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Acute Toxicity and Efficacy of *Psidium guajava* Leaves Water Extract on Salmonella Typhi Infected Wistar Rats

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Abstract: The acute toxicity and efficacy of *Psidium guajava* leaves water extract on Salmonella typhi infected wistar rats had been studied. Oral administration of 10–50 mg/100 g of the extract showed no significant harmful effect in the animals after 72 h. The administration of 10-30 mg/100 g of the extract 12 h through the same route to rats infected with Salmonella typhi produced a recovery within seven days. The Salmonella infection equally responded to chloramphenicol, a conventional antibiotic used in the treatment of this infection. These results suggested that the water extract of *Psidium guajava* leave was non toxic at the tested doses and effective against Salmonella infection in wistar rats.

Key words: *Psidium guajava* leaves, rats, administration, Salmonella typhi, extract

Introduction

Since ancient times, plants have been a veritable source of drugs, man tends to ignore the importance of herbal medicine (Sofowora, 1982). The world health organization in 1997 suggested that effective locally available plants be used as substitutes for drugs. Research work on medicinal plants be intensified and information on these plants be exchanged. This thought will go along way in the scientific exploration of medicinal plants for the benefit of man and is likely to decrease the dependence on importance of drugs (Amadou, 1998).

The boiled water extract of guava plant leaves and bark are used in medicinal preparations which are utilized as remedies for dysentery, diarrhoea and upper respiratory tract infections while guava fruit paste and cheese are popular dishes in Florida, West Indies and parts of South America (Datta, 1988).

The main objective of this study is to investigate the short term harmful effect that could be associated with the use of water extract of *Psidium guajava* or otherwise its safety and the efficacy of the extract against Salmonella typhi infection. The result of this study may prompt further studies on the leaves which may lead to clinical trials in humans, where Salmonella typhi do cause illness.

Materials and Methods

Fifty-five wistar rats of both sexes weighing 200-250 g were obtained from the College of Health Sciences, Usmanu Danfodiyo University, Animal House. The animals had free access to water and feed (Pfizer, Lagos, Nig.) ad libitum. The rats were housed in clean cages and allowed one week in the laboratory for acclimatization.

Fresh leaves of *Psidium guajava* were dried and grounded into powder and a stock solution containing 5 g/500 ml of the leaves powder in distilled water was prepared, filtered and stored in a refrigerator. From this stock solution the concentration of ingredient ml⁻¹ of the solution was estimated using evaporation method (Abatan and Arowolo, 1989; Ebong, 1995). A graded concentration of the extract ranging from 10, 20, 30, 40 and 50 mg ml⁻¹ was produced.

In the first phase, thirty rats of both sexes randomly separated into six groups of five rats each. The rats in group 2, 3, 4, 5 and 6 were administered orally with 10, 20, 30, 40 and 50 mg/100 g of the extract, respectively by using mini nasogastric tubes. Those in group 1, were left without the extract (control). The animals were then observed for physical and behavioural changes as well as the number of deaths for 72 h. After this period, the rats were re-weighed to note any weight changes.

Twenty-five rats of both sexes separated into five groups, five from each group was used for this phase of study. All the rats in the five groups were infected orally with pure culture solutions of Salmonella typhi (appro. 10⁶ ml⁻¹). The animals were observed for between 24-48 h. This was to allow the infection to fully established. The rats in group 1 were left without any treatment. Those in groups 2, 3 and 4 were treated orally with 10, 20 and 30 mg/100 g of the extract every 12 h for seven days while the animals in group 5 were treated with chloramphenicol 2.5 mg/100 g 6 h for the same duration.

The results are presented as means ± SEM and analyzed by using analysis of variance (ANOVA). Significant differences were tested by Duncan's multiple range test (DMRT) (Steel and Torrie, 1980).

Table 1: The characteristic changes during the acute toxicity study on *Psidium guajava* leaves water extract in rats (n = 5 rats per group)

Groups	Doses of extract (mg 100 g ⁻¹)	Mean weight of rats before treatment (g)	Mean weight after treatment (g)	Behavioural or physical change	Number of deaths
1	0	230±5	228±4	-	-
2	10	210±3	209±3	-	-
3	20	229±2	230±4	-	-
4	30	243±2	243±1	-	-
5	40	205±10	205±7	Insomnia	-
6	50	218±5	215±3	Insomnia Irritability	-

Table 2: The effect of *Psidium guajava* water extract on wistar rats, infected with *Salmonella typhi* (n = 5 rats per group)

Groups	Type of treatment (mg/100 g)	Days			
		0	2	5	7
1	0	Fever	Fever - Reduced activity	High fever Reduced feeding Inactivity	High fever -No feeding -Inactivity -Rough hair coat 3 Deaths
2	10 (extract)	Fever	low grade fever -Reduced activity	Low grade fever -Reduced activity	Low grade fever -Reduced activity
3	20 (extract)	Fever	Low grade fever	Normal	Normal
4	30 (extract)	Fever	Normal	Normal	Normal
5	Chloramphenicol (2.5)	Fever	Normal	Normal	Normal

Results and Discussion

The effect of oral administration of various doses 10, 20, 30, 40 and 50 mg/100 g of rat body weight is shown in Table 1. The extract at the tested doses did not produce any physical weight changes or death in the animals. Insomnia and apparent irritability were observed in some of the animals receiving high doses of the extract (40 and 50 mg/100 g).

The extract in a dose dependent manner (20 and 30 mg/100 g) significantly treats the symptoms associated with *Salmonella typhi* infection in the rats after seven days of twelve hourly oral administrations. About 60% of the animals that did not receive any treatment died within one week, the rats receiving low doses of the extract (10 mg/100 g) had the symptoms suppressed with no death and the group treated with a conventional antibiotic chloramphenicol recovered fully (Table 2).

The result of this study has shown that the water extract of *Psidium guajava* leaves was relatively very safe when taken at the tested doses. At a maximum dose of 50 mg/100 g, no death was recorded in the animals. The insomnia and irritability observed in some of the animals treated with 40 and 50 mg/100 g of the extract might be due to the high concentration of ascorbic acid (vit. C) present in the extract. Ascorbic acid has been reported to produce arousal effect in animals (Ezenwanne, 1991). Wambebe and Sokomba (1986) also reported behavioural

activation in rats, following administration of ascorbic acid.

The ability of the plant leaves water extract to treat the clinical symptoms of *Salmonella* infection in rats and prolonged the life of the animals is significant. The establishment of the disease after infection with the organism was characterized by fever, refusal to feed, inactivity and deaths in the animals. The presence of these symptoms in all the animals infected and the 60% death recorded in the untreated group confirmed that the inoculated organisms did establish the disease in the rats. The response of rats in group 5 treated with chloramphenicol also support this (Table 2). The administration of 10 mg/100 g of the extract did suppress the symptoms and prolonged the life of rats, while 20 and 30 mg/100 g did eradicate them and produced a full recovery in rats. This perhaps suggest that the extract administered at 10 mg/100 g is under dosage. This result do support the rationale for the use of this extract in herbal medical practice to treat disorders like diarrhoea, cough and fever (Maurice, 1993). The extract of the fruit had been found to have antibacterial and antifungal effects (Fadeyi, 1989). Wariso (1996) reported about the use of the leaves extract in combination with others by women in Eastern Nigeria on the umbilical cord of new born babies, they claimed do prevent infection and promote fast wound healing.

It is therefore, concluded that the water extract of *Psidium guajava* has no short term harmful effect and is effective against *Salmonella typhi* infection in wistar rats.

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