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Ethanol extract of *Ricinus Communis* increased Reproductive Hormones in Female Albino rats

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ABSTRACT

The effect of 100, 300 and 500 mg/kg of ethanol extract of *ricinus communis* extract on reproductive hormone: estrogen, progesterone, LH and FSH was investigated using virgin female albino wistar rats. The results showed that at lower doses *ricinus communis* extract caused a decrease in estrogen, progesterone and LH levels at $P < 0.05$, but at high dose of 500mg/kg it caused an increase in estrogen, progesterone levels at $P < 0.05$. The extract did not have significant effect on FSH at $P > 0.05$. Data suggested that the extract increased the hormones in a dose-dependent fashion.

Keywords. *Ricinus communis*. progesterone. estrogen. luteinizing hormone. follicle stimulating hormone.

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INTRODUCTION

There have been efforts made to explore the hidden wealth of medicinal plants for contraceptive use. Castor bean plant *ricinus communis* (Linn.) belongs to the family Euphorbiaceae. Different parts of the plant have been reported to have several medicinal values [1]. In males, decorticated and defatted castor seeds have an injurious effect on sperm characters of male mice[2], and the methanol seed extract has shown a reversible negative impact on male reproductive functions [3, 4.] Different parts and extracts of castor bean have been examined to detect its capability to be used as antifertility agent among different species of female animals [5-10]. Although many studies have demonstrated the antifertility effect of *ricinus communis* in human and experimental animals [5-10,] our recent study showed that methanol extract of the seed reduced prolactin level but increased pituitary gonadotrophins in metoclopramide induced hyperprolactinemia in female rats[11] Therefore, this study was undertaken to determine the effect of *ricinus communis* methanol extract on reproductive hormones of female rats.

MATERIALS AND METHODS

Twenty virgin female albino wistar rats (150 - 200 g) were purchased from the animal house of the Department of Veterinary Medicine, University of Nigeria, Nsukka. The animals were kept in four groups of eight rats at ambient temperature (between 27°-30℃) on a 14 hours light and 10 hours dark cycle. They were fed with normal rat chow (Vital Feeds, Limited Nigeria) and tap water ad libitum. The animals were acclimatized for two weeks in the animal house of the Department of Pharmacology, Faculty of Pharmaceutical Sciences, Madonna University Elele, Rivers State. The Animal Ethical Committee of the University approved all the protocols of the study. The seeds of *ricinus communis* were purchased from Relief market, Owerri L.G.A. of Imo State. The plant materials were identified and authenticated in Pharmacognosy Department, Madonna University, Elele. The administration of extract followed our previous protocol by Agbai and Nwafor [11] Control group: (Group 1) received distilled water and normal rat chow. Group II, III and IV received oral administration 100, 300 and 500 mg/kg of body weight of the extract respectively once daily for 30 days.

Extract preparation

The outer coating (husks) of the seeds were manually removed and the residual flesh. The residual flesh was sundried for one week and ground in a grinder into pulp. The wet ground pulp (736 g) was extracted by maceration with ethanol to afford pale yellow oils (274 g) and whitish scum. The pale yellow oily form was suspended for 48 hours in 90 % ethanol to remove excess

oil and extracted using a mechanical stirrer after which it was filtered with Whatman filter paper (No 1). The filtrate was then concentrated to dryness at 35˚C in an electric oven (gallenkamp) for 24 hours. It produced a semi-solid mass when dried and stored in an air tight container in the refrigerator below 10°C.

70.1 g of the extract is then measured using an electric weighing balance and then dissolved into 350.5 ml of distilled water (1 g of extract is dissolved in 5 ml of distilled water). The extract was administered orally using a 2 ml syringe without needle. This was done carefully to prevent damage of the alimentary canal of the rats.

Sample collection

At the end of four weeks experiment, the animals were sacrificed under anesthesia with the use of chloroform. Blood was obtained via cardiac puncture and was put in a labeled EDTA anticoagulant bottle for Enzyme-linked Immunosorbent Assay. Estrogen and progesterone were done using the method by Tietz [12], whereas FSH and LH estimation by Uotila [13].

Statistical analyses

Results are expressed as mean ± SEM. Statistical significance of the differences observed between control and experimental groups (ANOVA) was evaluated by Turkey's multiple comparison at $P < 0.05$

RESULTS AND DISCUSSION

Results obtained showed the plasma levels of pituitary gonadotrophins, estrogen and progesterone at 30 days. There was no significant difference in the FSH levels at $P > 0.05$. There was significant difference in LH levels at $P < 0.05$ between groups II and III compared to control group. However, there was no significant difference in LH at $P > 0.05$ between Group IV compared with control group. There was significant difference in estrogen and progesterone levels at $P < 0.05$ between control group compared to group II, III and IV respectively.

Table 1: Oral administration 100, 300 and 500 mg/kg of body weight of *ricinus communis* extract on some hormonal profile

	LH(mIu/mL)	FSH(mIu/mL)	Estrogen(pg/mL)	Progesterone(pg/mL)
Group I	4.83 ± 0.81	4.28 ± 0.96	7.78 ± 1.90	2.78 ± 0.43
Group II	3.95 ± 0.34*	5.63 ± 0.48	7.35 ± 1.45*	2.18 ± 0.17*
Group III	4.20 ± 0.30*	5.78 ± 0.48	6.75 ± 1.33*	2.35 ± 0.42*
Group IV	5.25 ± 1.04	5.30 ± 0.44	10.50 ± 1.25*	2.50 ± 0.41*

The extract elicited a significant decrease in LH levels as well significant decrease in estrogen and progesterone levels respectively. However, 500 mg/kg of extract caused a significant increase in LH and estrogen with a slight increase in progesterone, although not significant.

The increase in LH after oral administration of 500mg/kg of extract may be due to the action of LH on its receptors mainly located in the theca interna cells by which LH acts via cAMP to increase the conversion of cholesterol to androstenedione. Some of the androstenedione is converted to estradiol, which enters the circulation [14].

Although there was no significant difference in FSH level, result in table 1 showed an increase in FSH at different doses of extract. FSH has been shown to increase estradiol in circulation by acting on FSH receptors in granulosa cells which facilitates the secretion of estradiol by acting via cAMP to increase aromatase activity. LH also stimulates the mature granulosa to secrete estradiol [15] Therefore, the increased estrogen recorded may be due to the stimulatory effect of *ricinus communis* extract on pituitary LH secretion.

It was thought in our previous report [11] that the increase in LH and FSH could be due to the lowering effect of *ricinus communis* extract on prolactin level after metoclopramide administration but the present study has showed that *ricinus communis* extract increased plasma LH and FSH by a mechanism independent of hyperprolactinemia.

As observed in group IV rats, the significant increase in LH level could be due to feedback effect of estrogen. It has been reported that during the oestrous cycle, elevated estrogen level exerts a positive feedback effect and stimulates LH secretion [14] Therefore, at dose concentration of 500 mg/kg of extract exerted a positive feedback effect on LH secretion causing the increase in LH. Studies have shown that *ricinus communis* extract possessed estrogen-like effect[5, 15]corroborating the increase in estrogen level in the present study.

The level of progesterone was significantly reduced in a dose-dependent fashion; however, the experimental rats that received 500 mg/kg of extract showed an increase in plasma progesterone. The extract could possibly increase the activity of aromatase enzyme that converts most of the progesterone to estrogen [16.] McNeil et al.,[10] have demonstrated that *ricinus communis* extract suppresses ovarian function and hence reduced the number of ova released at oestrous, whereas one seed of *ricinus communis* taken orally is capable of inhibiting ovulation in humans [17.] At low dose concentration of extract may rapidly facilitate the action of the aromatase enzyme thereby converting most of the progesterone to estrogen thereby suppressing ovarian function.

The present study suggested that the *ricinus communis* extract significantly increased the plasma level of estrogen and LH in a dose dependent fashion in line with our previous study [11].

CONCLUSION

Ricinus communis extract mediated increase in reproductive hormone is dependent on its dose

concentration. Further studies need to be undertaken to study the effect of *ricinus communis* extract on the ovary morphology and oestrous cycle in virgin female rats.

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