

Full Length Research Article

EFFECT OF AQUEOUS LEAF EXTRACT OF TRIDAX PROCUMBENS ON BLOOD PRESSURE AND HEART RATE IN RATS.

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The Cardiovascular effects of aqueous extract from the leaf of *Tridax procumbens* were investigated on anaesthetized Sprague-Dawley rat. The intravenous administration of 3, 6, and 9mg/Kg of the aqueous extract caused significant decreases in the mean arterial blood pressure in a dose-related manner; i.e. the extract caused greater decrease in the mean arterial blood pressure at higher dose than at lower dose. Also, higher doses of the extract- 6mg/Kg and 9mg/Kg caused significant reductions in the heart rate while lower dose of the extract- 3mg/Kg did not cause any significant change in the heart rate. The hypotensive and the bradycardiac effects were immediate. The hypotensive effect of *Tridax procumbens* was inhibited by the pretreatment of the animal with atropine sulfate (1mg/kg). These results therefore seem to support the claim that the leaves of *Tridax procumbens* has hypotensive effect and that the mechanism of its action is possibly through activation of muscarinic cholinergic receptors.

Keywords: *Tridax procumbens*, Blood pressure, heart rate, acetylcholine, adrenaline.

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INTRODUCTION

Many plant species are used in folk medicine to manage hypertension due to their hypotensive properties. The plants include-*Bridelia atroviridis* Muell. Arg. (*Euphorbiaceae*) (Carallo *et al*; 1997), the *Commiphora opobalsamum* (Abdul-Ghani and Amin, 1997), extract from *Musanga cecropioides* (*Cecropiaceae*) (Kamanyi *et al*; 1996) and petal extract of *Hibiscus Sabdariffa*. (Obiefuna and Owolabi, 1993). These plants have been tested in various animal models and shown to possess hypotensive properties resulting in their use in the treatment of hypertension.

Tridax procumbens Linn (compositae) is common grass found in tropical southern part of Nigeria, growing primarily during raining season. The extracts of *Tridax procumbens* have been reported to have various pharmacological effects, antimicrobial activity against both gram-positive and gram-negative bacteria, and stimulate wound healing (Taddel and Rosas, 2000, Udopa *et al*; 1991, Diwan *et al*; 1982, and Diwan *et al*; 1983). Flavones, glycoside, polysaccharide, monosaccharides and asteraceae have been isolated from the leaves of the plant (Ali *et al*;

2001, Yadawa and Saurabh, 1998, Ali and Jahangir, 2002, and Raju and Davidson, 1994).

Traditionally, the local Yoruba population of Western States of Nigeria uses the leaf of the plant as treatment to reduce blood pressure. In an extensive search of the literature, there is no published report on the hypotensive effect of this plant as far as we are aware.

In view of the dearth of information in the literature evaluating the hypotensive property of this plant, the present study was undertaken to investigate the effects of aqueous extracts of leaves of *Tridax procumbens* on the blood pressure and heart rate in rats and to elucidate its mechanism of action.

MATERIALS AND METHODS

Fresh leaves of *Tridax procumbens* were collected from the botanical garden of the Lagos State University, during the month of June and July and were identified and authenticated by the Botany Department of the Lagos State University. Following identification, a voucher specimen of the plant was deposited in the herbarium of the Botany Department of Lagos State University, Lagos State. The plant extract was prepared by

blending and macerating 500g of the air-dried leaves of *Tridax procumbens* with 100ml of 0.9% (w/v) NaCl solution and kept at 40°C for 24 hours for extraction to take place. The resulting mixture was filtered and the extract recovered from the filtration by evaporation under reduced pressure in a Rotavapor with water bath set at 40°C. The resulting residue was weighed and reconstituted in 0.9% (w/v) NaCl solution to a final concentration of 2.2g/ml and kept wet-frozen in ampoules until ready for use.

Drugs:- The drugs used were: Urethane, alpha chloralose, heparin, adrenaline, acetylcholine and atropine sulfate. All drugs were purchased from sigma.

Experimental Procedure: Adult male albinos Sprague – Dawley rats weighing between 200-350g were used. The animals were housed in a cage in an environmentally controlled room at 21-24°C with free access to standard food and water.

On the day of the experiment the rats were anaesthetized with a 50:50 mixture of 25% urethane and 1% alpha chloralose at a dose 5ml/kg per body weight. The rat was dissected to expose the trachea. The trachea was cannulated for clear airway and spontaneous respiration.

The femoral artery and vein were exposed and cannulated using polythene catheters (3FG outer diameter 0.7mm and 15cm long). The femoral artery was connected to a pressure transducer and physiograph for pressure recording while the vein was used for injection of drugs and plant extracts. After cannulation, the rats were injected with heparin, 600u/kg per body weight to prevent blood clotting.

After 30 min period of equilibration the rats were injected with 0.1-0.5ml saline (NaCl 0.9%) or with the same volume of aqueous extracts of *Tridax procumbens*, the arterial blood pressure was allowed to return to the resting level between injections. The changes in blood pressure before and the lowest blood pressure after injection were noted. The heart rate was measured using a cardiac transducer model 7082 to polygraphic two channel recorder model 7070 of Ugo Basile Italy.

The possible interaction between the hypotensive action of *Tridax procumbens* extracts and cholinergic and adrenergic systems was studied by injecting the aqueous extracts immediately after treatment with different doses of the muscarinic receptor blocker atropine (1-6mg/kg) or immediately before treatment with the appropriate agonist acetylcholine (2ug/kg) or adrenaline (2ug/kg)

Statistics: The results are presented as mean standard error of the mean (SEM). The difference of means values were assessed for

statistical significance by using students t-test, value of p equal or less than 0.05 were taken to imply statistical significance.

RESULTS

In normal anesthetized rat the intravenous injection of aqueous extracts of *Tridax procumbens* (3, 6 and 9mg/kg) produced an almost immediate and significant reduction in mean arterial blood pressure (p<0.05). The hypotensive effects and duration were dose-dependent as shown in Table 1. Higher doses of the extract (6 and 9mg/kg) produced a more significant decrease in blood pressure.

Table 1: Changes in mean arterial blood pressure (MABP) following intravenous injection of different doses of aqueous extract of *Tridax procumbens*.

Extract Dose (mg/kg)	Reduction in MABP (mmHg)	Duration: (seconds)
Saline	-2.0± 2.3	
3.0	- 28.8± 3.0+	38.3± 4.6
6.0	- 35.0± 4.8*	46.7± 4.0
9.0	- 44.5± 5.7*	62.2± 6.2

Value represent the mean ± SEM (n=8)
 Reduction in MABP is the maximum changes in mean arterial blood pressure following the injection of the aqueous extract.
 MABPs of rats before each injection were 130.5 ±2.2.mmHg (n=8) * (P<0.01), + (P< 0.05).

TABLE 2: Changes in the heart rate following intravenous injection of aqueous extract of leaf of *Tridax procumbens*

Extract Dose (mg/kg)	Heart rate (beats/min.)	Reduction in Heart rate %
Saline	369.6± 6.6	
3.0	306.6± 15.4*	17.0
6.0	235.0± 27.6**	36.0
9.0	160.0± 13.6**	56.7

Values represent mean ± SEM (n=8); *p<0.05, ** p<0.01

Aqueous extract of *Tridax procumbens* also reduced significantly the heart rate of rats at doses of 6mg/Kg and 9mg/Kg. However, a lower dose of 3mg/Kg did not cause any significant change in the heart rate (Table 2)

The interaction of the extract with adrenaline did not produce any significant effect on arterial blood pressure and heart rate. However, pretreatment of the rat with atropine before injection of *Tridax procumbens* extract

significantly prevented the hypotensive effect of the extract (Table 3).

TABLE 3:

Effects of cholinergic and adrenergic agents on the hypotensive action of aqueous extract of *Tridax procumbens*

Treatment	Change in MABP (mmHg)
Extract alone (6mg/kg)	-35.6± 4.8
Adrenaline alone (2ug/kg)	+34.3± 3.8
Adrenaline (2ug/kg) after extract (6mg/kg)	+34.3± 3.8
Extract (6mg/kg) after adrenaline (2ug/kg)	-27.6± 3.4
Acetylcholine alone (2ug/kg)	-18.0 ± 2.0
Acetylcholine (2ug/kg) after extract (6mg/kg)	-30.8± 3.2
Acetylcholine (2ug/kg) after atropine (1mg/kg).	-2.2± 0.4
Extract (6mg/kg) after atropine (1mg/kg).	-15.0± 3.1

- Duration of each injection was approximately 15 second, followed 1 min later by a second injection of either saline or test agonist or antagonist lasting approximately 15 second.

DISCUSSION

The results of this investigation showed that the aqueous extract of the leaf of *Tridax procumbens* lowered mean arterial blood pressure and heart rate in normal rats. The dose-dependent nature of the effects of the leaf extract of the plant on blood pressure and heart rate of the rat suggests a cumulative action of the active substance(s) present in the leaves of the plant. This observation agrees with the earlier reports (Taddel and Rosas, 2000 and Udopa *et al*; 1991) on some biological activities of the *Tridax procumbens*.

The depressor and bradycardiac effects of the leaf extract of the plant are independent of adrenergic receptors since the extract had no effect on the increased blood pressure and heart rate caused by adrenaline. It may however be necessary to investigate further on the effect of the plant on high blood pressure induced by other means apart from adrenaline before any conclusion on its therapeutic value can be made. Meanwhile, the antagonism of the hypotensive effect of the extract by atropine pretreatment seems to suggest the involvement of cholinergic mechanism in the action of the leaf extract. It is however well-known that the stimulation of the cholinergic system in many animal species results in both hypotension and bradycardia (Ganong, 1993). Further studies may be necessary to elucidate the phytochemistry of the active principles in the leaf extract of the plant-*Tridax procumbens*.

In conclusion, the results of this study seem to support the traditional claim that the leaf of *Tridax procumbens* has blood pressure lowering effect and this is probably mediated through activation of muscarinic cholinergic receptors.

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