A COMPARISON OF THE GROWTH RESPONSE OF DIFFERENT SOYBEAN MEALS IN BROILER CHICKS UNDER ENERGY OR AMINO ACID DEFICIENT CONDITIONS

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19th ANNUAL AUSTRALIAN POULTRY SCIENCE SYMPOSIUM
SYDNEY NEW SOUTH WALES
12-14 FEB, 2007

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Summary

Soybean meals of similar proximate analysis have been shown to perform differently in broiler feeding trials. The question is whether the differences can be attributed to higher available amino acids (AA) or higher metabolizable energy (ME) or both. Three dehulled soybean meals from different origins were used to conduct a broiler chick feeding trial under either low AA or low ME conditions. The results showed that broiler chicks fed the AA deficient diet had significantly better feed conversion ratio than broiler chicks fed the energy deficient diet. On soybean meal origins, chicks fed the diet using a commercial Malaysian dehulled soybean meal[1] had significant higher body weight gain than chicks given diets containing commercial US dehulled soybean meal or commercial Argentinean dehulled soybean meal. No diet by soybean meal origin interactions were detected. This suggests that both available AA and ME content of soybean meals tested were important and contributed to better bird performance.

I. INTRODUCTION

There are several reports in the literature to suggest that soybean meal with similar proximate analyses can perform differently in broiler feeding trials (Neoh, 2003; Parsons *et al*., 1991; Vohra and Kratzer, 1991). A chick bioassay using the protein efficiency ratio (PER) was proposed by Mateo and Swick (2003) as a tool for predicting the quality of soybean meals. Subsequently Neoh and Ng (2006) showed a correlation between apparent metabolizable energy (AME), PER and the growth performance of broiler chicks given diets containing different soybean meals. The purpose of this study was to compare the performance of broiler chicks offered diets containing dehulled soybean meal from three different origins with either energy-deficient or amino acid-deficient diets, to determine if differences among soybean meal origins were more related to differences in AME, available amino acids or both.

II. MATERIALS AND METHODS

A 2 x 3 factorial experimental design was used in this trial. Two diets of different nutrient levels and three soybean meals of different origins were used. The energy and amino acid ratio as well as essential amino acids specifications of the diets were formulated according to recommendations from Degussa Feed Additives (2001). One of the diets was formulated to be deficient in metabolizable energy (ME, 12.13 MJ/kg) but adequate in amino acids (digestible lysine 11.13 g/kg). The other diet was deficient in amino acids (AA, digestible lysine 10.59 g/kg) with an "adequate" ME of 12.76MJ/kg. The three commercial dehulled soybean meals were US dehulled soybean meal (US SBM) as control, dehulled soybean meal processed from US soybeans by Soon Soon Oilmills, Malaysia (SS SBM) and Argentinean dehulled soybean meal (ARG SBM). The proximate analysis of the soybean meals are listed in table 1.

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[1] Soon Soon Oilmills, Malaysia.
[2]American Soybean Association, Singapore

Table 1 : The proximate analysis (as is basis), potassium hydroxide Protein Solubility (KOHPS), Trypsin Inhibitor Activity (TIA) and Total Lysine content of US SBM, SS SBM and ARG SBM

Parameters	US SBM	SS SBM	ARG SBM
Moisture, g/kg	122	119	117
Protein, g/kg	465	466	462
Oil, g/kg	15	17	19
Crude Fiber, g/kg	34	31	32
Ash, g/kg	64.2	60.2	65.8
KOHPS, g/kg	823	854	835
TIA, mg/g	14	19	19
Total Lysine, g/kg	29.2	29.6	28.4

The trial was conducted at the Bangkok Animal Research Center, Thailand. A total of 1500 Arbor Acres High Yield Breed, male chicks were randomly assigned to 6 treatments each with 10 replicates. The chicks were allocated equally over 60 pens and each pen contained 25 birds. All birds were fed *ad libitum* with the above experimental diets from 1 to 21 days of age. Body weight and total feed consumption were measured at the end of 21 days. Body weight gain and feed conversion ratio (FCR) were then calculated.

III. RESULTS AND DISCUSSION

The body weight gain, FCR and livability are shown in table 2. The results show that chicks offered diets with high ME and low AA had numerically greater body weight gain (9 grams or 1.2%, P=0.08) and a significantly better feed conversion ratio (4 points or 3%, P<0.0017) than those offered the low ME-high AA diets. For the soybean meals from different origins, the results showed that chicks fed the SS SBM diets had significantly greater body weight gain than chicks fed the US SBM control diets (18 grams or 2.3%, P< 0.0001) across diet types. Chicks fed the ARG SBM diets had significantly lower body weight gain than those given the US SBM control diets (-13g or -1.6%, P< 0.0001) and SS SBM diets (-30g or -4.0%, P<0.0001). There were no significant differences in livability. Overall, there appears to be no interaction between nutrient levels and soybean meal origins (P=0.86 for body weight gain and P=0.46 for FCR). These results suggest that both available AAs and ME content of soybean meals are critical determinants of the growth performance of broiler chicks. In terms of overall available nutrient content, the soybean meals can be ranked as SS SBM >US SBM >ARG SBM.

Table 2: Body weight gain, feed conversion ratio and livability of broiler chicks when offered US SBM, SS SBM or ARG SBM in diets formulated with low energy or low amino acid requirements.

SBM	ME MJ/kg	Dig. Lys g/kg	Body Weight Gain (g)	Feed conversion ratio	Livability (%)
Main effects					
Nutrient					
	12.13	11.13	763.1	1.391[a]	98.9
	12.76	10.59	772.1	1.351[b]	99.3
Significance of nutrients effects			NS	**	NS
Soybean meal					
US			765.9[a]	1.374	99.6
SS			783.7[b]	1.354	99.2
ARG			753.3[c]	1.386	98.6
Significance of SBM effects			****	NS	NS
Nutrient x SBM			NS	NS	NS
Treatment effects					
US	12.13	11.13	761.3[abc]	1.384[ab]	99.6
SS	12.13	11.13	777.5[cd]	1.383[ab]	99.6
AG	12.13	11.13	750.6[a]	1.406[a]	97.6
US	12.76	10.59	770.6[b]	1.363[bc]	99.6
SS	12.76	10.59	789.8[d]	1.325[c]	98.8
AG	12.76	10.59	756.1[ab]	1.366[abc]	99.6
Significance of treatment effects			***	**	NS
Pooled SE			6.2	0.015	0.54
CV, %			2.57	3.37	1.7

[a, b, c, d] Means with unlike superscripts within either main effects or treatment effects within a column differ *(P<0.05), **(P<0.01), *** (P<0.001), ****(P<0.0001). NS – not significant.

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