Sustainable Utilization of Cassava Plant for Feeding Monogastric Animals

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ABSTRACT
Cassava plant meal (CPM) which had 9.0% crude protein (CP) comprising unpeeled cassava tubers, leaves and tender-stems was developed to replace maize in the diets of rabbits, pigs, cockerels and broilers. Growth studies were conducted for eight weeks with rabbits, eight weeks with pigs, sixteen weeks with cockerels and four weeks with broilers. In broiler study, three experimental diets were formulated. 153 one week old broiler chicks were randomly distributed into the three diets. In the study with rabbits, 15 ten week old New Zealand white weaner rabbits were randomly allotted to three diets. In the study with cockerels, 150 day old cockerel chicks were randomly distributed to three experimental diets. 24 growing pigs were used in the pig study and they were randomly distributed into three diets. Results of these studies showed that growth rate decreased and feed to gain ratio deteriorated as the proportion of CPM in the diets of broiler was increased while with pigs, growth rate and feed to gain ratio were not negatively affected by the inclusion of CPM. With cockerels, growth rate and feed to gain ratio were negatively affected with the inclusion of CPM in the diets. The inclusion of CPM to replace maize in the diets of growing rabbits resulted in the improved performance of the animals in terms of daily gains, feed intake and feed to gain ratio.
Findings from these studies suggest the suitability of CPM to replace maize completely in the diets of pigs and rabbits. Partial replacement of maize with CPM gave satisfactory performance with cockerels and broilers.

STUDIES ON THE USE OF CASSAVA FOR LIVESTOCK FEEDING
Cassava is the most cultivated of the crops in Nigeria. It is a shrubby tree of 4 to 5 meters high whose stem separates in to several tubers. Ideally, it is grown at under 1,200 to 1,500 mm of rainfall where average temperature is 23^0C and a well drained soil, preferably on hilly ground. It can adapt to a variety of soil and climatic condition and can withstand drought more than cereals. It can be grown either from the seed or from stem cuttings,
the later being the commonest. Cassava can yield 5 to 100 tonnes of tubers per hectare, a good average being 10-20 tonnes per year (Felix *et al* 1994).
There had been several studies by many scientists in Nigeria on the use of cassava for livestock feeding. Most of these studies centered on the use of either flour or peels or leaves (Sonaiya and Omole 1977; Sonaiya *et al* 1982; Job *et al* 1980; Iyayi and Tewe 1994). Most of these studies confirmed the suitability of cassava to replace maize (partially or wholly) for all species of livestock.

STUDIES ON THE USE OF CASSAVA PLANT FOR FEEDING MONOGASTRIC ANIMALS AND RABBITS
The replacement of maize with cassava flour was reported to be economical from the previous studies. The price of cassava has been on the increase because, it has been attracting interest as an industrial crop in Nigeria having found various uses in the starch, pharmaceutical, bread and biscuit industries. This led to further studies in which cassava flour content of the diets was reduced considerably by adding more of peels, leaves and tender stems which are presently underutilized in Nigeria.
In the studies on the use of cassava plant meal for monogastric animals, cassava plant meal which had about 9.0% crude protein comprising unpeeled tuber, leaves and tender

stems was developed. The mixing ratios were 2.5:1 of unpeeled tubers to leaves plus tender-stems, while the ratio of leaves to tender-stems was 5:1. Cassava plant meal was used as maize replacer in the diets of rabbits, pigs, cockerels and broilers. Growth studies were conducted which lasted for eight weeks with rabbits and pigs, sixteen weeks for cockerels and four weeks for broilers.

In the broiler study (Akinfala *et al* 2002), a basal diet of 22% of crude protein was formulated with 50% maize. The maize was replaced with cassava plant meal at rates 0, 25 and 50% of maize. A total of One hundred and fifty three, One week old broiler chicks were randomly allotted to three experimental diets with each diet having three replicates.

In the study with rabbits (Akinfala *et al* 2003), fifteen, ten week old New Zealand White weaner rabbits were randomly allotted to three experimental diets formulated to contain about 15% circle protein. Five animals were used per treatment with each animal serving as a replicate. Cassava plants meal was used to replace 0, 50 and 100% maize in the diets.

In the study with cockerels, (Matanmi *et al* 2004) three experimental diets that contained about 16% crude protein and 10.37MJ metabolisable energy were formulated. Cassava plant meal was used to replace 0, 50 and 100% of maize in the diets. A total of One hundred and fifty day old cockerel chicks used in this study were randomly allotted into the three experimental diets and each diet had three replicates.

In the study with pigs (Akinfala *et al* 2010), twenty four growing pigs were used and they were randomly distributed into three experimental diets that contained 18% crude protein and 11.12MJ digestible energy. Six animals were used per treatment and each served as a replicate.

The design of these studies was completely randomized design. Proximate compositions of cassava plant meal, maize and experimental diets were carried out according to AOAC (1995), while the residual cyanide content of cassava plant meal was determined as outlined by ISO (1975). Routine management practices were followed in all the studies. Records of feed consumption, weight gain and feed/gain ratio were kept on treatment basis in all the studies. In these studies all data were subjected to analysis of variance using a computer software package (SAS 2000). There was no lesson or physical disability arising from the treatments effect in all the studies. The diets fed each species had a similar proximate analysis with only slightly higher level of crude fibre as the proportion of cassava plant meal was increased. The residual cyanide content was 33.5mg/kg which has been established as safe for livestock feeding.

The performance data of the livestock species are shown in Tables below. The feed intake was calculated on dry matter basis.

Table 1: Effect of cassava plant meal (CPM) in the diets of broiler chicks.

Parameters	Diets			
	0% CPM	12.5% CPM	25% CPM	SEM
Body Weight (g)				
Initial	96.8	100.0	95.4	2.1
Final	1106[a]	981[b]	910[b]	81.0
Daily gain (g/day)	36.0[a]	31.4[b]	29.1[b]	2.9
Daily feed intake (g/day)	64.57[a]	64.0[a]	65.71[a]	0.7
Feed/gain ratio	1.79[a]	2.04[ab]	2.26[b]	0.19
Feed cost/kg gain ($)	0.88	0.95	0.99	0.03

[a,b]: means along the same row having different superscripts differ at P<0.05

Source: Akinfala *et al* (2002)

Table 2: Effect of Cassava plant meal (CPM) in the diets of pigs

Parameters	Diets			
	0% CPM	25% CPM	50% CPM	SEM
Body Weight (kg)				
Initial	21.02	21.06	19.98	0.71
Final	41.00	39.17	38.83	1.96
Daily gain (g/day)	360[a]	300 [a]	340 [a]	17.64
Daily feed intake (g/day)	890[a]	940 [a]	960 [a]	20.82
Feed/gain ratio	2.5[a]	3.00 [a]	2.78 [a]	0.15
Feed cost/Kg gain ($)	0.45	0.46	0.37	0.02

Source: Akinfala *et al* (2010)

Table 3: Effect of Cassava plant meal (CPM) in the diets of cockerels.

Parameters	Diets			
	0% CPM	25% CPM	50% CPM	SEM
Body Weight (kg)				
Initial	33.50	32.48	32.30	0.65
Final	1679.83[a]	1445.33 [a]	1161.15[b]	132.12
Daily gain (g/day)	19.28 [a]	16.05[b]	12.88[c]	2.61
Daily feed intake (g/day)	99.21 [a]	99.60 [a]	100.01 [a]	0.50
Feed/gain ratio	5.15[c]	6.21[b]	7.77 [a]	0.12
Feed cost/Kg gain ($)	1.34	1.37	1.40	0.02

[a,b,c:] means along the same row having different superscripts differ at P<0.05
Source: Matanmi *et al* (2004)

Table 4: Effect of Cassava plant meal (CPM) in the diets of rabbits

Parameters	Diets			
	0% CPM	22.5% CPM	45% CPM	SEM
Body Weight (g)				
Initial	572	584	576	4.99
Final	1098[b]	1282[a]	1204[a]	75.40
Daily gain (g/day)	9.38[b]	12.40[a]	11.20[ab]	1.55
Daily feed intake (g/day)	43.90[b]	56.4[a]	60.80[a]	8.81
Feed/gain ratio	5.15[a]	4.89[a]	6.00[a]	0.47
Feed cost/Kg gain ($)	0.78	0.67	0.67	0.02

[a,b:] means along the same row having different superscripts differ at P<0.05
Source: Akinfala *et al* (2003)

In the study with broiler, the growth rate decreased and feed to gain ratio deteriorated as the proportion of the cassava plant meal in the diet was increased. In the study with pigs, the daily gain, feed intake and feed to gain ratio were not significantly (P>0.05) influenced

by the inclusion of CPM to replace maize in their diets. In the study with cockerels, daily gain and feed/gain were significantly (P<0.05) affected when CPM replace maize in their diets. The inclusion of CPM to replace maize in the diets of growing rabbits resulted in improved performance of the animals in terms of daily gain, feed intake and feed/gain ratio.

CONCLUSION AND RECOMMENDATION

Findings from the above studies suggest the suitability of CPM to replace maize completely especially in the diets of pigs and rabbits. Partial replacement of maize with CPM gave a satisfactory performance with broilers and cockerels. Based on the finding in these studies, there may be the need to characterize the nutrients in the CPM. Besides this, the inclusion of peels, leaves and tender stems is associated with high fibre content of the diets. This may probably be the reason for the observed utilization trend especially with poultry. On this strength, feed additives on CPM may make a difference and probably make the nutrients in CPM available to the animals.

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