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Effects of aqueous crude extract of *Securidaca longipedunculata* on the uteri and ilea of rats and rabbits

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Abstract
The aqueous extracts of *Securidaca longipedunculata* were investigated *in vitro* and *in vivo* in rats and rabbits. This study compares primarily the pharmacological actions of the root, stem and leaf extracts. The aqueous extracts (leaves, stem and root) of *Securidaca longipedunculata* were found to produce dose dependent contractions of the smooth muscles of the rat and rabbit uteri and ilea. The root extract produced the greatest response compared with the leaves or stem extract; hence, its use for the rest of the work. The root extract enhanced oxytocin-induced contractions of uteri smooth muscles. The oxytocin-like effect of the extract is consistent with the use of the extract locally to induce abortion. It was observed that the pregnant uteri (rat and rabbit) were more responsive than the rat uterus. Concentrations ranging from 0.1 mg/ml to 1.6 mg/ml were tried in this work. At a dose of 10mg/ml the root extract produced no effect in few regular cycling rats while the same dose induced irregular cycles (cyclic disturbances) in most of the rats that had regular cycles. The cyclic disturbances induced by the root extract coupled with its oxytocin-like effect limit its use in pregnancy as it may cause abortifacient effect.

Keywords: *Securidaca longipedunculata*; Uterus; Ileum; Oxytocin-induced contractions

Introduction

The plant, *Securidaca longipedunculata* belongs to the family, Polygalaceae. It is found mainly in the savannah wood land and on sandy or rocky soils. The plant is a shrub or a small erect tree of up to 20 feet high. It is also a climber with alternate, often entire, and sometimes big glandular leaves. The leaves are dark green with rounded apex. The branches are pubescent and the flowers are racemes reddish purple (Hutchinson, 1967). *S. longipedunculata* is commonly used in local medicines and is also often combined with other herbs in many parts of the world. In Hausa it is called "Sanya, Uwar magunguna" meaning the mother of all medicines, "Ipeta" in Yoruba and "alali" in Fulani. Msonthi (1984) reported the presence of saponin, methylsalicylate and tannin in the root extract and is used as an anti-inflammatory agent for treating rheumatism. It also has antiemetic effect and is used to treat snake bite, possessing antivenom effect (Staphan, 1964).

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Pousset (1984) reported the use of the root for treating headache and that the root, stem and leaves extracts have been screened primarily to compare their pharmacological actions and secondly to verify some of the therapeutic claims by using the root extract.

Experimental

Plant collection and identification. The plant material (leaves, stem and root) used in this work were obtained from the Department of Biological Sciences Herbal garden, Ahmadu Bello University, Zaria. It was accordingly identified and authenticated in the same department by Mr. U.S. Gala. Sample of the plant material was deposited in the herbarium for future references.

Experimental animals. Female Wistar rats (190 – 250g) and rabbits (1.8kg – 2.5kg) bred in the animal house, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria were used for this work. The animals were housed under standard environmental conditions of temperature, relative humidity and light. They were fed on locally formulated standard diet and had water *ad libitum*.

Extraction. The fresh root, stem and leaves of the plant, *Securidaca longipedunculata* were dried in open air under shade for a period of four weeks prior to the extraction process. The aqueous extract of the plant parts were obtained by decoction in accordance with the general process described in USP XII. The dried leaves, stem and root were coarsely powdered respectively and 30g of the powdered leaves, stem and root were each soaked in 150ml of cold, distilled water for 24 hours and then boiled for 15 minutes. They were allowed to cool at 40°C.

The decoctions were filtered and evaporated to dryness to yield an extract of 4.0% w/v, which was used for the studies.

A. Smooth muscle preparations

(i) Rabbit and rat ilea. 2 – 3cm strips of rabbit and rat ilea were suspended in an organ bath under a tension of 0.5g containing Tyrode solution, aerated with pure oxygen and maintained at a temperature of 37°C. Muscle contractions were measured using microdynamometer and its isotonic transducer (Ugo Basil). The preparations were allowed to equilibrate for 30 minutes before dosing with the extracts. Concentrations ranging from 0.1mg/ml to 1.6mg/ml were used for both rabbit and rat ilea and uteri preparations.

(ii) Rabbit and rat uteri. Rabbit (pregnant) and rat (pregnant and non-pregnant) were used. Non-pregnant female animals were brought into oestrous stage by pre-treatment with stilboestrol 0.1mg/kg (i.p) for 24 hours. 2 -3cm strips of the uterine horns (fallopian tubes) from the sacrificed animals were suspended in an organ bath containing Dejalon solution, aerated with pure oxygen and allowed to equilibrate for 60 minutes. Uterine recordings were also done as described above.

B. Reproductive study

Oestrous cycle. Female Wistar rats (180 – 250g) were subjected to daily vaginal smear between 10:00am and 11:00am and only rats that exhibited at least three consecutive, four day cycle were included in the study. The animals were injected with the root extract 10mg/kg (based on previous behavioural experiments), intraperitoneally (i.p) at proestrous (P), oestrous (E), metoestrous (M) and dioestrous (D) stages and their oestrous cycle observed for 12 days thereafter.

In another set of experiment, non-cyclic animals were used and the same procedure carried out as with cyclic rats.

Results

The leaves, the stem and the root aqueous extracts of *Securidaca longipedunculata* were observed to contract the smooth muscles of the rat and rabbit ilea and uteri in a dose dependent manner. The

root extract produced the greatest effect as compared with the leave and stem extracts. The response with the leave extract was the least while the root extract produced the greatest. The threshold response was observed at a concentration of 0.1mg/ml (fig 1). Concentrations ranging from 0.1mg/ml to 1.6mg/ml were tried in this work. The responses of the root extract (used for routine Work) were enhanced by oxytocin (fig. 2). It was observed that the pregnant uteri (rabbit and rat) were more responsive to the root extract than the non-pregnant rat uterus while the rabbit uterus was more responsive than the rat uterus (both pregnant and non-pregnant) (Fig. 3 & 4).

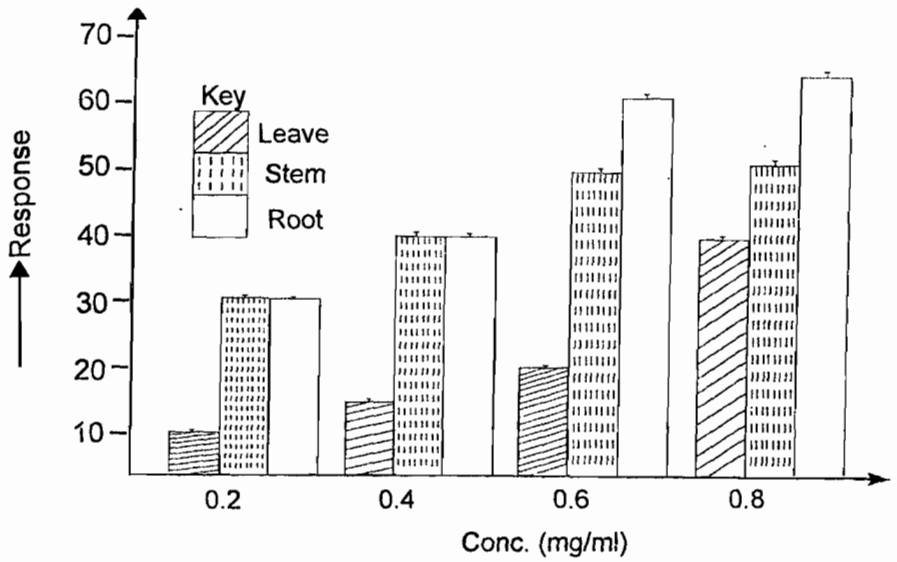

Fig. 1: The effect of leaves, stem and root extracts of securidacal longepdunculate on rat ileum

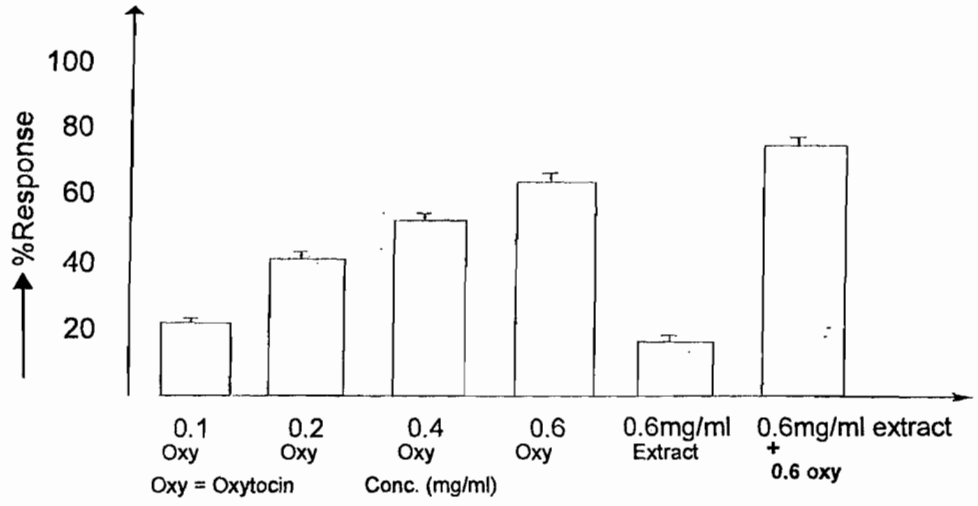

Fig 2. Effect of the root extract of *secundata longepedunculate* on oxytocin-induced contraction of pregnant rat utarus

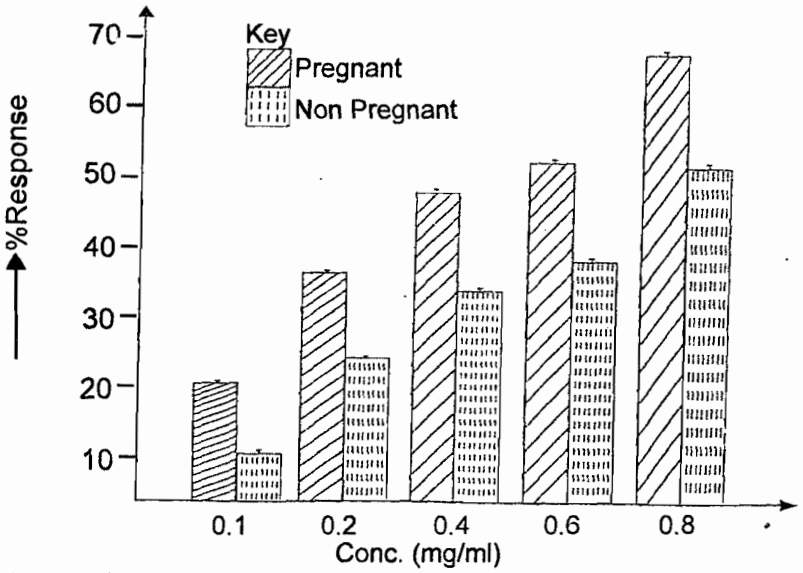

Fig. 3: The contractile responses of pregnant and non-pregnant rat uteri

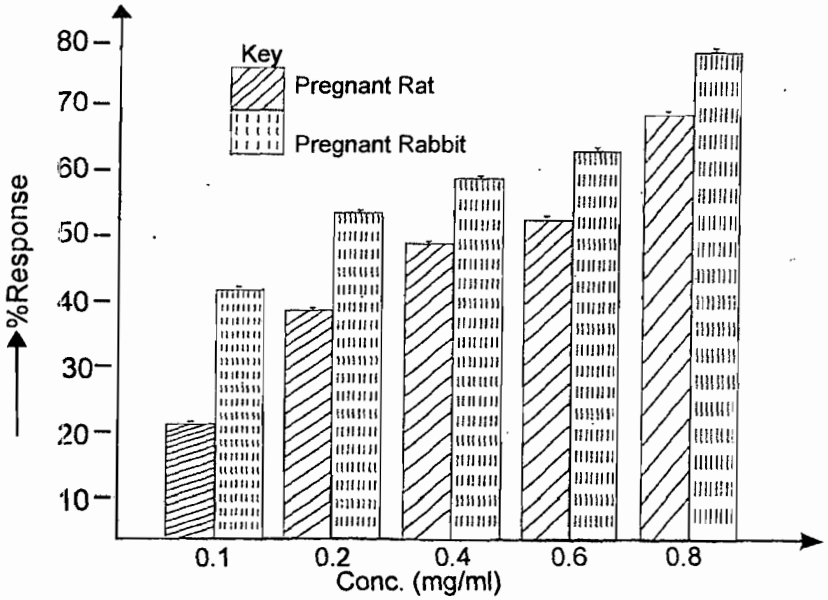

Fig. 4: The contractile responses of rat and rabbit pregnant uteri

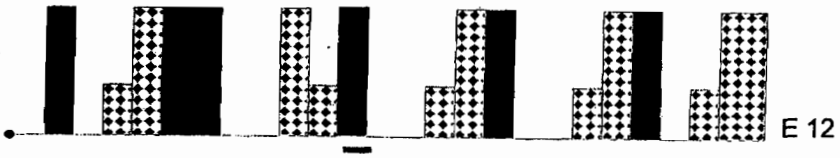

Fig. 5: Changes in oestruous cycle in normal cycling rats before and after intraperitoneal (I.P) administration of *Securidaca longepedunculata* root extract(10mg/kg) Proestrus (P) Oestrus (E) Metoestrus (M) and Dioestrue (D) are respectively indicated by low column, high column, solid column and Blank. A solid bar below each record stands for the period the drug was administered and the number at the end indicates the duration after drug administration.

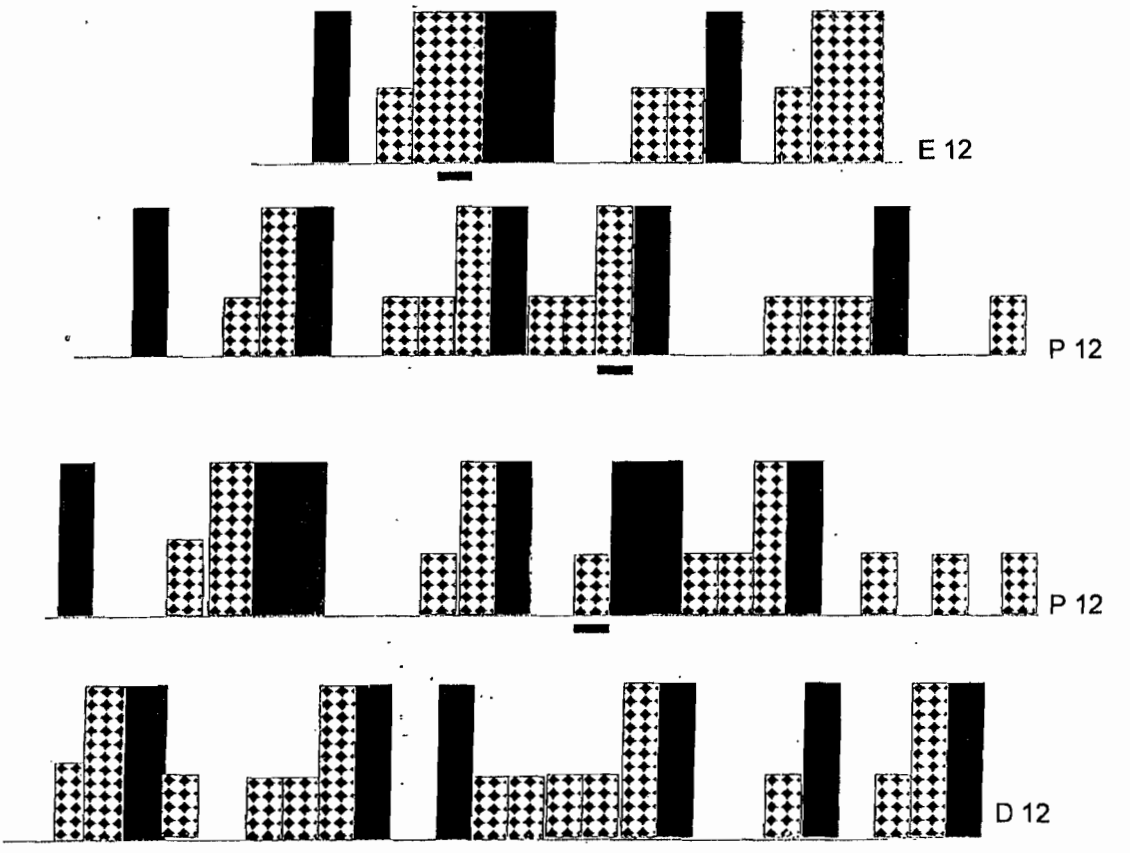

Fig 6. Changes in oestous cycle in non-cycling rats before and after intraperitoneal (I.P) administration of *Securidaca lougepedunculata* root extract (10mg/kg). Proestous (P) oestrous (E) Metoestrus (M) and Dioestrous (D) are respectively indicated by low column, high column, solid column and blank. A solid bar below each record stands for the period the drug was administered and the number at the end indicates the duration after administration.

Results obtained from these studies showed that the root aqueous extract of *Securidaca longipedunculata* had no effect in few cyclic rats but disrupted the regular cycles (cycling disturbances) in most rats. The extract further produced cyclic disturbances in non cyclic rats (Fig. 5 & 6). The number 12, in the result, at the end of each oestrous stage indicates the duration of days after drug administration and a solid bar below each record stands for the period (the stage) that the drug was administered.

Discussion

The leaves, the stem and the root aqueous extracts of the plant, *Securidaca longipedunculata* produced a dose dependent contraction of rat and rabbit ilea and uteri. The root extract was found to produce the greatest responses compared with the leaves and stem extracts (fig. 1). This implies part of the plant where substances responsible for the contractile responses, are mostly found. Our finding is consistent with that of Msonthi (1984) who reported that the root extract has the highest concentration of the active ingredients.

Oxytocin-induced contraction of the uterine preparation was enhanced by the root extract. The oxytocin-like effect of the extract is therefore consistent with its use locally to induce abortion. It was noted that the pregnant uterus was more responsive than the non-pregnant uterus. This is consistent with the state of the uterus as observed by Williamson *et al.*, (1996) when adult non-pregnant animals were injected with stilboesterol 24 hours prior to the experiment so as to induce oestrous stage. The increased responses of rabbit uterus compared with the rat uterus may be due to species differences. This has been shown by Brazeau (1965) who reported striking differences in uterine responses among various experimental animals and between animals and man.

The results obtained from the effect of the extract on reproductive system showed that the extract disrupted cyclic rhythm in most cyclic rats but produced no effect in few normal cyclic rats. The extract also produced cyclic disturbances in rats that were not cycling regularly. The overall effect of the extract of the cyclic rhythm is therefore cyclic disturbances although few rats were not affected. This is usual as a drug can produce an adverse effect on some individual without necessarily causing the same effect on few others. Like menstrual cycle, oestrous cycle in rats is age limited and controlled by suprachiasmatic nucleus (SCN) of the hypothalamus. Available data provide evidence for the existence of monosynaptic path from the SCN to the gonadotrophin releasing hormone (GnRH) in the hypothalamus of the female rat. This pathway contains at least vasoactive intestinal polypeptide (VIP) as a putative transmitter and plays a role in the circadian regulation of oestrous cycle in the female rat. Lesion of SCN has been shown to interrupt oestrous cycle and activity pattern in laboratory animals (Van der Beek *et al.*, 1993). It has also been recognized that lesions of the suprachiasmatic region in the rat resulted in persistent oestrous stage (Moore and Eucler, 1976; Flerko, 1996). That is, the female rat exhibits continuous vaginal oestrous for prolonged periods without evidence of oestrous cycle. This region is responsible for producing oestrous or heat.

The results obtained from our studies suggest that, apart from its oxytocin-like effect, the extract may also decrease the activity of the clock mechanism (suprachiasmatic nucleus) controlling gonadotrophin secretion and thus adversely affect the reproductive functions of the animals. This explains the disturbances in the normal cycle rhythm produced by the administration of the extract to the normal cycling rats and exacerbation of cyclicity in abnormal cycling rats.

The results also showed that the extract produced oxytocin-like effect without necessarily affecting the reproductive function of the animals since the extract produced no effect on few normal cyclic rats. However, it is difficult to predict the dose of the extract that will produce its oxytocin-like effect without affecting the reproductive function as a dose of 10mg/kg was found to produce no effect in few normal cyclic rats while the same dose produced cycling disturbances in most of the rats.

References

Brazeau, P. (1965): Drugs affecting uterine motility. In: "The Pharmacological Basis of Therapeutics". Louis, S. Goodman and Alfred Gilman (eds). 3rd edn. The Macmillan Company, New York, London and Toronto. Pp. 888.

Flerko, B. (1966): Control of gonadotrophin secretion in the female. In: Martini, L. and Ganong, W.F. (eds) Neuroendocrinology Vol. 1. acad. Press, New York. Pp. 613 -668.

Hutchinson, J. (1967): The genera of flowering plant. 2nd edition; Oxford University Press. Pp. 336 – 343.

Moore, R.Y. and Eucler, Y.B. (1976): Central mechanism in diurnal rhythm regulation and

Neuroendocrine responses to light. *Psychoneuroendocrinology*, 1: 265 – 279.

Poisset, J.L. (1984): Journal: Inflammatory properties of the plant *Securidaca longipedunculata*. Faculty of Medicine and Pharmacy, University of Dakar, Senegal; Reported by Aboyemi. Pp. 353.

Staphan, H. (1964): Across Africa, 2nd edition. Pp. 73.

Van der Beek, E.M., Wiegant, V.M., Van der Donk, H.A., Van den Hurk, R. Buijs, R.M. (1993): Lesions of the suprachiasmatic nucleus indicate the presence of a direct VIP containing projection to gonadotrophin releasing hormone in the female rat. *J. Neuroendocrinol.*, 5: 138-144.

Williamson, E.M, Okpako, T.D. and Evans, J.F. (1996). "Pharmacological methods in phytotherapy research".Vol. I, John Wiley & Sons pp 191-213.