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ORIGINAL ARTICLE

Aqueous extract of *Carpolobia lutea* root ameliorates paroxetine-induced anti-androgenic activity in male rats

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KEYWORDS

Androgenic parameters;
Carpolobia lutea;
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Abstract *Study objective:* This study aimed to investigate the effects of aqueous extract of *Carpolobia lutea* root on the androgenic indices of paroxetine-treated male rats.

Materials and methods: Sexually active, male rats (133.10 ± 4.21 g) were completely randomized into five groups (A–E) of 5 animals each. Rats in group A received 0.5 ml of distilled water once daily for 7 days while those in groups B, C, D and E which were induced with anti-androgenicity (oral administration of 10 mg/kg of paroxetine suspension, once daily for 21 days) received 0.5 ml of distilled water and 0.5 ml corresponding to 47, 94 and 141 mg/kg body weight of the extract respectively.

Outcome: Administration of paroxetine significantly ($p < 0.05$) reduced the levels of total protein, sialic acid, glycogen, total cholesterol and testosterone as well as the activities of alkaline phosphatase, acid phosphatase, lactate dehydrogenase and gamma-glutamyl transferase in the testes of the animals. In contrast, the decreased levels of these androgenic parameters following the administration of paroxetine were reversed by the extract towards those of the normal animals that received distilled water. The 141 mg/kg body of extract completely attenuated the levels of these androgenic parameters when compared with the normal distilled water treated animals.

Conclusion: The reversibility and/or enhanced synthesis of testosterone and androgen dependent parameters by the *C. lutea* root which confers anabolic and androgenic activities on the plant may explain the rationale for its use in the management of sexual dysfunction and fertility in animals.

1. Introduction

The testes of humans and other mammals are highly susceptible to damage from genetic disorders, environment or occupational exposure to chemical compounds including drugs like paroxetine (1). Paroxetine hydrochloride, one of

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the mostly used antidepressants is a short acting, highly selective serotonin reuptake inhibitor that blocks the presynaptic serotonin transporter receptor (2,3). It delays or abolishes orgasm or libido by inhibiting the activity of nitric oxide synthase and consequently impairs copulations and decreases penile erection in rats (4). Studies have shown that paroxetine at 0.36 mg/100 g body weight significantly reduced the production and release of serum luteinizing hormone, follicle stimulating hormone and testosterone in male rats (3). It also substantially decreases the concentration of testosterone in male rats (5). The reduced bioavailability or deprivation of androgen to the testes has been reported in many studies to impede or adversely affect the normal physiology of the testes and consequently reproduction (6,7). Therefore, this growing evidence of damage to testes needs to be addressed by screening medicinal plants with androgenic, restorative or ameliorative activities.

Carpolobia lutea G. Don (family: Polygalaceae) known as cattle stick (English), ikpafum (Ibibio), Agba or Angalagala (Igbo, Eastern Nigeria) and Oshunshun (Yoruba, Western Nigeria) (8,9), is widely found in tropical rainforest of Africa, Guinea savannah of Sierra Leone and Cameroon as dense overgrowth or evergreen shrub of 5 m high (10). The leaves have been acclaimed to cure malaria, snake bite, leprosy, fever, ulcer, dermal infection, venereal diseases, sterility, diarrhoea, headache and wounds. The leaves also have been acclaimed to be used to promote child birth while the root bark has been reportedly used for treating rheumatism, fever, general pain and insanity (11–15). Furthermore, the decoction of the root is reputed in Western and Southern Nigeria (Yoruba ethnicity and Ibibios of Akwa Ibom State of Nigeria) as ''ogun aleko'' meaning sexual invigorator or aphrodisiac (14,16).

Some of the acclaimed uses of the plant that have been substantiated by scientific evidence include anti-diarrhoeal and anti-ulcerogenic activities of the ethyl acetate fractions from the leaves, gastro-protective effect of the solvent fractions from the leaves, *in vitro* anti-plasmodial and neuropharmacology activity of the leaf fraction, anti-microbial activity of the leaves, *in vivo* anti-malarial activity of the leaf and root extract, analgesic, contraceptive, antidiabetic, hypoglycaemic activities of ethanolic leaf extract and fractions and aphrodisiac effect of the aqueous root extract (5,10,16–25).

Despite these arrays of pharmacological investigations, there is dearth of information on the effects of the plant root extract on paroxetine-induced anti-androgenic activity in male Wistar rats as it relates to androgen-dependent, secretory and synthetic testicular function indices. Therefore, these studies seek to evaluate the effect of aqueous extract of *C. lutea* root on paroxetine-induced antiandrogenic activity in male rats. This is a continuation of our research investigation on the probable mode of action of the plant as an aphrodisiac in paroxetine-induced anti-androgenicity in male rats.

2. Materials and methods

2.1. Materials

2.1.1. Plant materials

Fresh roots of the plant purchased from herb sellers at a market (Oja tuntun) in Ilorin, Nigeria were authenticated at the Department of Plant Biology, University of Ilorin, Ilorin, Nigeria. A voucher sample (UIH 1092) was deposited in the herbarium of the Department.

2.1.2. Animals

Twenty-five, healthy, in-bred, sexually active, male Wistar rats weighing 133. 10 ± 4.21 g were obtained from the Animal Holding Unit of the Department of Biochemistry, University of Ilorin, Ilorin, Nigeria. The animals were placed in their respective cages and housed in a well ventilated Animal House under the following conditions: temperature: 22 ± 3 °C; 12:12 h light and dark cycle; humidity: 45–50% (26).

2.1.3. Assay kits

Assay kits for cholesterol, lactate dehydrogenase, gamma-glutamyl transferase, acid phosphatase and alkaline phosphatase were products of Randox Laboratories, Co-Atrim, UK, while that of testosterone was from Monobind Inc., Lake Forest, USA. All other reagents used were of analytical grade and were prepared in volumetric flask using all glass-distilled water.

2.2. Methods

2.2.1. Preparation of extract

The procedure described by Yakubu and Jimoh (5) was adopted. Briefly, fresh roots of *C. lutea* were sliced very thinly, oven-dried at 40 °C for 48 h and pulverized. A known weight (50 g) of the powder was extracted in 200 ml of distilled water for 48 h at room temperature with constant shaking. The lyophilized (Vir Tis Benchtop K, Vir Tis Co., Gardiner, NY) filtrate yielded 5.12 g (percentage yield of 10.24%). Calculated amounts of the yield were constituted in distilled water to give the required doses of 47, 94, and 141 mg/kg body weight as used previously by Yakubu and Jimoh (5).

2.2.2. Animal grouping and extract administration

Twenty-five male rats, after two weeks of acclimatization were assigned into five groups (A–E) of five animals each. Rats in group A (control group) were orally administered 0.5 ml of distilled water, once daily with the aid of a metal oropharyngeal cannula while those in groups B, C, D and E apart from being treated with 10 mg/kg of paroxetine suspension (prepared daily in Tween-80 (BDH Chemicals, Ltd., Poole, England), suspended in 0.9% saline solution, once daily for 21 days, also received 0.5 ml each of distilled water, 47, 94 and 141 mg/kg body weight of the extract respectively for 7 days.

2.2.3. Preparation of testicular supernatant

The rats were sacrificed by placing them in a jar containing fumes of diethyl ether. Testes excised from the rats were immersed in ice-cold 0.25 M sucrose solution to maintain the integrity of the organ. The testes were blotted with blotting paper, cut very thinly with sterile scalpel blade and then homogenized in ice-cold 0.25 M sucrose solution (1:4w/v). The homogenates were centrifuged at $894 \times g$ for 10 min and the resulting supernatant was frozen at −20 °C. The biochemical assays were carried out within 24 h of preparation.