Digestibility of amino acids in malted sorghum sprouts supplemented with polyethylene glycol, charcoal, phytase and xylanase, when fed to broilers

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Abstract
The amino acid composition of malted sorghum sprouts (MSP) and its true amino acid digestibility (TAAD) when supplemented with polyethylene glycol (PEG), charcoal (CH), phytase and xylanase were determined. Methionine was the most limiting indispensable amino acid in MSP while leucine was the most abundant. The corresponding dispensable amino acids were tyrosine and aspartic acid respectively. The overall mean coefficient of TAAD for the 14 amino acids analysed for MSP was 0.715. The addition of PEG, CH, phytase and xylanase were not able to improve the TAAD of MSP probably because of the tannin which appeared to have been bound to the constituents of MSP.

Introduction

Malted sorghum sprouts (MSP), a by-product from brewing, food and allied industries consists of sorghum shoots left after malt extraction from young sorghum seedlings. MSP has been reported by Oduguwa *et al*., (2001) to have a low nutritive value for monogastric animals. The low nutritive value may be due to the non-starch polysaccharide (NSP) and tannin content of MSP. It has been reported that polyethylene glycol (PEG) and charcoal (CH) can reduce the effects of tannin on livestock (Sandoval Castro *et al*., 2003). Phytase and xylanase have also been shown to improve the nutritive value of plant materials. The effects of PEG, CH, phytase and xylanase on the dry matter digestibility and metabolisable energy of MSP have been documented (Oduguwa *et al*., 2005). Baseline data on amino acid composition of MSP are presented in this present study. Furthermore, the amino acid digestibility of MSP by broiler chickens when supplemented with PEG, CH, phytase and xylanase were also reported.

Materials and Methods

Sixty- four (64) male broilers (~2.65kg body weight) were used in the precision feeding study. Eight birds were fed 50ml glucose solution in order to estimate endogenous loss. The remaining 7 treatment groups each received 30g of feedstuff as follows: MSP, MSP + 1 g PEG/kg, MSP + 10g PEG/kg, MSP + 1g CH/kg, MSP + 10g CH/kg, MSP + 3600 IU of evolved E coli phytase/kg, MSP+ 1600 IU of a bacterial xylanase/kg. Excreta voided during a 48hr period were quantitatively collected and the coefficients of TAAD were determined.
Amino acid analysis was undertaken using HPLC. MSP and excreta samples were hydrolysed (6M hydrochloric acid) in sealed bottles at 110^{0}C for 24hrs in order to hydrolyse the protein. The resulting hydrolysate was diluted and filtered. 5ml of filterate were taken along with 0.5ml internal standard solution into 50ml quick fit

Table. Amino acid content and true amino acid digestibility coefficients of malted sorghum sprout when supplemented with polyethylene glycol, charcoal, phytase and xylanase

Amino acids	AA Content G kg DM^{-1}	MSP	[1]True MSP+1g PEG kg^{-1}	Amino MSP+10g PEG kg^{-1}	Acid MSP+1g CH kg^{-1}	Digestibility MSP+10g CH kg^{-1}	MSP+ Phytase	MSP+ xylanase	[2]SEM
Indispensible									
Arginine	8.9	0.776	0.702	0.766	0.831	0.785	0.764	0762	0.0446
Histidine	3.8	0.732	0.635	0.721	0.792	0.753	0.738	0.727	0.0480
Isoleucine	7.0	0.691	0.582	0.679	0.788	0.713	0.688	0.697	0.0638
Leucine	11.8	0.709	0.606	0.691	0.794	0.731	0.702	0.706	0.0581
Lysine	7.7	0.638	0.535	0.610	0.762	0.690	0.667	0.657	0.0573
Methionine	2.2	0.749	0.650	0.746	0.842	0.768	0.750	0.724	0.0613
Phenylalanine	6.3	0.690	0.586	0.673	0.776	0.723	0.685	0.682	0.0621
Threonine	6.2	0.607	0.467	0.542	0.698	0.639	0.590	0.539	0.0736
Valine	10.3	0.705	0.610	0.687	0.791	0.732	0.712	0.701	0.0589
Overall Mean		0.700	0.597	0.679	0.786	0.726	0.700	0.688	0.0579
Dispensable									
Alanine	11.4	0.726	0.627	0.708	0.822	0.755	0.727	0.715	0.0523
Aspartate	34.4	0.835	0.772	0.810	0.872	0.846	0.832	0.812	0.0291
Glutamate	21.2	0.709	0.605	0.680	0.791	0.727	0.690	0.698	0.0546
Glycine	8.7	ND	ND	ND	ND	ND	ND	ND	
Serine	5.5	0.661	0.523	0.612	0.747	0.702	0.648	0.615	0.0666
Tyrosine	3.7	0.716	0.603	0.715	0.826	0.748	0.716	0.688	0.0608
Overall Mean		0.715	0.607	0.689	0.795	0.737	0.708	0.695	0.0565

[1] Each value represent mean of 8 birds
[2] Pooled standard error of means
ND – Not Determined

round bottom flask and dried at 65^{0}C under vacuum. The residue was dissolved in 2.5 ml glacial acetic acid, transferred to a 20 ml polythene bottle and analysed by HPLC. Statistical analyses were performed using Genstat VII statistical software package.

Results and Discussion

The amino acid profile of MSP showed that methionine was the first limiting indispensable amino acid while leucine was the most abundant in that group. The corresponding dispensable amino acids were tyrosine and aspartic acid respectively. Methionine is the first limiting amino acid. This is typical of most tropical feedstuffs. Aduku (1992) identified methionine, lysine and tryptophan as the three most limiting amino acids in tropical feedstuffs. That is why composite feeds of various classes of poultry need to be supplemented with methionine, lysine and tryptophan (D'Mello 1993). It is noteworthy that the level of lysine in MSP is fairly moderate when compared to the lysine contents of cereals and their by-products.

The overall mean of coefficient of TAAD for the 14 amino acids analysed in this study for MSP was 0.715. This is lower than the average value reported by Pirgozliev *et al.,* (2002) for waxy (0.929) and non-waxy (0.906) wheat samples for the same amino acids. The total tannin content of MSP was 140 gkg^{-1}of which only 0.3 gkg^{-1} was extractable (Oduguwa *et al.,* 2005). Thus the tannin content is high and it appears to be bound with other nutrients thereby reducing their availability. This may partly explain the low TAAD of MSP compared to wheat and the lack of effect of the various treatments on the TAAD of MSP for poultry.

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