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UTILISATION OF DRIED PALMOIL MILL EFFLUENT BY YOUNG GROWING RABBITS.

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SUMMARY

Thirty-six 5-6 weeks old, local mixed crossbred rabbits (526.7 ± 0.2 g) were allocated to four treatments according to their initial weight. They were caged individually, and received *ad libitum* during 7 weeks, one of the 4 diets in which maize offal was replaced by 0, 2, 5 or 10 % dried palm oil mill effluent (Pome), respectively diets 1 to 4. The diets were fed as mash. The mean voluntary feed intake were not significantly different as the level of palm oil mill effluent in the diet increased. Rabbits fed no palm oil mill effluent (control) showed daily weight gains that were significantly lower ($P < 0.05$) than those fed supplementary Pome. The average final body weight recorded were 963, 1128, 1126 and 1308 g for treatments 1 to 4 respectively. As proportions of the live weight, there were no significant differences for warm carcass, head, liver, kidneys, heart, spleen, adrenals, brain and skin. However rabbits fed diets 1 and 4 recorded heavier testes. Mortality recorded were 1/9, 2/9, 0/9 and 1/9 rabbits for treatments 1 to 4 respectively.

From the results obtained, up to 10 % maize offal can be replaced with palm oil mill effluent in the diets of young growing rabbits certainly without adverse effect on performance and a significant weight gain increase may be observed.

RESUME : **Utilisation des déchets secs de purification de l'huile de palme chez des lapins en croissance**

Trente-six lapins issus de différents croisements locaux et âgés de 5-6 semaines ont été répartis en 4 lots et logés en cages individuelles. Pendant 7 semaines, ils ont reçu à volonté sous forme de pâtée, un aliment où les déchets provenant de la fabrication de farine de maïs avaient été remplacés par 0, 2, 5 ou 10 % d'effluent sec provenant de la purification de l'huile de palme ("Pome"), aliments 1 à 4 respectivement. La consommation alimentaire a été comparable pour les 4 lots, quelque soit le taux d'effluent incorporé. Les lapins ne recevant pas de "Pome" ont eu une vitesse de croissance significativement inférieure ($P < 0.05$) à celle des lapins recevant le résidu d'huile de palme. Les poids vifs moyens finaux enregistrés ont été respectivement 963 - 1128 - 1126 et 1308 g pour les 4 lots. Les mesures effectuées sur les carcasses n'ont pas montré de différences significatives concernant la carcasse chaude, la tête, le foie, les reins, le coeur, la rate, les surrénales, le cerveau et la peau exprimés en pourcentage du poids vif. Cependant les lapins des lots 1 et 4 ont enregistré un poids de testicules plus élevé. La mortalité observée dans les 4 lots était respectivement de : 1/9, 2/9, 0/9, et 1/9 lapins.

Les résultats obtenus montrent qu'au moins 10 % de résidu de maïs peuvent être remplacés par l'effluent sec de purification d'huile de palme, dans des régimes pour lapins en croissance sans effets nocifs sur les performances. Cela a même permis une amélioration significative du gain de poids.

INTRODUCTION

Animal protein intake is lower in developing countries than in the developed countries. To bridge this gap therefore, all reasonable and praticable options must be thoroughly evaluated. VIETMEYER (1984) and PETERS (1988) suggested use of small livestock (Microlivestock) such as the rabbit, guinea pig, grass cutter, "bush rat" of Africa, iguana and pigeons which hitherto have not been given priority attention. The other reasonable option is the use of agro-industrial by-products, since conventional feedstuff for livestock are in competitive demand and also expensive.

Presently, palm oil mill effluent, a by-product of the oil palm industry, is not utilised on a commercial scale. Studies have equally shown that disposal of this by-product can be a source of environmental pollution. One major potential use of palm oil effluent therefore is its use in animal feeds. The effluent is known to be essentially free of toxic constituents.

Studies by DAVENDRA and MUTAHURAJAH (1977), have shown that the effluent is of high feeding value to ruminants. HUTAGALUNG *et al.* (1975) , ASEKHAME (1985), and OKPEFA (1985) went further to demonstrate its high feeding value in diets of chickens. HUTAGALUNG *et al.* (1977) have shown that palm oil mill effluent can also be fed to growing and finishing pigs.The purpose of this paper is to evaluate the performance of young growing rabbits fed diets in which maize offal was replaced by different levels of palm oil mill effluent.

MATERIALS AND METHODS

Origin of the by-products studied

Palm oil mill effluent (POME) is an oily brown slurry which is obtained as a residual waste after extraction of oil from the fruits of oil palm-trees. The crude oil is separated by static setting into pure palm oil and a sludge. The POME is obtained after centrifugation of the sludge. This waste is artificially dried and the resulting product pelleted. In the case of this experimentation, POME was collected from the Nigerian Institut For Oil Palm Research (NIFOR, Benin City Nigeria), milled and then incorporated in the experimental diets. Its proximate composition was: dry matter 87.6 %; crude protein 12.3 %; crude fiber 11.9 %; ether extract 10.8 % and ash 13.5 %.

The maize offal to which POME was substituted in the diets, is a by-product of the local maize industry which comprise maize germ, gluten, zein and maize bran. It has an energetic concentration comparable to whole maize and has about 12.2 % crude protein level. Maize offal is also found to be rich in vitamin B complex.

Experimental Diets :

Four diets were compounded. Diet one (Control diet) had no dried palm oil mill effluent, while diets 2, 3 and 4 had maize offal replaced by palm oil mill effluent at 2 %, 5 % and 10 % respectively. The composition of diets and their proximate analysis are shown in Table 1.

Experimental animals and their management

Experiment was carried out on thrity-six 5-6 weeks old, mixed-crossbred rabbits (20 males, 16 females) weighting 526.7 ± 0.2 g. The rabbits were matched for weight and randomly assigned to four treatments. Nine rabbits were allocated to each treatment with each rabbit serving as a replicate. The animals were individually caged, maintained on raised wire screen floors and were fed and watered *ad libitum*.

The rabbits were fed experimental diets as mash, every morning. In addition the rabbits had access to a fresh supply of Guinea grass (*Panicum maximum*) in the late afternoon from about 5.00 p.m. to 7.00 a.m. the following day. The remnant were removed each morning before fresh concentrate (experimental diet) was fed. The feeding of Guinea grass to rabits was the same irrespective of the dietary treatment, so this green supply was not taken in account for the calculations.

The feeding trial lasted seventy days. At the end of the trial, the 5 heaviest rabbits of each treatment were slaugthered and the weight of carcass and some body parts controlled.

Medication

No specific medication routine was followed, but prophylactic precautions were taken when possibilities for disease outbreak was apparent. During the fourth and eighth week the rabbits were given coccidiostat.

Table 1 : Composition of the 4 experimental diets.

Diets	1	2	3	4
Ingredients				
Dried Palmoil meal effluent (POME)	0.00	2.00	5.00	10.00
Maize offal	60.01	57.74	54.31	48.58
Palm Kernel cake	28.50	28.70	29.02	29.57
Groundnut cake	9.50	9.50	9.67	9.86
Bone meal	1.50	1.50	1.50	1.50
Premix*	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Chemical composition				
Crude protein (CP)	18.56	18.30	17.45	18.29
Crude fibre (CF)	12.71	12.88	12.94	12.94
Ether extract (EE)	4.28	4.79	4.84	5.02
Nitrogen free extract (NFE)	58.47	50.54	53.90	57.74
Ash	5.98	5.66	5.87	6.01
Energy density** (kcal ME/g)	2.37	2.39	2.49	2.62

* Vitamin premix per kg contained : Vit A 3,000,000 i.u.; Vit D 6,000,000 i.u.; Vit E 4.0 mg ; Vit K 600 mg ; Vit B_1 200 mg ; Vit B_2 1.2 mg ; Vit B_3 2,000 mg ; niacin 6,000 mg ; Choline 84,000 mg ; Mn 24,000 mg ; Fe 800 mg ; Cu 16,000 mg ; Zn 18,000 mg ; I 500 mg ; Se 48 mg ; antioxydant (BHT).

** Calculated on the basis of the ingredients composition.

Table 2 : Performance characteristics of rabbits fed different levels of palmoil mill effluent (POME)

Diets	1	2	3	4
Level of POME	0.0	2.0	5.0	10.0
Average initial live weight (g)	528 ± 15	528 ± 12	556 ± 15	578 ± 11
Average final live weight (g)	963 ± 23^a	1128 ± 43^b	1126 ± 32^b	1308 ± 65^b
Total weight gain	435 ± 30^a	600 ± 39^b	590 ± 23^b	730 ± 31^b
Average daily weight gain (g)	7.8 ± 4.24^a	10.7 ± 5.6^b	10.2 ± 3.3^b	13.0 ± 4.4^b
Average daily feed intake (g)	73.6 ± 13.0	71.4 ± 7.8	75.2 ± 10.2	74.1 ± 2.0
Feed conversion efficiency (gain/feed)	0.11 ± 0.07	0.15 ± 0.08	0.14 ± 0.05	0.18 ± 0.07
Mortality	1/9	2/9	0/9	1/9

a, b..treatment means in the same horizontal row not bearing the same suffix are significantly different (P<0.05)

Data collection

Voluntary feed intake was recorded by substracting the leftovers from the amount fed. This was carried out on a daily basis. Growth performances, as expressed by weight changes, were recorded by weighing the rabbits on a weekly basis. Rabbits were weighed in post absorptive state.

Analytical and Statistical Procedures

Proximate analysis of diets was carried out using standard procedures of A.O.A.C. (1970). Data on voluntary feed intake, live weight changes, organs weights and efficiency of feed utilisation were analyzed as 4 treatments randomised block trial analysis of variance (STEEL and TORRIE, 1980) and significant means were tested according to Duncan's Multiple Range Test (DUNCAN, 1958).

RESULTS AND DISCUSSION

Table 2 shows the summary of the performance characteristics of growing rabbits fed different levels of dried palm oil mill effluent. Table 3 shows carcass measurements. The graphical presentation of the mean weekly growth rate of rabbits is shown on figure 1.

All rabbits showed a positive growth rate throughout the experimental period. On average, the daily growth rate observed with the 3 experimental diets were significantly (P < 0.05) higher than with the control one, the highest beeing observed with the highest proportion of POME. The differences were not associated with greater feed intakes and resulted in a better feed efficiency with POME. But because of the variability, the feed efficiency improvement is not statistically significant.

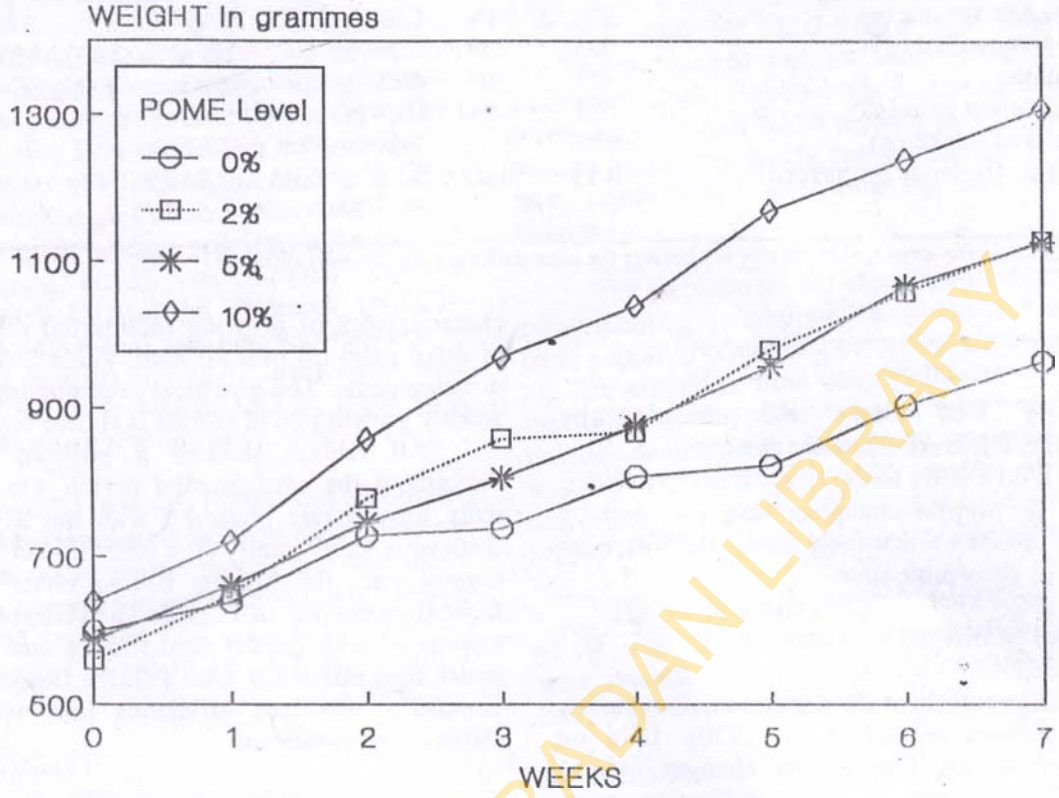
Average daily live weight gains were no different from those observed by ALAWA *et al.* (1989). However ABDELLA *et al.* (1988) reported higher average daily live weights gains for rabbits fed soyabean meal, decorticated cotton seed meal and molasses. Efficiency of feed utilisation for all dietary treatments were not significant. However ADUKU *et al.* (1988), using palm kernel meal as a major source of protein in rabbits diets got feed conversion efficiency

Table 3 : Organ weight as a percentage of live weight of rabbits fed different levels of POME.

Diets	1	2	3	4
Levels of palm oil mill effluent	0.0	2.0	5.0	10.0
Number of rabbits	5	5	5	5
Average live weight (g)	1450 ± 100	1343 ± 71	1270 ± 52	1440 ± 139
Warm slaugther rate (%)	50.9 ± 2.0	52.8 ± 1.9	52.7 ± 5.1	52.9 ± 2.2
Body components (% of live weight) :				
Head	9.31 ± 0.36	9.96 ± 0.07	9.85 ± 0.06	9.05 ± 0.90
Liver	2.65 ± 0.12	3.44 ± 0.83	2.47 ± 0.31	3.73 ± 0.02
Kidneys	0.66 ± 0.03	0.82 ± 0.13	0.84 ± 0.09	0.67 ± 0.02
Spleen	0.05 ± 0.02	0.06 ± 0.02	0.07 ± 0.02	0.06 ± 0.04
Heart	0.21 ± 0.02	0.21 ± 0.01	0.21 ± 0.01	0.21 ± 0.04
Testes	0.24 ± 0.01^a	0.18 ± 0.01^b	0.15 ± 0.04^b	0.24 ± 0.02^a
Adrenals	0.02 ± 0.001	0.02 ± 0.01	0.02 ± 0.003	0.02 ± 0.02
Brain	0.50 ± 0.03	0.50 ± 0.02	0.61 ± 0.08	0.56 ± 0.05
Fresh pelt	8.82 ± 0.89	9.22 ± 0.37	7.28 ± 0.06	10.14 ± 0.20

a, b means without common superscript in the horizontal column are significantly different (P < 0.05).

Figure 1 : Evolution of the rabbit's live weight during the 7 weeks of the trial



of up to 0.21. This result may be as a result of superiority of palm kernel meal over palm oil mill effluent.

No differences were observed between data controlled at slaughter. The only unexpected difference was the lower testes weight observed for treatments 2 and 3. No explanation can be proposed.

From a practical point of view the lower slaughter rate observed for the control rabbits may be emphasized. But it cannot be related to the lower growth rate above mentionned for this treatment, since only the heaviest rabbits were slaughtered in all groups, and since the live weight at slaugther of the control rabbits was fairly close the others.

Mortality

Between the third and fourth week of the experiment four rabbits died : one from treatment 1, two from treatment 2, and one from treatment 4. Post mortem examination revealed severe autolysis, soiled perineum and hind limbs, congested trachea and lungs. The stomach contents were hard and covered with mucus. Watery intestinal material that contained oocysts were also observed. The rabbits probably died of coccidiosis, enteritis and or constipation. The deaths were not however attributed to dietary effects.

CONCLUSION

From results obtained, it can be assumed that up to 10 % of the rabbit diet's ingredients can be substituted by dried palm oil mill effluent without compromising growth parameters. In addition, in the present case of maize offal substitution, the weight gain increased with the proportion of POME in the experimental diet.

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