



Research Article

Evaluation Of Spermatogenic Activity Of *Commelina Benghalensis* Against Cyclophosphamide Induced Reproductive Changes In Male Albino Rats

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ARTICLE INFO

Received: 30 Oct 2023

Accepted: 01 Nov 2023

Published: 05 Nov 2023

Keywords:

Infertility, *Commelina benghalensis*, Spermatogenesis, Cyclophosphamide, Testosterone

DOI:

10.5281/zenodo.10073402

ABSTRACT

Infertility is one of the major health problems in life. More factors such as drug treatment, chemotherapy, toxins, air pollutants, and insufficient vitamins intake have harmful effects on spermatogenesis and sperm normal production. Previous phytochemical investigations of the *Commelina* genus were reported on *C. undulata*., *C. benghalensis* L. and *C. communis* L. from which several types of compounds such as alkaloids, steroids, terpenoids, iridoids, flavonoids, lignans, aliphatic alcohols, polyols, and phenolic acids were obtained¹. The objective of the study is evaluating the effect of the *Commelina benghalensis* extract on male rats by evaluating some andrological parameters of the Wistar rat such as sperm volume, motility, count, liveability and morphology which are some of the indices that determine the ability of a male rats to produce viable spermatozoa and it is used as a sex stimulant in rural areas.

INTRODUCTION

Infertility is one of the major health problems in life, and approximately 30% of infertilities are due to a male factor². several conditions can interfere with spermatogenesis and reduce sperm quality and production. More factors such as drug treatment, chemotherapy, toxins, air pollutants, and insufficient vitamins intake have harmful effects on spermatogenesis and sperm normal production. "Sexual dysfunction, impotence and

other related problems including scientific community and medical practitioners since time immemorial. Sexual dysfunction may have psychosocial implication affecting men in many ways. There has been a constant exploration fonerwer herbal and chemical agents to overcome these age-old problems of sexual dysfunction.³

MATERIALS AND METHODS

Preparation of extract

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



Whole plant was air dried and crushed to moderate coarse powder(100g) was extracted with ethanol(800ml) at 78°C for 30 hrs using a soxlet extractor. The total extract thus obtained was concentrated in vacuum evaporator to constant weight the yield of thick viscous extract was 15% on testing.

Study design

Thirty-six male rats were randomized into 6 groups comprising of 6 animals each. The animals were treated with respective extracts or drug for 28 days and various test parameters were evaluated.

GROUPS	TREATMENT	NUMBER OF ANIMALS
		MALES
Group-I	Control	6
Group-II	Disease control(CP 6mg/kg b.w) daily by oral gavage	6
Group-III	CP+CB(200mg) daily by oral gavage	6
Group-IV	CP+CB(400mg) daily by oral gavage	6
Group-V	CB(200mg) daily by oral gavage	6
Group-VI	Standard(testosterone 0.5mg/kg b.w) twice a week by intramuscular route	6

RESULTS

Body weight

The effect of the ethanolic extract on body weight is summarized in Table 1. Treatment with CP+CB(200) showed 5 % increase in body weight, and CP+CB (400mg) showed 20 % increase in weight, Testosterone administration produced a 9.08 % increase in body wt, cp treated shows decrease in wt compared to control.

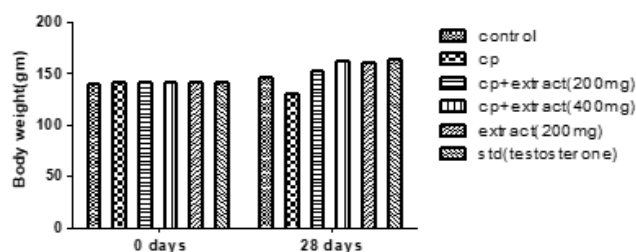
Tab. 7. Effect of ethanolic extracts of *commelina benghalensis* on body weights of albino rats

Group	0 days	28 days
Control	140.12 ± 0.009	144.52 ± 0.011
Disease control (CP)	141.12 ± 0.007	128.29 ± 0.007**
CP+CB (200mg)	140.22 ± 0.008	152.32 ± 0.007**
CP+ CB (400mg)	141.32 ± 0.007	162.33 ± 0.010*
CB(200mg)	140.52 ± 0.007	159.56 ± 0.016*
Standard (testosterone)	141.42 ± 0.009	163.42 ± 0.009**

All values are expressed as mean ± S.E.M, n=6; P* < 0.05 and P** < 0.01 Considered significant as compared to control.

Control: No drug; CB 200: Ethanolic extract (200mg/Kg b.w.) p.o.;

CB 400 Ethanolic extract (400mg/Kg b.w.) p.o.; CP-cyclophosphamide(6mg/kg b.w) p.o



Organ weight

The effect of the ethanolic extract on individual sex organ weight is summarized in Table 8. Treatment with cp+ c.b (200) showed 6.5 % increase in weight of testis, 6.6 % increase in weight of prostate gland, 6.8 % increase in seminal vesicles and 7.6 % in case of epididymis, while extract treatment showed an increment of ~ 14.2 % in weights, ~ 8.6 % increase in weight of testis, ~ 10.5 increase in weight of prostate, 9.2 % increase in the weight of seminal vesicles and 9.2% in case of epididymis after 28 days of treatment. Testosterone administration produced a ~ 6.3% increase in testis, ~ 24.09% in case of prostate weights, 6.3% increase in the weight of seminal vesicles and ~ 4.20 % in case of epididymal weights.



Tab. 8. Effect of ethanolic extracts of *commelina benghalensis* on organ weights of albino rats

Group	Weight of Seminal vesicles	Weight of Epididymis	Weight of Prostate	Weight of Testes
Control	300.93±0.011	578.62± 0.007	228.19± 0.037	1653.23± 0.010
Diseasecontrol(CP)	290.23±0.011*	570.12 ±0.011*	209.84± 0.012*	1530.25±0.014*
CP+CB (200mg)	312.25±0.014*	582.14 ±0.012*	236.72±0.009**	1678.24 ±0.014*
CP+ CB (400mg)	316.73±0.010*	590.33 ±0.010*	240.52±0.007**	1764.23 ±0.011*
CB(200mg)	313.22±0.009**	586.24 ±0.012*	241.35 ±0.014*	1698.62±0.009**
Standard (testosterone)	319.32±0.009**	592.12±0.007**	243.53 ±0.012*	1790.24 ± 0.012*

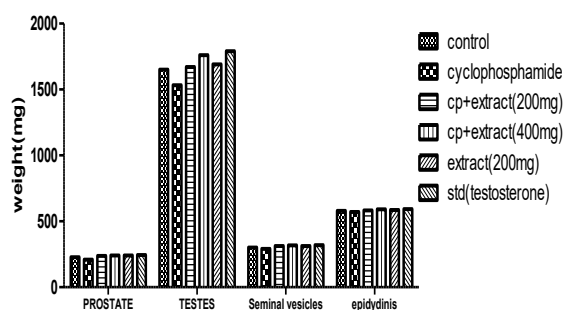
Weight of testes, prostate, seminal vesicles are expressed as mg/100g body weight.

All values are expressed as mean ±S.E.M, n=6; P* < 0.05 and P** < 0.01 Considered significant as compared to control.

Control: No drug; CB200: Ethanolic extract (200mg/Kg b.w.) p.o.;

CB 400 Ethanolic extract (400mg/Kg b.w.) p.o.;

CP-cyclophosphamide(6mg/kg b.w) p.o



Serum total testosterone, LH and FSH hormones measurement

Administration of 200mg/kg/rat and 400mg/kg/rat c.b for twenty-eight consecutive days had significant effect on LH and FSH concentration in the serum between the control and cp treated groups. The concentration of LH and FSH were and the corresponding value in (Table 9). However, the LH and FSH in control group were normal. In addition, serum total testosterone level increased significantly (p < 0.05) in animals received 200mg/kg/rat c.b in comparison to control group. The concentration of serum total testosterone level was (3.62 ±0.007, 1.76 ±0.007, 4.15 ±0.007, 5.67±0.007, 6.56±0.007 ngr/ml, respectively) in c.b than in control group.

Tab. 9. Effect of ethanolic extracts of *commelina benghalensis* on sex hormones in serum of albino rats

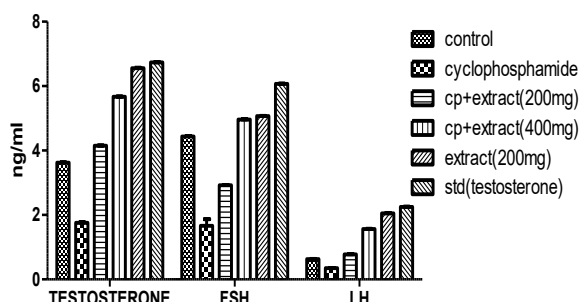
Group	Sperm count	Testosterone	FSH	LH
Control	95.68 ±0.811	3.62 ±0.007	4.44 ±0.007	0.63 ±0.007
Diseasecontro(CP)	68.18 ±0.25	1.76 ± 0.007**	0.202 ±0.202	0.35 ±0.007**
CP+CB (200mg)	114.46± 0.09*	4.15 ± 0.007**	2.924± 0.009**	0.776±0.006**
CP+CB (400mg)	131.60±0.071*	5.67 ± 0.007**	4.960± 0.007**	1.57± 0.005**
CB (200mg)	118.40±0.071*	6.56 ± 0.007**	5.07 ± 0.007**	2.05 ±0.007**
Std(testosterone)	123.70±0.071*	6.73 ± 0.009**	6.07 ± 0.007**	2.25± 0.007**

All values are expressed as mean ±S.E.M, n=6; P* < 0.05 and P** < 0.01 Considered significant as compared to control.

Control: No drug; CB 200: Ethanolic extract (200mg/Kg b.w.) p.o.;

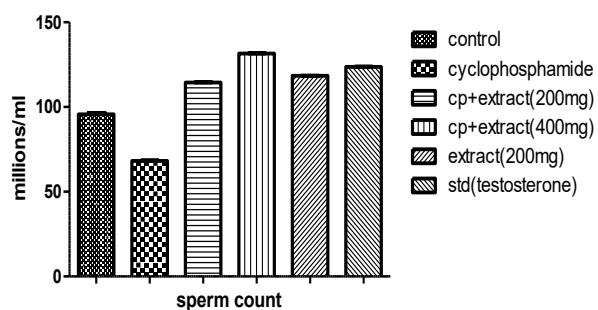
CB 400 Ethanolic extract (400mg/Kg b.w.) p.o.;

CP-cyclophosphamide (6mg/kg b.w) p.o

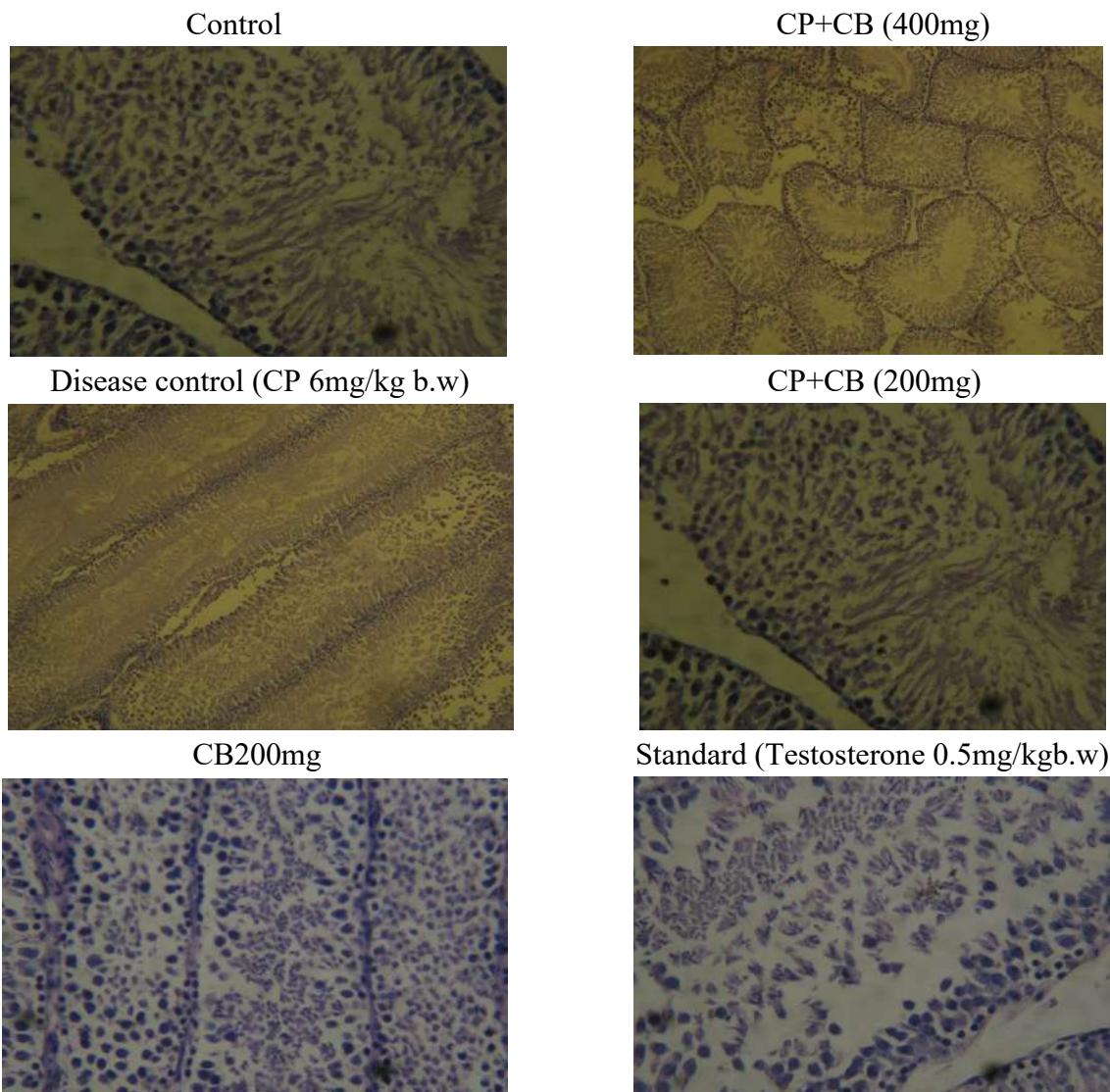


Sperm count

Administration of 200mg/kg/rat and 400mg/kg/rat CB for twenty-eight consecutive days had significant effect on epididymal sperm counts significantly increased in treated groups compared to control and testosterone groups. There is decrease in cp treated group and increase in CP+CB (400 mg) compared to CP group



Histopathological examination



The sections of the testis of the control group when compared with treated group animals showed observable differences in various stages of spermatogenesis observed in different treated groups. High number of spermatozoa in seminiferous tubules confirmed the increased

spermatogenesis, this is also proved by an increase in spermatogenic elements as compared to control. In case of testosterone treated group, a distinct hypertrophy compared to control group animals was observed in case of leydig cells and interstitial cells. The solid packing also suggests a supposed

role of testosterone in increasing the vascularization of testicular tissue

Bio-chemical parameters

Non toxicity of ethanolic extract can be further confirmed by conducting these bio chemical

parameters and there is no variation between the values in these groups compared to control

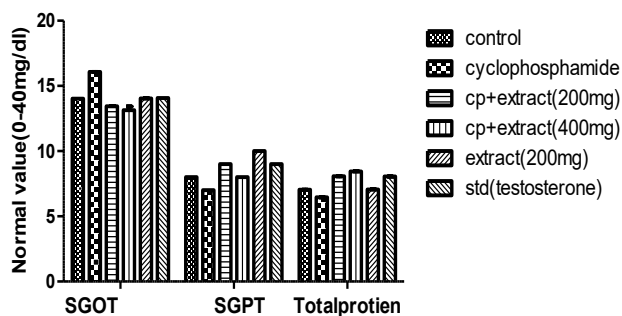
Tab. 10. Effect of ethanolic extracts of *commelina benghalensis* on Bio chemical parameters in serum of albino rats

Group	SGOT	SGPT	Total protein
Control	14.02± 0.001	8.44 ± 0.012	6.12± 0.012
Disease control (CP)	16.06 ±0.010*	7.23 ± 0.023*	5.89± 0.001**
CP+CB (200mg)	13.44± 0.014*	9.24± 0.012*	6.23± 0.045*
CP+ CB (400mg)	13.13± 0.218	8.34±0.056*	6.34± 0.098*
CB(200mg)	14.04± 0.012*	9.78± 0.076*	6.09± 0.012*
Standard(testosterone)	14.07± 0.001**	7.45± 0.045*	6.46± 0.012*

All values are expressed as mean ±S.E.M, n=6; P* < 0.05 and P** < 0.01 Considered significant as compared to control. Control: No drug; CB200: Ethanolic extract (200mg/Kg b.w.) p.o.; CB 400 Ethanolic extract (400mg/Kg b.w.) p.o.; CP cyclophosphamide (6mg/kg b.w) p.o

Orientation behaviour analysis

The ethanolic extracts markedly influenced the behaviour of the treated animals, which showed more attraction towards female rats. A more than two fold enhancement in attraction towards female was noticed in CB(400), compared to nearly two times increase in CB (200) and only one and half fold increase in testosterone treated group. The behavioral assessment of rats towards environment as well as self was also more pronounced as compared to control group animals.



Tab. 11. Effect of ethanolic extracts of *commelina benghalensis* on Orientation behaviour albino rats

Orientation activity (mean activity score)	Groups	0 days	14 days	28 days
Female (Licking & Anogenital smelling)	Control	4.628 ±0.009	4.618 ±0.004	4.64 ±0.007
	Disease control(CP)	4.190 ±0.001	4.30 ±0.007**	3.026 ±0.010*
	CP+CB(200mg)	4.460 ±0.001	4.352 ±0.002**	6.126 ±0.016*
	CP+ CB (400mg)	4.368 ±0.042	6.280 ±0.010*	8.47 ±0.033*
	CB (200mg)	4.512 ±0.006	6.236 ±0.004**	8.218 ±0.008**
	Std (testosterone)	4.550 ±0.006	6.504 ±0.004**	8.94 ±0.004**
Environment (Exploration, Rearing and Rearing and Climbing)	Control	3.52 ±0.004	3.53 ±0.006	3.54 ±0.008
	Disease control(CP)	3.456 ±0.064	3.44 ±0.010*	3.40 ±0.001**
	CP+CB(200mg)	3.48 ±0.046	3.60 ±0.001**	3.58 ±0.077*
	CP+ CB (400mg)	3.53 ±0.008	3.67 ±0.001**	3.76 ±0.001**
	CB (200mg)	3.52 ±0.001	3.63 ±0.001**	3.78 ± 0.001**
	Std (testosterone)	3.556 ± 0.016	3.51 ±0.0118*	3.77 ±0.018*
Self (Nongenital grooming)	Control	5.05 ±0.001	5.05 ±0.002	5.408 ±0.014
	Disease control(CP)	5.02 ±0.010	4.94 ±0.012*	4.87 ±0.001**
	CP+CB(200mg)	5.03 ±0.001	5.03 ±0.01*	5.10 ±0.001**

and Genital grooming	CP+ CB (400mg)	5.02 ±0.001	5.09 ±0.001**	5.16 ±0.001**
	CB (200mg)	5.04 ±0.001	5.13 ±0.001**	5.19 ±0.001**
	Std (testosterone)	5.04 ±0.010	5.12 ±0.002**	5.208 ± 0.001**

All values are expressed as mean ±S.E.M, n=5; P* $<$ 0.05 and P** $<$ 0.01 Considered significant as compared to control.

Control: No drug; EE 200: Ethanolic extract (200mg/Kg b.w.) p.o.;

CB400 CB (200mg/Kg b.w.) p.o.; CP-cyclophosphamide (6mg/kg b.w) p.o

The extracts markedly influenced the behavior of the treated animals, which showed more attraction

towards female rats. A more than two fold enhancement in attraction towards female was noticed in 400, compared to nearly two times increase in 200 and only one and half fold increase in testosterone treated group. The behavioral assessment of rats towards environment as well as self was also more pronounced as compared to control group animals.

Tab. 12. Effect of ethanolic extracts of *commelina benghalensis* on Sexual behaviour of albino rats

Group	Mount latency	Mount frequency	Intromission latency	Intromission frequency
Control	176.48 ±0.143	2.148 ±0.012	263.08±0.02	1.398±0.025
Disease control(CP)	185.44 ±0.117	1.934±0.035*	269.40±0.10	1.170± 0.044*
CP+CB(200mg)	138.92 ±0.014*	3.010±0.001**	267.61±0.01*	1.324±0.006**
CP+ CB (400mg)	137.30±0.001**	3.094±0.025*	268.90±0.001**	1.408±0.048*
CB(200mg)	145.09±0.026*	3.138±0.005**	249.32±0.08*	1.432±0.010*
Std (testosterone)	135.02±0.39	3.164±0.008**	261.16±0.040*	1.472 ±0.009**

All values are expressed as mean ±S.E.M, n=5; P* $<$ 0.05 and P** $<$ 0.01 Considered significant as compared to control.

Control: No drug; EE 200: Ethanolic extract (200mg/Kg b.w.) p.o.;

CB 400 CB(200mg/Kg b.w.) p.o.; CP-cyclophosphamide(6mg/kg b.w) p.o

CONCLUSION

Based on the results from the present study it is concluded that cyclophosphamide treatment of male rats alters spermatogenesis. Reduced fertility rate after drug treatment may be due to the damage in male germ cells and hence resulting in altered sperm function and infertility. Since, the herb had a beneficial effect on various physiological conditions responsible for exhibiting a better sexual performance i.e. improved anabolic activity, better orientation activities, and an overall improvement in various sexual behavior parameters In this study, ethanolic extract of *commelina benghalensis* (both 200 and 400 mg)

treatment protect against CP-induced adverse effects on sperm parameters. *commelina benghalensis* treatment provide better sexual performance compares to control and testosterone treated groups.

REFERENCES

1. Leseilane J. Mampuru et al.,(2008) Alteration of Bax-to-Bcl-2 ratio modulates the anticancer activity of methanolic extract of *Commelina benghalensis* (Commelinaceae) in Jurkat T cells African Journal of Biotechnology Vol. 7 (20), pp. 3569–3576, 20 October.
2. Isidori AM, et al.,(2006) A. Medical treatment to improve sperm quality. J Reprod Biomed;12:704 -714.
3. Subramoniam A, et al.,(1997).Aphrodisiac property of *Trichopus zeylanicus* extract in male mice. J Ethnopharmacol.;57: 21–27.
4. Fairley, et al., (1972) Sterility and testicular atrophy related to cyclophosphamide therapy. Lancet; 1:568.

5. Acevedo-Rodriguez, et al., (2005), "Monocotyledons and Gymnosperms of Puerto Rico and Virgin Islands", Contributions of the United States Faden, Robert B. "The misconstrued and rare species of Commelina (Commelinaceae) in the eastern United States", *Annals of the Missouri Botanical Garden* 80 (1): 208–218.

HOW TO CITE: Umamaheswari*, Dr. Bheemachari, Firdos Sultana, Raziya begum, Niveditha, Evaluation Of Spermatogenic Activity Of Commelina Benghalensis Against Cyclophosphamide Induced Reproductive Changes In Male Albino Rats, *Int. J. in Pharm. Sci.*, 2023, Vol 1, Issue 11, 145-151. <https://doi.org/10.5281/zenodo.10073402>