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EVALUATION OF THE POTENTIAL OF *PANICUM MAXIMUM* FORAGE ON GUT MICROBIAL POPULATION OF PIGS

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ABSTRACT
A trial was conducted to determine the potential *Panicum maximum* fresh forage using grower pigs. A total of 30 grower pigs at average weight of 18kg were used in the 63 days feeding trial. Five diets were formulated which contained 0, 5, 10, 15 and 20% levels of the fresh forage respectively. Each diet formed a treatment which was fed to the pigs and were fed 4% of their body weight, and water given *ad- libitum.* Treatments were replicated thrice and each replicate contained two pigs in a completely randomised design (CRD). The parameters taken were segmental gut contents from the stomach, caecum and colon which were collected by dissecting the gut segments. The digesta from the segments were collected in plane sterile 10ml tubes and taken to the laboratory for microbial gut population count. Result from the treatments showed that the numerical values of these beneficial microbes significantly ($p < 0.05$) increased in the forage treated group of pigs when compared with the control. This trial therefore concludes that dietary inclusion of *Panicum maximum* forage in pigs increased the beneficial microbial gut population. It is therefore, recommended that pig farmers should include fresh grass forages in the diet of grower pigs for improved gut health and improved performance.

INTRODUCTION

The challenges of monogastric farm animals digesting high fibre content diets, has been of great concern to livestock and poultry nutritionists. Recent understanding of the beneficial gut microbes and identification of marker linked to favour gut condition has been of tremendous assistance in handling this difficult situation (Callaway *et al.,* 2003) Forage has been reported to be helpful in the development of digestive tract, particularly the large intestine. Jorgensen *et al.,* (1996) in their trial found that grower pigs fed on high forage diet had a significantly heavier caecum and colon, and the gut content were also heavier than pigs fed on low forage diet. Pluske *et al.,* (1998) found that carcass yield was reduced to 0.025g for each additional gramme of forage. In another development, Ogle (2006) observed that dressing percentage over two percentage units is lower in pigs given a high fibre diet containing 300g/kg neutral detergent fibre (NDF) when compared with those given lower fibre diet (200g/kg NDF). Ogle, (2006) in another trial observed that all fibre digestion take place in the caecum and colon where bacteria break down fermentable carbohydrates that Forage has been reported to be helpful in the development of digestive tract, particularly the large intestine. Jorgensen *et al.,* (1996) in their trial found that grower pigs fed on high forage diet had a significantly heavier caecum and colon, and the gut content were also heavier than pigs fed on low forage diet. Pluske *et al.,* (1998) found that carcass yield was reduced to 0.025g for each additional gramme of forage. In another development, Ogle (2006) observed that dressing percentage over two percentage units is lower in pigs given a high fibre diet containing 300g/kg neutral detergent fibre (NDF) when compared with those given lower fibre diet (200g/kg NDF). Ogle, (2006) in another trial observed that all fibre digestion take place in the caecum and colon where bacteria break down fermentable carbohydrates. Available information shows that gut microbes can increase the efficiency of transforming high fibre diets into animal products, this can be maximized by the use of lower energy and protein density diets than the so called optimal diet with the aim of improving nitrogen

retention and also reduce protein cost (Anya *et al*. ,2019). Various intestinal regions of pig have different structural elements that provides optimal condition for the digestion and absorption processes in the digestive tract. Johansen and Bach-Knudsen (1994) reported that large dietary inputs and the secretion from the stomach, intestine, pancreas and gall bladder determines the composition of the digesta in the stomach and the upper part of the small intestine. The animal relies on the microbes in their gut to digest and ferment the plant biomass to provide energy in as short chain volatile fatty acids (VFA) and protein yielding nutrients that support animal maintenance, growth and lactation. It has also been reported that the population of useful bacteria like lactobacillus in the gut increased the pH of the gastrointestinal tract (GIT) due to increased production of VFA's (Ziggers, 2000).

The aim of the study was to evaluate the effect of *Panicum maximum* (guinea grass) forage on beneficial microbes in the gut of grower pigs.

MATERIALS AND METHODS

Location of study:

The experiments were conducted at the piggery unit of the teaching and research farm of college of animal science and animal production, Micheal Okpara University of Agriculture, Umudike, Abia State Nigeria. Umudike is located at latitude 5º29^{1}N and longitude 7º32^{1}E in the rainforest zone. It is characterized by daily temperature range of 27-35ºc.

Procurement and processing of test ingredients

The grass forage used in this study was obtained from the vicinity of the university. The fresh forages cut at their bloom stages were chopped into smaler sizes and incorporated into a formulated concentrate diet at 0, 5, 10, 15 and 20% supplementary levels.

Experimental Design.

A total of thirty (Landrace x Large white) grower pigs were used for each feeding trial. The pigs with initial average weight of 18kg were randomly distributed into five dietary treatments replicated three times with two pigs per replicate in a completely randomized design (CRD).

Experimental diets and feeding.

Diets were formulated to meet the nutritional requirements of the grower pigs.Five experimental diets were formulated to contain varying levels of fresh forage. T_1 wasthe control without forage while T_2, T_3 T_4 and T_5 contain the forage at 5, 10, 15 and 20% respectively, these were mixed with the concentrate diet to obtain uniform composition. The feed and water was provided *ad libitum* to the pigs.

Housing and mmanagement of the pigs

The pigs were housed in an open-sided pig house roofed with asbestos roofing sheet. The open sides of the building were covered with expanded metal and iron net to prevent flies and other insects from entering. Each pen measuring 2m x 7m replicated into three, housed two pigs each. The pens had a dwarf wall each of 120cm separating each other on a concrete floor. Each of the pens had a wallow, feeder and watering troughs made of concrete and a dung areas.

Two weeks before the commencement of the trial, the pens were washed, disinfected and fumigated with formalin. On arrival, the pigs were given the formulated ration for a period of two weeks, within this period, broad spectrum antibiotics, multi-vitamin and deworming drugs were administered to keep the animals fit for the trial. The pigs had adjustment period of two weeks after which they were fed daily at 8.00 hours and 16 hours at 4% of their body weight. Water was provided both in the wallow and drinking troughs throughout the management period.

Table1 . Composition of Experimental Diets Supplemented With Grass Forage

Ingredients	T_1	T_2	T_3	T_4	T_5
Concentrates (%)	100.00	95.00	90.00	85.00	80.00
Grass (%)	0.00	5.00	10.00	15.00	20.00
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Analysed Composition					
Dry Matter (%)	86.16	86.70	86.98	86.34	85.33
Crude Protein (%)	20.18	19.54	18.90	18.25	17.61
Ether Extract (%)	3.76	3.86	3.96	4.61	4.17
Crude Fibre (%)	5.38	6.95	8.57	10.17	11.76
Ash (%)	9.5	9.63	9.75	9.88	10.00
Nitrogen Free Extract (%)	54.47	54.51	54.30	54.04	53.05
Gross Energy ((kcal/kg)	4.00	3.97	3.94	3.90	3.87

Data ccollection and analysis

Two pigs were randomly selected from each of the treatment groups for gut microbial population count. The pigs were slaughtered and the intestine removed , then using a surgical blade, the gut contents from the stomach , caecum and colon were collected by dissecting the segments. The gut contents were then placed in a plane sterile tube and taken to the laboratory for microbial population count. The data collected were subjected to analysis variance (ANOVA) using (SAS 2004) and significant means were separated using Duncan Multiple range Test (DMRT)

RESULTS AND DISCUSSION

The results of feeding*Panicum maximum* forage on the microbial gut population in various segments of the gastrointestinal tract ofgrower pigs is shown in table 2 . It's inclusion in the dietsof grower pigs significantly ($P< 0.05$) increased the population of microbes in the stomach, caecum and colon in all the grass treatment groups. .The microbial population increased with increased grass forage percentage from 5 to 20%. The control group (0.0% forage) hadsignificantly($P<0.05$) the lowest gut(stomach and caecum) microbial population. Their population increased from the stomach down to the distal small intestine and further to the colon. This result agreed with the observation by Bach-Knudson *et al,.*(2001) and Jensen and Jorgensen (1994) who reported that gastrointestinal tract of pigs densely populated with bacteria increased from the stomach to the distal small intestine and further to the colon. The presence of these microbes might have contributed to the positive influences observed in the apparent nutrient digestibility. Ziggers (2000) reported that the population of gut beneficial bacteria like lactobacillus in the intestine increased the pH of the gastrointestinal tract due to increased production of volatile fatty acids, hence the environment of the system becomes unsuitable for the activities and multiplication of pathogens.

Table 2. Effects of grass forage on the microbial population in the gut of pigs.

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
Stomach ($x10^3$cfu/ml)	4.50^c	5.40^b	6.32^a	6.42^a	6.39^a	0.14
Caecum ($x10^3$cfu/ml)	4.25^c	5.42^b	6.40^a	6.70^a	6.80^a	0.12

Colon (x10^3cfu/ml)	6.90^{b}	7.20^{ab}	7.22^{ab}	7.60^{ab}	7.83^{a}	0.15

a-b means along the same row with different superscripts are significantly (P<0.05) different. SEM = Standard Error of Mean

CONCLUSION/RECOMMENDATION

The study showed that dietary inclusion of fresh P*anicum maximum forage in the diet ofgrower pigs increased the beneficial microbial gut population in stomach , caecum and colon and also enhanced growth of pig and therefore should be included in pig ration at 20 – 25% supplementary levels.*

REFERENCES:

Anya, M.I., Ozung, P.O., Umoren, E.P and Ayuka, A.A. (2019). The Rumen Microbiome: A Resource Pool For The Future. 8th ASAN-NAIG Conference 2019 .PP 1091-1095

Bach-Kndsen, K. E.Jensen, B. B. And Hansen, I. (2001). Digestion of polysaccharides and other components of the small and large intestineof pigs fed diets consisting of oat fractions rich in

Callaway, T., Edrington, T., Rychlik, J., Genovese, K., Poole, T., Jungy, I., Bischoff, K., Anderson, R., and Nisbet, D.J. (2003). Ionophores: Their Use as Ruminant Growth Promotant and Impact on Food Safety. Current Issue of Interest in Microbiology 4:

Johnsen, H. N. And Bach-knudsen,K. E. (1996). Effect of varying content of soluble dietary fibre from wheat flour and oat milling faction on gastric emptying in pig. British of Nutrition.75:339-351.

Jorgensen, H. ,Zhao, X., Eggum, B. O.and Zhao, X. Q. (1996).The influence of dietary fibre and environmental temperature on the development of GIT digestibility, degree of in the hind -gut and energy metabolism in pig. British journal of nutrition of Animal sc. 75: 365- 378.

Jensen, B. B. And Jorgensen, H. (1994). Effect of dietry fibre on microbial gas production in various regions of the gastrointestinal tract of pig. Applied and environmental microbiology 60: 189-190.

.Pluske, J.R., Siba,P.M., Pethic, D.W., Dourmic, Z. Mullam, B.P. and Hampson,D.J. (1998).Confirmation of the role of rapidly fermentable carbohydrate in the expression of some dysentery in pigs after experimental infection. Journal of Nutrition 126: 2920-2933.

SAS, (2001). SAS User"s Guide. Version 6.11. SAS Institute , Inc. Cary, NC

Ziggers, D. (2000). TOS, A New Prebiotic From Whey. Animal Feed Science and Technology 5: 34-36.

Ogle, B, (2006). Forage for pig ; nutritional physiochemical and practical implications . Workshop on forage for pig and rabbit . department of animal nutrition and management , Swedish University of Agriculture Sc. Sweden.