ELSEVIER

Fitoterapia 78 (2007) 530 – 534

FITOTERAPIA

www.elsevier.com/locate/fitote

Effect of *Curculigo orchioides* rhizomes on sexual behaviour of male rats

N.S. Chauhan [a,*], Ch. V. Rao [b], V.K. Dixit [a]

[a] *Department of Pharmaceutical Sciences, Dr. H.S. Gour University Sagar (M.P.), India*
[b] *National Botanical Research Institute, Lucknow, India*

Received 15 July 2006; accepted 11 June 2007
Available online 3 July 2007

Abstract

The rhizomes of *Curculigo orchioides* have been traditionally used as aphrodisiac. In the present study ethanolic extract of rhizomes was evaluated for its effect on sexual behavior in rats. Administration of 100 mg/kg of extract change significantly the sexual behavior as assessed by determining parameters such as penile erection, mating performance, mount frequency and mount latency. Moreover a pronounced anabolic and spermatogenic effect was evidenced by weight gains of reproductive organs. The treatment also markedly affected sexual behavior of animals as reflected in reduction of mount latency, an increase in mount frequency and enhanced attractability towards female. Penile erection index was also incremented in treated group.

Keywords: *Curculigo orchioides*; Aphrodisiac; Sildenafil citrate

1. Introduction

Introduction of synthetic drug Sildenafil citrate and its chemical analogues has drawn tremendous public and medical attention to the concept of sex male dysfunction [1]. There is a renewed interest towards the search of traditionally herbs, which are being constantly claimed for treatment of this dysfunction [2].

Curculigo orchioides also known as Kali Musli or Syah (black) Musli is considered as aphrodisiac in traditional literature [3]. It is found in the sub-tropical Himalayan ranges of India from Kumaon eastwards and in the Western Ghats from Konkan southwards. It is also being cultivated extensively in India for commercial purpose.

The plant finds mention in Ayurvedic treatise like 'Sushruta Samhita' and 'Charak Samhita' as Rasayan or rejuvenator [4]. Its tuberous roots and rhizomes are slightly bitter and mucilaginous in taste, and are used as tonic, demulcent, diuretic and restorative [5]. It is also used as a medical cure for piles, asthma, jaundice, diarrhoea, colic and gonorrhea [6].

The plant has been shown as hepatoprotective [7,8] immunostimulant [9,10] and antioxidant [11]. Indigenous medical practitioners of Korwa and Khasi hills of state of Madhya Pradesh India, use *C. orchioides* in asthma, jaundice

* Corresponding author.
E-mail address: chauhan.nagendra@gmail.com (N.S. Chauhan).

0367-326X/$ - see front matter © 2007 Elsevier B.V. All rights reserved.
doi:10.1016/j.fitote.2007.06.005

and male sterility [12]. Tuberous roots are used as tonic for strength, vigour, vitality and find use in several restorative and aphrodisiac formulations in the Ayurvedic system of medicine [13].

C. orchioides contains carbohydrates [14] alkaloids, glycoside, saponins and sterols [15], curculigosaponin A–F [16], curculigoside B and curculignin B and C [17]. Although the traditionally use as aphrodisiac there are no scientific studies regarding the effect of *C. orchioides* on sexual behavior.

2. Experimental

2.1. Plant material

C. orchioides rhizomes Gaertn (Amaryllidaceae), collected at Sagar M.P. (India) were identified in the Department of Botany, Dr H. S. Gour University, Sagar were a voucher specimen (No. NSC-CO-2005) has been deposited in the Departmental Herbarium.

2.2. Preparation of the extract

C. orchioides rhizomes powdered and dried were defatted with petroleum ether, extracted with EtOH, dried in vacuum giving the ethanolic extract (4.08% w/w).

2.3. Animal

Druckery rats of either sex weighing 120–150 g were housed in a standard environmental condition, fed on standard diet, water ad libitum at 24±2 °C and day–night cycle 06:00 h to 18:00 h. All the animal experimentations were out carried after prior permission from the institutional ethical committee of the Dr. H.S. Gour University, Sagar (M.P.) India.

2.4. Treatment

The animals were divided in groups of 6 rats each. Group I animals served as control and received only vehicle i.e. 0.2% gum acacia suspension. Group II was administered orally with 100 mg/kg/day of the *C. orchioides* rhizomes ethanolic extract suspended in 0.2% of gum acacia. Group III was given subcutaneously 0.5 mg/kg of testosterone propionate suspended in arachis oil twice weekly and served as positive control for anabolic studies. Group IV received sildenafil citrate 5 mg/kg and served as positive control for sexual behaviour and penile erection studies. Only male rats were used for forming a group.

2.5. Effect on sexual organ weight

After 30 days of treatment the body weights of animals were taken after which all animals were killed by decapitation. Testis, seminal vesicles and prostate glands were carefully removed and weighed [2].

2.6. Mating performance

After 7 days of treatment male rat of each group was individually placed in separate cage. After 1 h five oestrous female rats were admitted into each cage. On the following day morning, 8–9 h, the vaginal smear of each female rat was examined under microscope for the presence of sperm. The number of sperm positive female was recorded in each group [18].

2.7. Penile erection index

Penile erection was observed according to Bennassi–Benelli et al. [19] modified by Islam et al. [20]. The animals were administered test drugs for 30 days. On 30th day, half an hour after the treatment the animals were observed for penile erection index for a period of an hour. Penile erection for each rat was recorded when copulatory movements were observed in males in the absence of female rat, finally the male rat bent down to lick their penis in full erection,

Table 1
Effect of the *C. orchioides* rhizomes ethanolic extract on sexual organ weight in rats

Group	Weight of animal (g)		Weight of testis (g/100 g b.w.)		Weight of prostate (mg/100 g b.w.)		Weight of seminal vesicle (mg/100 g b.w.)	
	0 days	30 days	0 days	30 days	0 days	30 days	0 days	30 days
Group I (vehicle only)	121.5±0.84	122.3±0.84	0.70±.01	0.72±.01	80.0±1.5	81.43±1.4	233.8±16	238.75±18
Group II Ethanolic extract (100 mg/kg b.w daily)	123±0.8	133.2±1.65**	0.70±.01	0.70±0.02	78.45±1.6	90.99±2.18**	224.3±14	256.75±24*
Group III testosterone propionate (0.5 mg/kg) twice weekly s.c)	121.6±0.87	132.5±0.71**	0.69±.01	0.70±0.02	78.28±1.2	89.88±1.4**	230.26±17	284.52±11**

*$P<0.05$, **$P<0.005$.

ejaculation ensuing. Penile erection index was calculated by multiplying the percentage of rats exhibiting at least one episode of penile erection during one-hour observation, by the mean number of penile erection. Penile erection index (PEI) was calculated as:

PEI = % of rats exhibiting penile erection X Mean number of erections.

2.8. Effect on male sexual behaviour

After 30 days of treatment the effect on sexual behavior of male rats was determined [2]. In brief, male rat was placed in the observation glass chambers for 5 min to acclimatize with the cage environment. Sexually receptive female rat was then dropped silently from one side of the chamber as stimulus. The observations for sexual behavior viz mount latency and mount frequency were recorded. mount latency (ML) was calculated as the time from the introduction of female to the occurrence of first mount and mount frequency (MF) was observed as total number of mounts within 30 min.

2.9. Statistical analysis

Results are expressed as mean ± S.E. The significance of the data was evaluated using one way ANOVA followed by post-hoc test. The statistical analysis was carried out using Instat 2.1 software.

3. Results

The effect of the *C. orchioides* rhizomes ethanolic extract on sexual organ and body weight is summarized in Table 1. No significant effect was observed in the weight of testis in the treated animals. Treatment with *C. orchioides* rhizomes

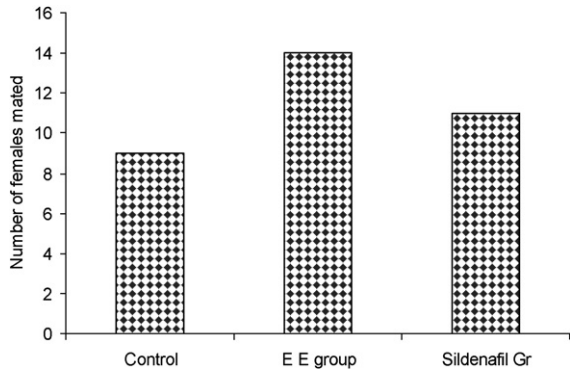

Fig. 1. Effect of the *C. orchioides* rhizome ethanolic extract on mating performance in male rats. Control: Vehicle only. EE Group: *C. orchioides* rhizome ethanolic extract 100 mg/kg/day for 7 days. $P<0.01$. Sildenafil Gr: Sildenafil treatment 5 mg/kg/day for 7 days.

Table 2
Effect of oral administration (30 day) of the *C. orchioides* rizomes ethanolic extract on sexual behavior in rats

Parameters	Mean time±SE		Penile erection index (PEI)
	Mount latency	Mount frequency	
Group I (control)	251.83±12.6	4.56±0.39	22.44±3.1
Group II ethanolic extract (100 mg/kg)	61.83±7.61**	19.16±2.8**	80.64±7.1**
Group III Testosterone propionate (0.5 mg/kg) twice weekly	165.4±7.9*	18.66±1.92*	86.7±8.9**
Group IV sildenafil citrate (5 mg/kg)	152.3±9.3*	19.2±2.3*	84.4±8.1**

*$P<0.05$, **$P<0.005$.

ethanolic extract showed 8.10% ($P<0.5$) increase in body weight, and 15.98% increase in weight of prostate gland and 14.42% increase in weight of seminal vesicle after 30 days of treatment. Testosterone administration produced a 8.96% ($P<0.05$) increase in body weight, 13.37% increase in weight of prostate and 23.56% increase in weight of seminal vesicle ($P<0.05$).

After 7 days of treatments, the extract treated Group significantly increase in mating performance from 9 in control Group to 14 ($P<0.01$) the score in the treated Group. The increase in mating performance was observed also in the sildenafil treated Group, even if not statistically significant (Fig. 1).

Penile Erection Index (PEI) was increased in all treated Groups. In control Group the value for PEI was 22.44±3.1. In the ethanolic-extract treated Group the value for PEI 80.64±7.1. It was 86.7±8.9 and 84.4±8.1 in testosterone and sildenafil treated Groups respectively which was used as positive control.

Sexual behavior of the animals was highly influenced by the treatment with ethanolic extract. Mount latency time was reduced by 75.44% in ethanolic extract and 39.52% in sildenafil treated Group ($P<0.05$) whereas only 34.32% reduction was observed in testosterone treated group. Similarly, mounting frequency was increased by four folds in ethanolic extract treated group. The result of this parameter is comparable with sildenafil treated Group (Table 2).

4. Discussion

The present investigation showed that the *C. orchioides* rhizomes ethanolic extract enhances sexual activity in male rats. Administration of extract of plant to rats for 30 days cause increase in the weight of ventral prostate gland and seminal vesicles. The androgens affect the development of secondary sex organs in the male as the growth of the ventral prostate and seminal vesicle is dependent on the presence of male sexual hormones [21,22]. Increase in the body weight of the *C. orchioides* rhizomes ethanolic extract treated rats could be due to the androgenic properties of this plant since androgens possess anabolic activity [23].

Testosterone the male sex hormone causes an increased blood flow and stimulates the growth of the target tissues. Testosterone also causes direct stimulation of spermatogenesis. Our result also show that there is an increase in spermatogenesis and weight of sexual organ in the *C. orchioides* rhizomes ethanolic extract treated Group compared to control Group [24]. These findings thus suggest a testosterone type action of the *C. orchioides* rhizomes ethanolic extract. Generally increase in testosterone level results in enhanced sexual behavior. Moreover, drug induced changes in neurotransmitter levels or their action at cellular level could also change sexual behavior [18].

The findings show that extract possess facilitatory effect and that the treatment increases sexual arousal, the state of sexual excitement or desire during sexual interaction [23]. The enhancement of sexual activity has been directly correlated to the enhancement of sexual pleasure. The effect in the *C. orchioides* rhizomes ethanolic extract treated group is much more pronounced when compared to the administration of sildenafil citrate and testosterone, which only improved penile erection. Administration of *C. orchioides* rhizomes ethanolic extract modified both the orientation as well as sexual behavior conclusively suggesting a better sexual performance after administration of the extracts.

The results thus suggest that the *C. orchioides* rhizomes ethanolic extract seems to be effective in treatment of erectile dysfunction and in enhancement of overall sexual performance in rats. The results therefore corroborate the hype of plant as herbal cure for sexual dysfunction. The findings also seems to support the traditional use of the plant as aphrodisiac.

Acknowledgements

Authors are thankful to Hetro drugs for providing Sildenafil citrate as a gift sample. One of the authors, NS Chauhan is thankful to University Grant commission, New Delhi (UGC) for providing financial assistance.

References

[1] Sandroni P. Clin Auton Res 2001;11:303.
[2] Thakur M, Dixit VK. Indian Drugs 2006;43:300.
[3] Sharma SK, Chunekar KC, Pondel K. Plants of Sharangdhar Samhita. National Academy of Ayurveda; 1999. p. 221.
[4] Chunekar KC, Yadav CL. Medicinal plants of Sushruta Samhita: European Institute of Ayurvedic studies 2005;vol. 1:201.
[5] Chopra RN, Nayar SL, Chopra IC. Glossary of Indian medicinal plants. CSIR: New Delhi India Publication; 1956. p. 84.
[6] Kirtikar KR, Basu BD. Indian medicinal plant, 2nd ed., vol. 2. Calcutta: Prabasi Press; 1987. p. 2469.
[7] Rao KS, Mishra SH. Indian Drugs 1996;33:20.
[8] Rao KS, Mishra SH. Indian Drugs 1996;33:458.
[9] Lakshmi V, Pandey K, Puri A, Saxena RP, Saxena KC. J Ethnopharmacol 2003;89:181.
[10] Bafna AR, Mishra SH. J Ethnopharmacol 2006;104:1.
[11] Venukumar MR, Latha MS. Indian J Clin Biochem 2002;17:80.
[12] Bajpai HR, Mishra M. J Hum Ecol 1998;9:295.
[13] Suri SS, Arora DK, Sharma R, Ramawat KG. Indian J Exp Biol 1998;36:1130.
[14] Tiwari RD, Misra G. Planta Med 1976;29:291.
[15] Rao RVK, Ali N, Reddy MN. Indian J Pharm Sci May–June 1978:104.
[16] Xu JP, Xu RS, Li XY. Phytochemistry 1992;31:233.
[17] Xu JP, Xu RS. Yao Xue Xue Bao 1992;27:353.
[18] Suresh Kumar PK, Subramoniam A, Pushpangadan P. Indian J Pharmacol 2000;32:300.
[19] Bennassi-Benelli A, Ferrari F, Pellegrini-Quarantotti B. Arch Int Pharmacodyna Ther 1979;242:242.
[20] Islam MW, Tariq M, Ageel AM, Al-Said MS, Al-Yhya AM. J Ethnopharmacol 1991;33:67.
[21] Vogel HG. Drug discovery and evaluation pharmacological assays. 2nd ed. New York: Springer-Verlag; 2002. p. 1177.
[22] Shivayogi PH, Shrishailappa B, Swamy HKS, Patil SB, Londonkar RL. J Ethnopharmacol 1997;56:55.
[23] Johnson MH, Everitt B. Essential reproduction. 3rd ed. Oxford: Blackwell Scientific; 1988. p. 1.
[24] Zarrow MX, Yochim JM, McCarthy JL. Experimental endrocrinology, A sourcebook of basic technique. New York: Academic Press; 1964. p. 125.