Performance of growing pigs fed pre-digested maizecobs and molasses (*mcmolas)* meal as a partial replacement for maize

[*1]ABILORO, O. B. and [2]OYEDEJI J. O.
[1]*Department of Animal Science, University of Benin City, Benin City, Edo State, Nigeria*
[2]*Department of Animal Science, Benson Idahosa University, Benin City*
e-mail: oyekunbi.abiloro@uniben.edu
ORCID: 0000-0003-4772-6872

Abstract
Availability of good quality feed at affordable price remains the major problem facing livestock producers, including pig rearing. This prompted this study to investigate the performance of growing pigs fed pre-digested *MCMOLAS* (Maize cobs + Molasses) meal as a partial replacement of maize and the study was carried out in two phases, Phase I involved the preparation of the *MCMOLAS* meal where 4 parts of milled maize cobs was mixed with 1 part by weight of molasses which was pre-digested with enzyme (Kenzyme) at 0.5g/1kg for 7days, sundried and stored for the feeding trial. Proximate composition of the *MCMOLAS* concentrate was determined before its introduction into growing pig diets. At phase II, four dietary treatments were formulated with *MCMOLAS* replacing 0%, 15%, 30% and 45% of maize in growing pig diets. Sixteen (16) growing pigs whose weight were in the range of 8.12kg - 8.62kg were randomly allocated to each dietary treatments replicated four (4) times with one (1) pig/replicate. The feeding trial was carried out at the University of Benin Teaching and Research Farm for the duration of eighty-four (84) days. Performance of the growing pigs were taken in the course of the experiment.
Growth performance showed that the feed intake and weight gain by pigs were significantly affected ($P<0.05$), the lowest average daily feed intake (1.28kg) was recorded among pigs fed 45% *MCMOLAS* meal. Although, the highest body weight gain was recorded among growing pigs fed 0% *MCMOLAS* meal, concurrently, the gains were similar to those fed 15% *MCMOLAS* meal. The Feed Conversion Ratio (FCR) showed no significant difference ($P>0.05$) across the dietary treatments. The eviscerated weight, heart, kidney, lungs, stomach, small intestine showed no significant difference across the whole treatments ($P>0.05$) as they increased along with increased *MCMOLAS* level in the diet. The retail cuts of pork all showed no significant difference across all the treatments. It can be concluded that *MCMOLAS* can be safely used in replacement of maize at 15% inclusion level in the diets of growing pigs without compromising their health, weight gain, growth performance and carcass characteristics.

Key words: *MCMOLAS* meal, Maize cobs, Molasses, Exogenous enzymes, Weaner pig.

Introduction
Major limitation to production of livestock consists of a weak livestock extension system, lack of improved breeds, lack of appropriate managerial skills, lack of cheap quality feed, lack of appropriate technology and weak livestock veterinary services. However, lack of good quality feed at affordable price remains the major problem facing livestock producers amongst all the lacks mentioned. (FAO., 2012, FAO., 2023). Moreover, rapid rise in human population requires more sources for food production and inability of livestock producer to meet up with human demand for meat, have led to need for many other meat sources for the rising populace. However, the high competition for cereals between man, industry and animals, has led to the animals being on the losing side and this is demonstrated in the cost of livestock production where feed is responsible for 80% of the total production cost (Akinfala and Tewe, 2001, Henchion *et al.,* 2017, Marinus *et al*., 2021).
Maize is produced world wide and it is a very common grain in Sub-Saharan Africa, and Asia and Latin America where they produced about 197million tons of maize (FAO, 2012, FAOStat, 2021) meanwhile one of other major maize producers in sub-Saharan Africa is Nigeria with 12.75million metric tons as at 2022/2023 marketing year. With this estimate of maize, it serves as an indication of the quantity of maize cobs available for use as feed ingredient in livestock production. Efforts are being put in place to ensure use of these maize cob which has been accounted for especially in some African countries which include Nigeria (Opeolu *et al.,* 2009; Raheem and Adesanya, 2011, Abiloro *et al*.,2021).
However, harvesting technologies and storage facilities for maize cobs do not exist even at the farm level because maize cob is used in its intact form after the grain has been removed or it is ground into finer particles. Farmers, do use maize cobs for cooking and heating by burning it and the burned cobs is ploughed back in the fields or are thrown away (Latif and Rajoka, 2001; Božović *et al.,* 2004; Zhang *et al.,* 2010). Hence the need to consider this discarded material as an alternative feedstuff for livestock.
Exogenous enzymes are now of common use in pig diets to disrupt anti-nutritional factors including fiber because pigs lack the digestive enzymes appropriate for fibre digestion. (Omogbenigun *et al.*, 2004; Jones *et al.,* 2010). The numerous and concentration of chemical properties existing among plant-based feed ingredients and the links among constituents within feed ingredients made the use of exogenous enzymes necessary. (Barletta, 2010; Kerr and Shurson, 2013). The improvement of the pig performance and digestibility of nutrient from the addition of exogenous enzymes to weaner pigs diets lies on great understanding of the characteristics as related to enzyme activity. Molasses on the other hand is a sweetener which is also high in energy. A combination of both maize cobs and molasses with its ensilage with Kenzyme® to form *MCMOLAS* meal may be

a good replacement for maize in growing pig's diet hence this present study.
The objective of this paper is to evaluate the performance of growing pigs fed pre-digested *MCMOLAS* as a partial replacement for maize.

Materials and Methods
Experimental Site and Climatic Data
The experiment was conducted at the Piggery unit of University of Benin Farm Project, Ugbowo Campus Benin City, Edo State, Nigeria. The campus lies between latitude 6^0 20'1.32"N and longitude 5^0 36'0.53"E of the Greenwish meridian in the rain forest zone, the area has an average annual rainfall ranging from 1800mm to 2500mm and relative humidity in the wet season ranging from 57.62% to 92.56% (Metrological Section of the University of Benin, 2025.)

Research Procedure
Production and Proximate Composition of *MCMOLAS* Concentrate.
The maize cob was collected from dry maize sellers at New Benin Market in Benin City, was milled at NIKSEG feedmill with industrial milling machine to granulated size. The milled maize cob was treated with an enzyme (Kenzyme®) at the rate of 0.5g of kenzyme to 1kg of maize cobs and was mixed with molasses which was sourced from a molasses distributor in Ikire, Osun State. It was mixed in a ratio of 4:1 Maize cob to Molasses and then ensiled in a bucket for a period of seven (7) days and on the 7th day, the *MCMOLAS* meal was opened, sun dried and stored in a sack. A sample was taken to the laboratory for chemical analysis. The result of the chemical analysis was then used in determining the contribution of *MCMOLAS* to the diets that was formulated in the next phase of the research.
Feeding Trials
Four diets (Table 1) were formulated with *MCMOLAS* meal replacing maize at 0%, 15%, 30% and 45% in growing pig diets on a weight for weight basis. Diet1 at 0% represented the control while diets 2, 3 and 4 contained the varying levels of *MCMOLAS* at 15%, 30% and 45% respectively.

Animals and Management
A total number of sixteen (16) mixed breed piglets of 5 weeks old with the weight range of 8.12kg – 8.62kg purchased from a reputable pig farmer was used for the experiment. The pigs on arrival were allowed to acclimatize with the environment for a period of two weeks by feeding them with a uniform diet under observation. After acclimatization the growing pigs were randomly assigned to four dietary treatments each replicated four (4) times, on weight equalization basis with each animal constituting a replicate and fed differently *ad libitum*, with clean drinking water also provided to satisfaction. The experimental design adopted was Completely Randomized Design (CRD).
Performance indices
Growth performance were measured as follows:
Growth performances
Live weight and weight gain
At the beginning of the feeding trial, the initial body weight of the pigs was taken and recorded. Weekly body weight of the pigs was also taken as the feeding trial proceeds so as to determine the differences between the previous and the final weights.
Feed intake
This was carried out by subtracting the left over from the known quantity of feed supplied.

Feed conversion ratio (FCR)
This is an expression of the weight gain per unit of feed consumed
Carcass Yield
The pigs were moved from the pen to the slaughter house where it was slaughtered, blood of the slaughtered pigs were drained out by hoisting after which the carcass weight was recorded. After weighing the bled pig, it was carefully dissected where the visceral of the intestinal organs such as the small and large intestine, kidney, liver and lungs were removed and weighed separately.
The eviscerated carcass was then weighed and separated into cut up parts such as head, neck, right and left ham, front limb, left limb, right loin, left loin and right and left shoulder. All the parts were weighed separately so as to evaluate the effect of the experimental diets on the growing pig body parts.
Statistical Analysis
The data collected were subjected to one way analysis of variance using Genstat (2009) and the Separation of means was done using the Duncan Multiple Range Test of the same statistical package at 5% level of probability.

Results
Performance of growing pigs fed *MCMOLAS* at varying levels.
The performance of growing pigs fed the varying level of *MCMOLAS* is shown in Table 2. The final body weight and total body weight gained significantly reduced among the growing pigs fed 30% and 45% *MCMOLAS* diets compared to the maize diet (P<0.05). However, final body weight and weight gain of the growing pigs fed 15% *MCMOLAS* was similar to the maize diet (P> 0.05). There was a significant difference in total feed intake and daily feed intake among dietary treatments (P<0.05). The highest feed intake (162.70kg) was recorded for 15% *MCMOLAS* while the lowest feed intake (107.30kg) was recorded among growing pigs fed 45% *MCMOLAS*. However, feed intake obtained for the control diet (156.70kg) was similar to 162.70kg obtained for 15% *MCMOLAS* inclusion. Apart from 15% *MCMOLAS* meal diet, the feed intake of the growing pigs was reducing as the quantity of *MCMOLAS* increases. Finally, the feed conversion ratio of growing pigs fed all categories of the diets were statistically similar (P>0.05).
The live weight, bled weight, carcass weight, right ham and left ham decreased significantly as the dietary level of *MCMOLAS* increases in the diets of the growing pigs (P<0.05). The lowest value was recorded for all the stated parameters at 45% *MCMOLAS* level of the growing pig diet. Conversely, the left shoulder, right shoulder, head weight, right loins and left loins, were not significantly (P>0.05) affected as the level of *MCMOLAS* increased in the diets of the growing pigs. The large intestine was significantly increasing as the level of *MCMOLAS* increases in the diets of the growing pigs (P<0.05) with 45% *MCMOLAS* level having the highest value of 8.65% of LW. However, the Lungs, Liver and Spleen were significantly affected by the

increase in the *MCMOLAS* level in the diets of the growing pigs (P<0.05).

However, the eviscerated weight, heart, kidney, stomach, empty stomach and small intestine were not significantly affected as the level of *MCMOLAS* increases in the diets of growing pigs (P>0.05). However, the lowest value was recorded for the heart (0.24% of LW), kidney (0.22% of LW) and stomach (4.38% of LW) at 45% inclusion level.

Discussion

The reduction in feed intake (FI) of the growing pigs observed in 30% and 45% *MCMOLAS* inclusion level is in contrast with the findings of Frank *et al*. (1983), Ndindana *et al*. (2002) and Kanengoni *et al*. (2004), who reported an increase in daily feed intake of pigs fed maize cobs based diets, however, this contrast could be attributed to the stage of maturity of the maize cobs when incorporated into the diets of the pigs, inclusion level of the maize cobs and the bulky nature of the maize cob used in the study which could have led to slow digestion rate in their digestive system thereby resulting in poor feed intake even though the diet was prepared with a sweetener (molasses). However, the average daily feed intake of growing pigs in this study was 1.94kg at 15% *MCMOLAS* which was higher when compared to the report of 1.09kg by Mwesigwa (2012) and no significant difference across all treatment reported by Bumbie *et al* (2017), Bumbie *et al* (2021) which connotes that the feed was palatable and acceptable by the growing pigs as a result of molasses present in the meal and possibly due to treatment being the lowest inclusion rate hence encouraging more intake of feed, however, it was observed in this study that as the *MCMOLAS* increased in the diet the intake of feed reduced which is not different from the report of Kanengoni *et al.,* (2015) which could be as a result of the increased fibre in the diet of the pigs. As treated maizecobs level increases in the diets, its increases the diet bulkiness and slows down the gastric emptying where gut fermentation produces short chain fatty acid (SCFA) which contributes some energy, stimulates satiety via hormones and can suppress appetite once sufficient fermentation occurs.

The body weight gain of pigs fed 15% *MCM OLAS* was as good as the control, this could be as a result of the presence of enzyme in the maize cobs which aided the proper digestion and utilization of the maize cobs just like the control which is similar to the report of Kerr and Shurson (2013) that the inclusion of an enzyme improves digestion and absorption of nutrients thereby aiding the growth of pigs. There was no changes in the daily weight gain of the pigs over the period of the study, it had a value that is quite lower than 0.23 kg reported by Mwesigwa *et al*. (2012), Shanmugam *et al.* (2016), however, 45% *MCMOLAS* had poor growth rate and this could be due to high quantity of crude fibre in the diet which was not totally digested and utilized by the growing pigs and was evident in the appearance of their feaces, which was also reported in a review conducted by Kanengoni *et al*.(2015) that as the inclusion level of maize cobs increases in a diet, their performances is reduced. This could also be attributed to the fact that the treatment contained the highest quantity of *MCMOLAS* with high volume of molasses which might have imposed a laxative effect on the pigs by not allowing the feed to stay long in their bowels for full digestion before it is been excreted. The total weight gain (TWG) and daily weight gain (DWG) at 15% *MCMOLAS* was similar to the reports of Frank *et al* (1983) that maize cobs do not always have depressing effects on TWG and DWG of pigs until it is increased above 15% of the diets. The ability of pigs to maintain a good weight gain when fed maize cobs is a function of their capacity to increase their feed intake so as to maintain the same feed intake as the control leading to the same digestible energy which was evident at 15% *MCMOLAS* inclusion level.

The similarity in the Feed Conversion Ratio (FCR) among the growing pigs despite the inclusion of *MCMOLAS* at varying level connotes the growing pigs FCR was not affected by *MCMOLAS* at any rate of inclusion. FCR is a good indicator that shows how animal converts feed consumed to weight gain (Amoah *et al*., 2017), this is also similar to the report of Boateng *et al*.,2021.

The live weight of the growing pigs used in this study was similar, however, it was observed that the pork of other treatments contained less or no fat when compared with the control which could be due to the levels of *MCMOLAS* replaced in the diets. This is similar to the report of Bumbie, (2017) and Bumbie *et al*., (2021), when he fed 40 large white pigs with corn cobs at 15% corn cobs, 15% corn cobs with enzyme, 25% corn cobs and 25% corn cobs with enzymes, he observed that the pork from the test diets were leaner compared to the control diet.

It was also observed that as the level of *MCMOLAS* increases in the diets, the intestinal organs of the pigs increased as it was reported by Wenk (2001), that heavier stomach, large intestine, small intestine, ceacum and longer colon are always evident in growing pigs fed diets high in fibre, similarly, Galassi *et al.,* (2010), also stated that heavy organ weight are usually demonstrated by pigs fed higher level of fibrous feed. This could also be attributed to the increased retention time and digester volume thereby leading to stretching and functional hypertrophy of the intestinal tissues.

Head weight, left loins and right loins of the growing pigs used in this study showed no changes in the dietary treatments including the control, this is not different from the report of Mwesigwa *et al* (2012) when he fed 48 growing pigs of about 8weeks a diet containing either maize bran or wheat as an energy source, he reported that the carcass length across the diets were all similar.

Conclusion

Based on this study, it can be concluded that *MCMOLAS* meal at 15% inclusion level had no adverse effect on the carcass and growth performance of the growing pigs.

.

Reference

Akinfala, O. and Tewe, O. O. (2001). Utilisation of whole Cassava plant in the diets of growing Pigs in the tropics. *Livestock Research for Rural Development, 13*(5), 13 – 21.

Amoah, K.O., Asiedu, P.,Wallace, P., Bumbie, G.Z. and Rhule, S,W,A. (2017). The performance of pigs at different phases of growth on sun-dried brewers spent grain. *32TLivestock Research for Rural Development.* 29(5).

Barletta, A., Bedford, M. R. and Partridge G. G. (2010). Introduction: current market and expected developments.

Enzymes in Farm Animal Nutrition. 2nd edition. CAB International; London, UK: 1–11.

Božović, I., Radosavljević, M., Žilić, S. and Jovanović, R. (2004). A genetic base of utilization of mxaize cob as a valuable naturally renewable raw material. *Genetika 36*(1), 245–256.

Boateng, M., Okai, D.B. and Amponsah, B.K. (2013). The influence of exogeneous enzyme-probiotics complex on growth performance and carcass traits of albino rat fed diets containing up to 60% rice bran. Online Journal of Animal Feed Research, Vol, 3, No. 1, pp. 23-27.

Bumbie, G. Z. (2017). Influence of corn cobs inclusion in pigs diets on growth, performance, carcass characteristics and blood parameters. Thesis submitted to University of Ghana for the award of Master of Philosophy Degree in Animal Science; University of Ghana. *http//ugspace.Ug.edu.gh*.

Bumbie, G.Z., Nortey, T.N.N.,Asiedu, P., Naazie, A, Amoah, K.O., Rhule, S.W.A. and Tang, Z. (2021). Influence of corncobs inclusion in Pig diets on growth performance and carcass characteristics. *International Journal of Sciencetific Engineering and Applied Science. (IJSEAS)* Vol.7, Issue 2, ISSN: 2395-3470.

FAO. (2012). Food and Agriculture Organization of the United Nation. Protein sources for animal feed industry.

FAO. (2023). Food and Agriculture Organization of the United Nation. The State of Food and Agriculture.

FAOSTAT. (2021). Food and Agriculture Organization of the United Nation Corporate Statistical Database.

Frank, G. R, Aherne, F. X. and Jensen, A. H. (1983). A study of the relationship between performance and dietary component digestibilities by swine fed different levels of dietary fiber. *Journal of Animal Science, 57:*(1), 645–654.

Galassi, G., Colombini, S., Malagutti, L., Crovetto, G. M. and Rapetti, L. (2010). Effects of high fibre and low protein diets on performance, digestibility, nitrogen excretion and ammonia emission in the heavy pig. *Animal Feed Science* and *Technology, 161:*(1), 140–148.

Henchion, M., Hayes, M., Mullen, A.M., Fenelon, M. and Tiwari, B. (2017). Future protein supply and demand: Strategies and factors influencing a sustainable equilibrium. *Food proteins and bioactive peptides,* 6(7), pg 53.

Jones, C. K., Bergstrom, J. R., Tokach, M. D., DeRouchey, J. M., Goodband, R. D., Nelssen, J. L. and Dritz, S. S. (2010). Efficacy of commercial enzymes in diets containing various concentrations and sources of dried distillers grains with solubles for nursery pigs. *Journal of Animal Science., 88:*(1), 2084–2091.

Kanengoni, A. T., Dzama, K., Chimonyo, M., Kusina, J. and Maswaure, S. M. (2004). Growth performance and carcass traits of Large White, Mukota and Large White×Mukota F1 crosses given graded levels of maize cob meal. *Animal Science. 78*(1), 61-66.

Kanengoni A. T., Chimonyo, M., Ndimba, B. K. and Dzama, K. (2015). Potentials of using maize cobs in pigs diet. (A Review). *Asian Australasian Journal of Animal Science*, 28:(12), 1669 – 1679.

Kerr, B. J. and Shurson, G. C. (2013). Strategies to improve fiber utilization in swine. *Journal of Animal Science Biotechnology 4:*(1), 11-14.

Latif, F. and Rajoka, M. I. (2001). Production of ethanol and xylitol from corn cobs by yeasts. *Bioresource Technology*. *77*(1), 57–63.

Marinus, F.W., Teun, V., Yvette, H. and Andre, B. (2021). Adaptation of livestock to new diets using feed components without competition with human edible protein – A Review of possibilities and recommendations. *Animals*, (17). 2293. https//doi.org/10.3390/ani11082293.

Metrological section of the University of Benin, (2025). University of Benin, Benin City, Edo State, Nigeria.

Mwesigwa, R., David, M. and Donald, R. K. (2012). Performance of growing pigs fed diets based on by products of maize and wheat processing. *Tropical Animal Health* and *Production, 41.*

marinus

Ndindana, W., Dzama, K., Ndiweni, P., Maswaure, S. and Chimonyo, M. (2002). Digestibility of high fibre diets and performance of growing Zimbabwean indigenous Mukota pigs and exotic Large White pigs fed maize based diets with graded levels of maize cobs. *Animal Feed Science Technology 97*(4): 199-208.

Omogbenigun, F. O., Nyachoti, C. M. and Slominski, B. A. (2004). Dietary supplementation with multienzyme preparations improves nutrient utilization and growth performance in weaned pigs. *Journal Animal Science*. *82(8)*, 1053–1061.

Opeolu, B. O., Bamgbose, O., Arowolo, T. A. and Adetunji, M. T. (2009). Utilization of maize (*Zea mays*) cob as an adsorbent for lead (II) removal from aqueous solutions and industrial effluents. *African Journal of Biotechnology*. *8(9):* 1567–1573.

Raheem A.A. and Adesanya D.A.(2011). A study of thermal conductivity of corn cob ash blended cement mortar. *Pacific Journal of Science* and *Technology, 12(7),* 106–111.

Shanmugam, S. I., Sang, I. L., Doo, S. N. and In, H. K. (2016). Effect of substitution of corn for molasses in diet on growth performance, nutrient digestibility, blood characteristics, fecal noxious gas emission and meat quality in finishing pigs. *Dankook University, Department of Resource* and *Science, Chenoa, Choongnam, South Korea, 45(3),* 1806-1809.

Wenk, C., (2001). The role of dietary fibre in the digestive physiology of the pig. *Animal Feed Science* and *Technology 90(4),* 21–33.

Zhang, M., Wang, F., Su, R., Qi, W. and He, Z. (2010). Ethanol production from high dry matter corncob using fed-batch simultaneous saccharification and fermentation after combined pretreatment. *Bioresource Technology*. *101(8),* 4959–4964.

Table 1: Composition of Experimental Diet (%)

Ingredient	Diet 1 (control)	Diet2 (15%*MCMOLAS*)	Diet3 (30% *MCMOLAS*)	Diet4 (45%*MCMOLAS*)
Maize	60.00	45.00	30.00	15.00
MCMOLAS	0.00	15.00	30.00	45.00
Groundnut meal	19.00	19.00	17.00	18.00
Soyabean meal	10.00	13.06	13.06	13.06
Wheat bran	7.35	4.29	6.29	5.29
Common salt	0.50	0.50	0.50	0.50
*Premix	0.20	0.20	0.20	0.20
Periwinkle	0.75	0.75	0.75	0.75
Bonemeal	2.00	2.00	2.00	2.00
Methionine	0.05	0.05	0.05	0.05
Lysine	0.15	0.15	0.15	0.15
Total	100	100	100	100
Determined composition				
Dry Matter (%)	88.34	85.10	85.48	85.63
Crude Protein(calculated)	20.55	20.79	19.36	18.93
Ether Extract (%)	18.30	14.09	9.90	5.78
Crude Fibre (%)	4.66	8.23	10.82	13.50
Ash (%)	5.19	7.91	4.36	7.46
NFE (%)	45.85	44.88	52.82	52.97
Energy(calculated) kcal/g	3353.00	3277.00	3148.00	3045.00
Calcium(mg/kg)	1.92	0.94	1.07	1.58
Phosphorous (mg/kg)	0.97	0.78	0.60	0.68

*Premix supplied the following per kg diet: vitamin A, 12,000 i.u; vitamin D3, 1200 i.u.; vitamin E, 15.i.u; vitamin K, 1.8mg; thiamine, 0.8mg; riboflavin, 3.0mg; niacin, 18mg; calcium panthothenate, 10.5mg; biotin, 0.0375mg; vitamin B6, 1.5mg; choline chloride, 75mg; folic acid, 0.3mg; vitamin B12, 0.012 mg; vitamin C, 15mg; manganese, 15mg; zinc, 87.6mg; copper, 15mg; iron, 75mg; iodine, 0.5mg; cobalt, 0.54mg; selenium, 0.06mg.

Table 2: Performance of growing pigs fed diets containing graded level of *MCMOLAS*

	DIETS				
Parameters	T1(0% *MCMOLAS*)	T2(15% *MCMOLAS*)	T3(30%*MCMOLAS*)	T4(45% *MCMOLAS*)	SEM
Initial Weight (Kg)	8.50	8.12	8.50	8.62	0.73
Final Weight (Kg)	24.62^{a}	22.25^{ab}	19.12^{ab}	17.50^{b}	1.57
Total Weight Gain(Kg)	16.12^{a}	14.12^{a}	10.62^{b}	10.50^{b}	1.51
Daily Weight Gain(Kg)	0.19^{a}	0.17^{ab}	0.13^{b}	0.13^{b}	0.02
Total Feed Intake (Kg)	156.70^{a}	162.70^{a}	131.70^{b}	107.30^{c}	4.56
Daily Feed Intake (Kg)	1.86^{a}	1.94^{a}	1.57^{b}	1.28^{c}	0.05
Feed Conversion Ratio	9.79	11.36	12.07	9.85	1.33

Abc means with different superscripts in the same row differ significantly ($p<0.05$)

Table 3: Effect of diets containing graded level of *MCMOLAS* on Carcass characteristics of pigs (Body cuts).

	DIETS				
Parameters (%lw)	T1 (0%*MCMOLAS*)	T2 (15%*MCMOLAS*)	T3 (30%*MCMOLAS*)	T4 (45%*MCMOLAS*)	SEM
Live wt(kg)	28.00^{a}	24.75^{ab}	23.00^{ab}	19.25^{b}	1.70
Bled wt	98.19^{a}	97.00^{a}	93.48^{b}	94.77^{b}	0.40
Dressed wt	76.91^{a}	70.71^{b}	68.48^{b}	70.00^{b}	1.13
Head wt	9.44	10.51	9.13	10.11	0.41
Right shoulder	10.64	10.31	10.22	10.10	0.61
Left shoulder	11.64^{a}	10.32^{a}	10.44^{a}	10.38^{b}	0.84
Right ham	12.33^{a}	11.92^{ab}	11.09^{ab}	10.33^{b}	0.37
Left ham	12.33^{a}	10.90^{ab}	11.30^{ab}	10.09^{b}	0.33
Right loin	7.87	6.87	7.83	6.77	0.51
Left loins	7.79	7.26	6.74	7.24	0.38

Abc means with different superscripts in the same row differ significantly (p<0.05).
Live Wt= Live Weight Bled Wt= Bled Weight Carcass Wt= Carcass Weight
Head Wt= Head Weight

Table 4: Effect of *MCMOLAS* meal on intestinal organs of growing pigs.

	DIETS				
Parameters (%lw)	T1 (0%*MCMOLAS*)	T2 (15%*MCMOLAS*)	T3 (30%*MCMOLAS*)	T4 (45%*MCMOLAS*)	SEM
Evicerated wt	19.10	22.80	23.50	23.40	1.36
Heart	0.29	0.25	0.28	0.24	0.03
Kidney	0.30	0.23	0.24	0.22	0.03
Lungs	0.74^{a}	0.74^{a}	0.62^{ab}	0.46^{b}	0.06
Liver	2.69^{a}	2.42^{ab}	1.96^{c}	2.10^{bc}	0.09
Spleen	0.11b	0.09a	0.10a	0.09a	0.01
Stomach	5.18	4.65	6.52	4.38	0.94
Empty stomach	1.11	1.17	1.24	1.22	0.10
Small intestine	5.95	6.26	6.52	4.38	1.22
Large intestine	5.18^{c}	7.28^{ab}	6.53^{bc}	8.62^{a}	0.41

^{abc} means with different superscripts in the same row differ significantly (p<0.05).
lw= live weight wt= weight