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Original Research Article

Antifertility Activity of Ethanolic Extract of *Costus pictus* Rhizome in Female Rats

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Abstract: The aim of the study is to evaluate the antifertility activity of ethanolic extract of *Costus pictus* rhizome in female rats. The Genus *Costus pictus* is an important medicinal plant called as insulin plant belonging to the family Costaceae. The rhizome of *Costus pictus* contains Diasogenin a steroidal saponin which is a potent antifertility agent. The antifertility activity of ethanolic extract of *Costus pictus* rhizome was evaluated in female rats. The extract at 200 and 400mg/kg was administered once daily for 19 days to female rats after gestation and on 20th day the rats were sacrificed to observe various parameters like Percentage of pregnant female animals in each group (PPF), Mean live foetal number per pregnant female (LFN), Mean foetal crown-rump length (FCRL), Mean corpus luteum number per pregnant female (CLN) and The Fertility Index. There was significant decrease in above parameter compared to control which indicate that the ethanolic extract of *Costus pictus* showed antifertility activity in female rats.
Keywords: *Costus pictus*, Diasogenin, antifertility activity, Fertility index

INTRODUCTION

Fertility control is an issue of global and national public health concern. Rising human population throughout the world more particularly in developing and underdeveloped parts has detrimental effects on the life supporting system on earth [1]. Fertility regulation comprising contraception and management of fertility forms an important component of reproductive health. Family planning has been promoted through several methods of contraception, but due to serious adverse effects produced by synthetic steroidal contraceptives, attention has now been focused on indigenous plants for possible contraceptive effect. Although contraceptives containing estrogen and progesterone are effective and popular, the risks associated with the drugs have triggered the need to develop contraceptives drugs from medicinal plants [2]. Hence, there is a need for searching suitable products from indigenous medicinal plants that could be effectively used in the place of pills.

The Genus *Costus* (Linn.) is an important medicinal plant belonging to the family Costaceae. The Genus as a whole is often called Spiral Ginger. The genus is represented by about 175 species distributed throughout the world. The aerial parts of the plant and rhizomes are edible, the rhizome being good source of carbohydrate, starch, amylase, protein and lipid. Moreover the rhizome is an alternative source of diosgenin, generally used to control diabetes and a suitable component for the synthesis of corticosteroids and oral contraceptives [3]. In Ayurveda, the rhizome and leaves of *Costus* species were described to be astringent, acrid, cooling, antidiabetic, purgative, anthelmintic, depurative, antifertility and expectorant [4]. Various parts of *Costus pictus* was reported to have antidiabetic [5] and antioxidant, antihyperlipidemic [6], diuretic [7], antimicrobial [8] and anticancer [9] activity. Due to presence of diosgenin, an effective contraceptive agent in *Costus pictus* rhizome, the study was conducted to evaluate the antifertility activity of *Costus pictus* rhizome, in female rats.

MATERIALS & METHODS

Plant Material & Authentication

The rhizomes of *Costus pictus* were collected within the campus of Shri Lakshmi Narayana Institute of Medical Sciences, Pondicherry. The plant was identified and authenticated as *Costus pictus* by Prof. Dr. P. Jayaraman, Director, Plant Anatomy Research Centre, and Chennai. The voucher specimen was deposited in the herbarium for further reference.

Extraction

The rhizomes were separated from the plant, washed to remove the soil debris and shade dried. The shade dried rhizomes were cut in to small pieces and coarse powder. The coarse powdered rhizome was subjected to extraction using ethanol as solvent by soxhlet apparatus. The extracts were concentrated by distilling the solvent at low temperature and vacuum dried.

Animals

Female Wistar albino rats (150-180gm) were obtained from the animal house of Shri Lakshmi Narayana Institute of Medical Sciences, Pondicherry. The animals were kept in polypropylene cages under room temperature, with 12-hour light and 12-hour dark cycle and were allowed to acclimatize for two weeks. The animals were provided commercial feed and clean drinking water *ad libitum*. The experimental protocols were reviewed and approved by the Institutional Animal Ethics Committee of the Institute.

Anti-Fertility Study [10]

Eighteen female Wistar albino rats were used in the study. The rats were paired overnight with sexually active males in the ratio of 2:1. Successful mating was confirmed by the presence of vaginal plug and or sperm cells in the vaginal smear the following morning between 9.00 and 10.00 hours. The day sperm cells were found in the vaginal smear was considered as day 1 of pregnancy. Thereafter, the female rats were randomly divided into three groups of six rats each. Group I, served as control received 1ml/kg of 0.1% Carboxy Methyl Cellulose (CMC) solution administered orally. Groups II & III rats were administered orally with ethanolic extract of *Costus pictus* rhizome at the doses of 200 and 400mg/kg respectively. All the test drugs were administered once daily for 19 days.

On day 20 of gestation, each rat was laparotomised under phentobarbitone sodium (45mg/kg., i.p). The uterine horns were dissected and incised at the greater curvature of the horns. The latter were examined for sites of implantation and resorption. Number of corpora lutea of pregnancy and number of live foetuses were determined. The postcoitum fertility index was evaluated using the following parameters according to the methods of Uchendu *et al* [11]. The following parameters were determined Percentage of pregnant female animals in each group (PPF), Mean live foetal number per pregnant female (LFN), Mean foetal crown-rump length (FCRL) and Mean corpus luteum number per pregnant female (CLN). The Fertility Index [12] was calculated by following equation

$$FI = \frac{LFN \times FCRL \times PPF}{CLN}$$

Statistical Analysis

Results were expressed as mean ± SEM. The data were analyzed by using one way analysis of variance (ANOVA) followed by Dunnet's't' test using GraphPad version 3. P values < 0.05 were considered as significant.

RESULTS

Table 1: Antifertility activity of ethanolic extract of *Costus pictus* rhizome in female rats

Drug Treatment	Live Foetus Number (LFN)	Foetal Crown Rump Length (cm) (FCRL)	Corpus Luteum Number (CLN)	Percentage of Pregnant Female (PPF)	Fertility Index (FI)
Group I Control	8.37±0.52	3.78±0.11	8.21±0.36	100	385.36
Group II *Costus Pictus* (200mg/kg)	4.07±0.13**	3.62±0.24	4.92±0.18**	50	149.73
Group III *Costus Pictus* (400mg/kg)	3.44±0.02***	3.05±0.17*	4.73±0.26**	33.33	73.93

Values are in Mean ± SEM (n=6)
*P<0.05, ** P<0.01 and *** P<0.001 Vs Control

Antifertility activity of ethanolic extract of *Costus pictus* rhizome was studied in female rats and the results were shown on table 1. After 19 days of drug treatment, % of pregnant females, foetus number, and foetal crown – rump length and corpus luteum number were determined. Based on the above observation the antifertility property of ethanolic extract of *Costus pictus* rhizome was expressed by fertility index.

The % of pregnant female was reduced to 50% and 33.33% with the 200 and 400mg/kg of ethanolic extract of *Costus pictus* rhizome respectively compared to control. *Costus pictus* significantly decreased the live

foetus number to 4.07±0.13 (P<0.01) at the dose of 200mg/kg and 3.44±0.02 (P<0.001) at the dose of 400mg/kg compared to control rats. In foetal crown rump length there was no significant change at 200mg/kg, but 400mg/kg significantly reduced to 3.05±0.17 (P<0.05). The corpus luteum number of control animal was found to be 8.21±0.36. It was significantly reduced to 4.92±0.18 (P<0.01) and 4.73±0.26 (P<0.01) by 200 and 400mg/kg of ethanolic extract of *Costus pictus* rhizome respectively. Fertility Index was decreased to 149.73 by 200 mg/kg and 73.93 by 400mg/kg of ethanolic extract of *Costus pictus* rhizome.

CONCLUSION

The results of the present study conclude the evidence for the antifertility activity of ethanolic extract of *Costus pictus* rhizome in female rats. Diosgenin, a naturally occurring steroid saponin present in the extracts of *Costus pictus* rhizome may be responsible for the antifertility activity. Further study is required to prove the exact mechanism of action of *Costus pictus* as a potent safe herbal antifertility agent.

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