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EFFECT OF VITAMIN FORTIFICATION IN AUBURN NO. 2 FISH FEED

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ABSTRACT

Vitamin fortification of the Auburn No. 2 pelleted fish feed increased net production of channel catfish an average of 19.3 percent in feeding tests conducted in replicated earthen ponds between April 13 and November 9, 1970. A stocking density of 4,000 fingerlings acre was used and the fish were fed 6 days per week. In comparison to a second commercial catfish feed containing identical vitamin fortification the fortified Auburn No. 2 feed produced an increase in net production of 39.5 percent.

Feed conversion, gain per day and average weight of fish at harvest were all superior with the fortified Auburn No. 2 feed when compared to the other two rations.

INTRODUCTION

Auburn No. 2 fish feed with a composition of 35 per cent soybean oil meal, 35 per cent peanut cake, 15 per cent fish meal, and 15 per cent distillers dried solubles and containing 46 per cent protein, has given satisfactory production as a supplemental feed for both catfish and bait

minnows in earthen ponds at Auburn University (Swingle, 1959, and Prather, 1959). However, in feeding trials in troughs it was found that this feed lacked some essential components required by catfish. Therefore, it is likely that no nutritional deficiencies were observed in fish in ponds because natural feeds were present in sufficient abundance to provide the needed nutrients which the supplemental feed lacked. Hastings and Dupree, (1969), reported increased gains and better conversions with channel catfish in ponds when their standard ration was supplemented with vitamins. Since little other data are available on the effect of the addition of vitamins to pond supplemental feeds it appeared that additional research in this area was needed.

MATERIALS AND METHODS

A feeding trial was conducted in earthen ponds in 1970 to determine the response of channel catfish to vitamin fortification of Auburn No. 2 pelleted fish feed. Auburn No. 2, Auburn No. 2 plus a vitamin package and a control feed containing 32 per cent protein, similar in composition to the standard ration used by Hastings and Dupree (Table 1), were used in the test. The vitamin supplement was similar to that used by Hastings and Dupree with slight modification and the composition is given in Table 2. The feeding experiment was conducted in 0.1-acre ponds with three replications per treatment. A saran sock was used over each inlet pipe to keep out any fish present in the water supply. Each pond was stocked with 400 fingerling channel catfish approximately 4 inches long on March 10, 1970. All fish were fed Auburn No. 2 at

TABLE 1. Ingredients used in control feed.

Ingredient	Pounds
Fish meal, 60% protein	240
Blood meal, 80% protein	100
Feather meal, 80% protein	100
Soybean meal, solvent, 44% protein	400
Dried fermentation solubles	160
Dehydrated alfalfa meal, 17% protein	80
Rice bran, 12% protein	810
Ground corn	100
Vitamin premix	10
Total	2,000

TABLE 2. Vitamin Premix*—amounts added per ton of Auburn No. 2 and control feed.

Vitamin	Amount/ton
A	12 mil USP
D_3	4 mil ICU
Riboflavin	8 g.
Pantothenic acid (d)	24 g.
Choline chloride	1400 g.
Niacin	100 g.
B_{12}	25 g.
E	100 g.
Menadione $NaBiSO_3$	4 g.
Folic acid	1 g.
Pyridoxine	5 g.
Thiamine	5 g.
BHT antioxidant	50 g.

* Similar to Hastings "Layer-Breeder" poultry premix except pyroxidine and thiamine were added and BHT antioxidant substituted for ethoxyquin.

2.5 per cent body weight, 6 days per week, during an acclimation period until April 11. Beginning April 13 each of the three feeds was fed to three ponds daily except Sunday at the rate shown in the feeding schedule below which was equivalent to 4 per cent body weight per day through July but at a somewhat lower percentage later in the experiment as the weight of fish increased.

Dates	Pounds fed per acre
March 11-April 11	1.0
April 13-April 30	2.5
May 1-May 20	5.0
May 21-June 10	7.5
June 11-July 2	16.0
July 3-August 5	25.0
August 6-September 30	30.0
October 1-November 4	40.0
November 5-November 7	20.0
Total	3,927.0

Samples of the catfish were obtained by seining at 4- to 5-week intervals and the feeding rate was increased so that each pond received the same weight of feed. There were fish kills following sudden phytoplankton die-offs in 2 of the 9 ponds so the feeding rates were reduced proportionately to the weight lost for those ponds. There was 89 per cent mortality in E-60 on September 2 and 23 per cent mortality in E-58 on September 14. Oxygen analyses and notes on phytoplankton abundance and resulting sunlight penetration were made approximately 3 times per week during the period. Phytoplankton composition and abundance varied tremendously from pond to pond throughout the experiment.

RESULTS

All ponds were drained November 9 and the results are given in Table 3. The data are omitted for the 2 ponds where fish kills occurred because significant numbers of fish were lost. Survival in all other ponds was 96.5 per cent or higher.

Net production with the Auburn No. 2 feed averaged 2,860 pounds per acre, while production with Auburn No. 2 plus vitamin package was 3,412 pounds which is an increase of 19.3 per cent. The average production with the control feed was 2,446 pounds, which most probably is related to the lower protein content since the identical vitamine package was added.

Feed conversion was best with the Auburn No. 2 feed with vitamin package added which was 1.16 as compared to 1.39 with Auburn No. 2 feed and 1.65 with the control feed.

Gain per acre per day was highest with the Auburn No. 2 feed with vitamins with an average of 14.1 pounds day, followed by gains of 11.8 and 10.0, respectively, for Auburn No. 2 feed and the control feed.

Average weight of catfish at harvest was 0.89 pound with Auburn No. 2 with vitamins, 0.75 pound for Auburn No. 2 feed and 0.63 pound for the control feed.

The results of this feeding test indicated that the addition of vitamins to Auburn No. 2 fish feed improved the most important parameters in catfish production. The cost of the vitamins is about $2.50 per ton of feed so the addition should be profitable to catfish producers. Using these production figures and current local price of fish feed, the addition of vitamins to the Auburn No. 2 feed decreased the feed cost per pound of catfish by 1.5 cents. Further research is needed to determine the effect of vitamin fortification at stocking densities lower than 4,000 per acre since most producers are currently using rates nearer 2,000 per acre or less. Additional experiments are also needed to determine if the

TABLE 3. Results per acre in feeding test with 4,000 channel catfish stocked March 10 and harvested November 9, using 3 different feeds.

Feed-Pond	Initial wt. fish, pounds	Net production pounds	Feed conversion	Per cent survival	Gain/day pounds	Av. wt. at harvest, pounds
Aub. No. 2						
E-59	35.6	3098	1.27	98.5	12.7	0.80
E-64	41.0	2622	1.50	97.5	10.8	0.70
Av.	...	2860	1.39	98.0	11.8	0.75
Aub. No. 2 plus vitamins						
E-62	35.0	3150	1.25	96.5	13.0	0.83
E-66	43.0	3674	1.07	99.0	15.1	0.94
Av.	...	3412	1.16	97.8	14.1	0.89
Control						
E-61	36.3	2756	1.43	99.0	11.3	0.71
E-63	37.5	1949	2.03	98.5	8.0	0.50
E-65	40.0	2634	1.49	99.0	10.8	0.68
Av.	...	2446	1.65	98.8	10.0	0.63

vitamin fortified Auburn No. 2 feed is satisfactory for intensive culture of catfish in raceways and cages where rates much higher than 4,000 per acre may be used in combination with water exchange and aeration.

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BIOLOGICAL FILTERS FOR INCREASED FISH PRODUCTION [1]

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INTRODUCTION

The production of fish in ponds is limited by several factors, among which are dissolved oxygen concentration and organic wastes in the water. Some wastes, particularly ammonia, are toxic to fish; while others contribute to the oxygen demand of the pond, reducing the oxygen available to fish.

Approximately 2,400 pounds of catfish per acre per year can be raised in ponds receiving supplemental feed (Prather and Swingle, 1960). The natural aeration and waste disposal systems of the pond are insufficient for larger crops and must be augmented by the fish culturist for larger yields. A flow of water through the pond is satisfactory if large volumes of suitable water are available and the subsequent pollution of the downstream environment is acceptable. Both the water used and downstream pollution are minimized if the water is purified and recirculated. Kuronuma (1968) reported harvests of common carp up to 30.3 kg/m^2 using mechanical filtration through coarse sand or small gravel and complete circulation every 2 hours. Other methods of purification need study. A biofilter, or trickling filter, is an efficient, widely used means of purifying sewage (Lohmeyer, 1957) which should be adaptable to the purification of water for fish. Chu and Greene (1967) grew goldfish (*Carassius auratus*) to a final weight equivalent to 18,330 lb/acre using small scale biofilters attached to aquaria.

This paper presents data on the use of biofilters to purify recirculated water for the culture of catfish. The general objectives of this research were to determine the potential production of a recirculating system with a biofilter; to determine the effects of the biofilter on water quality; and to compare the performance of channel catfish (*Ictalurus punctatus*) and white catfish (*I. catus*) in a biofilter system.

MATERIALS AND METHODS

All experiments were conducted in rectangular concrete ponds. The filters were boxes constructed of 2″ x 4″ pine boards spaced approximately ¾ inch apart, filled with two to four inch gravel and mounted over the ends of the ponds (Figure 1). The dimensions of the ponds and filters were:

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