EFFECT OF PHYTASE SUPPLEMENTATION IN SWINE RATIONS ON BONE AND CARCASS CHARACTERISTICS

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Received: 15-12-2014 Accepted: 02-02-2015

ABSTRACT

A feeding trial for a period of 114 days was conducted using 36 weaned Large White Yorkshire x Desi piglets (18 castrated males and 18 females, belonging to Centre for Pig Production and Research, Mannuthy) forming three groups with six replicates each, to assess the effect of phytase supplementation on bone and carcass parameters. The animals were divided into three groups (as uniformly as possible with regard to age, sex and weight and animals of each group were allotted randomly to six pens with two piglets in each pen) and were fed with three experimental rations, T1-Control ration containing 0.6 per cent calcium and 0.3 per cent phosphorus, T2 - Control ration without any mineral supplements and with 750 units of phytase/kg feed and T3-Control ration without phytase and mineral supplementation. At the end of the feeding and digestibility trials representative animals from each treatment group were slaughtered and carcass parameters were recorded. Dressing percentage was lower ($P<0.01$) for pigs fed rations T2 and T3 while loin eye area was lower ($P<0.05$) for T3 group than that of T1 and T2 and there was no significant differences ($P>0.05$) between the treatments with respect to their back fat thickness. X-ray examination of femur and mandible and histological examination of kidney samples also did not show any abnormalities among pigs of T1 and T2 and T3 groups. However rickety beads were seen on ends of ribs on carcass evaluation, in pigs fed T3 ration. The bone ash content was also lower ($P<0.01$) for animals fed ration T3 than that of T1 and T2. Pigs fed ration containing no added minerals but supplemented with phytase was showing similar percentage of bone ash as that of pigs fed the control ration (T1). Feed cost /kg gain of pigs belonging to group T1 was higher than that of T2 and T3. It can be concluded that phytase supplementation of rations resulted in alleviationof the mineral deficiencies in animals fed without any mineral supplementation but with phytase alone without any gross abnormalities of kidney or bone in pigs.

Key words – phytase, mineral digestibility, bone mineralization, pigs

INTRODUCTION

India produces 481thousand tones of pork per year which is 17.4 per cent of total meat production (FAO, 2010). Swine rearing is an enterprising livelihood of farm sector owing to the fast growth, high feed conversion and prolificacy of pigs and pork can fill up the large gap between the availability and requirement of meat in the country. Swine are fed mainly with cereal grains which are generally low in Ca while P is present mainly as phytate P with low availability and phytates also form complexes with Ca, Mg and other rations reducing their

availability in monogastric animals (Mc Donald *et.al*., 2002). Under field condition, pigs are reared on kitchen/hotel wastes alone without any mineral or vitamin supplementation and feed additives such as phytase has been used, to increase the digestibility of phytate-P to monogastric animals, and also helping to decrease the need for P supplementation to diets (Brady *et al*., 2003., Maguire *et al*, 2003). Leg weakness is an important problem in fast-growing pigs which affects the thriftiness of fattening pigs and also increases the culling rate in breeding animals. Calcium (Ca) and P play an important role in the skeletal development of pigs. Rearing of pigs without any mineral supplementation, which is the common practice among pig breeders of the State, will result in reduced growth performance and in bone abnormalities. Hence an investigation was undertaken to study whether phytase supplementation can alleviate negative effects of mineral deficiency by assessing the effect of phytase supplementation on bone and carcass parameters in cross bred pigs.

MATERIALS AND METHODS

Experimental Animals

Thirty six Large White Yorkshire x Desi weaned piglets (18 castrated males and 18 females) belonging to the Centre for Pig Production and Research, Mannuthy were randomly selected and were divided into three groups, as uniformly as possible with regard to age, sex and weight. Piglets of each group were allotted randomly into six pens with two piglets in each pen. They were randomly allotted to the three experimental treatments.

Housing And Management

All animals were dewormed before the start of the experiment. Each replicate was housed in separate pen in the same shed with concrete flooring and facilities for feeding and watering. The animals were washed every day in the morning before 10 AM and stalls were cleaned twice daily before morning and afternoon feeding. All the animals were fed with the respective ration in mash form and restricted feeding was followed throughout the experimental period. They were allowed to consume as much feed as they could, within a period of one hour. Balance of feed was collected and weighed before the next feeding. Clean drinking water was provided in all the pens for twenty four hours throughout the experimental period.

Experimental Rations

The animals were fed with standard grower ration up to 50 kg body weight and finisher ration from 50 to 70 kg body weight formulated as per NRC (1998), to contain 18 percent CP and 3200 kcal of ME /kg of feed and 16 per cent CP and 3200 kcal of ME / kg of feed, respectively. The three experimental rations were T1-Control ration containing 0.6 per cent and 0.3 per cent supplemented calcium and phosphorus respectively, T2- Control ration without any mineral supplements and with 750 units of phytase / kg feed (Liu *et.al.*,1997), (Phytase was obtained as Maxiphos - Polchem Hygiene laboratories PVT.Ltd, Pune containing 2500 units of phytase per gram) and T3- Control ration without phytase and mineral supplementation. The ingredient and chemical composition (AOAC, 1990) of the starter and finisher rations are furnished in Tables 1 and 2. Piglets of the three groups were maintained on the three experimental rations T1, T2 and T3 from weaning till they attained slaughter weight of 70 kg. Daily feed intake was recorded.

The feed,faeces and bone samples were analyzed for proximate principles (AOAC, 1990) and minerals such as Ca, Mg, Mn, Cu and Zn were analyzed using Atomic Absorption Spectrophotometer (Perkin Elmer 3110) after wet ashing using nitric acid and perchloric acid (2:1). Phosphorus content of the feed and

faecal samples were analyzed by colorimetry (Vanado-molybdate method, AOAC, 1990) using Spectrophotometer (Spectronic 1001 plus, Milton Roy, USA).

Radiological Examination

X- ray of mandible and femur bones of two animals, selected randomly from each group was done at Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences Mannuthy, using Seimans, 300 MA to study the effect of the experimental rations on bone development.

Slaughter Data

On attaining the slaughter weight of 70 kg, six male animals each from the three treatment groups were slaughtered at Meat Technology Unit, Mannuthy and data on carcass weight, back fat thickness, loin eye area were recorded. The back fat thickness was estimated as an average of the measurement of subcutaneous fat with skin at the level of 1st rib, last rib and last lumbar vertebrae (Sekher, 2003). Dressing

Table 1. Ingredient composition of experimental starter and finisher diets

Ingredients	Starter rations			Finisher rations		
	T1	T2	T3	T1	T2	T3
Yellow maize, kg	70	70	70	76	76	76
Soya bean meal, kg	29.4	29.4	29.4	23.5	23.5	23.5
Salt, kg	0.5	0.5	0.5	0.5	0.5	0.5
Lysine, kg	0.1	0.1	0.1			
Total	100	100	100	100	100	100
To 100 kg of the above mixture added						
Dicalcium phosphate, kg	1.7	-	-	1.7	-	-
Shell grit, kg	0.6	-	-	0.6	-	-
Zinc oxide, g	75			75		
Indomix AB_2D_3, g [1]	25	25	25	25	25	25
Rovi BE, g [2]	25	25	25	25	25	25
Phytase, g [3]	-	30	-	-	30	-

1 Indomix A, B2, D3, K (Nicholas Piramal India Ltd, Mumbai) containing VitaminA- 40,000 IU, VitaminB2-20mg, Vitamin D3-5000 IU and Vitamin K-50mg, per gram

2 Rovi BE (Nicholas Piramal India Ltd, Mumbai) containing Vitamin B1-4mg, Vitamin B6-8mg, Vitamin B12-40mg, Niacin-60mg, Calcium pantothenate-40mg, Vitamin E- 40mg, per gram.

3 Maxiphos (Polchem Hygiene laboratories PVT.Ltd, Pune) containing 2500 units of phytase per gram

Table 2. Chemical composition of grower[1] and finisher diets, %

Parameter	Grower Rations Treatments			Finisher rations Treatments		
	T1	T2	T3	T1	T2	T3
Dry matter, %	92.80	92.30	92.24	88.85	88.53	87.83
Crude protein, %	18.43	18.48	18.37	16.15	16.32	16.63
Ether extract, %	2.8	2.54	2.58	2.58	2.79	2.64
Crude fibre, %	3.57	3.23	3.14	3.49	3.48	3.32
Total ash, %	6.35	5.19	4.82	5.7	3.42	3.30
Nitrogen free extract, %	68.85	70.56	71.09	71.68	73.99	74.11
Acid insoluble ash, %	1.74	1.22	0.97	0.76	0.66	0.57
Calcium, %	0.75	0.2	0.19	0.75	0.20	0.20
Phosphorus, % (total)	0.57	0.25	0.24	0.56	0.26	0.25
Magnesium, %	0.33	0.24	0.24	0.34	0.24	0.25
Zinc, ppm	262.03	36.39	37.81	336.47	44.18	42.90
Copper, ppm	9.59	9.52	9.03	9.40	9.05	9.80
Manganese, ppm	13.79	13.44	12.98	13.16	13.58	12.44

[1] On DM basis

Table 4. Bone mineral[1] composition of animals, %

Treatments	Bone ash	Calcium	Phosphorus
T1	49.62[a]	19.45 (NS)	8.63 (NS)
T2	48.66[a]	20.78 (NS)	8.81 (NS)
T3	43.69[b]	17.01 (NS)	8.05 (NS)
Pooled SE	0.89	0.83	1.58

1Mean of six values a, b Means with different superscripts within each column differ (P<0.01 NS Nonsignificant

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