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Evaluation of abortifacient efficacy of *Rumex steudelli* (Tult) root traditionally used medicinal plant in South West Ethiopia

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ABSTRACT

The practice of traditional medicine for the control of fertility in most part of South Western Ethiopia is based on the uses of plant medicine for many years. The present study was carried out in female albino rat to explore the abortifacient activity of the *Rumex steudelli* roots. Pregnant rats weighing 140- 200 g were randomized into 7 groups. Rats were laprotomised on 10th day of pregnancy and the two horns of uteri were examined to determine the implantation sites. The administration of 400 mg/kg body weight of the aqueous extract of *Rumex steudelli* resulted in 95% abortion. The 200 and 400 mg/kg body weight alcoholic extract showed 100% fetus abortion. The phytochemical screening of the roots of *Rumex steudelli* revealed the presence of flavonoids, phenolics, alkaloids, steroids, tannins and saponins.

Keywords: Abortifacient, Female albino rat, *Rumex steudelli*, Post implantation, Resorption.

INTRODUCTION

The relationship between plants and human beings is not limited to the use of plants for food, clothing, religious ceremonies, ornamentation and shelter but also includes in human healthcare. They are used globally as therapeutic agents since ancient times ^[1].

Several plant products inhibit male and female fertility and may be developed into contraceptives. Even though, many indigenous plants have been shown to prevent the birth, only few plants have so far been investigated for their anti-fertility activity ^[2].

Some of these plants had spermicidal effects; other caused reduction in the sperm counts and altered the mobility of the sperms, some of them caused testicular change and altered hormone levels ^[3]. Over 7500 species of plants are estimated to be used by the ethnic communities of human and veterinary healthcare in different parts of the world ^[4]. It is necessary that we should have full knowledge regarding the occurrence, frequency distribution, phenology and other aspects for their proper utilization.

Throughout the history women have tried to control or enhance their fertility with various levels of societal support. Many herbal remedies are traditionally used as contraceptive (to prevent the ovulation or fertilization), abortifacients (to prevent implantation) and emmenagogues (to prevent the uterine flow) or oxytocics (to stimulate uterine contractions, particularly to promote labour) ^[5]. A number of plants species have been tested for fertility regulation beginning about 50 years ago and were subsequently fortified by national and international agencies ^[6]. Numerous herbs have been reported used historically by women to aid child delivery, stimulate menstrual flow or reduce fertility ^[7]. Therefore, the screening of plants with abortifacient activity and the subsequent identification and characterization of the active principle will prove to be useful guide towards the formulation of cheaper, affordable contraceptive with reduced toxicity.

Traditionally the tribal women prefer plant medicines rather than modern medicines for menstrual trouble, conception disorders, birth control practices, sterility, abortion ^[8].

Rumex steudelli (Amharic: Tult) belongs to family Polygonaceae, which is widely distributed in various parts of South West Ethiopia. The genus *Rumex* comprises around 200 species that are distributed geographically in tropical regions. It is usually an erect plant, usually with long tap roots.

The present work was undertaken to validate scientifically the abortifacient role of *Rumex steudelli* root as acclaimed by the traditional tribal users of Oromia region and South Nations and Nationalities region of South Western Ethiopia.

OBJECTIVES

General Objectives

- To study the potential abortifacient activity of the *Rumex steudelli* roots extract (aqueous and alcohol) in female albino rats

Specific Objectives

- To determine the presence of the major constituents of the extract *Rumex steudelli* roots
- To study the potential abortifacient activity of aqueous extracts of *Rumex steudelli* roots
- To study the potential abortifacient activity of alcoholic extracts of *Rumex steudelli* roots
- To investigate the acute toxicity of the *Rumex steudelli* roots

MATERIALS AND METHODS

Collection of plant material

The roots of *Rumex steudelli* plant were collected from different forest areas (Kersa, Gomma, Wushwush, Temenja Yaji, Janchu, Dedo) of Jimma Zone in Oromia Region and Bench Maji Zone in South Region, South western Ethiopia. The roots were identified and authenticated by experts from department of Plant Biology and Biodiversity Addis Ababa University, Ethiopia.

Preparation of extract

The roots of *Rumex steudelli* were collected, shade dried, powdered and subjected to soxhlet extraction successively with distilled water and alcohol. The extract was evaporated to near dryness on a water bath and kept at 4°C in refrigerator until the experimental testing.

Phytochemical screening

The presence of various plant constituents in the plant extract was determined by preliminary phytochemical screening as described by Thimmaiah [9].

Procurement and rearing of experimental animal

Healthy wistar strain female albino rats of about two month old and weighing 140- 200 g were procured from Plant Biology and Biodiversity laboratory, Addis Ababa University. The rats were housed in polypropylene cages and maintained under environmentally controlled room provided with a 12:12 hour light and dark cycle approximately at 25°C. They were fed on pellets and tap water. The rats were allowed to acclimatize to laboratory environment for 15 days before experimentation.

Acute toxicity study

The animals were divided in four groups of six rats each. The extract was administered orally at the dose of 100, 200 and 400 mg/kg body weight to the first three groups respectively. The fourth group was treated as control and received the vehicle only. The rats of both experimental and control groups were observed for 72 hr. for behavioural changes and mortality [10].

Abortifacient activity

The plant extract were tested in female albino rats for abortifacient activity by the method described by Khanna and Chaudhary [11]. The vaginal smears of caged female rats of known fertility were monitored daily. Unstained material was observed under a light microscope. The proportion among the cells observed was used for determination of the estrous cycle phases [12].

The female rats were caged with males of proven fertility in the ratio of 2:1 in the evening and examined the following day for the evidence of copulation. Rats exhibiting thick clump of spermatozoa in their vaginal smear were separated and that day was designated as 1st day of pregnancy. These rats were randomly distributed into 7 groups, one control group and 6 experimental groups of 6 animals each. On the 10th day of pregnancy animals were laprotomised under light anaesthetic ether using sterile conditions. The two horns of uteri were examined to determine the implantation sites. There after the abdominal wound was sutured in layers. Post operational care was taken to avoid any infection.

The extracts to be tested were then fed to operate pregnant rats. i. e. aqueous extract and alcoholic extract. *Rumex steudelli* (roots) at dose of 100 mg/kg, 200 mg/kg and 400 mg/kg body weight daily by an intragastric (i.g.) soft rubber catheter from day 11 up to the 15 day of pregnancy. The animals were allowed to go full term. After delivery the pups were counted and the abortifacient activity of extract was evaluated. Litters were examined for any malformations.

Statistical Analysis

All the data are expressed as mean \pm SEM (Standard error). Statistical analysis was done by Student's t-test and one way ANOVA [13].

RESULTS AND DISCUSSIONS

Preliminary phytochemical screening of *Rumex steudelli* roots revealed the presence of alkaloid, steroids, flavanoids, phenolics compound, saponins and tannins. The flavonoid isolated from *Striga lutea* and *Striga orabanchioides* possessed strong estrogenic and abortifacient properties [14, 15]. Flavonoids isolated from *Butea monosperma* have been reported to possess antifertility activity [16]. Alkaloids like constituent were reported to be possibly responsible for the suppressant effect on the uterine normal contraction and the high anti-implantation activity exhibited by the aqueous extract of *Graptophyllum pictum* [17]. Similarly alkaloids, steroids, flavonoids, saponins present in the *Rumex steudelli* extract might be responsible for its contraceptive activity. Sex hormones being steroidal compounds, the plant sterols were suspected to be responsible for its antifertility effects.

Clinical toxicity symptoms such as respiratory distress, salivation, weight loss and change in appearance of hair as well as maternal mortality were not observed at any period of the experiment. Similarly no mortality and changes in the behavioural, neurological and autonomic profile were observed in treated groups. The lowest dose 100 mg/kg and the highest dose 400 mg/kg body weight was used for abortifacient activity.

This suggested that short term use for this purpose is apparently safe. Similar finding was also observed by Tajuddin, *et al* [18], while working on ethanolic extract of *Myristica fragrans* and Zade, *et al* [19] on *Moringa oleifera* in female rats.

The roots of *Rumex steudelli* extract have been in use by the tribals of South Western part of Ethiopia (Kersa, Gomma, Wushwush, Temenja Yaji, Janchu, Dedo) as a means of abortifacient even without recourse to the scientific validity of the claim. Hence this study was carried out to validate scientifically this tribal claim. The oral administration of *Rumex steudelli* root extract (aqueous and alcohol) at the doses of 100, 200 and 400 mg/kg body weight produced a dose dependent adverse effect on fertility index and on number of implantation in the uterine horns of the female rats by virtue of an increase in the percentage of the post-implantation embryonic loss. The extracts of *Rumex steudelli* root when evaluated for their abortifacient activity, were found to exhibit pregnancy interceptive activity.

The abortifacient activity is expressed as percentage resorptions of fetus in uteri (Table 1).

Abortion refers to the premature expulsion of the products of conception from the uterus. Abortion may be due to maternal exposure to chemicals, which can disrupt pregnancy and cause detachment of the embryo [20].

The number of litters born due to the treatment of alcoholic and aqueous extract was significantly less than that of control. This indicates the abortifacient nature of the roots *Rumex steudelli*.

In the present study the administration of 400 mg/kg body weight of the aqueous extract resulted in 95% abortion. This was evident from decrease in the percentage of live fetuses. The 200 and 400 mg/kg body weight ethanolic extract showed 100% fetus abortion (Table 1).

Table 1: Effect of aqueous and ethanol extract of *Rumex steudelli* (roots) on fertility of rats when fed orally from day 11 to 15 of pregnancy

Treatment Groups	Drug dose (mg/kg body wt.)	Body weight (gm)	Sample size	No. of foetus in individual rats on day 10	No. of litter Delivered	No. of resorption in individual rats	No. of resorption in Mean \pm S. E.	% abortifacient activity
Control	-	150-200	6	8,7,9,8,6,7	8,7,9,8,6,7	0,0,0,0,0,0	0	Nil
Aqueous extract	100	150-200	6	10,9,7,6,8,9	5,4,3,3,4,4	5,5,4,3,4,5	4.33 \pm 0.33	53
	200	150-200	6	9,7,8,9,4,7	1,2,2,3,1,2	8,5,6,6,3,5	5.50 \pm 0.67	75
	400	150-200	6	6,4,6,7,8,6	0,0,1,1,0,0	6,4,5,6,8,6	5.83 \pm 0.54	95
Alcoholic extract	100	140-190	6	9,6,8,7,5,6	1,0,1,1,1,1	8,6,7,6,4,5	6.00 \pm 0.58	88
	200	150-200	6	5,8,4,6,8,6	0,0,0,0,0,0	5,8,4,6,8,6	6.17 \pm 0.65	100
	400	160-200	6	11,8,9,6,8,7	0,0,0,0,0,0	11,8,9,6,8,7	8.17 \pm 0.70	100

CONCLUSIONS

The present study suggests that the root extract of *Rumex steudelli* possesses abortifacient activity and these findings could explain its traditional use as an abortifacient agent. The administration of 400 mg/kg body weight of the aqueous extract of *Rumex steudelli* resulted in 95% abortion. The alcoholic extracts exhibited significant abortifacient activity. The 200 and 400 mg/kg body weight alcoholic extract showed 100% fetus abortion. The phytochemical screening of the extracts revealed the presence of flavonoids, phenolics, alkaloids, steroids, tannins and saponins. However an identification of its active constituent merits further detailed investigation.

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