

GROWTH PERFORMANCE AND ECONOMICS OF PRODUCTION OF WEANER PIGS FED GRADED LEVELS OF PLANTAIN PEEL MEAL SUPPLEMENTED WITH CORN PAP CHAFF.

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Abstract

This research was carried out to investigate the effect of graded levels of plantain peel meal supplemented with corn pap chaff on the growth performance and economics of production of weaner pigs. Plantain (*Musa paradisiaca*) is a fruit crop which produces about 30-40% peels in the form of agricultural by-products (wastes). These peels (ripe and unripe) have been harnessed as animal feed or feed ingredients. Twenty-four (24) weaner pigs of either sex of the large white hybrids were procured from a reputable farm in Yenagoa, Bayelsa State. The weaner pigs which weighed 4-5kg initial body live weight were distributed into four (4) treatments of six (6) pigs per treatment and replicated three times with two (2) weaner pigs per replicate in a completely randomized design (CRD). The plantain peel meal was served at 45kg, 30kg, 15kg and 0kg in T₁(Control), T₂, T₃ and T₄ respectively. Corn pap chaff was served to supplement the pig's ration. Proper farm management practices and routine medications and vaccinations were strictly observed. Cool water and feed were supplied ad libitum. The experiment lasted for eighty-four (84) days. All data was subjected to a one-way analysis of variance (ANOVA). Under growth performance indices, the parameters measured were the initial weight, final weight and feed intake. The weight gain, feed conversion ratio and mortality were calculated. Results on performance indicate that T₂ and T₃ were significantly ($P < 0.05$) better in final live weight, feed intake and feed conversion ratio; while feed intake increased linearly from T₃-T₄. The economics of production shows that the cost of production for all the treatment groups were similar; as there were no significant ($P > 0.05$) differences in the total cost of production. It was therefore concluded that weaner pigs can be fed between 15% and 30% graded levels of plantain peel meal (PPM) supplemented with corn chaff without causing any deleterious effects on the performance and economics of production.

Keywords: Plantain peels, Cornpap chaff, Weaner pigs, Growth performance, Economics of production.

INTRODUCTION

There is a sharp increase or demand for animal protein on the diets and the dinning table of so many persons/families. Dave (2003), reported that the gap between supply and demand could be due to increasing population, improving technology and increasing incomes. It is true that pig production is gaining centre stage in the livestock sub-sector/industry. This is because pigs are very prolific with a birth size of between 8-22 piglets per farrow; and a short gestation period of three months, three weeks and three days or (114-115 days). Other facts about the pigs are: They are omnivorous and indiscriminate eaters who can subsist on every cooked and uncooked farm wastes from the dinning hall, hotels, kitchens and parties. They are incredibly social and very clever animals. Pigs can recognize their names from four weeks. Shows sign to their young piglets (baby pigs) while breast feeding. Pigs can dream. Their genetic make-up is similar to man. They can swim very well. Pigs produce live weight gain, from a given weight of feed, than any other class of meat animals. The small intestines of the pig are used to make the catgut, a suture material.

Adamu et al (2017), reported the proximate composition of both the unripe and ripe plantain peels. Thus, unripe plantain peels: moisture (33.53), crude protein (2.93), ether extract (6.00), crude fibre (2.53), ash (6.30), and carbohydrate (84.01). Ripe plantain peels: moisture (53.30), crude protein (6.69), ether extract (5.37), ash (6.30) and carbohydrate (28.60). Plantain peels have been shown to possess so many anti-oxidant, anti-fungal, anti-bacterial, anti-cancer, anti-septic, aphrodisiac and other pharmacological activities. The value of plantain peel can also be seen in its food, exports, industrial, medicinal and as livestock feeds. (FDAFS, 2000). Unripe plantain peels has been processed into plantain peel fuofuo and eaten (swallowed) by man. Peels are properly washed to remove dust, sand, insect eggs and larva, cut into pieces, put in a blender and blended, cooked/baked in a pot and served, (Rasheed, 2003). Pigs can eat both ripe and unripe plantain peels with or without any supplementation or fortification.

Maize or corn pap chaff is the end product of milling maize. Wet corn chaff can be swallowed outrightly, while some others prefer to dry it, ground and sieve to get a finer product. It is usually served farm animals wet or dried. Health benefits of corn pap chaff is that it contains fibre, which is good to ease constipation and improve digestion. It protects the body against colon cancer, diabetes, and cardiovascular illness. It can be mixed with other feed ingredients and fed to livestock, Ponka et al, (2005).

Fokeu, (2005), reported the nutritional values of corn pap chaff as moisture (67.9 ± 2.24), ash (4.30 ± 0.88), protein (11.7 ± 1.42), lipid (17.6 ± 2.93), fibre (3.18 ± 0.48), and carbohydrates (63.2 ± 2.56).

Major Phytochemicals in corn chaff include Alkaloids, Tannins, Fluminoids, Saponins, Glycocides, Stroids and anthraquinones (Lawal et al, 2015).

Plantain peels (ripe and unripe) and corn chaff (wet or dry) are totally being consumed by both ruminant and non-ruminant animals. As a result of the increasing population of pigs and their fast growth rate. It has become imperative to source for alternative sources of agro-industrial by-products like the plantain peels and corn chaffs. The objectives of this study is to evaluate the response of pigs to the bioactive components of plantain peels and cornchaff and yet predict the possibilities of maximizing profit in the committee of pig farmers.

MATERIALS AND METHODS

Study Area:

This study was carried out at the piggery unit of the Teaching and Research farm, Isaac Jasper Boro College of Education Sagbama, Bayelsa State. Sagbama is situated within the South-South ecological zone of Nigeria and lies along the co-ordinates of latitude $40^{\circ}58'13''$ North, and longitude $6^{\circ}6'33''$ East of the equator. The climate has two seasons; the dry and the wet. Annual rainfall record stands at 2800-3000mm. temperature records indicate $27-32^{\circ}\text{C}$, and relative humidity is 75-87% ABS, (2016).

Source of Experimental Materials

The experimental materials, plantain peels (unripe and ripe), were collected from women roasting plantains. Corn pap chaff were also collected from large scale pap (Akamu) producers using maize. These waste products were weekly collected for the study.

Experimental Weaner Pigs.

Twenty-four (24) weaner pigs of either sexes weighting about 4-5kg were procured from a reputable farm in Yenagoa, the Bayelsa State Capital. Two weeks of pre-experimental period were allowed for all of them to acclimatize themselves to their new environment before the commencement of the experiment.

Experimental Design

Twenty-four (24) weaner pigs were randomly assigned to four treatments and three replications with six (6) weaner pigs per treatment, and with two pigs per replicate, in a Completely Randomized Design (CDR).

Housing and Management

The weaner pigs were allotted their pens in their various treatment and replications. The housing was to provide shelter from the rains, predators and hot weather. Feed and water were supplied ad libitum. Cool and clean water was also served. Routine medication and vaccinations were strictly followed.

Duration of the experiment

The experiment lasted for eighty-four (84) days

Experimental Model

The experimental model used was:

$$Y_{ij} = U + T_1 + E_{ij}$$

Where,

Y_{ij} = Individual observation

U = Overall mean

T_1 = Treatment effect

E_{ij} = Random error assured to be independently identically and normally distributed with zero means and constant variances.

Data collection

At the end of the study, data was collected on the growth performance and economics of production.

Statistical Analysis

All data was subjected to a one-way analysis of variance (ANOVA) in a completely randomized design (CRD) as prescribed by AOAC (2005) were significant ($P < 0.05$) differences are noticed, means were compared using the Duncan's New Multiple Range Test (DNMRT) as outlined by Obi (2001). The SPSS (2012) statistical package for social sciences, version 20, was used to carry out all the statistical calculations.

Results

Table 1. Composition of Experimental Diets

I n g r e d i e n t s	T	1T	2T	3T	4
Plantain peel meal (PPM) (kg)	4	53	01	50	
Corn pap chaff (CPC) (kg)	0	1	53	54	5
	4	54	54	54	5

Table 2: Proximate Composition of the Experimental Diets

P a r a m e t e r (I D M)	T	1T	2T	3T	4S	E	M
D r y m a t t e r	92 . 1	49 1 . 6	21 9 . 2	59 1 . 1	20 .		2
C r u d e p r o t e i n	15 . 5	01 6 . 0	91 6 . 4	81 7 . 1	50 .	0	1
C r u d e f i b r e	17 . 6	71 6 . 6	81 5 . 8	21 5 . 5	80 .	0	6
E i t h e r e x t r a c t	2 . 9	73 . 4	23 . 2	92 . 7	40 .	0	1
Nitrogen free extract	46 . 5	24 8 . 6	64 9 . 7	35 0 . 3	50 .	0	2
A s h	7 . 8	16 . 5	86 . 4	55 . 9	10 .	0	1
E n e r g y (m j / k g D M)	1 . 5	61 . 6	81 . 6	81 . 7	00 .	0	1

RESULTS AND DISCUSSION

RESULT

Table 3: Growth Performance of Weaner Pigs Feed Plantain Peel Meal Supplemented with Corn Pap Chaff.

Parameter (IDM)	T	1T		2T		3T		4S E M					
	4	5	k	g3	0	k	g1	5	k	g0	k	g	
Initial live weight (kg)	4	.	8	15	.	0	14	.	7	85	.	0	30 . 0 1
Final live weight (kg)	8	.	2	2 ^b	.	19	.	15 ^a	8	.	9	6 ^b	8 . 2 4 ^b ^c 0 . 2
Weight change (kg)	3	.	4	1 ^c	.	4	.	14 ^b	5	.	1	8 ^a	3 . 2 1 ^d 0 . 1
Feed intake (kg)	1	3	1	.	2	8 ^c	.	13	4	.	2	5 ^a	1 3 3 . 1 4 ^b 1 3 0 . 9 6 ^d 0 . 8
Feed conversion ratio	3	8	.	5 ^c	.	3	.	2	5	.	5 ^b	3	1 . 8 ^a 4 0 . 8 ^d 0 . 4
Mortality	0	.	0	00	.	0	00	.	0	00	.	0	00 . 0

abcd: means within the same row with different superscripts are significantly (P<0.05) different.

SEM: Standard Error of Means.

NS: Not Significant.

Under growth performance, the initial live weight of the weaner pigs was similar and the same across all the treatment groups, T₂-T₄; including T₁ (control) group (P<0.05). However, the final live body weight was significantly (P<0.05) affected in T₂ and T₃ by the plantain peel meal supplemented with corn pap chaff diets than the T₁ (control group) and T₄ which never had any supplementation. From the table, it was shown that weight gain was significantly (P<0.05) higher in T₂ and T₃ than the other treatment groups.

Feed intake was also better (P<0.05) in T₂ and T₃. T₄ was the least (P<0.05). The feed conversion ratio was best (P<0.05) for T₃ (31.8) with the least values. The poorest in feed conversion ratio was T₄ with 40.8. Mortality records indicate that there was no one case or incidence of deaths. (P<0.05).

Table 4: Economics of Production of Weaner Pigs Fed Plantain Peel Meal (PPM) Supplemented with Corn Pap Chaff. (CPC)

P A R A M E T E R T	1T	2	T	3T	4	S	E	M
	4	5	k	g	3	0	k	g
	1	5	k	g	1	5	k	g
	0	k	g	0	k	g		
Initial live wt (kg)	4 . 8	15 . 0	14 . 7	85 . 0	30 . 0			1
Final live wt (kg)	8 . 2	2 ^c 9 . 1	5 ^a 8 . 9	6 ^b 8 . 2	4 ^c 0 . 1			
Total weight gain (kg)	3 . 4	1 ^c 4 . 1	4 ^b 5 . 1	8 ^a 3 . 2	1 ^c 0 . 1			
G a i n (K g)						0 . 8		
Total feed intake	131.28 ^c	134.25 ^a	133.14 ^b	130.96 ^d	0 . 2			
Total feed cost (₦)	45,000 ^d	47,000 ^c	49,000 ^b	50,000 ^a	0 . 2			
Cost of feeding (₦)	15,000	15,000	15,000	15,000				
Daily feed cost (₦)	803.6 ^d	1,071.4 ^c	1,339.2 ^b	1,607.1 ^a	2 . 6	4		
Total cost of production (₦)	60,000 ^d	62,000 ^c	64,000 ^b	65,000 ^a	0 . 6			
Cost/kg wt gain (₦)	13,196.5 ^d	14,492.8 ^b	14,478.8 ^c	28,037.3 ^a	0 . 4			

abcd: means within the same row with different superscripts are significantly (P<0.05) different.

SEM: Standard Error of Means.

NS: Not Significant.

This experimental animals in T₂ (9.15kg) performed better than the rest of the treatment groups in terms of final live body weight. But T₁ (the control) had the least values (8.22kg) in T₃ total weight gain was highest (P<0.05) with the values as (5.18kg).

Total feed intake was highest (P<0.05) in T₂ (134.25 kg) and T₃ (133.14 kg) than T₁ (131.28kg) and T₄ (130.96 kg).

Total feed cost for the period of field experimentation revealed that T₁ (the control) (₦ 75,000) was the cheapest, (P<0.05) which t₄ (₦80,000) was the costliest (P>0.05). The total feed intake per pig times cost per kg feed (₦) equals o total feed cost pig hairs.

The cost per kilograms weight farm in Naira was a function of total feed cost per pig divided by the weight gain in kilogram. Results showed that of will take ₦78,037.3 to produce a one-kilogram weight of muscle with this feeding regime.

Total cost of production in naira during the feed under review (56 -days), revealed in following values. T₁ (₦60,000), T₂ (₦75,000), T₃ (₦75,000) and T₄ (₦80,000), respectively

DISCUSSION

All the weaner pigs for the study were sharing an average weight of 4.05-5.5kg, Agbabiake et al (2013), posited that this could be as a result of the fact that they were either born by the same parents, or were farrowed at about the same age brackets and nursed under similar environmental conditions.

The result obtained on the final live weight by the weaner pigs indicate that the animal converted the by-products they have eaten to muscle. Omu, (2012), reported that plantain and banana peels can serve as good sources of nutrients in the preparation of animal feeds as they are high in starch, proteins, lipid, ash and essential mineral contents.

Plantain and banana peels have attracted attention in recent times. This is because, they serve as a very good source of dietary fibre and anti-oxidants. Plantain peels has been investigated as feed and feed materials for Poultry, (Ironkwe and Oruwari, 2012); Fish, (Agbabiaka et al, 2013); and Snails, (Omole et al, (2015).

Akande and Agbateryi (2019), reported that the depressed weight change in experimental animals could have been as a result of the presence of anti-nutritional factors in their ration. In a related development, Garcie et al (2019), observed that the poor weight gain of finisher birds would have been due to poor nutrient utilization as a result of the presence of anti-nutritional factors.

Feed intake was better in T₂ and T₃. This may be due to the fact that low quality bulky feeds is compensated by the inclusion of concentrates in the diets. This is to check any form of negative influence on animal health.

Plantain is larger, starchier and less sweet than the smaller bananas. The proximate composition of plantain peels indicate that they are rich in total dietary fibre (64.33g/100g), Vitamins (Folic Acid) (33.12mg/100g); and minerals (Potassium) (35.61mg/100g). This may be why T₁ – T₃ had higher intake than T₄.

Results obtained in this study indicate that pigs in T₃ (31.8), had a better feed conversion ability than all the other groups. But T₄ (40.8) showed the least feed conversion ratio. The explanation to this is that treatment groups with the smallest feed conversion ratio values has the highest capacity to convert feed to flesh. This result agrees with the findings of Afoleyan et al (2009), who reported that dietary energy level is a major factor influencing feed intake and feed conversion ratio.

During the period of the field work, no deaths were recorded. Mortality rate was zero. This could be attributed to the meticulous farm management practices that were observed; and the routine medications and vaccinations of the animals. Garcie et al (2013), reported that balanced and adequate feeding is synonymous with sound health for all farm animals. The purpose of feed analysis is to enable farmers and farm advisors to monitor feed to meet the nutritional requirements of animals. Feeds are usually classified into two broad categories: concentrates and forages. Concentrates are high in energy contents. While protein varies from 2 – 80%, forages have a much lower range in protein content, from 2 – 22%.

Forages or roughages are low in net energy per unit weight, usually because of the high fibre content. Such products include all type of peels, seed coats, peels, brans, etc. the quantity and quality of good feed served is directly proportional to a disease free and healthy body.

The final live body weight from this study revealed that T₂ with 9.15 kg and 8.96kg and better performance than T₁ (the control) and T₄. The results obtained indicates that the plantain peel meal supplemented with corn pap chaff improved general performance of the weaner pigs. This work corroborates the findings of Iyegha-Eraakpotobor (2010) who worked on protein and energy partitioning for growth by rabbits feed soyabeans cheese waste diet and lablabhay. It was confirmed that the mix or supplementary feed had superior performance.

Antibiotics, chemotherapeutic appendix, microbial supplements (Prebiotics and probiotics), Enzymes and other feed additives are often added to swine diets to increase the rate and efficiency of gain improve digestibility and other purposes; but they are not considered as nutrients (Nsidinanya, et al 2020).

For total weight gain, that had the respectively. T₂ and T₃ had supplementation whereas, T₁ and T₄ had no supplementation.

Adegbola (2002), reported that when poor gravity roughages ad fed to ruminants without supplementation, this could cause consideration weight loss and finally death during the dry season.

According to Omu, (2023) the level of feeding plantain peel meal (PPM) to weaner pigs was borne cut primary from the desire to investigate cheap and alternative feeds for livestock and yet maximize profit.

As population is increasing, the quantity of corn pap chaff available for possible use in livestock feed in constantly increasing (FAO, 2010).Although, there are many studies on the use of plantain peel as a source of weaner pig meal, there is scarcity of information on the incorporation of plantain peel meal and corn pap chaff. The objective of this study was therefore to evaluate the growth performance and economic of production or feeding of weaner pigs of graded levels. Dietary supplementation increases production, increases fertility, improves growth, improves skeletal developments and maximize profit (Robert et al, 2020).Dietary fibre supplementation in the diets of gestating grows has beneficial effects on their gut microbiota, immunity, welfare, colostrum production, physiology, and overall performance. The utilization of plantain peel meal and corn pap chaff as individual ingredients and/or as a mix has been a long-time practice by the rural pig farmer. Agbabiaka and Okoriye, (2013).

The same authors stated that these two feed resources find an excellent supplement as both protein and energy source in the diets of pigs and catfish. Similarly, Sogunle et al (2009) reported that dietary supplementation has capacity to influence feed intake. Total feed cost indicates that T₁ (₦45,000). Was the least. The feed cost per treatment followed an ascending trend. The reason for T₄ having the highest values could better explained as perhaps. Due to the rush in sourcing for the corn pap chaff by different stock farmers, and the transport fare

paid to access the chaff. The benefits of dietary supplements include but not limited to these only: close nutritional gaps, regulate nutrient absorption, and avoid costly health problems. Raynolds et al (2012). The same authors stated that generally, feed nutrients perform three main functions. They provide energy contribute to body structure, and/or regulate chemical processes in the body.

Animal feeds are classified concentrates and roughages. The concentrates which are high in energy value include fat, cereal grains, and their by-products, such as barley, corn, rye, wheat, etc. They are also high in protein and include oil meals or cakes such as soya bean, canola, cottonseed, peanut and their by-products from the processing of sugar beats, sugarcane, animals and fish. Meanwhile roughages include – pasture grasses, hays, silage, root crops, straw, stover (corn stalks), and peels. They are usually rich in fibre. Total cost of production shows there was a linear increase from T₁ to T₄ in the values of ₦65,000, ₦75,000 and ₦80,000 respectively.

Oh et al, (2019): stated that fibre is made up of the indigestible parts or compounds of plants, which pass relatively unchanged through the stomach and intestines. Fibre is mainly a carbohydrate. The main role of fibre is to keep the digestive system healthy, blood cholesterol, weight control, stabilizing glucose, reducing other health challenges.

Dietary fibre is found in the indigestible parts of cereal, fruits and vegetables. A diet high in fibre keeps the digestive system healthy. Health conditions linked to a low fibre diet include: constipation, irritable bowel syndrome (IBS), haemorrhoids, diverticulitis, heart disease and some forms of cancers. Fayet et al, (2018).

CONCLUSION AND RECOMMENDATIONS

Conclusion

1. From the results obtained in this study, it is concluded that plantain peel meal supplemented with corn pap chaff has the potential to be used to feed weaner pigs.
2. Plantain peels possess medicinal properties that can be (have been) used to prevent, control and treat all kinds of diseases and improve efficiency.
3. This study has revealed that the often-undervalued plantain peel and corn chaff are found to contain substantial amount of nutrients mineral elements, phytochemical properties and many vitamins.
4. Pigs have the ability to convert agricultural wastes and by-products like plantain peels and corn chaff into muscles.
5. The study concluded that weaner pigs have the ability to convert plantain peel meal (PPM) based diet supplemented with corn pap chaff (CPC) to enhance growth performance, and without compromising economic gain.

Recommendations:

1. Weaner pigs can be served plantain peel meal (PPM) supplemented with corn pap chaff (CPC).
2. It is hereby recommended that the inclusion rates of 30kgPPM and 15kg CPC, and 15kg PPM and 15kg CPC should be maintained.
3. Further research should also be carried out using different inclusion rates.

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