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Nutrient Intake and Pre-Caeca Amino Acids Digestibility of Broiler Chickens Fed Differently Processed Soybean meal

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Introduction

The use of soybean meal in poultry rations have long been accepted because it provides an excellent source of energy (oil content: 180 - 220g/kg) and protein (370-420g/kg) with acceptable ammo acid (AA) profile (Sebastian *et al.,* 1997). Furthermore, full fat soybean have been in use in poultry diets neglecting the other processed products such as defatted, cooked and roasted soybeans. Where these are used the measured parameters are limited to growth indices and economy of production. Thus, information on the effects of differently processed soybean meal on different physiological ages of broiler chickens with respect to amino acid digestibility coefficient and nutrient utilization, which form the main thrust of this study, is rare.

Material and Methods

Soybeans were subjected to 3 processing methods (PM): cooking, roasting and defatting and each were included in the diets for broiler chickens of age 0-3, 3-6 and 6-8 weeks. A batch of 648 day old chicks (Ross 308) was divided into 3 groups. The 1st group was subjected to feeding trial at age 0-3weeks, the 2nd group was raised on a commercial diet till they were 3 weeks and raised on the experimental diets (3-6 weeks) while the 3rd group was raised on commercial diet up to 6 weeks and placed on the experimental diets (6-8weeks). The cooked soybean meal (SBM), roasted SBM and defatted SBM were included in diets A, B & C, respectively at the same level of 25% inclusion in each phase and fed to their respective experimental birds in a 3x3 factorial arrangement (3) differently processed SBM and 3 physiological growth phases: 0-3, 3-6 & 6-8 weeks. Titanium oxide was included as indigestible maker. At the close of each phase, birds were slaughtered and digesta collected from the gastro-intestinal tract between Meckel's diverticulum and 2cm anterior to the ileo-caeco-colonic junction, pooled for all birds from the same pen, freeze-dried and analyzed for nutrients, and the nutrient utilization and amino acid pre-caeal digestibility coefficient (DC) calculated.

Results and Discussion

Table 1 shows that the DM, CP, NFE and ash intakes were significantly ($p<0.001$) affected by processing method (PM) and bird's age (BA) while the energy intake was only significantly ($p<0.001$) influenced by PM. Also, the interactions between PM and BA for all the nutrients except the fat intake and energy intake were significantly affected. Base on DMI and CPI this

study suggests that at 0-3weeks of age, broiler chicks could be fed on diet containing defatted SBM, at 3-6weeks of age either cooked or defatted SBM could suffice while at 6-8 roasted or defatted SBM could be a better option to cooked SBM. This further confirms the earlier report (Kadim and Moughan, 1997).

Table 2 shows that for all the amino acids studied birds (0-3 weeks of age) fed defatted SBM-based diet had consistently lowest DC for the entire AA measured but cooked SBM had the highest MDC (0.87) which suggests that at 0-3 weeks of age cooked SBM may be a best option. Also, out of the 17 AA whose DC were measured, 5 each of this was highest in cooked and defatted SBM-based diet and 11 in roasted SBM-based diet for birds of age 3-6weeks, thus suggesting that roasted SBM may be a better option at 3-6 weeks of age than the cooked and defatted SBM. Similarly, of the 17 AA whose DC were measured, 7 of this was highest in cooked SBM-based diet, 12 in defatted SBM-based diet and 2 in roasted SBM-based diet suggesting that at age 6-8 weeks defatted SBM could be a better option to roasted and cooked SBM. The age of birds was observed not to significantly influence the DC of 6 amino acids out of 17 AA. Also, the mean digestibility coefficient (MDC) of birds on cooked SBM-based diet increased from 0.63 in birds of age 0-3 weeks to 0.85 in birds of age 6-8weeks while it decreased from 0.87 in birds on defatted SBM-based diet through 0.83 at 3-6 weeks to 0.85 at 6-8weeks of age while it decreased drastically from 0.85 in birds of 0-3 weeks old to 0.81 in birds of age 6-8 weeks old in roasted SBM, indicating that age of birds could also be a major factor in DC of AA measurement. This is further confirmed by the significant interaction that existed between age and processing methods for the entire AA measured except histidine and valine. This suggests in part that as the animal ages the PC digestibility co-efficient could improve as observed in defatted SBM. This may be because as the birds' advances in age, the size and length of the ileum also increase thereby providing a longer and larger surface area for the digestibility and absorption of nutrients in the lumen (Huang *et al.,* 2005).

Conclusions and Outlook

It could be concluded that the bio-utilization of SBM by broiler chickens depends on the processing methods adopted and the physiological age at which they are fed to the birds as interactions between the processing methods and age of birds were in most cases significant.

References

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Table 1: Nutrients intake & energy utilization of birds of different ages fed on differently processed soybean meal-based diets

Age	0-3weeks			3-6wks			6- 8wks				P Values		
Processing	Defatted	Cooked	Roasted	Defatted	Cooked	Roasted	Defatted	Cooked	Roasted	±SEM	Proc	Age	Age X Proc
Feed Intake g/day	31.87	22.38	28.19	95.71	84.42	91.70	121.19	130.96	146.80	35.30	***	***	***
DMI g/day	28.66	19.40	25.05	85.88	72.22	85.16	110.10	128.18	130.16	31.06	***	***	***
CPI g/day	20.77	20.24	19.58	21.16	19.88	18.61	17.08	15.60	16.19	9.09	***	***	**
CFI g/day	7.95	5.28	6.61	6.30	5.25	8.34	6.44	7.29	7.22	1.87	***	***	***
NFE g/day	47.81	49.01	43.31	46.22	50.46	45.01	52.09	50.06	51.90	29.90	***	***	**
FI g/day	9.01	3.81	10.58	9.20	8.29	10.70	8.04	11.16	10.62	171.60	NS	NS	NS
AI g/day	5.01	7.39	5.82	6.18	5.12	5.81	3.46	3.35	3.11	5.35	***	***	***
GEI MJ/kg	11.32	11.48	11.90	11.62	11.66	11.77	11.53	11.72	11.82	0.50	**	NS	NS

DMI - Dry Matter intake, NFE = Nitrogen free extract intake, FI = Fat Intake, AI - Ash intake, GEI = Gross energy Intake. ±SEM = Standard error of mean, CPI = Crude protein intake, CFI = Crude fibre intake

Table 2: Pre-caecal digestibility coefficient of amino acid of broilers of different ages fed differently processed meal based-diets

Age	0 – 3weeks			3 – 6weeks			6 – 8weeks				P Value		
Processing	Defatted	Cooked	Roasted	Defatted	Cooked	Roasted	Defatted	Cooked	Roasted	±SEM	Proc	Age	Age X proc
Lysine	0.68	0.91	0.93	0.85	0.88	0.80	0.89	0.86	0.87	0.04	***	NS	***
Histidine	0.71	0.90	0.78	0.74	0.84	0.85	0.75	0.85	0.74	0.07	**	NS	NS
Arginine	0.69	0.86	0.81	0.85	0.84	0.86	0.87	0.83	0.78	0.03	***	***	***
Aspartate	0.59	0.85	0.88	0.85	0.81	0.87	0.84	0.84	0.84	0.05	***	*	***
Threonine	0.57	0.85	0.86	0.89	0.89	0.78	0.85	0.90	0.78	0.12	NS	NS	*
Serine	0.59	0.91	0.85	0.92	0.84	0.92	0.86	0.87	0.84	0.03	***	***	***
Glut. acid	0.63	0.86	0.90	0.86	0.77	0.82	0.85	0.83	0.78	0.05	NS	NS	***
Proline	0.59	0.90	0.86	0.84	0.86	0.88	0.84	0.84	0.88	0.05	**	NS	***
Glycine	0.64	0.89	0.86	0.85	0.81	0.85	0.88	0.85	0.82	0.03	***	***	***
Alanine	0.59	0.87	0.83	0.82	0.83	0.87	0.88	0.85	0.80	0.04	**	**	***
Cysteine	0.54	0.84	0.90	0.85	0.86	0.89	0.88	0.82	0.77	0.06	**	**	***
Valine	0.68	0.92	0.82	0.74	0.64	0.84	0.86	0.85	0.81	0.12	NS	NS	NS
Methionine	0.57	0.88	0.77	0.87	0.93	0.92	0.86	0.86	0.79	0.07	**	***	**
Isoleucine	0.67	0.86	0.82	0.84	0.79	0.84	0.84	0.87	0.79	0.02	***	***	***
Leucine	0.68	0.82	0.92	0.86	0.86	0.88	0.89	0.87	0.85	0.04	**	**	***
Tyroxine	0.67	0.86	0.83	0.84	0.85	0.84	0.84	0.83	0.81	0.03	***	***	***
Phenylalaline	0.58	0.87	0.84	0.84	0.89	0.85	0.84	0.84	0.83	0.05	***	***	***
MDC	0.63	0.87	0.85	0.84	0.83	0.86	0.85	0.85	0.81				

MDC = Mean Digestibility Coefficient, ±SEM = Standard Error of Mean, NS = Not Significant, * = P< 0.05, ** = P< 0.01, *** = P< 0.001