

Nutritional Assessment Of 'Gwangwarasa' Type Of Natural Potash (Kanwa)

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ABSTRACT

This study makes a preliminary attempt to characterize the 'gwangwarasa' type of 'kanwa' in terms of its chemical composition and effect on feed intake of ewes fed with the mineral substance. The result indicates that 'gwangwarasa' type of 'kanwa' contains higher concentration of sulphate than other constituent anions, which associate with sodium. Fortification of dietary supplements with 'gwangwarasa' significantly ($P < 0.05$) improved forage and total feed intake specifically at 2.27 and 6.81% levels of 'kanwa' inclusion in the diets of ewes. Thus, kanwa may be useful in improving appetite and furnishing needed minerals in sheep grazing poor quality forage particularly in the dry season.

INTRODUCTION

It is apparent from recent scientific reports that there is an intensive application of geologic mineral substances in animal nutrition. In Nigeria, the renewed government interest in solid mineral exploration perhaps explains why a wide range of naturally occurring inorganic salts are being used for various purposes including livestock feeding. The beneficial effects of mineral supplementation on crop residue and nutrient utilization for increased animal productivity have been reported^{1,2}. Adamu *et al.*³ attest to the improved efficiency of feed utilization when heifers were strategically supplemented with mineral mixture. Whereas common salt significantly improved live weight gains of the heifers, addition of salt plus phosphorus to either urea or cottonseed-based diets much more improved weight gains. Also physiologic functions of the various body systems seem to be positively activated when salt is fed to animals. For instance, the outflow rate, which possibly determines relative length of time ingesta remains exposed to the activities of ruminal microbes, is positively correlated to feeding of salts and sodium bicarbonate^{4,5}. Similarly, in diets balanced equally for protein, energy and mineral contents, supplementation either with kaolin or mineral mix of volcanic origin resulted in lower blood urea concentration in Sanen goats than the unsupplemented group⁶. Cobalt supplementation in East African goats also caused significantly higher

values of body condition score, erythrocyte count, mean cell volume, haemoglobin and serum vitamin B₁₂ concentration⁷.

The use of 'kanwa' salt otherwise called natural potash or lake salt for diverse purposes has been reported by many authors. Ekanem and Harrison⁸ noted that 'kanwa' ore is an age-long commodity of trade across the Sahara. It is often used as a tenderizer in cooking, an ingredient in certain foods and medicinal preparations, a medicament for some ailments and a mordant in dyeing, a purgative in drinking water for livestock and body 'purifier' for increased breast milk yield in postpartum women. Kassim *et al.*⁹ crystallized baking powder and soda ash from a sample of 'kanwa'. Otchere *et al.*¹⁰ reported that 'kanwa' is commonly fed to cattle by the pastoral herders as mineral supplement in drinking water. Perhaps, the attractiveness of 'kanwa' as a supplementary mineral substance relative to other evaporates relates to its abundance, low cost and the believed absence of deleterious effect on the animals offered. Beside chemical evaluation of some samples, which suggests that 'kanwa', consist of chlorides, sulphates and carbonates of Na, Ca and K as well as some micro mineral nutrients^{8,11-13} it is uncertain if nutritional assessment of a specific variety of 'kanwa' has been done.

The object of this work is to attempt to characterize the 'gwangwarasa' type of 'kanwa' in

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terms of its chemical content and nutritional importance.

EXPERIMENTAL

Materials

A bulk of 'gwangwarasa' type of 'kanwa' was obtained from Gashua, Yobe state. The grey powdery mineral stuff is said to be extensively excavated from the Chad basin, which occupies 23,000 km² between lat. 6°N and 26°N and long. 7°E and 25°E. It is mined with hoes and axes at shallow depth under a superficial coverage of sand and clay. The 'kanwa' ore is a young sedimentary deposit found where internal drainage exists in the arid and semi-arid regions. Theoretically the evaporites desiccate from accumulation of weathered rock products by infrequent surface run-off into depressions without outlets. Due to rapid evaporation of moisture from such depressions, as often experienced in the arid regions, a high concentration of the included salts bearing the specific chemical characteristics of the drainage area results¹⁴. Thus differences in the chemical make-up of the sources of origin of the materials are apparently responsible for varieties of 'kanwa' known to be in existence. A few other examples are 'jar kanwa', 'mangul', 'gallo' etc found in local markets in Northern Nigeria.

Chemical Analysis

Samples of the 'gwangwarasa' type of 'kanwa' were analysed for cation and anion content using standard colorimetric, photometric and atomic absorption spectrophotometric methods¹⁵.

Diet Supplementation

Portions of the salt were used to fortify supplementary diets for 25 growing ewes allotted in fives to 5 treatments at 0, 2.27, 4.54, 6.81 and 9.09% levels of 'kanwa' inclusion. The diets were fed at 1.5% live weight and the animals were allowed access to pasture. Two animals per treatment were caged for 4 weeks to determine forage intake and other feeding parameters.

RESULTS AND DISCUSSION

Chemical Analysis

Table 1 compares chemical compositions of the 'gwangwarasa' type of kanwa in this and previous² studies. The occurrence in 'kanwa' of appreciable proportions of essential macro- and micro-mineral nutrients, salts and the absence of

Table 1: Chemical composition of 'gwangwarasa' and other types of 'kanwa'.

| Type | Na (%) | Ca (%) | K (%) | Fe (%) | Mg (ppm) | P (ppm) | SO ₄ ⁻ (%) | CO ₃ ⁻ (%) | HCO ₃ ⁻ (%) | Cl ⁻ (%) | |
|------------------|--------|--------|-------|--------|----------|---------|----------------------------------|----------------------------------|-----------------------------------|---------------------|------|
| Gwg ¹ | 21.98 | 5.38 | 2.06 | 0.45 | 1600 | 408 | 67.33 | 51.12 | 12.0 | 3.05 | 0.04 |
| Gwg ² | 31.10 | - | 0.47 | - | - | - | 67.37 | - | - | - | 0.14 |
| Jak ² | 3.6 | - | 1.50 | - | - | - | 57.80 | 0.93 | 0.97 | 0.26 | - |
| Mgl ² | 32.5 | - | 0.35 | - | - | - | 19.70 | 0.94 | 0.58 | 44.38 | - |
| Gal ² | 34.2 | - | 0.22 | - | - | - | 1.45 | - | - | 56.97 | - |

Source: (1) Current study; Gwg = Gwangwarasa; Jak = Jar kanwa
(2) Ako.. Mgl = Mangul Gal = Gallo

harmful chemical substances support its applicability for livestock feeding. Makanjuola and Beetlestone¹⁶ have earlier described 'kanwa' as a sesquicarbonate containing equimolar quantities of Na₂CO₃ and NaHCO₃. Earlier chemical analyses^{16,11} further showed that 'gwangwarasa kanwa' consists of Na₂SO₄, 87.81%; Na₂CO₃, 0.69%; NaCl, 0.5%; and MgCl₂ as trace.

It is apparent from the present study and in agreement with earlier analyse^{16,11} that 'gwangwarasa kanwa' has a distinctly higher level of SO₄⁻ compared with other samples of 'kanwa'. The SO₄⁻ associates with Na⁺ given the persistently higher proportion of this cation as compared to others in the 'kanwa' sample⁸. Contrarily, however, high variability of CO₃⁻ and HCO₃⁻ concentrations as well as low concentration of Cl⁻ and PO₄⁻ preclude these anions from being used as reference chemical features for distinguishing this 'kanwa' variety. Nonetheless, the presence of CO₃⁻ and HCO₃⁻ apparently confers on the sample of 'kanwa' its alkaline nature with a pH of 10.3 for a 4% aqueous solution.

Diet Supplementation

Table 2 indicates gross composition of supplementary diets fortified with varying

Table 2: Gross composition of 'kanwa'-based supplementary diets.

| Dietary treatment (% level of) | 1 | 2 | 3 | 4 | 5 |
|-----------------------------------|-------|-------|-------|-------|-------|
| 'kanwa' | 0 | 2.27 | 4.55 | 6.81 | 9.09 |
| Supplemented Na | 0 | 0.5 | 1.0 | 1.51 | 2.00 |
| Maize offal | 78.37 | 75.21 | 72.09 | 68.99 | 65.85 |
| Cottonseed cake | 21.67 | 21.52 | 23.37 | 24.20 | 25.06 |

proportion of the 'kanwa' salt. The ewes individually consumed on a daily basis a pre-determined quantity of the supplementary diets of about 200g that is equivalent to 1.5% of their body weight. Mean daily intake of the supplement, forage and total feed per treatment groups are displayed in Table 3. Mean daily intake of supplement, forage and total feed tend to increase with increasing level of salt supplementation.

Table 3: Mean daily (g) supplement, forage and total feed intake per ewe.

| Dietary Treatment | 1 | 2 | 3 | 4 | 5 | SEM |
|-------------------|--------------------|---------------------|--------------------|--------------------|---------------------|-------|
| Supplement | 200.0 ^a | 197.6 ^{ab} | 200.0 ^a | 200.0 ^a | 189.9 ^b | 3.91 |
| Forage | 476.9 ^b | 561.1 ^a | 488.9 ^b | 586.1 ^a | 515.9 ^b | 41.93 |
| Total feed | 676.9 ^b | 758.7 ^{ab} | 688.9 ^b | 786.1 ^a | 705.8 ^{ab} | 2.34 |

Different superscripts on the same row indicate significant ($P < 0.05$) variation between treatments.

The level of intake of forage and total feed are highest for sheep on 'gwangwarasa kanwa' — supplemented groups 2 and 4 containing 0.5 and 1.51% of supplemented Na respectively and lowest for the unsupplemented group 1. A comparison of treatment means shows that both forage and total feed intake differed significantly ($P < 0.05$) among treatment groups. Highly significant variations are also noticeable in the daily forage and total feed intake within the period of feeding ($P < 0.01$). Thus the study indicates that 'gwangwarasa' has some nutritional potentials for livestock feeding as it is capable of improving appetite and probably furnishing ruminant livestock with some essential mineral nutrients (especially sodium and trace elements) known to be unavailable in dry season

forage of the savanna, thereby enhancing forage feed intake.

CONCLUSION

The chemical composition of the 'gwangwarasa' type of 'kanwa' indicates its applicability as a safe mineral supplement for ruminant production. Its characteristically high sulphate content confers a unique chemical feature for distinguishing it among other varieties of 'kanwa' ore. Fortification of dietary supplement with the 'gwangwarasa kanwa' significantly improved intake of forage and total feed in sheep.

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