Antihypertensive and hematological effects of *Tribulus terrestris* Aqueous Extract

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Abstract

The effect of 100 and 50 mg/kg body weight *Tribulus terrestris* aqueous extract at on the cardiovascular system of rats was studied. Initial heart rate of 160, systolic100 & diastolic 40was considered as normal pressure.. One minute after extract administration the blood pressure and heart rate of rats were raised. The rats' blood pressure continued in a remarkable increasing manner reaching a 180 systolic, 150 diastolic mm/Hg and the heart rate beat were 200, no mortality was observed. Perfusion pressure was raised with the aqueous extract administration then reduced to the normal level after 90 minutes. It was concluded that aqueous extracts of *Tribulus terrestris* possess significant hypotensive activity in hypertensive rats. The hypotensive effects of *Tribulus terrestris* appeared may be due to the direct arterial smooth muscle contraction and membrane hypo polarization. These results suggested the curative effect of *T. terrestris* aqueous extract on hypertensive animals.

Key words: Plant, hypertension, blood constituent

Introduction

Tribulus terrestris family: Zygophyllaceae is widely distributed plant in Sudan and is locally called as Dereisa. It is used traditionally for various medicinal purposes including treatment of kidney troubles, particularly stones. In the classical Chinese medicine *Tribulus terrestris* is used as tonic and have been used in treating a variety of diseases including hypertension and coronary heart disease, ocular inflammation and infertility of both sexes (Gauthaman *et al*, 2003). *Tribulus terrestris* has been commonly used in folk medicine in Turkey as diuretic and against colic pains, hypertensions and hypercholesterolemia (Arcasoy *et al*, 1998). It is also used as a remedy for leprosy, Scabious skin disease and psoriasis, headache, hepatitis, inappetence, ophthalmia, stomatitis, vitiligo and vision disorders (Adaikan *et al*, 2000). Also it has been shown to increase the free serum testosterone, (Brown *et al*, 2001). In previous studies, *Tribulus extract* revealed hypotensive , cardiac depressant effects and contractile activities on smooth muscles ,Mossa *et al* (1983). *Tribulus terrestris* has significantly lowered the blood pressure and it has been found to be effective in treating angina pectoris by dilating the coronary arteries and improving the cardiac circulation Wang *et al* (1990). This plant has an antimicrobial and cytotoxic activity (Ali *et al*, 2001). It has been shown to reduce the amount of urinary oxalate, Sangeeta *et al* (1994) and it has antiurolithic activity in experimentally induced urolithiasis in rats too (Ananad, *et al*. 1994). It was that found saponins from *Tribulus terrestris* inhibited the growth of a certain type of liver cancer cell line, (Ray, 2001).

Materials and Methods

***Preparation of the aqueous extract of *Tribulus terrestris*:**

Whole aerial parts of the plant were collected from Butana area –Central Sudan- The specimen were air-dried, powdered and homogenized. 2.5g of the dried plant material of *Tribulus terrestris* were refluxed with 100 ml of water in a round bottom flask fitted with condenser on a heating mantle at set temperature 100^{o}C for 5-6 hours. The solution was filtered through Whatman; No.1 filter paper. The residue was refluxed again with fresh water adopting similar conditions and filtered as above. The combined two filtrates were concentrated using Buchi Evaporator under reduced pressure. The concentrated extract was transferred into weighed dishes and freeze dried

The solid extract was weighed and kept in for later use. The approximate percentage yield of the extract was 31.1%.

Thirty healthy rats, weighing 250–300 g. were used as experimental animals. The animals were kept and maintained under optimum laboratory conditions at 25-28^{o}C temperature, 70% humidity, and a photoperiod of 12 hrs they were allowed to feed standard pelleted diet of 20% crude protein and 2.5 (Mcal ME/kg) and free access to water. Groups B and C were administered with *Tribulus terrestris* aqueous extract orally at a dose of 100 mg/kg body weight and via intravenous route at a dose of 50 mg/kg body weight respectively. Two other groups were designated as controls and administered with distilled water. The aqueous extract was administered to normotensive rats to observe the increase in rat's blood pressure at both systolic and diastolic pressure and the increase or decrease of heart rate was measured and compared to control non treated groups.

***Hematological activity of *Tribulus terrestris*:**

Aqueous extract of *Tribulus terrestris* was administered orally to 10 rats at a dose of 4g/kg body weight daily for 15 consecutive days. Hematological values were measured and compared with those of normal rats, Hb level, Hct, MCV, MCH, MCHC, platelet count and RBC count were evaluated.(Zygophyllus was used as stander toxic plant extract that cause hyper pressure in experiment animals).

Results: and Discussion

Aqueous extract of *Tribulus terrestris* administered orally at doses of 100 and 50 mg/kg body weight of starting material was administered via oral and intravenous routes in normotensive rats produced significant increase in rat's blood pressure (Fig 4). Both systolic and diastolic were significantly increased and the heart rate showed no significant increase compared to control. Addition of extra dose of *Tribulus terrestris* aqueous extract to hypertensive rats significantly reduced the blood pressure to the normal values (table 1, figure 1)

***Hematological activity of *Tribulus terrestris*:**

The treated group developed a significant reduction ($P<0.01$) both in mean corpuscular volume (MCV) and the mean total white blood cells (WBC) ($P<0.001$) and significant increase ($P<0.02$) in platelets numbers compared to the controls. The mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) was found to be in the normal range (figure 2).

Table [1] the effect of *Tribulus terrestris* aqueous extract on blood pressure and heart rate:

Groups	Systolic Pressure mm/Hg	Diastolic Pressure	Heart rate (mm/Hg)

Tribulus terrestris extract	150	103.3	170
Normal rats(control)	100	40	160

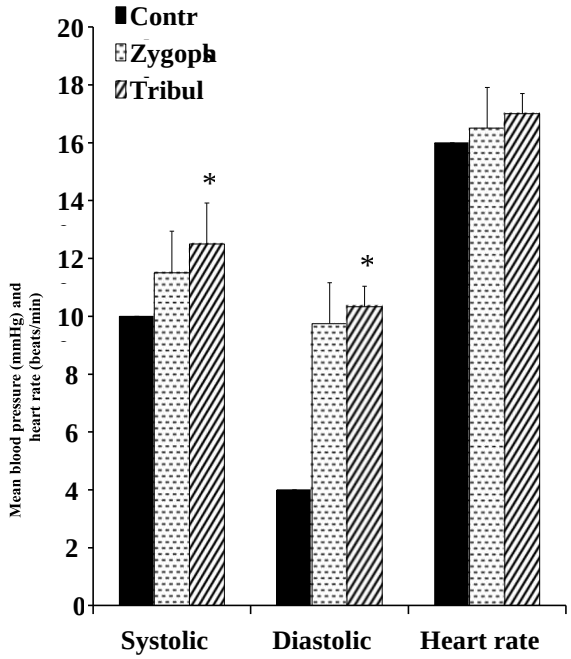

Figure [1] The effect of *Tribulus terrestris* aqueous extract on blood pressure and heart rate

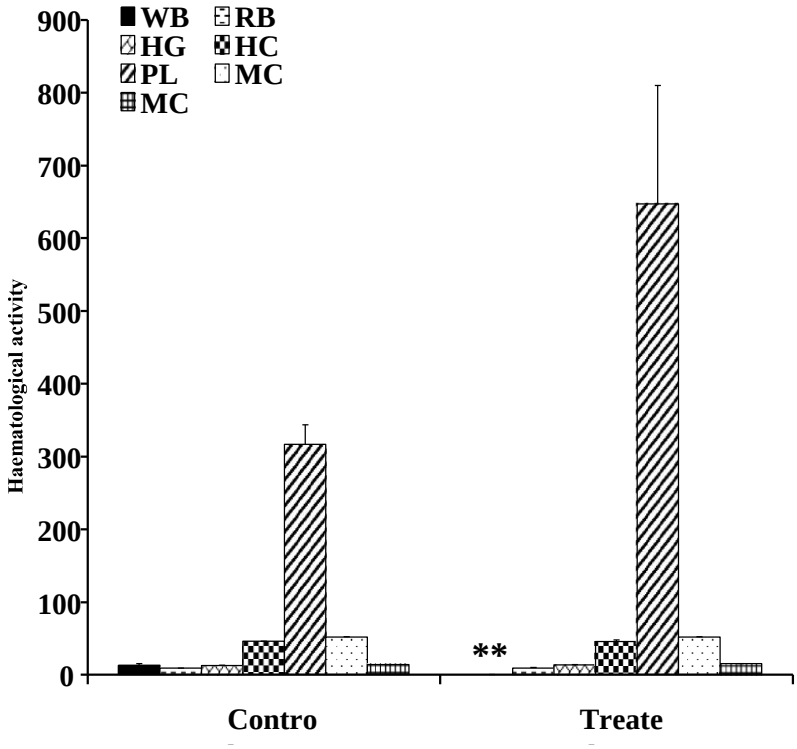

Figure [2] The chronic toxicity: Effects of *Tribulus terrestris* aqueous extract on Hematology

Discussion

Intravenous and intragastric treatment of normotensive and / or hypotensive rats with the aqueous extract of *Tribulus terrestris* resulted in a significant increase in hypertension. However, additional dose of the extract to the already hypertensive rat resulted in significant reduction in blood pressure. This finding has dual effects of *Tribulus terrestris* that caused hypertension on normotensive rats and antihypertension on hypertensive rats.
Our findings are in agreement with those of (Mossa *et al*., (1983)_, Rees et al., (1990),wag *et al*., (1990) ,AlAli *et al*., (2002), Sharifi *et al*,(2003) ,Oludotun *et al*,(2005).
The mechanism responsible for the antihypertensive activity has not been elucidated and it is still not fully understood, Sharifi, *et al*.,(2003) and Oludotun *et al*.,(2005) .Sharifi *et al*., suggested that the antihypertensive mechanism might be related to the plant inhibitory effect on angiotensin converting enzyme (ACE) and possibly through inhibition of (ACE) in controlling renovascular hypertension. In addition to this mechanism its ability to increase nitric oxide(NO) release from the endothelium and nitrergic nerve endings (Adaikan *et al*.,2000) and direct smooth muscles relaxant effects (Arcasoy *et al*.,1998) including a vasodilator effect mediated via a direct effect of the arterial smooth muscles or interfering with other neuroeffector mechanisms such as adrenergic systems. Rees *et al*,(1990) indicated that the antihypertensive effect was partly dependant on nitric oxide released from the vascular endothelium, or due to membrane hyperpolarization vasoconstriction produced by the low dose in addition to releasing NO from the vascular endothelium.
The major chemical constituents of *Tribulus terrestris* from aqueous or (alcoholic) methanolic extracts are the steroidal saponins Yan *et al*.,(1996), The beneficial effects of these chemicals have partly been attributed to their ability to increase nitric oxide (NO) release from the endothelium and nitrergic nerve ending and direct smooth muscle relaxation (Wang ,*et al*.,(1997), Arcasoy *et al*.,(1998), Adaikan *et al*.,(2002), Oludotun ,*et al*.,(2005).
While Wag *et al*,(1990) mentioned that *Tribulus terrestris* extracts has been found to be effective in treating hypertension and angina pectoris by dilating the coronary arteries and improving the cardiac circulation. In contrast to our result Sharifi *et al*., (2003) confirmed that the methanolic and not aqueous extract dosedependently and reproducibly increased blood pressure and when the blood pressure was raised it produced reproducible and dose-dependent reduction, this because methanolic extract contained vasoconstrictor and vasodilator substances while the aqueous extract contained only vasodilator substance. However, in the current study *Tribulus terrestris* aqueous extract has hypertensive effects on normotensive rats, and it reduced significantly the blood pressure of the already hypertensive rats. On the other hand, *Tribulus terrestris* aqueous extract has caused a reduction in Mcv values which indicates that chronic administration of this plant may cause microcytic anemia.

Conclusion

It is concluded that *Tribulus terrestris* aqueous extract has vasoconstrictor and vasodilator effects and may have a curative antihypertensive effects with the fact that its chronic administration can be a cause of microcytic anemia.

Acknowledgements:-

The authors would like to thank Zayed Complex for Herbal Research and Traditional Medicine, United Arab Emirates for their technical assistance, providing the instruments and continuous helping. This work was supported by the Sudan Ministry of Higher Education and Scientific Research.

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