

COMPARATIVE ANALYSIS OF SINKING TIME INDEX AND WATER STABILITY OF DIFFERENT LEVEL OF INCLUSION OF CASSAVA FLOUR AND BREWER YEAST IN A TEST DIET

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ABSTRACT

The ability of fish feed to maintain its nutritional content for considerable period of time in pond water has become an important aspect of Aquaculture. Several feed binder, mostly starch with other ingredient capable of creating air trap within the pellet of formulated feed has been used to improve the integrity of fish feed in water. The presence of the above characteristics in cassava flour and brewer yeast inform their selection for this experiment. This research therefore compares the effect of different percentage inclusion of cassava flour and brewer yeast on fish feed stability and sinking time index of a test diet.

Pearson square method was used to formulate a 40% crude protein diet using Fish meal, Soyabean meal, Groundnut cake, rice bran, maize and BDG. Cassava and yeast will each be included at 5%, 10%, 15%, 20% and 25% level and represented as C1, C2, C3, C4, C5 for cassava and Y5, Y4, Y3, Y2 and Y1 for yeast respectively. The treatments were represented as C1Y5, C2Y4, C3Y3, C4YY2, C5Y1.

Floatation tests and water stability test were conducted to determine floatation and the level of disintegration of the test diet per time respectively.

All data were analyzed using Analysis of Variance (ANOVA) followed by Fisher's Least Square Difference (LSD) at 5% level of significance.

The result shows significant different across the floatability of the test diet. The diet (C1Y5) had the best floating time index, while the diet (C5Y1) had the least floatability performance. Water Stability shows diet (C5Y1) gave the best water stability percentage, while (C1Y5) gave the least water stability percentage.

The result of the experiment shows that brewer yeast is a very good floating agent and can support floatation of feed in water for more than 25minutes, while cassava flour has shown itself as a capable candidate for prolonging the stability of aqua feed in water.

Further research can be conducted in the direction that will determine the percentage inclusion of a floating agent and a binder for maximum result of floatation and water stability determination.

Keyword- Fish Feed, Feed Binder, Aquaculture

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INTRODUCTION

The success of fish farming business depends largely on the provision of low cost and good quality fish feed that can guarantee optimum feed conversion ratio. Presently, Aquaculture production still frequently experience low feed conversion efficiency which is mostly linked to feed wastage (Devenport, 2003). In a bid to produce good quality feed that will give the best feed conversion efficiency and reduce wastage, scientist have resolved to the production of feed with high nutritional value (Barrows *et al.*, 2008; Paus *et al.*, 1998) and maximum water stability and digestibility (Hansen and Storebakken, 2007; Booth *et al.*, 2000; Bahurmiz and Ng, 2007) through the use of starch to bind nutrient components of feed together. Starch is an important component of fish feed, it serves the purpose of binding the ingredients in order to form a durable, floating and water stable pellet (Obi *et al.*, 2011).

In Nigeria, Floating feed are in greater demand than sinking pellets, this is because it offers the opportunity for the farmer to observe feeding activity and satiation point of fish thereby discouraging overfeeding and feed wastage. Floating feed also exhibit superior characters such as greater water stability, digestibility, water protection, zero water pollution and zero wastage of raw materials (Almaraaj, 2010)

Unfortunately, only calculated choice of ingredient combination and starch component(s) will give the desired result of floatation and binding quality of the feed (Riaz,1997). Therefore, it is important to combine ingredients that will give low bulk density and high

buoyancy pelleted feed (Obi *et al.*, 2011). In order to produce feed with this characteristics, it will require the inclusion of good quality feed binder which is normally starchy feed material like cassava tuber starch, maize flour starch, millet flour starch among others (Solomon *et al.* 2011), in combination with other feed materials that have the characteristics of trapping air within pellet of the formulated feed, such as yeast, duckweed, honeycomb (Falayi and Sadiku, 2013) and melon shell (Obi *et al.*, 2011). The presence of the above characteristics in cassava flour and brewer's dry grain as reported by (Solomon *et al.* 2011) inform their selection for this experiment. This research therefore compares the effect of different percentage inclusion of cassava flour and brewer yeast on fish feed stability and sinking time index.

SOURCE AND PROCESSING OF FEED MATERIAL

The feed materials used for the experiment (cassava flour, fish meal, maize, yeast, groundnut cake, soyabean meal, rice bran, and brewer dry grain) will all be sourced from a reputable feed milling industry at Akobo, Ibadan. All the feedstuffs will be given appropriate processing and handling care to improve their digestibility and remove anti-nutritional factor. Soyabean, groundnut cake and fish meal will be processed as described by (Solomon *et al.* 2011), while yellow maize, rice bran and brewer yeast will be prepared following the description of (Gbadamosi *et al.* 2006). Dried cassava tuber will be ground to powder after processing and sieved with 0.2mm sieved before use in the formulation of diet.

FEED FORMULATION AND COMPOUNDING

Pearson square method will be used to formulate a 40% crude protein diet using Fish meal (25%), Soyabean meal (15%) and Groundnut cake (10%) as the protein ingredient in the mixture, while rice bran (8%), maize (10%) and BDG (7%) will be included in the diet. Cassava and yeast will each be included at 0%, 5%, 10%, 15%, 20% and 25% level and represented as C1, C2, C3,

C4, C5 for cassava and Y5, Y4, Y3, Y2 and Y1 for yeast respectively. The treatment will be represented as C1Y5, C2Y4, C3Y3, C4Y2, C5Y1.

All values are in percentage

Feed materials					
Fishmeal	25	25	25	25	25
Soyabean meal	15	15	15	15	15
Groundnut cake	10	10	10	10	10
Rice bran	8	8	8	8	8
Maize	10	10	10	10	10
BDG	7	7	7	7	7
Cassava	5	10	15	20	25
Yeast	25	20	15	10	5
Total	100	100	100	100	100

EXPERIMENTAL SET UP

Floataion Test

Glass aquaria of dimensions $54 \times 30 \times 27$ cm will be filled up to $\frac{3}{4}$ of its capacity (32805cm³) with tap water in the Fisheries and Aquaculture Laboratory of the University of Ibadan, Nigeria. Floataion tests will be carried out using glass aquaria triplicates for each treatment hence a total of 15 glass aquaria will be used for the study. Twenty balls of each diet bound with different level of cassava and yeast as floater will be dropped into the aquarium and observed for 25 minutes at 5 minutes interval. At the end of every observation (timing was made by a stop-watch), the number of balls that are afloat were recorded accordingly. The mean numbers of the floating balls will be expressed

Final Number of balls afloat

% balls afloat = ----- $\times 100$

Initial number of balls afloat

Water Stability Test

Water stability test will be conducted using triplicate samples containing 15 single pellets (2mm) diameter tied in nylon sieve materials of 1mm mesh size. These will be tied carefully with a twine to avoid breakage and slowly immersed in the aquarium. Five samples for each treatment

will be fixed in aquaria and allowed to remain for time intervals of 20, 40 and 60 minutes. At the end of every test time, one of the samples for each replicate will be lifted slowly with the aid of the twine and allowed to drain for 3 minutes after which the contents will be put on flat boards and sun-dried for two days and weighed to obtain dry matter weight. The weight obtained here is the left over from the original weight after immersion due to disintegration for each test period i.e. weight of whole pellets. The water stability was calculated as the percentage of the weight of retained (whole) pellets against the initial total sample dry weight using the equation:

$$\% \text{ water stability} = \frac{\text{Weight of retained whole pellets}}{\text{Initial total weight of pellets}} \times 100$$

DATA ANALYSIS

All data were analyzed using Analysis of Variance (ANOVA) followed by Fisher's Least Square Difference (LSD) at 5% level of significance.

RESULTS

Proximate Composition of Diet

	C1Y5	C2Y4	C3Y3	C4YY2	C5Y1.
Moisture %	4.4	4.6	4.7	4.6	4.8
Crude Protein	43.0	41.2	39.9	39.1	38.6
Crude Fibre	7.3	7.3	7.7	7.8	7.9
Ether Extract	7.2	6.7	6.6	6.4	6.2
*NFE	38.1	40.2	41.1	42.2	42.7

*Determined by Subtraction from 100 percent of other parameters.

Floatation Result (%)

	C1Y5	C2Y4	C3Y3	C4YY2	C5Y1.
5 Min	93.75±1.79 ^a	81.45±1.09 ^b	67.5±1.12 ^c	56.55±1.69 ^d	49.75±1.09 ^e
10 Min	82.31±1.67 ^a	67.45±2.14 ^b	54.12±1.34 ^c	37.14±1.34 ^d	25.42±2.40 ^e
15 Min	45.63±2.27 ^a	24.31±1.67 ^b	15.56±3.33 ^c	0.00 ^f	0.00 ^f
20 Min	34.63±3.25 ^a	0.00 ^f	0.00 ^f	0.00 ^f	0.00 ^f
25 Min	22.34±2.24 ^a	0.00 ^f	0.00 ^f	0.00 ^f	0.00 ^f

Means with same letter along the row are not significantly different according to Duncan Multiple Range Test (p=0.05)

Water Stability (%)

	C1Y5	C2Y4	C3Y3	C4YY2	C5Y1.
20 Min	78.75±3.45 ^a	82.75±2.33 ^b	87.5±1.64 ^c	92.75±3.69 ^d	96.75±1.59 ^e
40 Min	54.75±2.14 ^a	61.75±1.60 ^b	66.61±1.57 ^c	79.45±2.23 ^d	85.87±1.38 ^e
60 Min	24.75±1.79 ^a	33.75±1.09 ^b	42.5±1.12 ^c	49.75±3.69 ^d	65.75±1.09 ^e

Means with same letter along the row are not significantly different according to Duncan Multiple Range Test (p=0.05)

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DISCUSSION

Proximate Composition

The proximate composition of the test diet shows that the treatment C1Y5 and C5Y1 has the highest and lowest percentage of crude protein respectively, with the crude protein decreasing across the treatment with decreasing percentage inclusion of Yeast and increasing percentage inclusion of cassava flour. This attribute can be directly linked to higher crude protein in yeast as compared to cassava flour; this is as tarried with the findings of (Eyo, 2005). Crude fibre also shows slight significance among the treatments with no significance between C1Y5 and C2Y4.

Floatation Result

The result shows significant different across the floatability of the test diet. The diet (C1Y5) had the best floating time index, while the diet (C5Y1) had the least floatability performance. Generally, floatability decreases progressively from (C1Y5) to (C5Y1). This is directly proportional to the decrease in percentage inclusion of yeast and increase in percentage inclusion of cassava flour in the test diet. This results is similar to the result recorded by Momoh *et.al.*, 2016 and Falayi and Sadiku (2013). The diet however had better floatation than the result recorded by (Adeparusi and Famurewa, 2011) when 40% CP diets were produced, possibly as a result of the inclusion of yeast in the experimental diet.

Water Stability Result

Water Stability shows significant difference across the test diet, with a mild difference at 20min. A sharp difference was recorded at 40minute period. Generally, diet (C5Y1) gave the best water stability percentage, while (C1Y5) gave the least water stability percentage. This shows a positive trend of higher percentage stability with higher percentage cassava inclusion.

Effiong *et al.*, 2009, reported a water stability of 82.81% for fish feed formulated using cassava starch as binder after one hour of exposure to water. This is however higher than the 65.75% being reported in this research. This can be attributed to differences in the choice of treatment, while this research included yeast; duckweed was used in the research of (Effiong *et al.*, 2009), hence, accounting for the difference in water stability value.

Conclusion and Recommendation

The result of the experiment shows that brewer yeast is a very good floating agent and can support floatation of feed in water for more than 25minutes. While Cassava flour has shown itself as a capable candidate for prolonging the stability of aqua feed in water. Also, starch and brewer yeast also have beneficial nutritional advantage to the fish and are affordable. In summary, the different ingredients used and their percentage inclusion gives the resulting physical properties of the pellet. The quantity of starch used and inclusion of other materials that can create air trap in the pellet will suggest the durability of the pellet. Because starch gelatinizes and acts as a binding agent, the more starch present, the better the quality of the pellet.

Further research can be conducted in the direction that will determine the percentage inclusion of a floating agent and a binder for maximum result of floatation and water stability determination.

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