

Evaluation of Aphrodisiac Activity of *Cordyceps chaitanya* and *Cordyceps militaris* in Male Wistar Rats

Linga Gowtham¹, Pooja Kattimani¹, Salini Parameswaran Nair¹, Prashant Yuvaraj Mali²,
Santhepete Nanjundaiah Manjula^{1,*}

¹Department of Pharmacology, JSS College of Pharmacy, JSS Academy of Higher Education and Research, Mysuru, Karnataka, INDIA.

²Department of Pharmacology and Pharmacy Practice, Yashwantrao Bhonsale College of Pharmacy, Sawantwadi, Sindhudurg, Maharashtra, INDIA.

ABSTRACT

Background: Male sexual health is greatly affected by the issue of erectile dysfunction (ED), which is a complication that is characterized by persistent failure to attain or sustain an erection that can be sufficient for satisfactory sexual intercourse. The disorder has a significant prevalence among males globally and is capable of causing psychological distress, decreased self-esteem, and relationship problems. The etiology of ED is complex, and it includes impaired blood circulation of the penis (vascular insufficiency), disruption of nerve conduction, hormonal dysfunctions (in particular, low testosterone), and psychosocial stressors. Traditional pharmacological therapy of ED involves the use of phosphodiesterase type-5 (PDE5) inhibitors including sildenafil (Viagra), which act by increasing vascular perfusion of the penis, but have adverse effect profiles and are contraindicated in some groups of patients. **Objectives:** The current study was conducted to examine whether *Cordyceps chaitanya* (CC) and *Cordyceps militaris* (CM), together in a polyherbal preparation, have therapeutic value in male sexual functioning in terms of key copulatory parameters: mounting frequency (MF), intromission frequency (IF), mounting latency (ML), Intromission latency (IL), and post-ejaculatory interval (PEI) in adult male rats. **Materials and Methods:** The experimental design involved oral administration of CC and CM for 15 days, with sildenafil used as the positive control. **Results:** The treatment caused statistically significant increases in both MF and IF and significant decreases in ML, IL, and PEI, which are all indicators of aphrodisiac activity. These results indicate that this combination formulation has moderate pro-sexual efficacy, but it was weaker than sildenafil in the circumstances of the study. **Conclusion:** In general, the evidence confirms the potential of the CC and CM formulation as a natural aphrodisiac agent and the need to explore complementary therapies using herbs in combination with existing pharmacotherapies to expand the therapeutic options in ED management. More mechanistic studies are justified to help understand the mechanism of action of CC and CM in the clinical setting.

Keywords: Erectile dysfunction, *Cordyceps chaitanya*, *Cordyceps militaris*, Sildenafil, Sexual behavior.

Correspondence:

Dr. Santhepete Nanjundaiah Manjula
Professor, Department of Pharmacology,
JSS College of Pharmacy, JSS Academy
of Higher Education and Research,
Mysuru-570015, Karnataka, INDIA.
Email: snmanjula@jssuni.edu.in

Received: 24-03-2026;

Revised: 09-04-2026;

Accepted: 15-06-2026.

INTRODUCTION

Male reproductive health fundamentally depends on the capacity to produce and maintain sufficient erection to achieve and maintain satisfactory coitus; its deficiency can severely reduce quality of life, self-esteem, and relationship fulfillment.¹ Various risk factors contribute to this condition, which are cardiovascular morbidity,² dysglycaemia,³ and neuropsychiatric disorders like anxiety and depressive disorders.

The existing management interventions include phosphodiesterase-5 (PDE5) inhibitors, vacuum constriction devices, intracavernosal injection therapy, prosthetic implants, and structured lifestyle intervention.⁴ The neurovascular cascade underlying physiological penile tumescence is comprised of relaxation of corporal smooth-muscle and filling of erectile compartments with arteries.⁵ The major mediator in this cascade is nitric oxide (NO), which is produced within the vascular endothelium and the parasympathetic noradrenergic noncholinergic (NANC) nerve terminals. NO stimulates soluble guanylyl cyclase and leads to the production of cyclic guanosine monophosphate (cGMP), which subsequently causes relaxation of smooth muscle and increased penile blood inflow.⁶ Compression of subtunical venules during the same time limits the venous outflow, which stabilizes tumescence.⁷ The impairment of this pathway (especially through endothelial inadequacy and



DOI: 10.5530/pc.2026.3.17

Copyright Information :

Copyright Author (s) 2026 Distributed under
Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia, [www.mstechnomedia.com]

depletion of NO) is the cause of a considerable percentage of clinical ED cases.⁸

CM is a long-time entomopathogenic fungus used in traditional East Asian medicine.⁹ Its reported biological effects include immunomodulation, adaptation, and reproductive functions, which can be mainly attributed to cordycepin (3,2-deoxyadenosine) and high-molecular-weight polysaccharides. The increasing inclusion of this organism in nutraceutical and functional-food markets is an indicator of the growing scientific interest in this organism. CC is a new polyherbal extract formulation under the Poorna Arogya Nisarga Dhatu Health, Bangalore, where CM is prepared with four other botanicals: *Withania somnifera* (Ashwagandha), *Nelumbo nucifera* (Kamal gota), *Embllica officinalis* (Amla), and *Tribulus terrestris* (Gokhru).¹⁰ Each constituent has shown adaptogenic, antioxidant, or pro-erectile effects independently, and hence their combination is a rationally conceived candidate against managing male sexual dysfunction.¹¹ This study was thus conducted to evaluate the pro-sexual efficacy of CC and CM in sexually experienced male Wistar albino rats, through an established copulatory behavior paradigm and benchmarking of its effects against sildenafil, a selective PDE5 inhibitor that has been extensively used in clinical practice.¹²

MATERIALS AND METHODS

Preparation of 0.5% carboxy methyl cellulose

Carboxymethyl cellulose (Sigma-Aldrich, India) (0.5 g) was dissolved in 100 mL ultrapure (Millipore) water and stirred constantly. Polysorbate 80 (Sigma-Aldrich, India) (100 µL) was then introduced enhance particle dispersion, and the suspension was stirred for 6 hr to ensure thorough mixing and prevent clumping. This method guarantees the homogeneity of the solution, enabling its stability and efficacy for the intended application.

Preparation of dosing of *Cordyceps chaitanya* (CC) and *Cordyceps militaris* (CM) capsule formulation

The *Cordyceps chaitanya* (CC) and *Cordyceps militaris* (CM) formulations in the form of capsules were received as gift sample from the Poorna Arogya Nisarga Dhatu Health, Bangalore used in the study. The *Cordyceps militaris* (120 mg of powdered Cordyceps) were dissolved in ten milliliters of purified water pre-heated to 80°C. The mixture was stirred continuously and left to settle without disturbance after 7 min to be completely hydrated. The contents of one CC capsule (60 mg) were added without filtration to allow cooling to room temperature. The total volume was further split into two 5 mL aliquots, each containing 30 mg CC and 60 mg CM. The dosing volumes were corrected to the body weight of the respective animals, and each animal got one aliquot of the dose once daily, during the 15 days of treatment.

Animals

The adult male and female Wistar albino rats were acquired from a CCSEA-certified breeder and acclimatized to a 7-day period under controlled laboratory conditions (22±3°C; 30-70% relative humidity; 12-hr light-dark cycle). Laboratory grade animal food and drinking water were provided in unlimited quantities. Experimental procedures were pre-approved by the Institutional Animal Ethics Committee of the Centre of Experimental Pharmacology and Toxicology, JSS College of Pharmacy, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India (Protocol Approval No. JSSAHER/CPT/IAEC/170/2023).

Aphrodisiac properties of *Cordyceps chaitanya* and *Cordyceps militaris* in male rats

The aqueous extract of CC was tested on the pro-sexual activity in weighing 200 g 3-month-old male rats. The dose of CC in oral form was 120mg/kg with CM 240mg/kg. Sildenafil (5 mg/kg, p.o.) was used as a reference drug.¹³ Male rats were chosen according to their sexual performance in a pre-training period, and were randomly divided into four groups of six each. The main study included estrus female rats that were ovariectomized as mating partners. The protocol of grouping animals as mentioned in (Table 1).

Preparation and selection of rats for the main study

Before the actual experiment, the male rats were subjected to a 23-day habituation test of ovariectomized estrous female rats. At the beginning of every session, there was a 10-min acclimatization period in the observation chamber. The animals that did not mount and did not penetrate the vagina within 30 min after presenting to the female were considered sexually inactive and substituted with sexually active ones. The dark environment was set aside to allow formal testing of sexual performances of male and female rats, which was conducted in line with the nocturnal patterns of their activities. The quantification of the following behavioral endpoints was done in 25 min time frame.¹³ Mount frequency (MF): Number of attempts to mount before ejaculation. Intromission frequency (IF): Sum of successful vaginal penetrations made before ejaculation. Mount latency (ML): Time taken between the female introduction and initial attempt by male to mount her (seconds). Intromission latency (IL): Time taken (seconds) between female introduction and first definite vaginal penetration. Post-ejaculatory interval (PEI): Interval between end of the first ejaculatory series and the beginning of copulatory activity (seconds).

Ovariectomy in Females

Female rats were bilaterally ovariectomized at least a month prior to behavioral testing under aseptic conditions as shown in (Figure 1). The ketamine purchased from the Global Calcium Pvt. Ltd., Bangalore, Karnataka (75 mg/kg body weight) and xylazine purchased from Pharma Corporation of India, Bangalore,

Karnataka (10 mg/kg body weight) were used to anaesthetize animals. Hair removal and a chlorhexidine scrub and 70% ethanol were used to prepare the surgical site by disinfection and hair removal, respectively. Below the second right mammary gland, a transverse incision of about 1.5 cm was made, and the incisions made below the tail with later incisions being made to reach the peritoneal and abdominal musculature. Both ovaries were visualized, exteriorized, and removed, and peritoneal closure was done with an absorbable suture and skin closure with a non-absorbable suture (size 3-0). Rats were kept under filter paper bedding to avoid hypothermia and kept alone after the operation. The wounds were immersed in povidone-iodine solution twice a day, and oral tramadol was purchased from Karnataka Antibiotics and Pharmaceuticals Ltd., Bangalore, Karnataka (30 mg/kg) was administered as analgesics. Daily replacement of bedding and 10 days of sanitization of cages with Dettol® disinfectant solution were followed until full wound healing was achieved. Animals were then re-sorted. This procedure guaranteed the presence of sterility and full post-surgery treatment to reduce pain and facilitate healing, which preserved the well-being of experimental animals.¹³

Induction of artificial estrous phase

The hormonal priming was used to induce estrous in ovariectomized females. The regimen used was to administer diethylstilbestrol propionate (DES, 1 mg/kg, p. o., Natural Biogenex Pvt. Ltd., Bengaluru, Karnataka, India) 48 hr before

male-to-male mating and progesterone (5 mg/kg, s. c., Unimed Technologies Ltd., Halol, Gujarat, India) 4 hr before the test- a sequential regimen which effectively induces lordosis receptivity. Vaginal cytology was done to establish estrous phase: a 10- μ L saline lavage (0.9% NaCl) was taken using atraumatic insertion of a pipette and placed on a labelled glass slide and examined under a microscope using 10x and 40x objectives without condenser light.¹³

Statistical analysis

All the data were presented as mean $\pm$ standard error of the mean (SEM). One-way analysis of variance (ANOVA) was employed to perform between-group comparisons; in the case that the omnibus test was statistically significant ($P < 0.05$), post-hoc pairwise comparisons were carried out using Tukey's post hoc test. GraphPad Prism (version 9) was used for all statistical analyses. The statistical significance levels were established as: (a) $P < 0.05$ compared to the vehicle control group; (b) $P < 0.05$ compared to sildenafil.

Table 1: Protocol of animal grouping for the aphrodisiac study.

Groups (n=6)	Treatment
Control	Vehicle (0.5% CMC and 0.1% Tween 80), administered orally
Standard	Sildenafil 5 mg/kg was administered orally to male rats
Treatment	Each male rat received 120mg/kg CC and 240mg/kg CM, orally



Figure 1: A) Representative image showing ovary in the female rats; B) Representative image showing ligation of fallopian tube and removal of the ovary.

RESULTS

Investigation of aphrodisiac activity of *Cordyceps chaityanya* and *Cordyceps militaris* in male rats

The behavioral tests were performed on male rats that were fed with oral doses of 120mg/kg CC and 240 mg/kg CM during a 15-day period to describe aphrodisiac activity.

Aphrodisiac effect of *Cordyceps Chaithanya* and *Cordyceps militaris* on MF and IF in male rats

The MF and IF were measured in three groups over a 25-min post-administration observation, with mating sessions conducted at a 1:1 male-to-female ratio. The sildenafil (standard) group displayed a statistically significant elevation in MF (23.0 ± 0.92) and IF (17.0 ± 0.49) relative to the vehicle control group (MF: 8.0 ± 0.88 ; IF: 5.50 ± 0.43). CC and CM treatment also showed a statistically significant increase in both MF and IF and a corresponding decrease in ML and IL compared to the control group. Sildenafil was shown to be more effective when compared to the treatment drug, with a significantly higher increase in frequency and a decrease in latency, which means that the standard drug was still significantly stronger (Figure 2).

Aphrodisiac effect of *Cordyceps Chaithanya* and *Cordyceps militaris* on ML and IL in male rats

ML and IL measurements were recorded in 3 groups at a post-drug observation period of 25 min, and sessions were done in a 1:1 male-to-female proportion. The standard group exhibited a significant decrease in ML (65.0 ± 3.29) and IL (90.0 ± 5.29) relative to the control group (ML: 130.0 ± 2.54 ; IL: 171 ± 5.44). CC and CM treatment further led to a statistically significant decrease in mounting latency and intromission latency as compared to the control group. When sildenafil was compared with the reference drug, it was found to have a much better reduction in both types

of latency and was found to be much more effective in general (Figure 3).

Aphrodisiac effect of *Cordyceps chaithanya* and *Cordyceps militaris* on the post ejaculatory interval in male rats

The PEI was measured in three groups during a 25-min post-drug phase, with the male-to-female ratio being 1:1. The standard group (250 ± 31.61) exhibited a reduction in PEI relative to the control group (414.50 ± 36.88). A significant PEI decrease was also observed with CC and CM treatment in contrast to the control. When compared with the treatment drug, sildenafil proved to have a much better reduction in PEI, and it was found that the standard drug was also more effective in this parameter compared to CC and CM (Figure 4).

DISCUSSION

ED is a complex disorder that is marked by the inability to achieve or sustain a penile erection that could be used to have adequate sexual intercourse.¹⁴ Its pathophysiology involves vascular, neurological, hormonal, and psychological aspects. The decreased bioavailability of nitric oxide (NO) and endothelial dysfunction play a key role in the disruption of penile vasodilation and hemodynamic regulation.¹⁵ Also, impaired neurotransmitter signaling, decreasing testosterone levels, and psychosocial influences like stress, anxiety, and depression are also contributing to the development of ED. It is thus necessary to have a multifaceted approach to therapy, which is relevant in treating the diseases by addressing these interrelated pathways in order to achieve maximum disease management.

The *Cordyceps* genus has been used as the basis of the herbal preparation CC that has gained interest in its putative therapeutic value.⁹ Historically, *Cordyceps* species were known to have

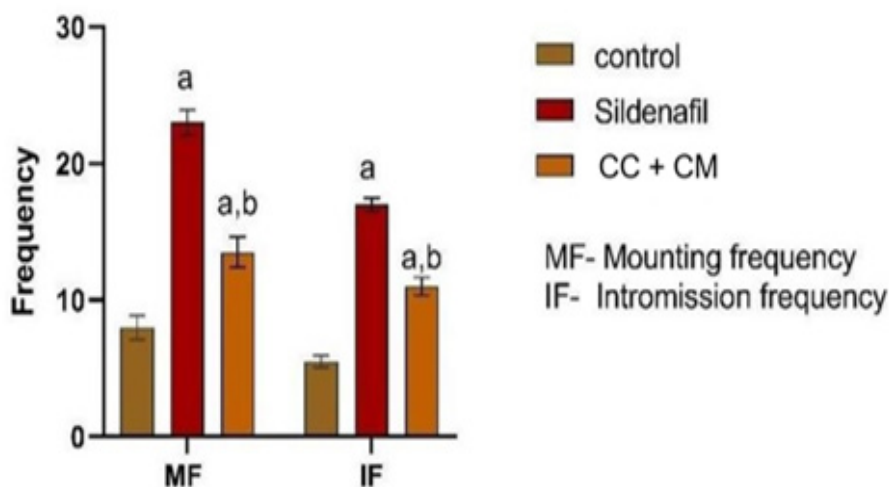


Figure 2: Aphrodisiac effect of *Cordyceps chaithanya* and *Cordyceps militaris* on mounting and intromission frequency in male rats. The values are presented as Mean $\pm$ SEM ($n=6$), and statistical analysis was conducted using one-way ANOVA followed by Tukey's multiple comparison test. A significance level of $p<0.05$ was applied. Statistical significance is denoted as follows: $p<0.05$ indicates significance when compared with the control group (a), (b), and (c).

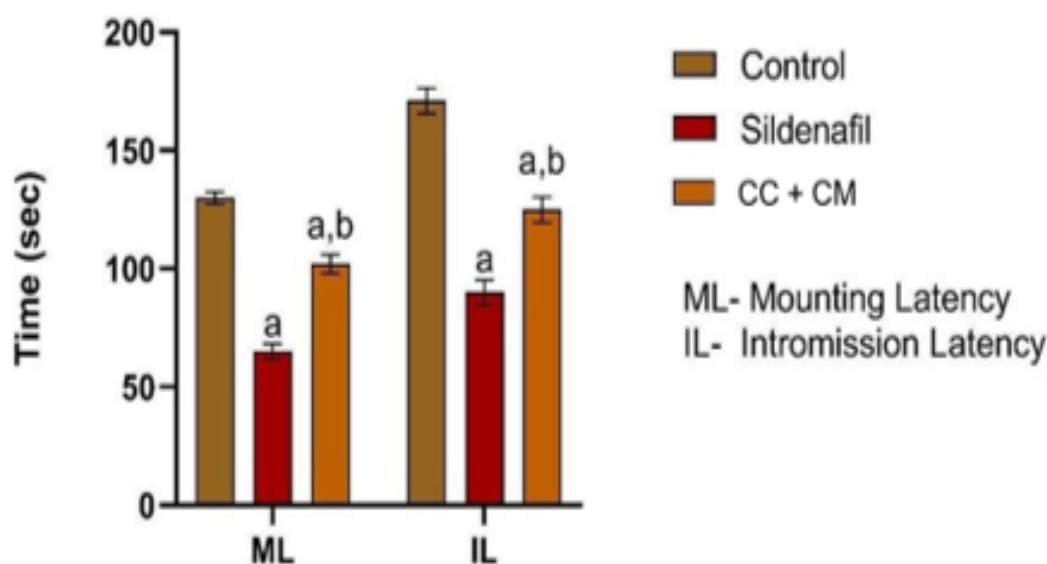


Figure 3: Aphrodisiac effect of *Cordyceps chaithanya* and *Cordyceps militaris* on mounting latency and intromission latency in male rats. The values are presented as Mean $\pm$ SEM, $n=6$, and statistical analysis was conducted using one-way ANOVA followed by Tukey's multiple comparison test. A significance level of $p<0.05$ was applied. Statistical significance is denoted as follows: $p<0.05$ indicates significance when compared with the control group (a), (b), and (c).

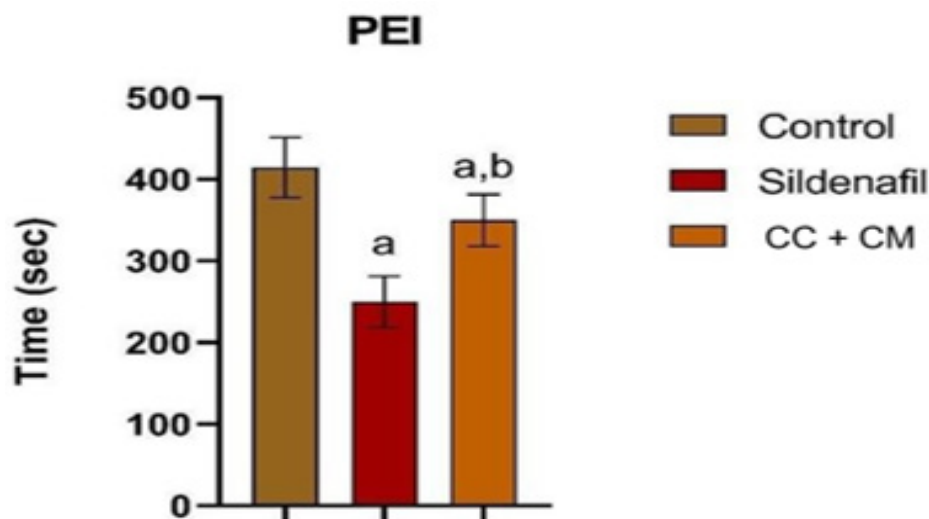


Figure 4: Aphrodisiac effect of *Cordyceps chaithanya* and *Cordyceps militaris* on the post-ejaculatory interval in male rats. The values are presented as Mean $\pm$ SEM, $n=6$, and statistical analysis was conducted using one-way ANOVA followed by Tukey's multiple comparison test. A significance level of $p<0.05$ was applied. Statistical significance is denoted as follows: $p<0.05$ indicates significance when compared with the control group (a), (b), and (c).

aphrodisiac and restorative properties. It is believed that the formulation possesses antioxidant, anti-inflammatory, and immunomodulatory effects and could improve endothelial performance and sexual functioning.¹⁶ It was previously investigated that the effects of CM on the reproductive parameters in streptozotocin (STZ)-induced diabetic male rats.¹³ The results of that study indicated that CM treatment significantly ameliorated epididymal sperm variables, serum testosterone levels, and copulatory behavior among diabetic animals. CM application also mitigated oxidative stress as indicated by decreased malondialdehyde (MDA) levels and increased glutathione (GSH)

and catalase (CAT) activities. These results suggest that CM has pharmacological potential in alleviating testicular oxidative stress and repairing sexual performance in adult rats.

CONCLUSION

In the present research, CC and CM were tested on its aphrodisiac activity in male rats by applying the standard parameters of copulatory behavior. The findings showed high MF and IF and a decrease in ML, IL and PEI relative to control group, which, collectively, indicated an improvement in sexual performance. Compared to reference drug sildenafil, this combination

formulation had comparatively lower efficacy, but it still brought significant changes in the sexual behavior parameters compared to vehicle control, that means that the formulation is not as potent as sildenafil, and yet it has significant aphrodisiac activity.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the institution for providing the necessary facilities to conduct the experiment, and research was supported by the JSSAHER research grant (Grant sanction number: JSSAHER/REG/RES/URG/54/2023-24). The authors also thank Poorna Arogya Nisarga Dhatu Health, Bangalore, for providing the *Cordyceps Chaitanya* formulation used in this study.

ABBREVIATIONS

CC: *Cordyceps chaitanya*; **CM:** *Cordyceps militaris*; **MF:** Mount frequency; **IF:** Intromission frequency; **ML:** Mount latency; **IL:** Intromission latency; **PEI:** Post-ejaculatory interval; **NO:** Nitric oxide; **cGMP:** Cyclic guanosine monophosphate; **PDE5:** Phosphodiesterase type-5; **ED:** Erectile dysfunction; **CMC:** Carboxy Methyl Cellulose; **STZ:** Streptozotocin; **MDA:** Malondialdehyde; **GSH:** Glutathione; **CAT:** Catalase; **SEM:** Standard error of the mean; **ANOVA:** Analysis of variance.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

SUMMARY

ED is a common ailment that is marked by a severe inability to attain or maintain penile erection, which has a negative impact on sexual performance.

Its etiology is characterized by multifactorial impairments of physiological, hormonal, and psychological mechanisms.

The major aim of the research was to describe the aphrodisiac effect of CC and CM versus normal sildenafil.

This formulation is an herbal preparation, which was orally given to rats over a period of 15 days. There were significant increases

in mounting frequency, intromission frequency, and decreases in mounting latency, intromission latency, and post-ejaculatory interval.

The paper thus concludes that the CC and CM combination formulation exhibits a slightly reduced aphrodisiac activity compared to sildenafil, although it is a biologically active natural candidate to be developed further.

REFERENCES

1. Yafi FA, Jenkins L, Albersen M, Corona G, Isidori AM, Goldfarb S, et al. Erectile dysfunction. Nature Reviews Disease Primers. 2016;2(1):16003.
2. Yannas D, Frizza F, Vignozzi L, Corona G, Maggi M, Rastrelli G. Erectile dysfunction is a hallmark of cardiovascular disease: Unavoidable matter of fact or opportunity to improve men's health? Journal of Clinical Medicine. 2021;10(10):222.
3. Defeudis G, Mazzilli R, Tenuta M, Rossini G, Zamponi V, Olana S, et al. Erectile dysfunction and diabetes: A melting pot of circumstances and treatments. Diabetes Metabolism Research and Reviews. 2022;38(2):e3494.
4. Huang SA, Lie JD. Phosphodiesterase-5 (PDE5) inhibitors in the management of erectile dysfunction. Pharmacy and Therapeutics. 2013a;38(7):407.
5. Van Driel MF. Physiology of penile erection-A brief history of the scientific understanding up till the eighties of the 20th century. Sexual Medicine, 2015;3(4):349-57.
6. Burnett AL. Nitric Oxide in the Penis: Physiology and Pathology. Journal of Urology. 1997;157(1):320-24.
7. Sangiorgi G, Cereda A, Benedetto D, Bonanni M, Chiricolo G, Cota L, et al. Anatomy, pathophysiology, molecular mechanisms, and clinical management of erectile dysfunction in patients affected by coronary artery disease: A review. Biomedicines. 2021;9(4):432.
8. Salvio G, Ciarloni A, Cutini M, Balercia G. Hyperhomocysteinemia: Focus on endothelial damage as a cause of erectile dysfunction. International Journal of Molecular Sciences. 2021a;22(1):418.
9. Pohsa S, Hanchang W, Singpoonga N, Chaiprasart P, Taepavarapruk P. Effects of cultured *Cordyceps militaris* on sexual performance and erectile function in streptozotocin-induced diabetic male rats. BioMed Research International. 2020;1(1):4198397.
10. Tuli HS, Sandhu SS, Sharma AK. Pharmacological and therapeutic potential of *Cordyceps* with special reference to Cordycepin. 3 Biotech. 2014;4(1):1-12.
11. Sirotkin AV, Kolesarova A. Puncture vine (*Tribulus terrestris* L.) in control of health and reproduction. Physiological Research. 2021; 70 (Suppl 4):S657.
12. Huang SA, Lie JD. Phosphodiesterase-5 (PDE5) inhibitors in the management of erectile dysfunction. Pharmacy and Therapeutics. 2013b;38(7):407.
13. Goswami SK, Gangadarappa SK, Vishwanath M, Razdan R, Jamwal R, Bhadri N, Inamdar M N. Antioxidant potential and ability of phloroglucinol to decrease formation of advanced glycation end products increase efficacy of sildenafil in diabetes-induced sexual dysfunction of rats. Sexual Medicine. 2016;4(2):e106-e114.
14. Kalsi J, Muneer A. Erectile dysfunction - an update of current practice and future strategies. Journal of Clinical Urology. 2013;6(4):210-9.
15. Salvio G, Ciarloni A, Cutini M, Balercia G. Hyperhomocysteinemia: Focus on endothelial damage as a cause of erectile dysfunction. International Journal of Molecular Sciences. 2021b;22(1):418.
16. Tal R, Mueller A, Mulhall JP. The correlation between intracavernosal pressure and cavernosal blood oxygenation. The Journal of Sexual Medicine. 2009;6(10):2722-7.

Cite this article: Gowtham L, Kattimani P, Nair SP, Mali PY, Manjula SN. Evaluation of Aphrodisiac Activity of *Cordyceps chaitanya* and *Cordyceps militaris* in Male Wistar Rats. Pharmacognosy Communications. 2026;16(3):151-6.