

Research Article

Antifertility Studies on the Stem - Bark of *Detarium senegalense* J. F. Gmelin (FABACEAE) on Female Mice.

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Abstract

The drugs that control fertility are termed anti-fertility agents and are also called oral contraceptives. Many plants are reported to have fertility regulatory activity. The aim of the present study was to investigate the antifertility activity on the stem bark of *D. senegalense* on female mice. In the present study anti-fertility evaluation was carried out using three extracts from stem bark of *D. senegalense* by oral administration at doses of 200mg/kg and 400mg/kg. Control was maintained using 2ml normal saline. After 14 days of treatment the female mice were mated with male mice in the ratio of 2:1. After 10 days of mating laparotomy was carried out and the number of implantation sites in the uterine horns were recorded. The anti-implantation activity of the three extracts when administered before mating was significant when compared with control. The results of the present study conclude that the extracts of *D. senegalense* were observed to have anti-implantation activity which supports the basis of its use in traditional medicine as contraceptive.

Keywords: *Detarium senegalense*; Antifertility; Implantation; Female mice.

INTRODUCTION

Detarium senegalense, J.F. Gmelin (Fabaceae) is a native of tropical Africa, found close to river bank. It grows naturally in the drier regions of West and Central Africa. *Detarium senegalense* is a medium sized to fairly large tree up to 35–40 m tall; it is planted as fruit tree and as ornamental shade tree [1]. It is commonly known as tallow tree. It is also known as “Kwakuragwahiu” and “Taura” in Kilba and Hausa languages respectively [2]. It is also known as “Ofo” (Igbo), “Gatapo” (Kanuri) and “Ogbogbo” (Yoruba). The stem bark, seeds, leaves and roots extracts of *D. senegalense* are widely used in herbal

medicine in Nigeria. Reports have shown that the stem bark of *D. senegalense* is used as a contraceptive traditionally in Sokoto [3]. Leaf and shoot decoctions are used to treat fever, trypanosomiasis, dysentery, anaemia, conjunctivitis, [4] arthritis, inflammations, fractures, boils and skin complaints [5].

Drugs that control fertility are called anti-fertility agents and are also termed oral contraceptives. They affect and are involved in the menstrual cycle and ovulation in females. In combined form, estrogen and progesterone are given as birth control pills. When there is prevention of fertilization, ovulation,

implantation and destruction of the zygote or abortion in females, then the anti-fertility substance is considered to be active. Furthermore, this substance prevents spermatogenesis, inhibits testosterone, affects the gonadotrophin of the organs or the motility of the sperm in males. Many researchers have emphasized on the importance of plants as sources of anti-fertility drugs [6]. Herbal contraceptives and abortifacients are plants that are used in the control of birth, or in the prevention of pregnancy and for premature expulsion of a foetus from the womb. It has been reported that many plants have sterilizing, contraceptive and abortifacient properties [7]. However, the aim of the present study is to evaluate the antifertility potential of the stem bark extracts on female mice.

MATERIALS AND METHODS

Plant Material: The stem bark of *D. senegalense* was collected from Charanchi LGA, Katsina state, Nigeria. After which it was air dried, reduced to powdered form and stored in air tight containers for further use.

Extraction procedure: Extraction of the plant material was done using the method described by [8] with slight modification. The pulverized plant material (700 g) was extracted successively in 3.5 litres of n-hexane, ethyl acetate and 70% methanol using successive cold maceration in order of increasing polarity. The extract obtained was concentrated to dryness on a rotary evaporator and stored in dessicator for further experiment.

Experimental Animals: A total of 32 female and 16 male Albino mice weighing 16 g – 20 g bred in the laboratory animal unit of the Faculty of Pharmaceutical Sciences A.B.U Zaria, were used for the experiment. The animal were housed under similar condition of temperature and relative humidity, light, dark cycle. They were fed on standard diet, grower mesh and water *ad libitum*. The mice were maintained under standard laboratory conditions in accordance with the protocols approved by the ABU, Zaria Ethical Committee on use and care of experimental animals.

Anti-Fertility Studies: The anti-implantation activity was evaluated using the method employed by Pandiarajan *et al.*, and Sachin *et al.*, [9-10]. The fertile female mice were divided into eight groups of four animals each and the various groups were

treated with different dose of the extracts. The treatment was done for 14 days, on the 15th day; the female mice were kept with male mice of proven fertility in the ratio 2:1. The female mice were examined for evidence of copulation the following morning by the presence of thick clumps of spermatozoa in vagina.

After 5 days of mating, the female mice were separated from the males and were left again for 5 days to give chance for possible pregnancy to develop before laparotomy was carried out using chloroform as anesthesia in sterile conditions. The uteri horns were examined to determine the number of implantation sites and were recorded. The mice were randomly divided in 8 Groups, Each group consist of 4 animals as follows:

Group I: Positive Control (Ethinyl estradiol 0.02 mg/kg)

Group II: Negative Control (Normal Saline)

Group III: 200 mg/kg n-Hexane Extract

Group IV: 400 mg/kg n-Hexane Extract

Group V: 200 mg/kg Ethyl acetate Extract

Group VI: 400 mg/kg Ethyl acetate Extract

Group VII: 200 mg/kg Methanol Extract

Group VIII: 400 mg/kg Methanol Extract

The percentage of anti-implantation activity was calculated using the following formula (11):

% anti-implantation activity =

$$\frac{\text{Number of mice showing no implantation in each group}}{\text{Total Number of animals in each group}} \times 100$$

RESULTS AND DISCUSSION

Detarium senegalense pre-mating extracts administration had anti-implantation activity (Table 1) at all extract dose levels. The results obtained in Table 1 showed clearly that the methanol extract (ME) at doses of 200 mg/kg and 400 mg/kg were more effective than 200 mg/kg and 400 mg/kg ethyl acetate extract and 200 and 400 mg/Kg N-hexane extract. Therefore, the anti-implantation effect was extract and dose dependent. After treatment with the

three extracts and on laparotomy, the uterine horns showed not only a reduced number of implantation sites but also of smaller sizes when compared with that of the control animals.

The anti-implantation effect of *D. senegalense* stem bark extracts seen in this study suggests that the main anti-fertility property of the plant extracts could be their anti-implantation property. Positive control had 100% anti-implantation demonstrating the role of hormones in fertility. Previous research work by Daniyal *et al.*, and Dinesh *et al.*, supported this result on anti-ovulatory and anti-implantation properties of medicinal plants [12-13]. *D. senegalense* extracts

perhaps did not act as an abortifacient since there was no vaginal bleeding observed in the experimental animals. The endometrial environment might not be conducive for implantation [14].

The effect of *D. senegalense* stem bark extract on reproductive parameters provides a pointer towards possible anti-fertility properties of the extracts. Contraceptive properties of drug compounds could be anti-ovulatory, anti-fertilization, disrupt embryo implantation or cause abortion [12]. The presence of spermatozoa plugs was evidence that mating did occur and perhaps fertilization took place.

Table 1: Anti-implantation Effect of *D. senegalense* Stem Bark Extracts Administered before Mating

Groups	Doses mg/kg	No. of animals	No. of animals showing implantation	No. of animals not showing implantation	No. of Implantation	% Anti-Implantation
EE	0.02	4	0	4	0	100
NS	-	4	4	0	18	0
HE	200	4	2	2	8	50
HE	400	4	1	3	3	75
EAE	200	4	1	3	3	75
EAE	400	4	1	3	2	75
ME	200	4	0	4	0	100
ME	400	4	0	4	0	100

KEY: EE=Ethinyl estradiol; NS= Normal saline; HE=Hexane Extract; EAE= Ethyl acetate Extract; ME= Methanol Extract

CONCLUSION

The extracts from the stem bark of *D. senegalense* were observed to significantly have anti-implantation activity which supports the basis of its use in traditional medicine as contraceptive.

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