6.32	5.81	57.04	1443.34

Studies Parameters

The study parameters used were:

Weight Gain (WG) g/fish=Final Weight (FW) - Initial Weight (IW) [20].

Daily Weight Gain (DWG) g/fish/day= WG/number of days. [20].

Relative Growth Ratio (RGR)%=WG/IW [20]

Food Conversion Rate (FCR)=Food Intake (FI)/WG [21].

Food Efficiency Ratio (FER)=WG/FI [22].

Apparent Digestible Coefficient (ADC)=[(Cr_2O_3 in food%/Cr_2O_3 in feces %×100]-100 Apparent Protein Digestible (APD) =100-[(Cr_2O_3 in food%/Cr_2O_3 in feces %)×(protein in feces %/protein in food%)×100] [23].

Digestibility Experiment

The digestibility experiment was conducted separately in glass aquarium. Chrome Oxide Cr_2O_3 at 1% was add to ingredient and formulated to pellet. Fishes were fed at the same program of the nutrition experiment with incessant observer during the experiment. From three replicates of each dietary treatment, the feces samples were daily collected in the morning by siphoning after removal of the uneaten feed following the ‘‘immediate pipetting’’ method outlined by [24]. The Feces naturally released by the fish could be easily detected and were immediately removed from the water with a glass canula. After 15 day experiment the fish feces were weighed, desiccated and analyzed [23]. The standard curve conducted to estimation the concentration of Cr_2O_3 according to [25].

Statistical Analysis

Statistical Analysis of the data was performed by analysis of variance (ANOVA) using Microsoft software Statistical. Mean differences between treatments were tested for significance at $P \leq 0.05$ and comparisons were made with Duncan’s multiple range test [26].

Results and Discussion

Water temperature, dissolve O_2 and pH during the experiment trial were 27.5–29.2 C^o, 7.2-7.6 mg/L and 7.2-7.7 respectively which were suitable for fish performance [27]. The statistical analysis showed improve the value of all treatments of germination for 24h (T_3), 48h (T_5 and T_6), and 72h (T_7 and T_8) and the treatments of multi-enzyme+ Probiotic (T_9 and T_{10}) without germination (T_1 and T_2) for parameters WG, DWG, RGR, FCR, FER, ADC and ADP (Tables- 4 and 5). No difference has been observed for initial weight (IW) for all treatments. The results of weight gain (WG) showed no significant differences $p \geq 0.05$ between T_3, T_5, T_6, T_9, T_{10} and T_{11}, T_{10} was the best one (30.92 gm/fish) which significantly distinction $P \leq 0.05$ on compared with T_1, T_2, T_4, T_7 and T_8 (Table- 4). The

statistical results for DWG were proximal consentient with parameter of WG which showed no significant difference between T_3. T_5, T_6, T_9, T_{10} and T_{11}. The T_2 (raw WC subs. ratio 100% for YC) was the lowest one which was not significantly differed with T_1 (raw WC subs. ratio 50% for YC) and T_7 (WC ger.for 72h) recorded 0.191, 0.225 and 0.252 g/day/fish respectively (Table- 4). The statistical results for of RGR showed no significant difference between T_3, T_5, T_6, T_9 and T_{10}. The results above accentuated the effective role of germination for WC and the efficiency of three germinate periods (24h, 48h and 72h). Germination treatment may caused decreased the levels of tannin in WC, the results of the chemical analysis and tannin ratio for WC showed decrease in the levels of tannin with any increase the period of germination of WC (0.159, 0.0193, 0.0182 and 0.0180% for raw WC and germination 24h, 48h and 72h respectively (Table-2), perhaps, these condition decrease the negative effect of tannin on digestible enzymes by detached the conjunction of tannin compound with protein and starch [8], these results concordant with [28] and [29] which citation the germination effect of white corn to interpret decreasing the tannin level which have ability to make complex compound with protein and carbohydrate by hydrogen binders, and it more tend to with protein which demand on pH. The tannin had possibility to bind with enzyme like trypsin and amylase causing decrease of its efficiency [30].

Several studies showed that the ability of tannin binding with starch causes decrease digestion, and this compound was centralize in cortex of the white corn, can be remove of it by soaking and germination maybe decrease the tannin. Some studies reported that lysine content of sorghum grains increased as a result of germination process [(30 and 31]. Therefore, lysine content of the diets in current this study which includes germinated was expected to increase. Growth indicator (WG, DWG and RGR) for T_3 and T_4 were less compared with the germination treatments of 48h and 72h and the treatments T_9 and T_{10} (additive of muti-enzyme+probiotic), it seems that the germination treatments 24h was not enough to decrease the negative effect of tannin. The studies have demonstrated an array of deleterious influences of tannin including increased endogenous protein secretion, formation of less digestible tannin-dietary protein complex, inhibition of digestive enzymes and toxicity of absorbed tannin or its metabolites [6]. It's appeared that these negative effects may resulted from the ability of tannins and specially condensed tannins, to bind and precipitate proteins including grain proteins and digestive enzymes [(32].

The results of FCR showed no significant differences $p \geq 0.05$ between T_{10}, T_3 and T_9 (1.99, 2.23 and 2.26 respectively) which distanced on all treatments except T_8 (2.28). The statistical results of FER showed significant distinct $p \leq 0.05$ for T_{10}, T_3, T_8 and T_5 which were 50.05%, 44.81%, 43.82% and 43.01% respectively on all treatments except T_9 which was 42.81% (Table- 5). The parameter of ADC showed no significant differences between T_5, T_6, T_9 and T_{10} and the parameter of ADP showed no significant differences between T_5, T_6, T_7, T_9, T_{10} and T_{11}. These results demonstrated decrease the value of T_1 and T_2 (raw WC) compare with the germination treatments which prove. Some studies reported that lysine content of sorghum grains increased as a result of germination process [29 and 30]. Therefore lysine content of the diets in this study that contained germinated sorghum was expected to increase. The levels of tannin in the WC without germination (Table-3) in T1 and T2 had definite effected on growth indices, performance level, efficiency and conversion food and digestion coefficient (Tables- 4 and 5), the decrease of tannin maybe decrease the acrid spud taste of CW which due to increase the palatability of diets from experiment fish. The lower performances have been observed with fish fed by diet with T1 and T2.

Vegetation growth in WC for 72h may take most nutrient compounds from the germ of WC and lead to decrease nutrients value (Table- 3), this situation had affected all parameters of T_7 and T_8, therefore, the germination for 72h thought to be unsuitable despite the tannin decrease (Table- 3).The results of used mixture using of multi-enzyme & probiotic (T_9 and T_{10}) showed improve all the parameters which had more efficiency compared with germination treatments, may due to decrease tannin and its role in increasing nutrient value (Table-3),also may be due to the benefit effect of probiotic depend on the number of microflora which grow fastly and product enzymes and vitamin like riboflavin (B_2) and niacin (B_3) [33].

The improvement in T_9 and T_{10} including the probiotic which contain more species or type of beneficial microflora such as *Lactobacillus acidophilus*, *Streptococcus faecium* and *Bacillus subtilis* lead to best results from using one or more of these flora, these different beneficial micro flora distributed on segment of the gastrointestinal according of the pH for each segment, the behavior and

pH degree favorite of the beneficial microflora, and making their metabolism efficiency which have significant in digestive nutrient compound and dissolution some element in segment of the intestinal, so it improve the absorption and metabolism, therefore, it's give nutrient requirement to fish [34]. These results agree with [35 and 36] which notice that the efficiency of proteases enzyme which product by beneficial microflora, it make at impulse and stimulant for growth and product essential amino acid and shored the growth and digestion rate [32]. This study concluded to use WC germinated for 48h (T5 and T6) and 0.5% multi-enzyme & probiotic.

Table 4- Effect of different levels of white corn in growth indicia (Mean±standard deviation)

Ingredient	Substitution ratio% for yellow corn	IW g/fish	FW g/fish	WG g/fish	DWG g/fish/day	RGR%
Raw white corn	T1 50%	24.89 ±0.41 a	44.49 ±0.51 de	19.60 ± 0.47 de	0.225 ±0.61 dc	78.77 ±1.79 e
	T2 100%	24.83 ±0.75 a	41.49 ±0.51 e	16.65 ±0.42 e	0.191 ±0.51 d	67.06 ±1.51 f
White corn germination for 24h	T3 50%	24.80 ±0.25 a	52.44 ±0.48	27.66 ±0.25 ab	0.321 ±0.31 ab	111.60 ±0.52 abc
	T4 100%	24.93 ±0.185 a	49.19 ±1.75 bcd	24.26 ±1.57 bcd	0.282 ±0.185 bc	97.25 ±5.57 cde
White corn germination for 48h	T5 50%	24.71 ±0.494 a	51.97 ±1.49	26.77 ±1.49 abc	0.311 ±0.175 ab	108.34 ±5.88 abc
	T6 100%	24.74 ±0.401 a	50.40 ±0.33 bcd	25.66 ±0.29 abc	0.298 ±0.13 ab	103.71 ±1.05 abc
White corn germination for 72h	T7 50%	25.52 ±0.135 a	47.33 ±3.61 cd	21.71 ±3.37 cde	0.252 ±0.39 cd	84.98 ±12.75def
	T8 100%	24.63 ±0.615 a	49.11 ±1.61 cd	24.38 ±2.13 bcd	0.283 ±0.25 bc	98.98 ±11.12 bcd
White corn + Multi-Enzyme & Probiotic	T9 50%	24.92 ±0.12 a	51.61 ±2.49 bc	26.68 ±2.61 abc	0.308 ±0.315 ab	107.12 ±11.02 abc
	T10 100%	24.22 ±0.56 a	55.14 ±2.38 ab	30.92 ±1.82 a	0.359 ±0.21a	127.63 ±4.64 ab
Control without white corn	T11	31.67 ±0.25 a	57.77 ±1.04 a	26.43 ±0.46 abc	0.303 ±0.51 ab	83.49 ±0.84 de

The means which have similar number in the same column no significant differences between at probability level ($P \geq 0.05$)

Table 5- Effect of different levels of white corn processing in FI, FCR, FER, ADC% and APD%) (Mean ± standard deviation)

Ingredient	Substitution ratio% for yellow corn	FI g/fish	FCR	FER%	ADC%	ADP%
Raw white corn	T1 50%	63.49 ±1.11 ab	3.24 ±0.13 d	30.78 ±1.02 dc	56.39 1.18 f	59.46 ±0.75cd
	T2 100%	62.48 ±1.79 b	3.75 ±0.87 d	26.65 ±2.04 d	51.45 ±0.63 f	53.62 ±2.54 d
White corn germination for 24h	T3 50%	61.72 ±0.52 bc	2.23 ±0.0 a	44.81 ±3.14 a	60.64 ±0.41 ef	61.09 ±1.01 c
	T4 100%	59.41 ±0.145 bc	2.45 ±0.16 bc	40.84 ±2.74 bc	59.11 ±0.57 f	61.81 ±2.33 c
White corn germination for 48h	T5 50%	62.19 ±1.03 bc	2.33 ±0.91 b	43.01 ±1.68 a	70.81 ±2.41 a	78.35 ±2.12 ab
	T6 100%	61.21 ±0.99 bc	2.38 ±0.65 b	41.93 ±1.15 b	68.74 ±0.93abc	79.97 ±1.10 a
White corn germination for 72h	T7 50%	58.51 ±3.05 bc	2.73 ±0.28 c	36.9 ±3.83 c	65.59 ±0.89 cd	76.38 ±2.16 ab
	T8 100%	55.5 ±3.92 c	2.28 ±0.41 ab	43.82 ±0.73 a	64.17 ±1.21 de	72.64 ±1.17 b
White corn + Multi-Enzyme & Probiotic	T9 50%	60.08 ±2.02 bc	2.26 ±0.14 a	42.81 2.85 ab	70.16 ±1.08 ab	79.90 ±2.82 a
	T10 100%	61.72 ±1.24 bc	1.99 ±0.75 a	50.05 a ±1.86	70.19 ±1.97 ab	79.58 ±0.67 a
Control without white corn	T11	69.52 ±2.28 a	2.63 ±0.41 c	38.03 ±0.59 bc	66.45 ±0.64 cd	75.47 ±2.86 ab

Means which have similar number in the same column no significant difference at probability level ($P \geq 0.05$)

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