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There is no soybean production and utilization report this month since the latest values were included in the December Soybean Meal INFOsource newsletter and the values for the coming season are not available. It is anticipated that the April newsletter will feature soybean and soybean meal supply and demand estimates for the 2010 crop season.

In developing this newsletter, an impressive website surfaced that showed the growth of soybean production from 1962 to 2005 by geographic area. This website shows visually the changes in world soybean production (http://centrec.com/resources/promotional/SoybeanModel/WSPmodel.html). You may want to check out this unique website.

Comparing Soy Protein Products for Turkeys
An experiment was conducted to investigate the effects of diets containing soybean meal, soy protein concentrate and soy protein isolate on growth performance and gut function of the young turkey. One-day-old male turkey poults were randomly assigned to four dietary treatments, with seven pens per treatment and 29 birds per pen. The four experimental diets were isonitrogenous and isocaloric and contained similar amounts of total and water-soluble nonstarch polysaccharides and fed for two-four week periods. The content of oligosaccharides differed among the diets and averaged 2.4, 1.9, 0.9, and 0.1% for the soybean meal, soy protein concentrate and soy protein isolate-based diets, respectively. When compared with SBM, birds consuming the soy protein concentrate and soy protein isolate diets had higher ($P < 0.05$) final BW (4.32 vs. 4.45 and 4.46 kg, respectively). Incorporation of soy protein isolate as a substitute for soybean meal resulted in improved ($P < 0.05$) feed utilization (from 1.76 to 1.67), but did not affect the final BW. The authors concluded that partial or almost complete substitution of soybean meal with soy protein concentrate suppressed the fermentation processes in the ceca and enhanced the growth rate. Substitution of soybean meal with soy protein isolate significantly improved feed utilization, but decreased the body weight of 4-wk-old turkeys with no effect on growth rate of older 8-wk-old birds. *(Note-the comparison of the three soy protein products would have been more meaningful if the diets would have been balanced for essential amino acids. The amino acid content of the three protein sources is different).*

Jankowshi, J. and co-workers. 2009. *The effect of diets containing soybean meal, soybean protein concentrate, and soybean protein isolate of different oligosaccharide content on growth performance and gut function of young turkeys. Poultry Sci. 88:232-2140.*

Glycerin (Glycerol) Use-Layers
The effect of dietary crude rapeseed glycerin (glycerol) on laying performance; egg quality; retention of N, Ca, and P; and metabolizability of energy was determined. The dietary treatments consisted of a control corn-soybean diet containing 6% corn starch (17% CP, 2,775 kcal/kg of AMEn, 0.81% lysine, 0.36% methionine, 3.60% Ca, and 0.37% available P) and three experimental diets containing 2, 4, or 6% crude glycerin by substituted for corn starch. During the experimental period (28 to 53 wk of hen age), the dietary level of glycerin had no significant effects on performance (egg production (95.6%), egg weight (60.4 g), daily egg mass (57.8 g/hen), daily feed consumption (121 g/hen), and feed conversion (0.477 g of egg mass/g of feed consumed). No significant treatment effects were found for egg quality parameters (albumen height, Haugh units, yolk color and thickness, density and breaking strength of eggshell), excretion and retention of N, Ca and P, or metabolizability of energy. Linear regression analysis revealed that the AMEn value of crude glycerol was 3,970 kcal/kg (as-is basis). The results of this study demonstrated that crude glycerin may be incorporated to a level of 6% in the diet of laying hens without any detrimental effect on egg performance, egg quality, nutrient retention, and energy utilization.

Swiatkiewicz, S. and J. Koreleski. 2009. *Effect of crude glycerin level in the diet of laying hens on egg performance and nutrient utilization. Poultry Sci. 88:615-619.*

Soybean Checkoff-funded Research
Soybean growers, through their soybean checkoff program, are investing in soybean research projects targeted at both improving production technologies and expanding soybean use. A report was recently developed, and funded by the United Soybean Board, that provides a listing of the various production research projects; soybean composition studies; utilization projects and technology transfer activities that are funded in part by the soybean checkoff. On October 1, 2009 soybean growers were funding 622 projects with a total investment of $47.1 million.

About 20 of the projects specifically targeted research to improve the feeding value of soybean meal and soybean hulls. Another 35 projects were directed at improving the composition of soybeans to improve their value for end users of soybean meal and oil. The entire Soybean Checkoff-funded Research Database report can be found on the Internet at (www.soybeancheckoffresearch.org) for all to use. It is hoped that this searchable (by soybean research topic, funding board and researcher) website database will serve the soybean grower, research administrator and those interested in learning more about the soybean research programs that are being funded by soybean growers through their checkoff. The website provides a method to quickly search for soybean checkoff-funded projects that are underway.

Some of the checkoff-funded research projects directed at improving the nutritional acceptance of soybean meal for livestock, poultry and aquaculture producers are as follows:

The effect of various processing techniques on the nutritional value of soybean meal fed to weaned pigs; *Jonathan Holt (Illinois State University).* The objectives of the research in this current proposal are to: 1) Analyze the nutrient and energy digestibility of diets containing fermented soybean meal fed to weaned pigs; 2) Determine if various processing of soybean meal can enhance the growth performance of weaned pigs; and 3) Quantify the amount of anti-nutritional factors present in soybean meal processed using various techniques.

Adipocyte development in neonatal piglets receiving soy infant formula; *Sharon M. Donovan and Paul S. Cooke (University of Illinois-Urbana/Champaign).* The proposed studies investigate the hypothesis that isoflavones, predominantly genistein in soy infant formula will reduce adipose cell development and gene expression in neonatal piglets.

Increasing utilization of soy-derived protein sources in aquaculture feeds; *Jesse Trushenski and Christopher Kohler (Southern Illinois University-Carbondale).* The researchers will evaluate a range of soybean-derived protein sources in hybrid striped bass feeds, in order to identify maximal inclusion rates for soy products in aquafeeds for carnivorous fish. Specifically, they plan to: 1) Evaluate the extent to which soybean meal may spare fish meal in feeds for hybrid striped bass without impairing performance; 2) Identify the extent to which a reduced fish meal feed can be amended by inclusion of soy protein concentrate to further reduce fish meal; and 3) Further reduce the remaining fish meal by including soy protein isolates containing about 90% protein.

Nutritional enhancement of soybean carbohydrates and hulls for animal feed using microbial cultures; *Praveen Vadlani, Ron Madl, Dan O'Brien (Department of Grain Science and Industry, Department of Extension Agricultural Economics NW Research Extension Center, Kansas State University).* The objective of this project is to ferment the soluble carbohydrates in soybean hulls into microbial protein and to characterize the fiber digestion and nutritional improvement of the soybean hulls. The study will compare the economics of the fermented hulls product to soybean hulls and distillers grains.

Characterization of alternative soybean storage practices and their effects on post-harvest quality; *Jason Ward and Jeremiah Davis (Agricultural and Biological Engineering Department, MAFES, Mississippi State University).* This research involves measuring the storage conditions within polyethylene grain bags and its effect on soybean quality.

Enhancing the nutritional value of soybean seed meal to meet the amino acid requirements of livestock; *Monty Kerley and Hari Krishnan (Animal Science Department, University of Missouri).* The overall goal of this research is to improve the density of amino acids in soybean protein that are nutritionally relevant and limited in availability in commercial soybean meals.

Microbial digestion of soybean hulls; *Monty Kerley (Animal Science Department, University of Missouri).* The goal of this project is to increase the feeding value of soybean hulls by identifying the technology that would improve fermentability and feeding value of soybean hulls.

Identification of soybean proteins which are allergenic to young pigs; *Monty Kerley and Hari Krishnan (Animal Science Department, University of Missouri).* The goal of this project is to eliminate soy proteins that cause allergic reactions in the gut of young pigs.

Is soy allergen effect on pigs a myth? *Monty Kerley (Animal Science Department, University of Missouri).* The goal of this research is to improve the performance of the young pigs fed soy protein. The objectives are to determine the feeding value of a low oligosaccharide soybean meal and then to assess various commercial enzymes for their ability to hydrolyze the oligosaccharides present in soybean meal.

Optimum level of soybean meal in sow lactation diets; *Gary Allee (Animal Science Department, University of Missouri).* The goals of this project are to determine the optimum levels of soybean meal in diets for parity one and parity two high-producing sows during lactation in a commercial environment. The researcher will follow subsequent performance and evaluate the influence of treatments during lactation not only on litter size, but also longevity in the breeding herd.

Evaluation of replacement of fish meal with soybean meal in hybrid striped bass diets; *Tom Losordo and M.J. Turano (North Carolina State University Sea Grant Program).* This study focuses on the creation of soy-based diets for hybrid striped bass. If successful in replacing fish meal with soy meal in the diet of hybrid striped bass, the species could be used as a model for creating diets for other fin fish including salmon.

Value of soybean residue for cattle feed; *Vern Anderson and Breanne Ilse (North Dakota State University Carrington Research Extension Center, Carrington, N.D.).* The goal of this project is to determine the nutritional value of soybean resides. Soybean residues will be collected and analyzed for crude protein, crude fiber, acid detergent fiber, fat and mineral contents. The relative economic value of the soybean residue will be determined for gestating beef cows.

Assessing the nutritional energy value of stacked trait low phytate/low oligosaccharide soybean in animal feeding applications; *Philip Lobo (United Soybean Board).* The objective of this research is to conduct animal feeding studies of the low phytate/low oligosaccharide soybeans developed at Virginia Tech.

Dietary energy utilization of soybean meals originating from varieties having altered sugar composition fed to broiler chicks; *William Dozier (Auburn University).* This research will evaluate soybean meals originating from experiment soybean cultivars having altered sugar concentrations.

Increasing metabolizable energy in soybean meal; *Mian Riaz (Texas Engineering Experiment Station).* This project focuses on increasing the availability of soybean's metabolizable energy for monogastric animals by using the alpha-galactosidase enzyme during meal extrusion.

Soy-in-aquaculture research; *John Campen (United Soybean Board).* The Soy-in-Aquaculture Managed Program is a program designed to remove the barriers to the use of soybean meal and soy protein concentrate in diets fed to aquaculture species. The research project focuses on the following species: marine shrimp, seriola (yellowtail and amberjack), cobia, cod, tilapia, white sea bass, milkfish, summer and olive flounder, Asian seabass, and giant grouper. These species are large industries currently under utilizing or consuming little or no soybean meal or soy protein concentrate. The highly integrated and collaborative nature of this initial series of projects should result in expansion of soybean meal and protein concentrate into new rapidly growing markets.

Additional information on these soybean checkoff-funded projects can be found on the www.soybeancheckoffresearch.org website. Also included on the website are email addresses for the lead investigators so one can contact the research group for additional information on the project.

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Soybean Meal Digestibility-Shrimp
Apparent digestibility coefficients of dry matter, crude protein, crude lipid, gross energy, phosphorus and amino acids in Peruvian fish meal, fermented soybean meal, extruded soybean meal, soybean meal, peanut meal, wheat gluten meal, corn gluten meal, shrimp byproduct meal, meat and bone meal, poultry meat meal and plasma protein meal were determined for white shrimp (Litopenaeus vannamei). A reference diet and test diets (consisting of 70% reference diet and 30% of the feedstuff) were used with 0.5% chromic oxide as an external indicator. A total of 1440 shrimp (initial mean body weight 1.05 ± 0.01 g) were randomly distributed to 36 500-L fiber glass tanks with 40 shrimp per tank and three tanks per diet. The shrimp were fed to apparent satiation four times a day and the feeding experiment lasted for 6 weeks. Digestibility was determined by collecting fecal material.

Results indicated that apparent dry matter digestibilities for white shrimp (L. vannamei) were the highest for the Peruvian fish meal treatment, with the animal products ranging from 52.8–71.2% and plant products 70.0-77.1%. The protein and lipid from plant and animal sources were well digested by white shrimp. Apparent protein and lipid digestibility were in the range 87.9–93.2% and 91.6–95.3%, respectively, in plant products, and 75.0–92.3% and 83.7–92.8%, respectively, for animal products. The white shrimp demonstrated a high capacity to utilize phosphorus in the ingredients. The apparent phosphorus digestibility ranges of animal feedstuffs and plant feedstuffs were 58.9–71.6% and 75.8–82.3% respectively. Amino acid availability reflected protein digestibility, except that in meat and bone meal, for which the availability of some amino acid was lower, possibly due to protein damage during processing. These digestibility values of the soy products would support their use of these ingredients in least-cost formulated diets for white shrimp.

Table-Apparent Digestibility of Feed Ingredients for Juvenile White Shrimp

Meal Ingredients	Dry Matter (%)	Crude Protein (%)	Crude Lipid (%)	Gross Energy (%)	Phosphorus (%)
Fermented SBM	70.0±6.9	90.9±5.1	93.2±3.0	74.1±1.2	67.2±4.5
Extruded SBM	71.2±7.9	90.8±5.2	91.9±2.5	82.0±3.4	68.9±4.5
Soybean Meal	**70.0±4.5**	**89.0±2.7**	**91.6±3.6**	**81.4±4.1**	**64.3±3.8**
Peanut Meal	70.0±5.0	93.2±2.0	95.3±1.2	82.3±3.9	58.9±3.2
Wheat Gluten	76.5±6.0	89.39±5.8	92.5±1.1	86.8±4.6	71.6±2.2
Corn Gluten	77.1±2.1	87.9±2.2	91.9±3.8	86.1±4.8	70.8±1.5
Shrimp By-product	52.8±6.9	73.9±2/6	91.6±4.2	72.3±1/4	78.7±2.4
Meal & Bone	56.3±6.7	73.9±2.2	83.7±3.9	84.8±2.3	75.8±3.4
Poultry By-product	68.5±3.5	75.0±2.7	89.6±2.5	75.4±4.6	76.0±3.8
Plasma Protein	71.2±3.7	92.3±3.1	89.7±3.9	88.2±6.2	73.3±3.6
Fish Meal	83.8±3.7	91.6±5.2	92.8±2.3	86.8±4.7	82.3±3.5

Yang, Qihui and co-workers. 2009. Apparent digestibility of selected feed ingredients for white shrimp Litopenaeus vannamei, Boone. Aquaculture Research 41:78-86.

High-Protein Distillers Dried Grains-Broilers Two experiments were conducted to evaluate by-products of corn fermentation. The first experiment determined nutrient digestibility of high-protein corn distillers dried grains (HP-DDG; 54% CP) after feeding semi purified diets from 15 to 22 days of age. The AMEn of HP-DDG was 2,526 kcal/kg, whereas standardized ileal lysine, methionine, and threonine digestibilities were 73.0, 84.9, and 73.0%, respectively.

In a second experiment, an industry control diet regimen was compared with that of either an approximate 25 or 50% replacement for the level of 48% crude protein soybean meal (SBM) inclusion in the diet utilizing the amino acid digestibility and AMEn determined from the first experiment. From 0 to 14, 14 to 28, and 28 to 42 d of age, the HP-DDG in the 50% SBM replacement diet was added at 25, 23.5, and 21% of the diet, respectively. To meet digestible amino acid needs, the diet containing 50% SBM replacement with HP-DDG contained 3.2, 3.6, and 4.4% units more crude protein than the control diet regimen from 1 to 14, 14 to 28, and 28 to 42 d of age, respectively. Dietary replacement of up to 50% of SBM inclusion with HP-DDG had no effect on bird performance at 14 or 42 d of age or breast fillet yield at 42 d of age; however, it decreased body weight gain and increased feed:gain ratio from 14 to 28 d of age. Birds consuming a diet with 50% replacement of SBM with HP-DDG consumed 17.1% more nitrogen compared with those consuming the control diet. This additional nitrogen and fiber consumed resulted in birds being fed the 50% replacement for SBM diet excreting 21.9 and 31.8% more manure dry matter and nitrogen, respectively. Due in large part to the amino acid profile and digestibility of HP-DDG, the use of HP-DDG as a large proportion of the diet is feasible, but results in more manure and manure nitrogen from broilers. *(This means that nutritionists need to carefully evaluate the bioavailability of amino acids in alternative feed ingredients since feeding excessive levels of protein to assure the feed contains minimum levels of the critical amino acids leads to environmental concerns).*

Applegate, T.J. and co-workers. 2009. The nutritional value of high-protein corn distillers dried grains for broiler chickens and its effect on nutrient excretion. Poultry Sci. 88:354-359.