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CARCASS TRAITS, FATTY ACID AND AMINO ACID PROFILE OF LWY PIGS FED WITH BREWERY WASTE BASED DIET

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Abstract: A study was conducted to assess the influence of different levels of inclusion of dried brewer grains on the carcass traits, fatty acid and amino acid profile of Large White Yorkshire pigs under intensive system of management. Twenty four weaned LWY piglets were selected and randomly divided into three groups comprising of eight piglets each and allotted as Group I (0 per cent dried brewer grains) as control, Group II (15 per cent dried brewer grains) and Group III (30 per cent dried brewer grains). It was found that live weight, hot carcass weight, dressing percentage, carcass length, cutup parts except ham, meat, bone and fat percentage, edible and inedible parts showed no significant difference between the treatment groups. Other carcass traits viz., back fat thickness, loin eye area showed a highly significant ($p<0.01$) difference between the three treatment groups. Whereas, cutup part of ham showed a significant ($p<0.05$) difference between the treatment groups. With regard to fatty acid profile of Longissimus dorsi muscle, polyunsaturated fatty acid , monounsaturated fatty acid and saturated fatty acid showed highly significant ($p<0.01$) difference between groups. The oleic acid content in meat was higher in Group III followed by Group II and I. Out of 17 amino acid screened only two amino acid were found to be in detectable limit namely alanine and leucine.

Keywords: Carcass traits, Fatty acid, Amino acid, dried brewer grains, LWY pigs.

Introduction

Pig farming is one of the emerging livestock industries which will give quick economic return to the farmers. Among the various livestock species, piggery is most potential source of meat production and more efficient feed converters after the broiler. The pig can utilize wide variety of feed stuffs viz. grains, forages, damaged feeds and garbage and convert them into valuable nutritious meat.

Pork is most nutritious meat with high fat and low water content and has better energy value than that of other meats and it is also rich in vitamins like Thiamin, Niacin and Riboflavin. But, only drawback is the feed cost. To overcome the total cost, unconventional feeds can be added in the diet. There are many Agricultural and industrial waste includes dried brewer grains (DBG), ghee residues (GR), biscuit waste, palm kernel cake, tamarind seeds, mango

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peels, sugarcane etc., Among various agro-industrial byproducts dried brewer grains is the most efficient unconventional feedstuff for monogastric animals. Due to its lower cost, non-toxic nature and high nutrient content, it can be economically used. Hence this study was conducted to assess the carcass quality of pigs fed with different levels of brewery grains in dried form.

Methodology

Twenty four weaned Large White Yorkshire piglets were selected for the purpose of the study and were randomly divided into three groups comprising of eight piglets each and allotted as Group I (0 per cent dried brewer grains) as control, Group II (15 per cent dried brewer grains) and Group III (30 per cent dried brewer grains). In each group, equal numbers of male and female piglets were taken and all the males were castrated. The trial was conducted for a period of 140 days (61-201 days of age). Standard managemental practices were followed with regards to health care of piglets. Feed samples were analysed for their nutrient composition to calculate effective inclusion of dried brewery grains. Data on live weight at the end of the trial, carcass quality traits and *Longissimus dorsi* muscle was used to assess amino acid (Fabiani, 2002) and fatty acid profile of pork from different treatment groups. The collected data were statistically analyzed by One Way ANOVA by using SPSS 20.

Results and Discussion

Carcass Traits

The carcass traits of Large White Yorkshire pigs fed with 0, 15 and 30 per cent inclusion level of dried brewer grains (Table 1) showed that there was no significant difference in the live weight, hot carcass weight, dressing percentage and carcass length fed with dried brewer grains. This may be due to high protein content and fiber content in the diet, supported for the better growth to the level of control diet. In this experiment, the crude protein content in the diet is adequate in the treatment groups contributed for the non-significant difference between the treatments (Hang *et al.,* 2009). This is in agreement of Young *et al*. (1967) reported that there was no other significant differences due treatment in carcass characteristics studied as the diet containing 100 per cent of their supplemental protein from dried brewer grains. However, there was significant difference between treatments with regard to back fat thickness and loin eye area. This may be due to higher crude protein content contributed for meat conversion rather than fat, which in turn lowered back fat thickness in dried brewer grains supplemented group at 15 and 30 per cent levels.

Cutup parts

Cutup parts of Large White Yorkshire pigs fed with 0, 15 and 30 per cent inclusion level of dried brewer grains (Table 2) showed no significant difference between treatment groups except Ham. The weight of Ham was significantly higher than control diet. This may be due to higher crude protein content contributed for meat conversion rather than fat.

Meat, Fat and Bone percentage, Edible and Inedible offals

Meat, Fat and Bone percentage, Edible and Inedible offals of Large White Yorkshire pigs fed with 0, 15 and 30 per cent inclusion level of dried brewer grains (Table 3,4 and 5) showed that there was no significant difference between the treatment groups fed with dried brewer grains compared to control diet. From the results of proximate analysis it can be inferred that the nutrient content of different treatment groups were found to be equal in energy, crude protein and crude fiber which match with BIS standards.

Fatty Acid Profile

Fatty acid analysis of *Longissimus dorsi* muscle under different inclusion level of dried brewer grains (Table 6) revealed that there was highly significant difference between treatment groups with regards to polyunsaturated fatty acid and monounsaturated fatty acid. This might be due to the fact that maize is the chief energy source for control diet whereas variety of grains added in the brewery process such as barley, wheat, maize ,oats etc., this would be the reason for the variations in the polyunsaturated fatty acid and monounsaturated fatty acid content in the treatments. This finding concurred with reports of Xu *et al.* (2008) who reported an increase in unsaturated fatty acid content of pork fat when 30 per cent distiller grains are fed to the pigs.

Lower saturated fatty acid observed in dried brewer grains fed diet compared to control diet pigs might be influenced by inclusion of maize and soya bean meal in grower-finisher rations. The results obtained in the study clearly reveals that inclusion of dried brewer grains in the ration has less saturated fatty acid in *Longissimus dorsi* muscle compared to control diets to pigs having a beneficial effect in *Longissimus dorsi* muscle.

Amino Acid Profile

Amino acid analysis of *Longissimus dorsi* muscle under different inclusion level of dried brewer grains showed significant difference between the treatment groups with essential and non-essential amino acid such as Leucine and Alanine. Essential amino acid such as leucine was higher in brewer grains fed groups whereas non-essential amino acid is higher in control fed diet. The increased essential amino acid content in the treatment diet

might be contributed by fermentation of grains through enzymatic reaction where starch is converted into protein (amino acid) (Li et al.,1998). Non-essential amino acid namely alanine which was significantly higher in control diet. This may be due to higher level of maize and soya bean meal in control diet. Though soya bean meal is a good source of protein when combined with cereal grains such as maize, it contains relatively low levels of certain essential amino acids such as lysine, methionine, threonine and tryptophan.

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Table 1. Carcass traits of Large White Yorkshire Pigs

S. No	CARCASS TRAITS	Dried brewer grains			*p* value
		0 % Group I	15 % Group II	30 % Group III	
1	Live weight (kg)^{NS}	83.28 ± 2.97	81.52 ± 2.93	82.00 ± 2.49	0.41
2	Hot Carcass weight(kg)^{NS}	55.26 ± 3.10	54.93 ± 2.51	55.01 ± 2.06	0.40
3	Dressing percentage ^{NS}	66.35 ± 0.82	67.38 ± 1.39	67.09 ± 0.60	0.76
4	Carcass length (cm) ^{NS}	82.00 ± 0.18	83.88 ± 0.13	81.72 ± 0.20	0.62
5	Back fat thickness (mm)*	33.70 ± 0.19^{b}	29.00 ± 0.15^{a}	30.40 ± 0.03^{a}	0.00
6	Loin eye area (cm^2)*	28.78 ± 2.25^{a}	31.03 ± 2.12^{c}	30.72 ± 0.86^{b}	0.00

Mean of 4 observations; NS-Not Significant

*Mean values bearing different superscript in a row differ significantly ($p < 0.01$)

Table 2. Cutup parts (kg)

S.NO	CUTUP PARTS	Dried brewer grains			*p* value
		0 % Group I	15 % Group II	30 % Group III	
1	Jowl^{NS}	2.75 ± 0.19	2.52 ± 0.05	2.90 ± 0.09	0.17
2	Boston butt^{NS}	5.77 ± 0.52	5.30 ± 0.56	6.65 ± 0.41	0.21
3	Picnic shoulder^{NS}	9.07 ± 0.56	9.51 ± 0.28	8.94 ± 0.30	0.59
4	Loin^{NS}	14.51 ± 1.28	16.40 ± 1.66	14.52 ± 1.33	0.58
5	Bacon^{NS}	11.61 ± 0.52	11.82 ± 0.90	11.32 ± 0.43	0.86
6	Ham*	13.38 ± 0.48^{a}	15.42 ± 0.57^{b}	14.50 ± 0.43^{b}	0.04

Mean of 4 observations ; NS- Not Significant

* Mean values bearing different superscript in a row differ significantly ($p < 0.05$)

Table 3. Meat, fat and bone percentage

Carcass Traits	Dried brewer grains			*p* value
	0 % Group I	15 % Group II	30 % Group III	
Meat	43.64 ± 1.50	44.72 ± 0.39	44.01 ± 0.57	0.72
Fat	33.48 ± 0.60	33.51 ± 0.53	32.72 ± 1.05	0.44
Bone	22.86 ± 1.33	21.75 ± 0.15	23.26 ± 0.50	0.71

Mean of 4 observations ; Values not significant

Table 4. Edible offals (%)

S.NO	Edible offals (%)	Dried brewer grains			*p* Value
		0 % Group I	15 % Group II	30 % Group III	
1	Liver	1.50 ± 0.05	1.37 ± 0.07	1.40 ± 0.06	0.35
2	Lungs	0.96 ± 0.10	0.73 ± 0.06	1.74 ± 0.91	0.41
3	Heart	0.31 ± 0.02	0.29 ± 0.02	0.27 ± 0.01	0.47
4	Spleen	0.27 ± 0.02	0.26 ± 0.03	0.21 ± 0.08	0.28
5	Kidney	0.27 ± 0.02	0.28 ± 0.01	0.27 ± 0.01	0.88
6	Head	6.55 ± 0.41	6.60 ± 0.49	6.87 ± 0.32	0.83

Mean of 4 observations; Values not significant

Table 5. Inedible offals (%)

S.NO	Inedible offals (%)	Dried brewer grains			*p* value
		0 % Group I	15 % Group II	30 % Group III	
1	Stomach & Intestine	10.20 ± 0.41	11.10 ± 0.99	10.03 ± 0.36	0.46
2	Tail	0.51 ± 0.25	0.12 ± 0.01	0.19 ± 0.03	0.19
3	Fore leg	0.69 ± 0.02	0.74 ± 0.04	0.71 ± 0.04	0.68
4	Hind leg	1.33 ± 0.05	1.36 ± 0.11	1.29 ± 0.10	0.89
5	Bristles	1.06 ± 0.13	1.19 ± 0.06	1.05 ± 0.13	0.66
6	Blood	1.53 ± 0.11	1.64 ± 0.05	1.63 ± 0.04	0.57

Mean of 4 observations ; Values not significant

Table 6. Fatty acid profile of *Longissimus dorsi* muscle

Fatty acid	Fatty acid (Per cent)	Dried brewer grains			*p* value
		0 % Group I	15 % Group II	30 % Group III	
Poly-unsaturated Fatty acid (PUFA)	Linoleic Acid (C18 : 2)	11.82 ± 0.01^{a}	13.52 ± 0.04^{b}	13.66 ± 0.00^{c}	0.00
	Linolenic Acid (C18 : 3)	0.77 ± 0.00^{a}	1.25 ± 0.00^{b}	1.23 ± 0.00^{b}	0.00
	Ecosapentaenoic Acid (C16 : 0)	0.14 ± 0.00^{a}	0.18 ± 0.00^{b}	0.17 ± 0.00^{b}	0.00
	Docosahexaenoic (C22 : 6)	0.21 ± 0.00^{c}	0.25 ± 0.00^{b}	0.16 ± 0.00^{a}	0.00
Mono-unsaturated Fatty acid (MUFA)	Oleic Acid (C18: 1)	43.39 ± 0.10^{a}	45.91 ± 0.20^{b}	46.56 ± 0.01^{c}	0.00
	Palmitoleic Acid (C16 : 1)	2.50 ± 0.04^{a}	5.83 ± 0.00^{b}	6.28 ± 0.00^{b}	0.00
Saturated Fatty acid (SFA)	Myristic Acid (C14 : 0)	1.40 ± 0.01^{c}	1.27 ± 0.00^{b}	1.04 ± 0.00^{a}	0.00
	Palmitic Acid (C16 : 0)	22.08 ± 0.15^{a}	23.68 ± 0.22^{c}	23.06 ± 0.00^{b}	0.00
	Stearic Acid (C18 : 0)	12.34 ± 0.07^{c}	8.97 ± 0.00^{a}	10.14 ± 0.04^{b}	0.00
	Arachidic Acid (C20: 0)	0.47 ± 0.01^{c}	0.13 ± 0.00^{a}	0.31 ± 0.00^{b}	0.00
	Behenic Acid (C22 : 0)	1.26 ± 0.01^{c}	0.85 ± 0.00^{b}	0.58 ± 0.00^{a}	0.00
	Others	0.95 ± 0.00^{a}	0.43 ± 0.00^{a}	0.81 ± 0.00^{b}	0.00

Mean of 4 observations

* Mean values bearing different superscript in a row differ significantly ($p < 0.01$)

Table 7: Ingredient composition (% DMB) of grower rations fed to LWY pigs (61-150 days)

Ingredients (%)	Dried brewer grains		
	0 % (Group I)	**15 % (Group II)**	**30 % (Group III)**
Maize	56.70	48.20	39.75
Dried brewer grains	0.00	8.55	17.00
Deoiled rice bran	0.70	12.52	14.15
Sunflower oil cake	12.00	0.00	0.00
Soyabean meal	21.50	21.80	18.40
Vegetable oil	6.50	6.26	8.00
Mineral mixture	2.00	2.00	2.00
DL-methionine	0.10	0.10	0.10
L-Lysine	0.00	0.07	0.10
Salt	0.50	0.50	0.50
Total	**100**	**100**	**100**

Rations formulated based on nutritive values of individual ingredients

Table 8: Ingredient composition (% DMB) of finisher rations fed to LWY pigs (151-210 days)

Ingredients (%)	Dried brewer grains		
	0 % (Group I)	**15 % (Group II)**	**30 % (Group III)**
Maize	54.30	46.20	38.00
Dried brewer grains	0.00	8.20	16.30
Deoiled rice bran	3.57	19.50	22.00
Sunflower oil cake	20.00	0.00	0.00
Soyabean meal	11.50	15.70	12.00
Vegetable oil	8.00	7.70	9.00
Mineral mixture	2.00	2.00	2.00
DL-methionine	0.10	0.10	0.10
L-Lysine	0.03	0.10	0.10
Salt	0.50	0.50	0.50
Total	**100**	**100**	**100**

Rations formulated based on nutritive values of individual ingredients