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# Oligosaccharide levels in soy meals don't affect channel catfish performance

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## Soybean meal has strong amino acid profile



Differences in levels of oligosaccharides in feed did not appear to affect the nutrient utilization and growth performance of the channel catfish.

Soybean meal is the predominant protein source used in commercial channel catfish feeds because it has the best amino acid profile among all commonly available plant protein feedstuffs. Using traditional breeding techniques, soy breeders have found varieties with oligosaccharide content reduced from 5.0 to 6.0 percent to less than 0.5 percent.

Research has shown that poultry, swine and trout fed low-oligosaccharide soybean meal (LOSBM) had enhanced performance compared to animals fed conventional soybean meal (CSBM). Low-oligosaccharide meal has higher nutritional values than conventional soybean meal. It contains higher protein (about 58.0 versus 48.0 percent) and much lower levels of the oligosaccharides stachyose and raffinose (under 0.5 versus 5.8 percent) than CSBM.

Oligosaccharides are considered unutilizable by fish because there is a lack of digestive enzymes and microbial activities in fish guts. These compounds can also interfere with nutrient digestion and promote unhealthy gut microflora.

The nutritionally improved soybean meal had not been evaluated in diets for channel catfish. Therefore, a study was conducted at the Mississippi State University's National Warmwater Aquaculture Center in Stoneville, Miss., USA, to compare CSBM and LOSBM as the main protein sources in channel catfish diets.

## Experimental design

Four diets were formulated to contain 28 or 32 percent protein with CSBM or LOSBM supplying most of the protein (Table 1). To maintain other ingredients at similar levels in the varied diets, slightly more corn was used in those containing LOSBM because less of the meal was used due to its higher protein

content. All diets were produced using cooking extrusion under commercial conditions at the Fish Technology Center in Bozeman, Montana, USA.

## Li, Ingredient composition, Table 1

Ingredient	Diet 1 (28% Protein, CSBM)	Diet 2 (28% Protein, LOSBM)	Diet 3 (32% Protein, CSBM)	Diet 4 (32% Protein, LOSBM)
Conventional soybean meal	28.93	-	40.95	-
Low-oligosaccharide soybean meal	-	23.10	-	32.62
Cottonseed meal	15.00	15.00	15.00	15.00
Corn gluten feed	20.00	20.00	20.00	20.00
Corn grain	17.61	23.39	15.67	23.90
Wheat middlings	15.00	15.00	5.00	5.00
Lysine-hydrochloride	0.28	0.26	0.18	0.14
Dicalcium phosphate	0.93	1.00	0.95	1.09
Other ingredients*	2.25	2.25	2.25	2.25

Table 1. Ingredient composition of experimental diets.

Twenty channel catfish with mean initial weights of 10.0 grams/fish were stocked into each of 20, 110-L flow-through, glass aquariums. Five aquariums were randomly allotted for each dietary treatment. Water temperature was maintained at  $30 \pm 1$  degrees-C, and dissolved-oxygen levels were kept above 5.0 mg/L. Fish were fed to apparent satiation once daily for nine weeks.

## Results

Regardless of dietary protein levels, the juvenile catfish fed diets containing LOSBM had feed consumption, weight gain and feed conversion similar to those fed diets containing CSBM (Table 2). This supported previous observations that channel catfish utilize CSBM well as a protein source.

## Li, Mean performance of channel catfish, Table 2

Diet No.	Dietary Protein (%)	Soybean Meal Type	Feed Consumption (g/fish)	Weight Gain (g/fish)	Feed-Conversion Ratio	Survival (%)
1	28	CSBM	52.9	29.1	1.36	100
2	28	LOSBM	51.0	27.5	1.36	100
3	32	CSBM	58.8	38.9	1.20	100
4	32	LOSBM	54.3	34.2	1.23	100

Pooled standard error			1.8	1.9	0.03	–
ANOVA (P)						
Dietary protein			0.03	< 0.01	< 0.01	
Soybean meal			0.12	0.14	0.56	
D.P. x SBM			0.50	0.47	0.62	

CSBM = conventional soybean meal; LOSBM = low-oligosaccharide soybean meal.

Table 2. Mean performance of channel catfish fed diets containing 28 or 32% crude protein with conventional or low-oligosaccharide soybean meal.

Fish fed 32 percent-protein diets with CSBM or LOSBM had significantly higher feed consumption and weight gain, and lower feed-conversion ratios than fish fed 28 percent protein diets. This result was contrary to the authors' previous findings that a traditional diet containing 28 percent protein mainly supplied by CSBM and animal proteins was sufficient for optimum growth of fingerling and food-size channel catfish. This difference may have been due to interactions between the protein levels and ingredient compositions of the diets used in various studies.

The diets used in the present study contained 20 percent corn gluten feed, an alternative feedstuff that is currently used in commercial channel catfish feeds. Also, the 15 percent cottonseed meal level was slightly higher than the 5 to 10 percent content in the traditional channel catfish feeds used in previous studies.

Research has shown that corn gluten feed and cottonseed meal have lower protein and energy digestibility than soybean meal does. While a 28 percent protein diet containing 20 percent corn gluten feed and 15 percent cottonseed meal can be well utilized by pond-raised, food-sized channel catfish, it may not meet the protein and energy requirements for channel catfish fingerlings raised in aquariums.

## Perspectives

Results from the present study demonstrated that juvenile channel catfish utilized both CSBM and LOSBM equally well. With the dietary ingredient compositions used, differences in levels of oligosaccharides did not appear to affect the nutrient utilization and growth performance of the channel catfish. During fingerling production, channel catfish should be fed a 32 percent protein feed, especially if the feed contains alternative feed ingredients such as corn gluten feed and cottonseed meal.

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