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**Study of Safety of Potash As A Food Additive**

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Potash is an organic substance used by many communities of the world for different purposes. However, its safety has been very uncertain before now limiting its use by many communities to achieve their desired culinary. We, therefore, conducted toxicological parity animal study to ascertain safety of this condiment in food preparations to clear the paranoid associated with its use.

Pure commercial potash was used to carry out lethal dose (LD 50) test for acute toxicity on 12 healthy male Wistar rats in 2 phases. This was followed by parity biochemical investigations on liver, albumin, serum electrolytes and kidney profiles of 30 healthy male grouped Wistar rats after feeding the rats on different graded doses of potash in pure highly profiled commercial feed for 28 days for chronic toxicity. The highest dose of 500mg/kg body weight of potash was tolerated by the study animals and, therefore, there was no morbidity or mortality. The biochemical parameters investigated including liver enzymes (ALT, AST, ALP); Albumin; Serum Electrolytes (NA<sup>+</sup>, K<sup>+</sup>, CL<sup>-</sup>, HCO<sub>3</sub><sup>-</sup>) and Kidney functions (Urea and Creatinine) were within established normal ranges of the parameters. The values obtained from the test groups of the animals did not deviate significantly from the values of the parity control study group (p<0.05). Potash, which is used for different purposes at a minimal dose has no deleterious effects on our study animals.

**Keywords:** Study, Safety, Potash, Additive**Introduction:**

Potash known and called various names by various tribes in West African sub- region as "Kaun" or "Akanwu" is a vital ingredient that plays a significant role in the preparation of traditional dishes. It is made up of various mined and manufactured salts that contain potassium in water soluble form. It is naturally found in large evaporate deposits from ancient lake and seabed or in rock formations (Diniz, 2018). The name potash was derived in 1477 from the Middle Dutch word *potaschen* meaning potashes (van der Sijs, 2010). There are various types of potash; sylvite (KCL called regular potash or Muriate of potash), polyhalite or potassium sulphate (K<sub>2</sub>SO<sub>4</sub>)/sulphate of potash, Carnallite (potassium magnesium chloride and water), etc, (Rabiu and Malami, 2018). Potash is called Akanwu in Igbo language and referred to as Kaun in Yoruba language while the Hausa tribe of Northern Nigeria call it Kanwa. It is also in this Northern part of Nigeria, potash deposit is found, (Rabiu and Malami, 2018). Kaun or Akanwu is edible and is commonly used for culinary purposes. It is used for cooking of pulses such as beans, black beans (Mexican beans), cowpea, etc in order to fast tenderize the pulses so easily. It is also used for mixing water and oil while preparing native delicacies (Abacha), native magi (ugba) and meat culinary just to enhance their palatability (Iweka *et al*, 2016). It is added in ewedu and okro soup, a popular Yoruba ethnic dish, during preparation to increase the green colour and texture of the soup (Okpala, 2015).

Apart from naturally occurring potash, it is also produced world-wide in large commercial quantities, exceeding 30 million tonnes per year, mostly for use in fertilizer production. Various types of fertilizer-potash exist but constitute the largest global industrial use of the element-potassium (Knight,1992). The old method of producing potash was by collecting ash from burnt palm fruit head, ( $K_2CO_3$ ), then leaching the ash. The supernatant is evaporated in hot iron pot, leaving behind residue called potash (Dennis,2000). Since the discovery of the important role of potash in fertilizer production, this old method has been abolished. It is the potash of Sulphur, which is non-inflammable, white crystalline salt that is chemically used for producing fertilizers due to its potassium and Sulphur contents (The world potash industry,2000).

Evidence shows that potash has a myriad of health benefits. In Northern Nigeria, potash has been reported to be used in the treatment ailments as cough, tooth ache relief, as fungicide, abortifacient (Diniz 2018). The people of this region consume potash with belief that it suppresses libido and, therefore, has contraceptive effect (Rabiu and Malami,2018). It is also used as a preservative because of its bromated content (Diniz,2018).

Potash has high sodium content, which is not good for the body. The adverse effect of high sodium consumption includes headaches, an increase in blood pressure, kidney disease, kidney stone, stroke and osteoporosis. Recent research report shows that excessive consumption of potash suppresses steroidogenesis and, therefore, pregnant women are advised to refrain from taking any kind of concoction containing potash and that the high contents of other elements found in potash could cause pathological changes to liver and kidney cells (Anonymous,2016). Report of anonymous research work of 2021 shows that high consumption potash negatively affects sperm quality and sex hormones of male sex Wistar rats (Anonymous,2018). Long and frequent use of potash in culinary as a softener or tenderizer reduces the amount of protein present in food and could lead to protein malnutrition.

However, in spite of all these health benefits and paranoid associated with safety of potash, we, therefore, speculate in this outlook on future directions for safety of potash as a food additive and emphasize on limited and appropriate use of potash in our culinary.

### **Materials and Methods.**

The research was carried out in the Anatomy Laboratory of Faculty of Basic Medical Science of the University from the month of November,2023 to April, 2024. A total of 42 albino Wistar male sex rats that weighed between 120g and 160g with no significant difference in weight between the control group and test groups and no blemish were used for the study. The control and test groups of animals are of the same parity. The animals were bought at the animal farm of the university and transferred to anatomy laboratory. They were kept in a cage with a stand that separated their feed and water from coming into contact with their sheet. They were fed adequately with good feed and water (*ad libitum*) for 14 days to acclimatize them to their new environment before starting the experiment.

**Acute toxicity study (LD 50):** Experiment on LD50 was done with 12 rats in two phases in accordance with method described by Lorke (1983) as follows.

**Phase I:** Nine Wistar mice divided into three groups of three animals each were administered wholesome graded milligrams of potash of 0.5mg/kg,10mg/kg and 100mg/kg body weight of the study animals. The potash was bought from a popular and biggest commercial market in the city. It was dissolved in distilled water measured weight by volume. A 22-gauge oral feeding needle was used to administer the potash to the animals. All the animals received their feed and water accordingly. They were monitored for 24 hours for morbidity and mortality.

**Phase II:** In this phase, only 3 animals were used. 100mg/kg, 200mg/kg and 500mg/kg body weight of potash was administered to the first animal, second and third animal in the order of the milligram of potash. The animals received their and water accordingly. They were equally observed for morbidity and mortality for 24 hours.

**Chronic toxicity study:**

Based on the acute toxicity study described above, six groups of 5 study animals per group were created. Group 1 was the control group and was fed only feed and water. The 5 (11 – V1) other groups were fed potash of 5 different gram weights matched with constant gram weights of 100 of feed. They were fed and hygienically maintained for 28 days. On the 29<sup>th</sup> day of the study, blood samples from ocular puncture was collected from all the study animals in a clean heparin-free laboratory precipitin bottles and well labeled. The samples were carefully sent to the clinical laboratory of the University for investigations of possible biochemical changes.

**Result.**

Acute toxicity test (LD 50) was carried out on 12 of the study animals in two phases (phase 1 & 11) as shown in Table 1. We used Lorke's method to calculate highest tolerability dose for the animals (500g) of potash fed to the animal. Table 11 shows the various graded doses of potash mixed with constant weight of feed (100g) which was used to feed the 5 different groups of test animals while the control group receive only rat feed for 28 days of the study.

Tables 3 and 4 shows results and normal values of biochemical parameters carried out in the blood sample of the study animals (control and 5 test groups) after 28 days of the study.

**Table 1: Result of acute toxicity study**

Group	Number of Rats	Potash dose (mg/kg)	Duration of study (hours)	Morbidity/Mortality
<b>Phase 1</b>				
1	3	0.5	24	Nil
2	3	10	24	Nil
3	3	100	24	Nil
<b>Phase 11</b>				
1	1	100	24	Nil
2	1	200	24	Nil
3	1	500	24	Nil

**Table 2: Result of chronic toxicity study**

Group	Number of Rats	Dose(g/g) of potash/food	Duration of study	Morbidity/Mortality
Control	5	100g (feed only)	28	Nil
Test 1	5	20/100	28	Nil
Test 11	5	40/100	28	Nil
Test 111	5	60/100	28	Nil
Test 1V	5	80/100	28	Nil
Test V	5	100/100	28	Nil

**Table 3: Liver Function and Albumin profiles of Wistar Rats fed graded doses of Potash mixed rat feed (g/g).**

Parameter s (iu/L and /g/dL)	Control 1	Test 11	Test 111	Test 1V	Test V	Test V1	Normal values (range)
ALT	11.6±1.14	10.4±1.14	11.6±1.14	11.4±1.14	11.0±2.0	11.0±0.82	3-15
AST	15.00±1.11	14.1±0.89	12.8±1.92	11.4±1.34	11.17±1.17	11.0±1.15	5-18
ALP	27.00±2.24	28.00±1.58	27.80±2.59	4.65±0.23	4.35±±.3	28.00±1.14	25-92
ALB	4.4±±0.16	4.4±0.16	4.96±29.4	4.62±0.15	-	-	3.5-5.2

**Table 4: Renal function and Electrolyte profiles of Wistar Rats fed graded doses of potash mixed with rat feed (g/g)**

Parameters (mmol/L, Meq/L &mg/dL)	Control 1	Test 11	Test 111	Test 1V	Test V	Test V1	Normal Range
Na+	142.2±1.48	139.8±11.23	144.4±3.85	139.6±10.36	135.83±5.6	137.75±4.35	135-148
K+	4.34±0.46	3.92±0.23	3.88±0.16	3.92±0.26	4.03±0.18	4.03±0.13	3.5-5.3
CL-	96.8±1.30	94.00±2.45	93.6±3.29	96.00±2.00	94.67±1.21	93.25±1.50	97-108
HCO <sub>3</sub> -	27.50±0.84	26.20±2.17	26.80±1.92	26.40±2.07	26.17±1.17	26.50±1.29	24-30
Urea	43.0±5.00	36.60±4.34	39.00±4.90	35.00±3.16	34.67±2.66	35.50±1.19	15-40
Cr	1.49±0.18	1.25±±.08	1.35±0.18	1.23±0.12	1.22±0.11	1.24±0.11	1-2

**Key:** ALT, AST & ALP=iu/L  
 Alb, Urea & Cre =mg/dL  
 Na+, K+, HCO<sub>3</sub> & Cl=Meq/L

**Discussion.**

Potash, a by-product of organic material used for various purposes in different African settings. Communities in northern part of Nigeria, in West Africa, use it as herbal remedy to treat various ailments (Rabiu & Malami, 2018). In the southern part of the same country it is used at homes and hotels in culinary, meat and cowpea tenderizer and dish enhancer while in most communities it is a major component of tobacco snuff, a recreational beverage consumed mostly by elderly people of the society. It is reported that Hausa women use it to prepare special porridge with millet and guinea corn which they often take after childbirth in order to boost breast milk production (Oyeleke, 1988). Evidence abounds that potash has ever before now used by many communities of West Africa for different purposes despite growing speculation about its safety.

Nevertheless, recent scientific evidence shows that potash has no deleterious effects on liver enzymes within a regulated dose (Iweka *et al*, 2016 & Rabiu and Malami, 2018). Our acute toxicity results show that the above maximum dose of 11.31g/kg of potash is capable of causing morbidity and mortality in study animals (body weight 120-160g) which corroborated the work of Iweka and Colleagues (2016). For this reason, the proportion of potash used for any purpose can never be of equal magnitude with the congener. This is similar to Maggi, a condiment which is a taste enhancer made up of monosodium glutamate. This culinary agent according to literature is capable of causing malignancy but because it is used in small quantities and in combination with other carbohydrate substances, it is rendered innocuous. The results

of liver function tests, albumin test, serum electrolyte tests and renal function tests of our study fell within normal ranges and did not deviate significantly to the results of control animal group of the same parity ( $p < 0.05$ ). The normal values of serum albumin which showed no significant difference with the values of control group is an indication that potash has no deleterious effects on liver enzymes when ingested within a narrow-limited dosage. Also, the work of Rabiou and Malami (2018) showed that potash is safe within a calculated narrow range for treatment of certain ailments. Potash, therefore, has no deleterious effects on liver, albumin, serum electrolytes and kidney functions when used in minimal doses especially as a condiment in culinary and as an additive. The safety margin calculated from our study underscores the emphasis on the use of potash as an additive in culinary and congener in beverages but never to be consumed as a wholesome substance.

### Conclusion

Potash is safe for all domestic use at moderate dosage.

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