Original article

Effect of vajikaran rasayana herbs on pituitary–gonadal axis

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Abstract

Aim of the study: Rasayan drugs act inside the human body by modulating the neuro-endocrino-immune system. Vaajikaran rasayan is the special category of rasayan which investigate the reproductive system and enhance sexual function. Curculigo orchioides, Astercantha longifolia and Mucuna pruriens are well known vajikaran rasayan herbs. The effect on sexual behaviour and reproductive parameters are reported for all these plants. There are no studies on the measurement of follicular stimulating hormone, luteinizing hormone that are release from pituitary–gonadal axis. Our objective was to study the effect of extract on reproductive hormone levels.

Materials and methods: The study was performed by administrating ethanolic plant extracts at the doses 50 and 100 mg/kg in rats. The serum hormones follicular stimulating hormone (FSH), luteinizing hormone (LH) and testosterone were measured using ELISA kit.

Results: Administration of ethanolic extract of plants significantly increases the level of follicular stimulating hormone, luteinizing hormone and testosterone level in treated groups in a dose dependent manner.

Conclusions: So it was concluded that the administration of vajikaran rasayana viz. C. orchioides, A. longifolia and M. pruriens ethanolic extracts modulate the level of the pituitary hormones FSH and LH.

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Keywords: Rasayana; Neuro-endocrino-immune systems; Curculigo orchioides; Astercantha longifolia; Mucuna pruriens; FSH; LH; Testosterone

Introduction

Rasayana are a group of herbal drug preparations widely used in Ayurveda to improve the general health of the body. Rasayana therapy nourishes and rejuvenates the body and has many facets like longevity, memory enhancement, immunomodulation and adoption. Many researchers have suggested neuro-endocrine immune axis to explain the rasayana action. Three plants of rasayan category viz. Curculigo orchioides, Astercantha longifolia and Mucuna pruriens were selected to prove this theory.

C. orchioides Gaertn. (Hypoxidaceae) is an endangered rasayana herb, native of India. It possesses aphrodisiac [1–3], immunostimulant [4], hepatoprotective [5] and antihyperglycemic [6] activity.

Astercantha longifolia Nees (Acanthaceae) is also known as Kokilaaksha. The seeds are acrid, bitter, aphrodisiac, tonic, sedative and used for diseases of the blood. The plant is reported to have antitumor [7], hypoglycemic [8], hepatoprotective [9], and haematopoietic activity [10]. Improvement in sexual behaviour and spermetogenesis has also been shown [11].

M. pruriens Linn. (Fabaceae) is a popular Indian medicinal plant, which has long been used, in traditional Ayurvedic Indian medicine. These plants qualities were pharmacologically studied for various activities like antidiabetic [12], spermatogenic [13], aphrodisiac [14], neuroprotective effect [15], antioxidant [16], memory enhancement [17] and anti-Parkinson’s activity [18].

All these plants belong to a subclass of rasayana known as vrishya rasayana—meaning the rasayana having virility and aphrodisiac activity and are constituents of many marketed formulations for impotence, sexual failure and falling libido as well as erectile dysfunction. No scientific reports substantiate action of these plants on reproductive hormones like FSH, LH and testosterone. The studies provide a scientific basis to support the use of plants as aphrodisiac by measuring reproductive hormone levels.
Materials and methods

Plant material

Seed of Astercantha logifolia (AL) and Mucuna pruriens (MP), rhizomes of Curculigo orchioides (CO) were collected from the forest surrounding the university campus. The plant was authenticated by Dr. Pradeep Tiwari, Department of Botany, Dr. H.S. Gour University, Sagar, India, where a voucher specimen (No. NSC-CO-2005) for CO, (No. B/H/512) for AL and (NSC/Mp/2007) for MP has been deposited in the Departmental Herbarium.

Preparation of the extract

Powdered plant materials were first defatted with petroleum ether (60–80 °C). The defatted marc was extracted with ethanol (95%) in soxhlet apparatus. Removal of solvent under vacuum gave AL (7%, w/w), MP (4.2%) and CO (4.08%) yields of ethanolic extract of respective plants.

Animal

Albino wistar rats of either sex weighing 120–130 g were housed in a standard environmental condition. They were fed standard diet and kept at 24 ± 2 °C and day–night cycle 06:00 h to 18:00 h. Prior permission from the institutional ethical committee of the Dr. H.S. Gour University, Sagar (M.P.), India was obtained for carrying out the experiment.

Treatment

The rats were divided into seven groups of six animals each. Group I animals served as control and received only vehicle i.e. 0.2% gum acacia suspension. Animals of groups II–VII were given ethanolic extract orally by feeding needle 50 and 100 mg/kg respectively for 28 days. After 28 days of treatment blood sample were taken from each group. Blood samples were placed at room temperature for approximately 30 min. Then, the tubes were centrifuged at 2000 rpm for 10 min, the supernatants were collected and serum was used for analysis of hormone level.

Hormone assay

Serum concentration of testosterone (Eiagen Testosterone kit, Italy), luteinizing and follicle stimulating hormones (Erba Fertikit, Germany) was measured following an immunoenzymatic method with an ELISA reader, according to the standard protocol given in assay kit.

Statistical analyses

Statistical analysis of results was performed by using a two-way factorial analysis of variance (ANOVA). A P-value of less than 0.05 was considered evidence for statistical significance.

Results

Table 1 shows the concentrations of circulating follicle stimulating hormone, luteinizing hormone, and testosterone in serum after administration of extract for 28 days. The result clearly shows that administration of extract significantly increases the level of testosterone and LH.

Discussion

Administration of extracts increased serum LH, FSH and total testosterone suggesting the stimulation of hypothalamic–pituitary–gonadal axis. The fundamental regulator of reproduction is controlled by GnRH informs the hypothalamus and its release is influenced by different neurotransmitters. The components of the extract maintain the pulse episodes of GnRH, hence an elevated level of FSH and LH is observed. Luteinizing hormone and follicle stimulating hormone are called gonadotrophins because they stimulate the gonads, the testes in males. In the testes, LH binds to receptors on Leydig cells, stimulating synthesis and secretion of testosterone. The increase in the concentration of LH significantly stimulates the synthesis and release of high levels of testosterone in blood. This leads to assume that some phytoconstituent present in the ethanolic extract may possibly mimic the function of LH to stimulate interstitial cells.

The increase in the concentration of testicular testosterone observed in the present study is an indication of the androgenic potential present in the extracts. Testosterone is the main male gonadal hormone produced by the interstitial Leydig cells of the testis. A critical level of blood testosterone is required for the maintenance of normal sexual desire, nocturnal penile tumescence, and non-erotic penile erections in most men. A certain concentration of androgens is also required for the initiation and maintenance of spermatogenesis and for the stimulation of growth and function of the prostate and seminal vesicles [19]. The androgenic potential of the extract may be due to the stimulation of spermatogenesis at the testicular level. Testosterone is used to stimulate the cell of epididymis and seminal vesicles to activate and nourish spermatozoa in corresponding organs. The combination of FSH and testosterone is qualitatively and quantitatively responsible for fully normal spermatogenesis [20,21]. These effects are likely to be mediated via the hypothalamic GnRH system.
In our study high levels of LH, FSH and testosterone were observed. The following two mechanisms are suggested for the observation. First, extract may have some constituents that act either as estrogen antagonist or as aromatase-inhibitor. When estrogen antagonist like clomiphine and aromatase-inhibitors like testolactone are administered to normal man a high level of circulating LH and FSH together with high plasma testosterone concentration was observed [22,23]. The second possibility is that some components of the extract may act on kisspeptin neuron that controls the negative feedback mechanism [24].

Testosterone level stimulates the sertoli cell to synthesize and release a variety of products like nutrients to developing spermatozoa, androgen binding protein, inhibin, etc. The synergistic effect of FSH and testosterone accelerates spermatogenesis so that a large number of spermatozoa are produced in the lumen of seminiferous tubule. Excessive number of sertoli cells causes high production of nutrients in the cells to meet the requirements of nourishment to spermatozoa. Some constituents of the extract are instrumental in producing sertoli cells which may be responsible for low production of inhibin resulting in continuous inflow of FSH.

As this situation remains consistent for a longer time, high levels of testosterone levels are observed. Increased testosterone level do not account for the persistent low sexual behaviour through activation of brain receptor. The possibility of any components activating the parasympathetic pathway in brain cannot be ruled out.

In spite of increased serum testosterone levels, no toxicity was noted. This indicates that the concentration is not supra-optimal and the hormone gets metabolized without causing any deleterious effects. The reported antihepatotoxic and antioxidant activity of the plants may be helpful in protecting any damage due to high testosterone level.

There are only few plants extracts like Lycium barbarum fruit extract (10 mg/kg) and Bryonia laciniosa seed extract (50, 100 and 150 mg/kg). Administered to rats, it increases a serum hormone level (FSH, LH, T) and accessory sexual organ weight [25,26]. This is the first report of the effect rasayana drug on the hypothalmic–pituitary–testicular axis. This opens a promising new avenue of research in the field of rasayana category.

**Conflict of interest**

No conflict of interest declared.

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**References**