Kanwa cattle salt as a potential micronutrient fertilizer in Nigeria's Middle Belt

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Summary

UNTIL RECENTLY kanwa *has primarily been known as a mineral supplement fed to traditionally managed cattle in central and northern Nigeria. Preliminary studies carried out by ILCA's Subhumid Zone Programme in 1984 indicated its potential as an economically attractive source of plant micronutrients. A 200 kg/ha increase in the crude protein yield of stylo (*Stylosanthes hamata *cv. Verano) was obtained by applying 50 kg of* kanwa *per ha, at a total cost of only US$ 5.00.*

Introduction

With an average rainfall of 900–1500 mm per annum, the subhumid zone of Nigeria could, with favourable soil conditions, support high levels of plant production. However, even when NPK fertilizer is applied crop yields are usually low, which is largely attributed to micronutrient deficiencies (Heathcote, 1970; Osiname et al, 1973; Smithson and Heathcote, 1974).

ILCA's studies on *Stylosanthes hamata* cv. Verano at the Kachia Grazing Reserve, Kaduna State, Nigeria, showed that this forage legume has high resistance to anthracnose and recovers well after being burned or overgrazed. However, its dry-matter (DM) yields were disappointing and its response to phosphorus (P) was less than expected.

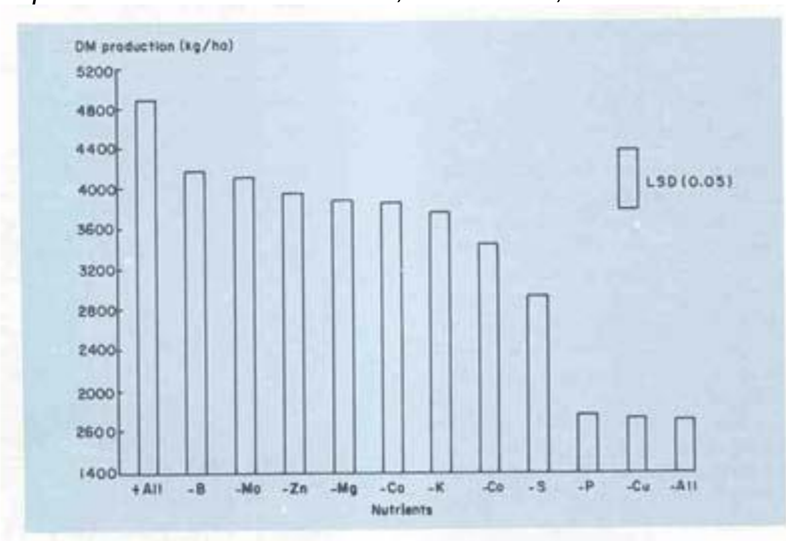
Concurrent with these studies, livestock nutrition studies were conducted in an effort to explain a dry-season flush of oestrous activity in cows supplemented with *kanwa,* a traditional cattle salt containing essential micronutrients. The possible use of this relatively cheap material as a micronutrient fertilizer was examined and the results are reported in this article.

Methods

Micronutrient deficiencies

In 1983, a series of nutrient omission experiments were conducted to determine the cause of the lower-than-expected DM yields of *Stylosanthes hamata* cv. Verano. Figure 1 shows DM production of*S. hamata* when supplied with all essential nutrients and when systematically deprived of individual nutrients. The results clearly indicate that P and copper (Cu) were the most limiting nutrients: when either was withheld the yield was as low as when no nutrients were applied.

Figure 1. *Dry-matter production of* S. hamata *supplied with all nutrients and systematically deprived of individual nutrients, Kurmin Biri, 1984.*



Fertilizers to correct specific micronutrient deficiencies are not available in Nigeria. The commonly used commercial NPK fertilizers contain varying amounts of micronutrients as impurities, but in quantities which are generally insufficient to correct severe deficiencies.

An analysis of *kanwa* carried out as part of the Programme's livestock nutrition studies revealed that it contains many essential micronutrients, including Cu (Table 1). This finding attracted interest in the possible use of *kanwa* as a cheap micronutrient fertilizer. *Kanwa* is mined in northeastern Nigeria and costs between 8 and 10 (US$ 10–12.5) per 100 kg.

Table 1. *Composition of* kanwa.

Element	Content
Major nutrient (%)	
Na	1.5
K	4.7
Ca	23.7
P	0.6
Micronutrient (ppm)	
Mg	848.7
Fe	74.7
Mn	407.2
Cu	44.2
Co	23.6
Zn	176.0

Kanwa as a micronutrient fertilizer

In 1984 a trial was conducted at the Kachia Grazing Reserve on ferruginous soil, on the use of *kanwa* as a micronutrient fertilizer. The area used for the experiment had been under *S*. *hamata* since 1980.

Thirty-six 1 m^2 plots separated by 0.3 m wide paths were laid out in a 3 x 4 factorial design with three replicates. The treatments were 0, 50 and 100 kg of *kanwa/*ha (KW_0, KW_1 and KW_2) and 0, 18, 36 and 54 kg P/ha (P_0, P_1, P_2 and P_3). The *S*. *hamata,* which was about 8 cm high at the start of the experiments, had also received 12 kg P/ha at the time of establishment.

The *kanwa* and triple superphosphate were mixed and topdressed in the second week of June 1984. The plots were harvested in early November, and DM and seed yields of the stylo were determined.

Results and discussion

Application of either *kanwa* or P significantly (P < 0.001) increased the DM yield of *S*. *hamata* (Figure 2). The response to *kanwa* was linear up to the highest level of application (100 kg/ha) while the response to P was quadratic with maximum DM yield occurring at 36 kg P/ha (Table 2). Application of P and *kanwa* also significantly (P <0.001) increased seed yield of *S. hamata* (Figure 3).

Figure 2. *Experimental plots showing the effect of P and* kanwa *on* S. hamata *cv Verano.*

Photo: Ann Waters-Bayer.

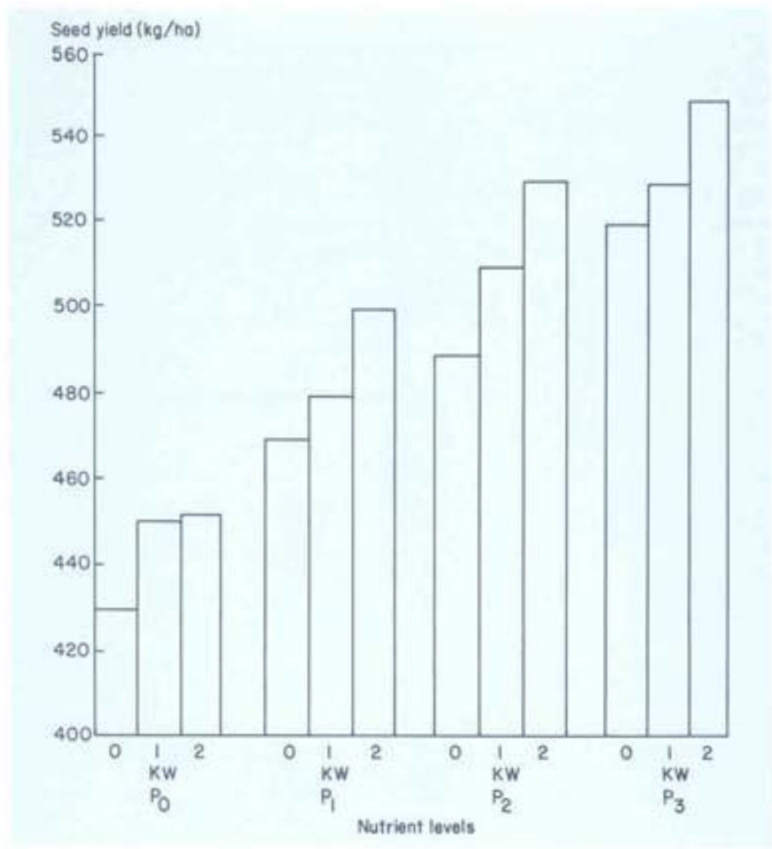
(P_0Kw_0 = Zero levels of P and kanwa).

Table 2. *Effect of P and* kanwa *applications on dry-matter production of* Stylosanthes hamata *cv. Verano, 1984*.

Phosphorus rate (kg/ha)	DM yield of *S. hamata* c. Verano (kg/ha)			
	Kanwa rate (kg/ha)			Mean
	0	50	100	
0	2936±252*	4 412	4 828	4 059±146*
18	4 864	5 048	5 636	5 182
36	4 544	5 884	6 484	5 637
54	4 964	5 360	6 484	5 603
Mean	4 327±126*	5 176	5 858	

* ± SE (Standard error).

Figure 3. *Effect of P and* kanwa *applications on seed production of* S. hamata, *Kurmin Biri, 1984.*



An analysis of crude protein (CP) yield revealed that applying 50 kg of *kanwa/*ha (at a cost of ₦ 4 or US$ 5) increased the CP yield of *S. hamata* by 200 kg/ha. Two hundred kilograms of CP in the form of cottonseed cake, which is the most readily available alternative source of CP, would cost about US$ 230.

Increasing population pressure in the subhumid zone of Nigeria has resulted in arable agriculture expanding onto less fertile land, where crop–livestock production is more difficult to sustain due to rapid soil degradation.

Trials by ILCA have shown that growing *Stylosanthes* for 1–3 years can substantially improve soil structure and fertility (Mohamed-Saleem, 1984), and that these improvements are positively correlated with the amount of stylo biomass produced. Hence if yields of stylo can be increased by using a combination of P fertilizer and *kanwa,* the yields of subsequent food crops should be substantially increased, at lower cost than with commercial N fertilizers.

The increase in stylo yield when *kanwa* was applied may be partially due to nutrients other than P and Cu, and *kanwa* may be useful as a broad-spectrum micronutrient fertilizer. However, before*kanwa* can be used as fertilizer on a wide scale, it will be necessary to ascertain:

- The extent and the type of micronutrient deficiencies in the subhumid zone;
- Optimum levels of *kanwa* application;
- The extent of *kanwa* deposits available; and
- The economics of its complementary use as a direct livestock mineral supplement.

Conclusions

The results reported in this paper demonstrate the potential of *kanwa* to correct the micronutrient deficiencies of ferruginous soils, which constitute more than 50% of the soils in the subhumid zone. A combination of forage legumes, which can fix atmospheric N at low levels of P application, and *kanwa* will greatly improve soil fertility, thereby increasing production of food crops and providing better-quality forage.

References

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