



Assessment of the Elements Content of Some Crops Residues in a KUST Wudil Research Farm, Kano State

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ABSTRACT

The chemical properties of some crop's residues grown in the research Farm, Wudil were chemically analyzed in order to assess the percentage nutrient content of some crops; six different crop residues were taken as samples which include: Millet Stover, sorghum Stover, Maize Stover, Rice straws, Cowpea stem and Groundnut haulms. The nutrient analyzed includes N, P, K, Ca, Mg and Fe. The results indicate that the content of almost all nutrients increased on the burnt residues, except Nitrogen N. the results also show that the Stover's and straw contained more Mg, P and K and little content of Ca.

ARTICLE INFO

Article History

Received: July, 2022

Received in revised form: August, 2022

Accepted: September, 2022

Published online: September, 2022

KEYWORDS

Crop residues, Chemical properties, Research farm

INTRODUCTION

Soil organic matter consists of decomposing plant and animal's residues. The residues become a part of soil humus; some portions often remain for thousands of years. Crop residues, weeds, grasses, tree leaves, worms, bacteria, fungi and actinomycetes are part of this mixture. Organic matter is responsible for most desirable surface soil structure, promotes a greater proportion of large pore sizes, improves water and air relations, and reduces erosion by wind and water. Donahue R. L. (1965).

Crop residues includes stems, leaves, roots, chaffs and any other plant that remains after agricultural crops are grazed or harvested (USDA, 1978). Singh and Balasbrahmanian (1977) refer to crop residues as harvest residues (straws, Stover and haulms) and processed waste (groundnut shells, rice husks, oil cakes etc). Crop residues accumulate from various agricultural activities Balarasubhamian and Nnadi (1978) reported that about 31.41 million tons of crop residues were produced for the 1970-1971 season in the savanna regions of Northern Nigeria. Currently, approximately about 20 million tons of dry crop residues are produced annually in the savanna region of Northern Nigeria of which

cereals

constitute about 14.2 million tons (FM A & NR, 1990). Crop residues are known to be the major source of phosphorus, Sulphur, Nitrogen, and other micro and macro nutrients to the soil (Foth, 1951). Plant residues incorporated to soil are allowed to dry and later burn, ideally this should be done at the beginning of the raining season to minimize loss of considerable amount of ash by wind for the ash return considerable amount of cations to the soil and probably most of the phosphate (Jones, M. T. and Wild, 1975). However, the effect of crop residues and other farm waste on crop performance and soil attributes varied and depend upon the type of residues, soil and application rate and methods of application as well.

MATERIALS AND METHODS

Sampling Site and Sampling

This research was conducted at Kano University of Science and Technology, Research Farm. The farm is located behind the University Fence to the north in Wudil local government area of Kano state, which is situated in the savanna region of northern Nigeria between latitudes 12° 11' N to 12° 14' 11" N and longitudes 7° 38' E to 8° 38'



E. It has an annual rainfall ranging from 850-870mm per-annum with an annual temperature ranging from 38°C to 43°C and relative humidity of 40% to 51.3%. The plant residues commonly found in the savanna areas were collected from the research farm in Wudil. Such residues include: Millet Stover, Sorghum Stover, Maize Stover, Rice straws, Groundnut haulms and cowpea stem.

Sample Preparation

Plant residues were ground using a mechanized mill made of stainless steel. After gridding each sample, the mill is wipe clean for further grinding of other samples. This is ensuring to avoid contamination of samples by one another. Second part of the samples was burned in a metal container. The ground samples and burnt samples were each kept separately in clean labeled polythene bags for analysis.

Laboratory analysis

Both samples were analyzed for:

1. Nitrogen: Micro-Kjedahl wet digestion methods as describe by Bremer (1965).
2. Phosphorus, Calcium, Magnesium, potassium and Iron were determined by the wet digestion methods using the mixtures of Nitric (HNO_3), sulphuric (H_2SO_4) and perchloric (HClO_4) acids. Phosphorus was determined using Bausch and comb spectrophoto-meter, Iron was determined using the atomic absorption spectrophotometer (A.A.S.) while Potassium, Calcium and Magnesium were determined using flame photometer.

RESULTS

The results obtained table 1. Indicates that the Millet Stover, Sorghum Stover and Maize Stover contained approximately same amount of Nitrogen in both ground plant residues and burnt plant residues, the Phosphorus content of the various materials on the table shows that Maize Stover plant residues contain slightly higher phosphorus as compared to cowpea stem the maize Stover contains more phosphorus than cowpea stem in both the ground plant residues and burnt plant residues. Generally, among the cereals analyzed, the phosphorus content of Maize Stover is higher than that of the cowpea

stem. Therefore, we can suggest that more phosphorus is contained in Maize Stover than in cowpea stem. The results also include rice straw which have the highest phosphorus content in the burnt plant residues table 2.

The results also indicate that the Stover, straw and stem contains more amount of potassium in both ground plant residues and burnt plant residues than the groundnut haulms this shows that potassium is stored in the stoves/straw/stem than in the groundnut haulms. The results also shows that the burnt plant residues contains more potassium than the ground plant residues, this shows that phosphorus and potassium are more available after burning this correspond with the Bartholomew and Janssen (1933), who reported that plant tissues analysis for potassium content is mainly due from the ash than from the unburnt residues to the greater availability of potassium in the ash. The results also indicates that Maize Stover, Rice straw and cowpea stem contains less amount of Calcium in both the ground plant residue and burnt plant residues. The optimal levels of Ca were put is average between 1.0% - 1.75% any figure below or above 1.76% is deficient and luxury consumption level respectively. It is also observed that all of the samples are deficient in Ca, which may be due to the low CEC and Ca content of the tropical savanna soils.

The results also indicates that Maize Stover ground plant residues contains more Mg than the Rice straw, however, the Groundnut haulms have a higher amount of Mg as compared to Stover. The sorghum Stover on the other hand, contains less amount of Mg in both the ground plant residues and the burnt plant residues. The ground plant residues analyzed are not deficient in Mg if compare to the home's (1966) range for optimal levels as 0.06% - 0.35% value below 0.05% are considered deficiency levels and above 0.36% as luxury consumption levels. Consequently, the burnt plant residues analyzed contains more Mg levels than the ground plant residues.

The results show that Millet Stover contains more Fe in both the ground plant residues and burnt residues than Maize Stover. The concentration of Fe in plant varies from 0.005% - 0.06% (Katyal and Randhawa, 1983), it

can be observed in the results obtained that all the plant sampled contained adequate level of Fe, this is because the soils of this region are rich in Fe

and it is required in small amounts as micronutrients.

Table 1. Nutrients Content of Some Plant Residues in Research Farm, Wudil, Kano State

Plant samples	GROUND PLANT RESIDUE					
	N	P	K	Ca	Mg	Fe
Millet Stover	0.79	0.065	0.81	0.091	0.093	0.44
Sorghum Stover	0.81	0.43	1.51	0.63	0.27	0.33
Maize Stover	0.71	0.11	1.31	0.22	0.24	0.17
Rice straws	0.52	0.10	1.61	0.21	0.23	0.01
Cowpea stem	0.71	0.09	0.52	0.045	0.061	0.01
Groundnut haulms	0.033	0.13	1.27	0.74	0.44	0.21

Table 2. Nutrients Content of Some Plant Residues in Research Farm, Wudil, Kano State

Plant samples	BURNT PLANT RESIDUE					
	N	P	K	Ca	Mg	Fe
Millet Stover	0.87	0.88	0.98	0.91	0.73	0.71
Sorghum Stover	0.84	0.73	1.53	0.64	0.31	0.41
Maize Stover	0.90	0.31	1.42	0.33	0.36	0.18
Rice straws	0.55	0.31	1.63	0.31	0.32	0.06
Cowpea stem	0.85	0.143	0.72	0.075	0.081	0.31
Groundnut haulms	0.053	0.23	1.38	0.86	0.54	0.52

SUMMARY AND CONCLUSION

The trend between these samples generally the Stover contains more nutrients specifically Nitrogen, Phosphorus, Potassium, Magnesium and Iron than the straw stem and haulms. The trend between the straw and stem shows that the straw contains more Nitrogen, Potassium and Magnesium while the Cowpea stem contains more amounts of Nitrogen and Phosphorus. The groundnut haulms contain more amount of Potassium.

Farmers of this savanna sub-region disposes their crops residues either through in-situ (on the farm) burning, incorporation (application of the unburned residue) or feeding them to animals. Even though a considerable amount is used as feed (Adeoye and Agbim, 1989), most of the crop residues are either burnt or incorporated. In Nigeria today, the availability and cost of fertilizers has reached an extent where the peasant farmers cannot afford it in fact constant use of chemical

fertilizers is hazardous to the soils of this sub-region as the residues formed by them are not easily leached away due to low rainfall in the area as a result (such problem as declined in yield) due to toxicity or salinity problems). As such alternative ways have to be found to ameliorate effect of this problem. This study does not include all the important macro and micro nutrient, but selected plant nutrients, however, with this study we can easily estimate the amount of nutrient content in both ground plant residues and burnt plant residues as well, this can also serve as the most efficient and cheap method to cut down costs of fertilizers using plant residues. Effective and proper incorporation of plant residues and their burnt residues is important so as to ensure rapid and proper decomposition and also avoid losses by wind or leaching



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