# CHEMICAL COMPOSITION OF SALTLICK (*KANWA*) AND ITS EFFECTS ON SELECTED BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS IN RABBITS

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## Abstract
*In livestock management, mineral supplementation is usually by the use of mineral salt dust, rock or tablets often mixed with feed, water or given directly as licks. "Kanwa" is the local trade name of saltlick used as a supplement in livestock and domestically in homes especially in the Northern parts of Nigeria. The chemical constituents of Kanwa sample in this study were found to be 22% Na; 3% K; 0.75% Ca; 0.01% Mg and 0.0003% Fe. The PCV values (%) were 39.92 ±3.22, 41.16 ±1.53, 40.35± 2.31 and 42.31 ±1.2 for the control and Groups 1, 2 and 3 respectively. The serum protein showed a fluctuating pattern over the experimental period but with a mean of 6.27±1.35g/100ml for control, while 6.67 ±0.65, 6.15± 0.53 and 6.62 ±1.30 g/100ml were for Groups 1,2 and 3 respectively. The serum glucose values indicated that group 1 animals had the least value of 4.55± 0.62mmol/L while the highest level was observed in Group 3 animals (6.2 ±1.88 mmol/L). Controls and Group 2 animals had values of 5.70 ±1.47 and 5.76 ±1.18 mmol/L respectively. It can be concluded therefore that kanwa supplementation has beneficial nutritional effects in the rabbits.*

Keywords: Supplementation, Minerals, Weight-gain, Livestock

## Introduction
Inorganic mineral elements make up about fifty percent of the body weight of plants and animals including man. These mineral elements may also be supplied as dietary supplements in various feeding situations. Some are obtained primarily from industrial processes and few are supplied as pure compounds. A direct consumption of large quantity of soil or bones is often an indication of mineral deficiency in animals (Corah, 1996).

Mineral elements are required in the body for bone strength, fast growth, high productivity, reproduction, lactation, optimum health etc. Underwood (1977) and McDowell (1973) have presented a comprehensive description of the many diverse biological functions of the mineral elements as well as specific clinical signs of deficiencies or toxicities.

Wasting diseases, loss of hair pigmentation, skin disorders, abortion, diarrhoea, anaemia, loss of appetite, bone abnormalities, tetany, low fertility, and pica are some of the clinical signs often suggestive of mineral deficiencies through out the world (Mcdowell, 1977).

As a result of the poor soil quality, rarely does man and animal obtain adequate mineral nutrient from the diet. In addition the mineral elements are not synthesized, when not available in the diet, thus there is the constant need for supplementation to enhance balanced nutrition for growth and good health.

For disease management purposes many individuals use multivitamins/mineral as prophylactics (Huang *et al*, 2007). In livestock management, mineral supplementation is usually by the use of mineral salt dust, rock or tablets often mixed with feed, water or given directly as licks. These are often not readily available commercially, as a result of difficulties involved in its transportation, storage and cost of production.

"Kanwa" is the local trade name in northern Nigeria for the lake salt deposit, primarily obtained from geological weathering of igneous rocks; it is predominantly found in the Lake Chad region of West Africa. In addition to its use as a supplement in livestocks, Kanwa is domestically used in homes in culinary, for tenderizing, (*Vigna ungulata* (beans), tough and hard meat cuts are tenderized with kanwa during cooking), as food additive, for preservation, seasoning, flavouring and colouring. It is also used as a preservative to hinder growth of microorganisms that cause food spoilage. The Gwaris in Niger state of Nigeria daily make use of kanwa to prepare their cereal and grain porridge meals.

Because of the high cost and scarcity of the commercial saltlick, the Fulani have preference for the use of kanwa as mineral supplement for their cattle and they claim that it has wide nutritional and medicinal values on their livestock. The objective of this work is therefore to determine nutritional benefits or otherwise that may arise from the usage of kanwa.

## Materials and Methods

### Sample collection

Kanwa salt used for this investigation was obtained from the Minna township market, Niger State Nigeria. The samples were coded, crushed ground into fine powder, sieved and stored in polythene bags from which portions were taken for analysis as required.

### Sample Extraction

Five grams of the air dried "Kanwa" salt was extracted with 125ml of 2.5% acetic acid in a conical flask for one hour. The mixture was filtered was used for analysis.

### Experimental Animals

Thirty-two rabbits between the ages of 8-12weeks and weighing between 380-779g were purchased from the animal house of the Federal University of Technology, Minna, Niger State, Nigeria. De-worming and control of endo- and ecto- parasite treatment was carried out using Ivomec Super. The animals were then grouped into four with eight animals in each group (4males and 4 females). The animals were conditioned for two weeks and fed a diet compounded with 7kg ground maize, 2.65kg roasted Soya beans, 0.265kg of bone meal and 0.065kg of salt. Water and feed were provided ad-libitum. The animals were weighed weekly for the duration of the experiment using Avery balance (W and T Avery Ltd Birmingham).

### Experimental Design

Fifty grams of kanwa was dissolved in 100ml (50% w/v) of distilled, de-ionized water. The animals in three of the four groups were gavaged 200mg/kg.bw (group 1), 800mg/kg.bw (group2) and 3200mg/kg.bw (group3) respectively. The fourth group which served as the control received only water. The dosing was carried out twice weekly as commonly practiced by the local herds' men for a period of 3, 6 and 9 weeks.

### Heamatological and Biochemical Parameter Determinations

The packed cell volume (PCV) was estimated following collection of blood into heparinized capillary tubes which was transferred to the heamatocrit centrifuge and spun at 12,000rpm for 5 minutes. Analysis for the mineral elements (Fe, Cu, Zn, Ca and Mg) in the salt sample were by Atomic Absorption Spectrophotometric method as described by Whiteside (1984). Sulphate was determined by the turbidmetric method (Allen *et al*, 1974). Phosphate and Carbonate were however by titrimetric method, (Vogel, 1964). Chloride was determined by Schales and Schales titrimetry method (1941) and serum Urea was assayed by the diacetyl/monoxime method of Kaplan *et al*, (1988) and Glucose was determined using Hospitex diagnostic kits based on the principle of glucose oxidation by glucose oxidase enzyme (Reitman *et al*, 1959). Serum total protein was estimated by the Biuret method (Kaplan *et a*l, 1988).

### Statistical Analysis

Results are presented as Means±standard deviation (SD). Statistical significance between groups were analysed using student t-test with values at $P<0.05$ being considered as significant.

### Results

Results obtained from the mineral analysis of Kanwa salt sample used in this experiment were presented in Table 1. Which shows Sodium (22%), K, (3%), Ca, (0.75%), Mg,( 0.01%) and Fe, (0.0003%). Table 2 gives the weight variations of the four groups as 52.74± 2.39 for control, while 56.02 ±7.17, 58.60 ±10.60 and 63.23 ±4.48 were for groups 1, 2 and 3 respectively. Percentage packed cell volume (PCV) were 39.92 ±3.22, 41.16 ±1.53, 40.35± 2.31 and 42.31 ±1.2 for the control, Groups 1, 2 and 3 respectively as shown in Table 2. Treatment increased the PCV though this was not significantly different from the controls. Total proteins fluctuated over the experimental period but with values of 6.27±1.35g/100ml for control, while 6.67 ±0.65, 6.15± 0.53 and 6.62 ±1.30 g/100ml were for Groups 1,2 and 3 respectively. Serum urea values for the control group was higher (9.82 2.12mmol/L0, while a fluctuation was observed in the treatment groups over the experimental period, with Group 1 having the lowest level of 7.02 ±1.59mmmol/L, while the values for Groups 2 and 3 were 8.76 ±1.88 and 8.33± 0.56 mmol/L respectively. The serum glucose values presented in Table 2 indicates that the group 1 animals have the least value of 4.55± 0.62mmol/L and the highest level was observed in Group 3 animals (6.2 ±1.88 mmol/L), while the control and the Group 2 animals had values of 5.70 ±1.47 and 5.76 ±.1.18 mmol/L respectively .

Table 1: Percentage Composition of Kanwa

| Constituent | % Composition |
|---|---|
| $Na^{+}$ | 22 |
| $K^{+}$ | 3.0 |
| $Ca^{++}$ | 0.75 |
| $Mg^{++}$ | 0.10 |
| $Fe^{++}$ | 0.0031 |
| $Zn^{++}$ | 0.0002 |
| $Cu^{++}$ | 0.00005 |
| $CO_3^{=}$ | 0.15 |
| $SO_4^{=}$ | 0.06 |
| $PO_4^{=}$ | 0.00014 |
| $Cl^{-}$ | 0.13 |

Table 2: Results of Different Parameters in Kanwa Treated Rabbits.

| Parameter | Control | 200mg/Kgbw | 800mg/Kgbw | 3200mg/Kgbw |
|---|---|---|---|---|
| Glucose (mmol/L) | 5.7±1.47 | 4.55±0.62 | 5.76±1.18 | 6.21±1.18 |
| Total Protein (mmol/L) | 6.27±1.35 | 6.67±0.65 | 6.25±0.53 | 6.62±1.30 |
| Urea (mmol/L) | 9.82±2.12 | 7.02±1.59 | 8.76±1.88 | 8.33±0.56 |
| Cholesterol (mmol/L) | 5.80±2.11 | 4.76±1.39 | 6.09±1.60 | 5.91±1.68 |
| Weight (g) | 52.74±2.34 | 56.02±9.17 | 58.60±10.6 | 63.23±4.48 |
| PCV (%) | 39.47±3.22 | 41.16±1.53 | 40.35±2.31 | 42.31±1.20 |

## Discussion

The mineral content of the kanwa sample in this study revealed the presence of Na, K, Ca, Mg, Fe, Zn, Cu, Cl, $CO_3$, $SO_4$ and $PO_4$ with Na having the highest concentration. These findings are in agreement with those of Makankjuola (1974); Gbodi and Ekwuegbu, (1983), which reported that Kanwa is a salt notably high in Na, K, Ca, Cl, $CO_3$, $PO_4$ with traces of Fe, Zn, Cu, and $SO_4$. This result is comparable with those of common refined and commercial saltlicks except that kanwa being unrefined may contain traces of undetermined contaminants likely to be hazardous to animals. Egwin *et al*, (2002) however, described kanwa as a salt with varying composition depending on where is mined. The supplementation of feed with kanwa for nutritional benefits to animals in the absence of the refined commercial salt lick may be encouraged but with improved purification to eliminate carbonaceous materials (Adefolalu and Gbodi, 2010).

The role of these elements to animal nutrition cannot be underscored, calcium, Phosphorous and magnesium are associated with the metabolism, growth and maintenance of bones, teeth and muscles. Calcium performs critical functions in muscle contraction, nerve impulse transmission iontransport and transmission of signals across membranes (Champe and Harvey, 1987). Magnessium is an activator of some enzymes, such as glycolytic enzymes, and cocarboxylation reactions. Zinc is present in red blood cells in many carbonic anhydrase and zinc protein complexes, deficiency of zinc may cause dwarfism and hypogonadism (Chatterjea and Shinde, 2008).

The nutritional benefit of Kanwa is notable from the consistent weight gain which was higher in the group 3 animals that received the highest dose (3200mg/Kg body weight) of Kanwa Bortulossi and McMeiniman, (1996) reported an increase in body weight with mineral supplementation in livestock.

There was no alteration of the haemopoetic functions as reflected by the PCV (an index of anaemia) levels. Thus kanwa is able to prevent anaemia.The slight increase in the PCV of the treated animals compared to the control group was not dose dependent and not significant at ($P>0.05$). Also all the values were within the normal range of 35- 45 % (Kozma *et al*, 1974). The slight increase though not significant may be due to the animal being in their growing stage.

The higher serum Protein levels in the treated groups is also a reflection of the nutritional benefit of Kanwa. This observation of increased serum protein level due to Kanwa is in agreement with the findings of Wooley *et al,* (1954), who also observed increase body weights

due to effects of mineral supplementation in livestocks. Increased body weight is an indication of body building which is a function of protein. It may be implied here that kanwa is able to enhance the body building function of protein.

The lower urea levels observed in the treated groups compared to the control is an indication of a positive nitrogen balance whereby more nitrogen intake is greater than the nitrogen excreted, this is equally supported by the previously observed increased body weight and serum protein levels in the treated groups.

The serum glucose determination is an index of glucose utilization. Groups 1 and 3 animals had the highest and lowest glucose levels respectively (Table 2) as compared with that of the control, but the differences were not significant ($P>0.05$) . This is implying a normoglycemic level in all the groups. The mineral elements in kanwa support the physiological and biochemical system of metabolism. An elevated serum glucose level could be a defect in insulin production and action, and if sustained turns into a syndrome called diabetes mellitus.

The serum cholesterol was normal in all the groups. Hypercholesterolemia is universally accepted as a major risk factor for atheroscelorosis, however at any given concentration of plasma cholesterol, there is still great variability in the occurrence of cardiovascular events (Garg, 2010).

## Conclusion

The supplementation of feed with Kanwa can have nutritional benefits in animal herds such as cattle especially in the absence of the commercial salt lick. Therefore, supplementation of animal feeds with kanwa for nutritional benefits in the absence of the refined commercial salt lick may be encouraged but with improved purification to eliminate carbonaceous materials and avoid heavy metal contaminations.

## References

Adefolalu, F.S., & Gbodi, T.A., (2010). The effects of kanwa (saltlick) on kidney function indices in Rabbits, *International Journal of Applied Biological Research* 2(2), (49-54).

Allen, E.S., Grimshaw, H.M., Parkinson, J.A. & Quarinby, C., (1974). *Chemical Analysis of Ecological Material*. Blackwell scientific publication, London. (233).

Ammarman, C.B., Miller, S.M., Fick, K.R. & Hansard, S.L. II, (1977). Contaminating elements in mineral supplements & their potential toxicity. (A review). *Journal of Animal Science* 44, (485-508).

Birch, N.J. & Karim, A.R., (1988). *Potassium in Handbook on Toxicology of Inorganic Compounds.* Editor N.G Seiler & H Sigel. New York: Marcel Dekker, (543-553).

Bobboi, A., Gidado, A., Edoji, I. & Milala, A. A., (2004). The effects of the root of *Xylopia quinasii* on blood, liver and Kidney Function indices in rats. *Nigerian Journal of Natural Products and Medicine*. 8, (52-54).

Bortulossi, G. & McMeiniman, T., (1996). Dietary nitrogen & Phosphorous depletion in cattle and their effects on live weight gain, blood metabolite concentration and phosphorous kinectics. *Journal of Agricultural Science.*, 126: (193-201).

Chatterjea, M. N. & Shinde, R., (2008). Metabolism of Mineral and Trace elements. *In a Textbook of Medical Biochemistry.* Jaypee Brothers Medical Publishers (P) LTD New Delhi. (570-594).

Corah, I., (1996). Trace mineral requirements of grazing cattle. *Animal Feed Tech.* 59, (61-70).

Egwin, E. C., Aderotimi, B. O. & Adeyemo, S., (2002). Efficacy of some nupe medicinal plants against salmonella typhi an invitro study. *Journal of Ethnopharmacology*, 80, (21-24).

Garg, G. P. (2010). Dietary Antioxidants*. In a textbook of biochemistry*. Discovery Publishing House PVT LTD. (1-7).

Gbodi, T. A. & Ikwuegbu, A. O., (1982). Chemical composition of native mineral licks (Kanwa and Kantu) used as sources of mineral supplements to cattle in Nigeria. *Nigeria. Veterinary, Journal* 11(2), (82-85).

Hall, A., (2001). Electrolytes. *Principles and methods of toxicology*. Fourth Edition, Wallace Hayes. Taylor & Francis (Editor). Philadelphia. (456-501).

Huang, H. Y., Caballero, B. Albery, A. S., Samba, R. D., Schneyer, C., Wilson, R. F., Ceng, T. Y., Prokopowic, Z. G., Banes, G. J. II, Vassy, J. & Bass, E. B., (2007). Multivitamin/mineral supplement and prevention of chronic disease/, (Executive summary). *American Journal of Clinical Nutrition* 85(1) 2655-2685.

Ikwuegbu, A. O., Gbodi, T. A. & Ogbonnah, G. A., (1983). Effect of local salt (kanwa) & proprietary mineral salt licks in the ration of milking cow. *Nigerian Veterinary Journal* 14(1) 66-69.

Kaplan, L. A., Szabo, L. L. & Ophein, E. K., (2005). *Clinical Chemistry, Interpretation & Techniques*. 3rd Edition Lea & Philadelphia, (130-170).

Kozma, C., Macklin, W., Cummins L. M. & Murer, (1974). Anatomy, physiology & Biochemistry of rabbits. *In the biology of the laboratory Rabbit*. Editor Weisbroth S. H. Flatt R. F. & kraus A. L. Academic press. New York, San Francisco London. (60-70).

McDowell, I. R., (1996). Feeding minerals to cattle on pasture. *Animal Feed Science Technology,* Elvisier, 60:247-271.

Merill, J. C., Morton, J. J. P. & Soileau, S. D., (2001). Metals*. Principle & Methods of Toxicology,* 4th Edition, Editior Wallace H, Taylor & Francis. Philadelphia, (649-660).

Okerman, I., (1988). Library of veterinary practice. *Disease of domestic rabbits.* Translated by Richard Sundale. Blackwell Scientific Publication Oxford, London. (13-15).

Reitman, S. & Frankel, S., (1957). A colourimetric method for the determination of serum glutamate oxaloacetate & glutamate pyruvate transaminase, *American Journal of Clinical Pathology*, 28:56.

Schales, O. & Schales, S. S., (1941). A simple & accurate method for determination of chloride in biological fluids. *Journal of Biological Chemistry*. 140: (879-884).

Teizt, N. W., (1973). Electrolytes. *Fundamentals of clinical chemistry.* Editor Teizts (873-803).

Vogel, A. I., (1964). Volumetric analysis of chlorides. *A textbook of quantitative inorganic analysis.* Longmans. Green and Co. Ltd (181).

Whiteside, P. J. & Bruce, A. M., (1984). *Atomic Absorption data book.* Sixth Edition. Pye Unicam Ltd. (14-70).

Wooley & Mickelson (1954). Effects of potassium, sodium and calcium on the growth of young rabbits fed purified diets containing different levels of fat and proteins. *Journal of Nutrition.* 52(4) 59l-600.