



ACUTE TOXICITY STUDY OF "GADAGI" TEA ON RATS

*A. M. Gadanya, M. S. Sule and M. K. Atiku

Department of Biochemistry, Bayero University, Kano.

*Correspondence author

ABSTRACT

Acute toxicity study was carried out on three most common types of "Gadagi" tea preparations, "sak", "sada" and "magani".. LD₅₀ values of each type of the tea were determined. Results of phase I and phase II of the study showed no mortality was recorded in any of the experimental groups of rats in 24 hours and up to four weeks after oral administration of 5000mg/kg of each type of the tea. Hence, oral administration of all the "Gadagi" tea preparations studied at a dose of less than or equal to 5000mg/kg (equivalent to 7.90cm³, 6.90cm³ and 8.20cm³ for "sak", "sada" and "magani" respectively) could be safe.

Keywords: Acute Toxicity, Lethal Dose, "Gadagi" tea.

INTRODUCTION

Acute toxicity is the ability of a chemical to cause ill effect "relatively soon" after one oral administration or a 4 – hour exposure of a chemical in air (Senin, 2006). "Relatively soon," is usually defined as a period of minutes, hours (24) or days (up to about 2 weeks) but rarely longer (Senin, 2006). LD stands for "Lethal dose." LD₅₀ is the amount of material, given all at once, which causes the death of 50% of a group of test animals. The LD₅₀ is one way to measure the short – term poisoning potential (acute toxicity) (Senin, 2006).

Toxicologists can use many kinds of animals but most often testing is done with rats and mice. It is usually expressed as the amount of chemical administered (e.g. milligrams) per 100grams (for smaller animals) or per kilogram (for bigger subjects) of the body weight of the test animal. The LD₅₀ can be found for any route of entry or administration, but dermal and oral administration methods are the most common. The LD₅₀ value obtained at the end of the experiment is identified as LD₅₀ (oral), LD₅₀ (skin) e.t.c. as appropriate. The most frequently performed lethality study is the oral LD₅₀. The results of oral studies are important for drugs, food and accidental domestic poisonings. In general, the smaller the LD₅₀ value, the more toxic the chemical is. Also, the larger the LD₅₀ value, the lower the toxicity (Senin, 2006).

LD₅₀ value can be compared to other values using a toxicity scale. Confusion sometimes occurs because several different toxicity scales are in use. The two most common scales used are the "Hodge and Sterner scale" and the "Gosselin, Smith and Hodge scale (Senin, 2006)." These tables/scales differ in both the numerical rating given to each class and the terms used to describe each class. It is important to know that the actual LD₅₀ value may be different for a given chemical depending on the route of exposure (Oral, dermal, inhalation) (Senin, 2006).

"Gadagi" tea is a composite used as a stimulant mostly by drivers and commercial motorcyclists in Kano and some parts of Northern Nigeria. Many "Gadagi" tea consumers get involved in accidents which the society rightly or wrongly attributed to the negative effect of the tea. There are three major types of "Gadagi" tea, viz:

1. "Sak"/baki: This is a mixture of sugar (76g), highland tea (5.69g) and mint plant (0.3g) boiled together in water (1 liter).

2. "Sada": This is a mixture of sugar (114g), highland tea (5.69g), ginger (4.40g), lemon grass (0.30g), mint plant (0.30g) and negropepper (0.34g) boiled together in water (1 liter).

3. "Magani": This is a mixture of sugar (76g), highland tea (5.69g), leaves of *Citrus aurantiifolia* (3.50g), garlic (1.00g), chips of African mahogany (3.80g), mango leaves (2.50g), *Thonningi sanguinea* (0.80g) and leaves of river red gum (2.50g) boiled together in water (1 liter).

Other types include, garlic/herbal, ginger, "gahwa", and "shayi da magani". The component of each varies from one individual producer to another. In addition, there are some special types called 'cockroach' and even 'bastard'. The 'cockroach' type is "Gadagi" tea with high concentration of Nescafe. The bastard type has high concentration of "Alabukun" (acetylsalicylic acid). Also, there is another type of "Gadagi" tea which is boiled with a plant called *Wiltheria indica*, which makes its consumers feel much stronger.

A study has shown that, aqueous extract of African mahogany (*khaya senegalenses*) and Tea plant (*Camellia sinensis*), which are among the major ingredients used in preparation of the tea, have hepatotoxic and hyperglycemic effects (Gadanya *et al.*, 2009). Chemical pathology and histopathology test results showed that "Gadagi" tea is hepatotoxic to rats (Atiku *et al.*, 2009). Therefore, this research work is aimed at finding out the LD₅₀ value of the tea, so as to encourage or discourage its consumption.

MATERIALS AND METHOD

Sample preparation

Samples of "sak", "sada" and "magani" types of Gadagi" tea were obtained from Kofar Wambai Market, Kano, Nigeria (one of the oldest and the most popular "Gadagi" tea market). They were subjected to

direct heating process. Residues were obtained and weighed using a weighing balance.

The procedure was repeated five times. Average weight was determined and used in the following formular for determination of amounts of tea in cm³ to be administered.

Formula:

$$\text{Amount of tea (cm}^3\text{)} = \frac{\text{Amount consumed by 70kg man in cm}^3 \times \text{Average of rats (g)} \times \text{dose (mg/kg)}}{100 \times \text{Average Amount of tea residue (g)}}$$

(Gadanya, 2011)

Where:

- Amount consumed by 70kg man = 700cm³
- Average amount of tea residue = 53.42g, 60.57g, and 51.35g, for "sak", "sada" and "magani" respectively.
- Average weight of rats = 120g for "sak" and "magani" groups, and 100g for "sada" group.

Determination of Acute toxicity (LD₅₀)

The method of Lorke (1983) was used in the LD₅₀ determination.

Three groups of four rats each were orally administered with the tea at doses of 10mg/kg, 100mg/kg and 1000mg/kg body weight and were observed for 24hours. In the second phase, four groups of one rat each were administered orally with the tea at doses of 1500mg/kg, 2250mg/kg, 3500mg/kg and 5000mg/kg. They were observed for 24hours and number of death was recorded. The same procedure was carried out on each of the three types of the tea and LD₅₀ value was determined.

preparations studied contain highland tea which is a product of tea plant (*Camellia sinensis*). All teas from *Camellia* tea plant are rich in polyphenols, which are a type of antioxidants (Stephen and Duffy, 2001). A study showed that, "Gadagi" tea contain tannins, saponins, flavanoids, cardiac glycosides and alkaloids (Gadanya, 2011). Diets containing tannins at low dosages (0.15 – 0.2%), have been shown to improve well – being of the human body (Shiavone *et al.*, 2008). Saponins enhance nutrient absorption and aid in animal digestion. Cardiac glycosides could improve circulation and heart function in congestive heart failure (El-olemy *et al.*, 1994).

RESULTS AND DISCUSSION

From the result of acute toxicity study of "sak", "sada" and "magani" (Tables 1a and 1b), no mortality was recorded in any of the experimental groups in 24hours and up to four weeks after oral administration of 5000mg/kg of each type of the tea. This is equivalent to 7.90cm³/kg, 6.90cm³/kg and 8.2cm³/kg for "sak", "sada" and "magani" respectively. For 70kg man, this is equivalent to 553cm³, 483cm³ and 574cm³ for "sak", "sada" and "magani" respectively. According to toxicity classes of Hodge and Sterner (2005), any compound with oral LD₅₀ (rat) of 5000mg/kg or more should be considered as practically harmless. This could be attributed the fact that, all the tea

However, toxicity could occur when teas brewed from plant parts containing cardiac glycosides. Significant toxicity is usually as a result of suicide attempt or inappropriate self-administration for therapeutic purposes (Raffi and Mark, 2009). Also, alkaloids have some pharmacological effects and are used as medications, recreational drugs, or in entheogenic rituals e.g. the local anesthetic and stimulant cocaine, the stimulant caffeine, the analgesic morphine or the antimalarial drug quinine (Tailang and Sharma, 2009). Hence, oral administration of "sak", "sada" and "magani" at a dose of less than or equal to 5000mg/kg could be safe.

Table 1: (a-b): Mortality recorded in Lethal Dose (LD₅₀) determination for "Sak", "Sada" and "Magani".

(a) Phase I:

Dose (mg/kg)	"Sak"	"Sada"	"Magani"
10	0/4	0/4	0/4
100	0/4	0/4	0/4
1000	0/4	0/4	0/4

(a) Phase II

Dose (mg/kg)	"Sak"	"Sada"	"Magani"
1,500	0/1	0/1	0/1
2,250	0/1	0/1	0/1
3,500	0/1	0/1	0/1
5,000	0/1	0/1	0/1

Key: ($\frac{0}{4}$) 0 = number of death, 4 = number of rats used for test

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