Journal of Basrah Researches (Sciences) **52**(1), 191 (2026)
DOI: https://DOI.org/10.56714/bjrs.52.1.14

The impact of beetle cocoon (Larinus maculates F.) extract on the functional and biochemical parameters of testes and epididymides of mice

Nahla J.M.S. Al-Shahery, Rana H. K. Al-Rubaye *

Department of Biology, College of Education for Pure Sciences-Ibn Al-Haitham, University of Baghdad, Iraq.

ARTICLE INFO

Received 02 March 2026
Revised 03 April 2026
Accepted 05 April 2026
Published 30 June 2026

Keywords:

Larinus maculatus, Beetle cocoon extract , Testes; Epididymis; Sperm parameters

Citation: N. J. M. S. Al-Shahery, R. H. K. Al-Rubaye., J. Basrah Res. (Sci.) **52**(1), 191 (2026). DOI:https://DOI.org/10.56714/bjrs.52.1.14

ABSTRACT

The current study was conducted to reveal the effect of administration beetle cocoon extract BCext. (which is commonly used to treat certain diseases in traditional medicine) on the functional and biochemical of some organs of male reproductive system in mice. Adult male mice were divided into 3 groups (10 mice each) as follows: G1: animals were gavaged with 0.1 ml of tap water for 4 weeks. G2: animals were gavaged with 0.1 ml "200mg. k^{-1} b.w." of BCext. for 4 weeks. G3: animals were gavaged with 0.1 ml "400 mg. k^{-1}b.w "of BCext. for 4 weeks. Dosage with BCext. resulted in a significant ($P \leq 0.001$, $P \leq 0.05$) decrease in the mean weight of testes and caudal epi., sperm parameters, serum T hormone, FSH, and LH levels, CAT activity, while, the concentration of MDA was increased significantly ($P \leq 0.05$) in treated mice compared to control. Also, a significant ($P \leq 0.001$) reduction was observed in testicular and caudal epi.total protein concentration in G2 and G3. These results reflect the systemic toxic effect of beetle cocoon extraction on the male reproductive system.

1. Introduction

The practice of folk medicine has been known since ancient time across many culture. People still rely on it to relieve their pains and aches because it's inexpensive, accessible, and generally considered safe. Rogiere et al (2024) indicated that, 80% of the world's population used the folk medicine [1]. Various parts of plants such as leaves, seed, or their extracts have been used as a type of folk treatment .In the same context, folk medicine also includes the utilizing of secretions from some plants and insects as treatment for various diseases despite the lack of high quality standards for it's purification [2].Wherein, Efa (2023) reported that the some animals and their products belongs to mammals, birds, reptiles, amphibians and insects were used as remedies [3]. In Iraq and other countries such as Egypt ,Syria and Turkey the extract of beetle larvae cocoon that known as Tihan (the product of the salivary glands of larvae of Larinus maculatus) has been used up to the present time based on inherited knowledge to treat respiratory inflammation, anti- asthmatic ,viral and bacterial infection [4,5].However despite its uses , the limited studies available have confirmed the adverse effects of this extract on certain organs. [6] elucidated that dosing mice with extract of beetle cocoon caused a negative effect in the liver, spleen, kidney, lung, heart and brain .Similarly, [7] obtained comparable

*Corresponding author email: rana.h.k@ihcoedu.uobaghdad.edu.iq

ISSN: 1817-2695 (Print); 2411-524X (Online)
Online at: https://jou.jobrs.edu.iq

results in the liver of rats dosed with 200 and 400 mg.k-1 b.w. of the extract. Furthermore, the extract showed a significant reduction in most blood parameters, while resulting in an increased WBC account [6]. Whereas [8] reported that the administrated male mice with Tihan extract showed potential role in their innate immune response. Additionally, mice treated with hot beetle cocoon extract showed a significant reduction in normal serum glucose and lipid profile parameters [9]. In previous study confirmed that, beetle cocoon extract contains a bioactive ingredient, namely polysaccharides, which enhance phagocytosis and promote the migration of neutrophils to inflammatory site outside the blood stream [10]. While, [11] reveled that, the bioactive gradients of beetle cocoon extract were analyzed via Gas Chromatography-Mass Spectrometry (GC-MS) which identified nine ingredients as follows:(benzoic acid, 2-butanol, hexamethyl-3, purin 6-1, acetophenone, tricyclo , cyclotrisil, glyceraldehyde and performic acid. These compounds exhibited great antioxidant and cytotoxic potency against lung cancer cell line A549 at concentration of 600 and 200 $mg.ml^{-1}$. The two essential components of the male reproductive system "testes and epididymides" are responsible for sperm production within seminiferious tubules of the testes and for synthesizing androgen" testosterone" and other hormones. The immature and non-motile testicular sperm gain their maturation "motility and fertilizing capability" as pass through the four regions of the epididymides "initial segment, caput, corpus, and cauda" through the interaction of sperm with the luminal environment of each region. Therefore, the importance of epididymides includes concentration, maturation, protection and storage sperm [12]. Additionally, it is well documented that the male reproductive system is highly sensitive to reproductive toxic agents,"such as environmental, chemical and physical factors ". These sensitivity of reproductive system arises from continuous cell division during spermatogenesis, limited antioxidant defenses, and exposure to endocrine disrupter. Consequently, these toxic agents are considered triggering factors for oxidative stress in testicular and epididymal tissues, and subsequently in sperm via reactive oxygen species ROS elevation. This causes disruption in their membranes, protein, and DNA, ultimately leading to infertility [13].The impairment of normal physiological functions resulting from exposure the reproductive organs to toxic agents is termed "reproductive toxicity"[14].Despite the documented effects of the beetle cocoon extract on some organs " liver, spleen, lung, heart, kidney, brain and blood parameters" its impact on reproductive system remains gap, the present study was designed to investigate for the first time, the influence of beetle cocoon extract on some physiological and biochemical aspects of the male reproductive system.

Materials and Methods

1.1. Preparation of beetle cocoon extract (BCext.)

Beetle cocoon extract (BCext.) was obtained from local markets in Baghdad, Iraq .It was confirmed by an insect taxonomist at the natural history museum .Post removing insects from inside the shells , a hot aqueous extract of beetle cocoon was prepared according to [15] . Ten grams of cocoon powder were dissolved in 100 ml of D.W. and heated for 2h by magnetic stirrer. The centrifugation of solution was done at 400g for 30 min, the supernatant was filtered and dried. The two concentrations of 200 and 400 $mg.k^{-1}$of BCext. were chosen according to [7] and kept at 4°C until used.

1.2. Experimental Design

Thirty adult male BALB/c mice (35 days old) were maintained under controlled conditions (14 h light : 10 h dark cycle, temperature 21 ± 1 °C, in animal house of College of Education for Pure Sciences/ Ibn Al-Haitham, University of Baghdad, Iraq. Mice were divided into three groups (10 animal / group) as follows:

G1:Ten male mice were administrated with 0.1 ml of tap water for 4 weeks (control) .

G2: Ten male mice were administrated with 0.1 ml of 200mg.k-1 of extract of BC ext. for 4 weeks.

G3: Ten male mice were administrated with 0.1 ml of 400mg.k -1of extract of BC ext. for 4 weeks.

Before sacrificing the animal of all groups, their weights were determined and a heart puncture was performed to draw blood samples, which centrifuged at 2500 g for 10 min to obtain of sera for hormonal study. For the purpose of functional and biochemical studies, the eradicated testes and

caudal epididymides (caudal epi.) were weigh and performed to assessment of caudal epi.sperm parameters. Also,30 of these organs were kept in -18 ° C for the biochemical studies oxidative stress (OS) and total protein (TP).

1.3. Examinations of caudal epi. sperms parameter

To release of caudal epi sperm the restricted caudal epi.of each group were minced with microsurgical scissor in 0.9 %normal saline .One drop of suspension was tested under 40x to study the sperm parameters (concentration, motility , viability and morphology) [16,17,18] .

1.4. Hormonal Measurement

Serum testosterone (T), follicle-stimulating hormone (FSH), and luteinizing hormone (LH) levels were measured using commercial kits (bioMérieux, France) with the MINI VIDAS automated immunoassay system [19].

1.5. Biochemical indicators assay

Testes and caudal epi.of each group were homogenized in Phosphate-Buffered Saline (PBS) by performed a homogenizer at 4° C. Centrifugation of the homogenate was performed at 3000 g for 15 min at 4C˚. The function of these organs used for different studies as follows:

1.5.1. Measurement of testicular and caudal epi. Oxidative status

The concentration of Malondialdehyde MDA (the final product of lipid peroxidation) was determined by method of [20]. While the activity of enzymatic antioxidant catalase CAT was according to [21].

1.5.2. Assay of testicular and caudal epi. total protein concentration

The total protein concentration in testicular and caudal epi supernatant fraction was estimated by colorimetric assay that depend on the principle of Biuret. The measurement was performed smart spectrophotometer BIORAD USA at 450 nm wave length [22].

1.6. Ethical considerations

This work has been approved by the ethical committee of the biology department at University of Bagdad, College of Education for Pure Sciences/ Ibn Al-Haitham in Baghdad, Iraq. On 23/1/2023, the authorization was acquired under reference number EC-87. The experiments were performed in accordance with internationally accepted guidelines for the care and use of laboratory animals and complied with the ARRIVE guidelines.

1.7. Statistical analyses

SPSS version 23 was used for a statistical analysis on the acquired data. A difference was considered statistically significant if its P value was less than 0.05. The information was presented as (Mean ± Standard Error). One-way analysis of variance (ANOVA) were used to compare the groups statistically followed by the Least Significant Difference (LSD) post-hoc test for multiple pairwise comparisons.

2. Results

Weights of testes and caudal epi. post BCext. administration

The results showed that BCext. induced a significant ($P \leq 0.001$) reduction in the weights of testes and caudal epi. of treated groups G2 and G3 compared to values of control "G1" ,while no significant difference ($P > 0.05$) when comparing G2 and G3 (Fig. 1 A and B).

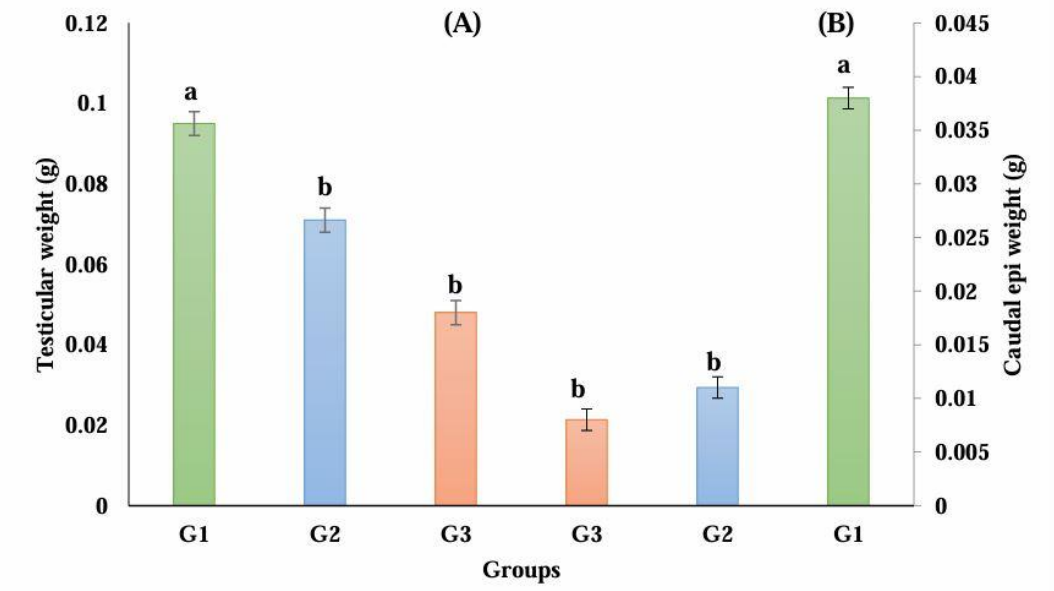

Fig. 1.A.B The Effect of BCext. on testicular and caudal epi weight.

The different letters symbolize a significant (P≤0.001) difference between experimental groups.
The symmetric letters symbolize non-significant (P>0.05) difference between experimental groups.
The values indicate the mean± SEM.

Effect of BCext. on sperm parameters

The current study revealed harmful effect of BCext. on function of testes and caudal epi. that represented by a significant (P≤0.001) decrease in sperm parameters (concentration, viability, motility, and morphology) of G2 and G3 compared to control "G1", while there was no significant (P>0.05) difference between G2 and G3 in these parameters as demonstrated in Fig. 2 C and D and Fig.3E and F.

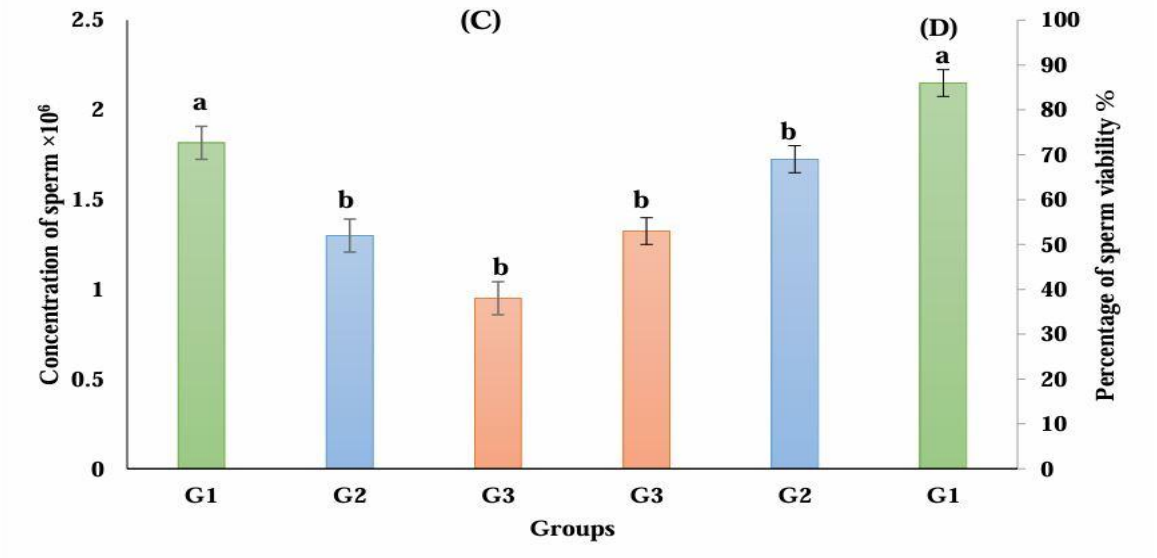

Fig. 2.C.D The Effect of BCext. on sperm concentration and viability.

The different letters symbolize a significant (P≤0.001) difference between experimental groups.
The symmetric letters symbolize non-significant (P>0.05) difference between experimental groups.
The values indicate the mean± SEM.

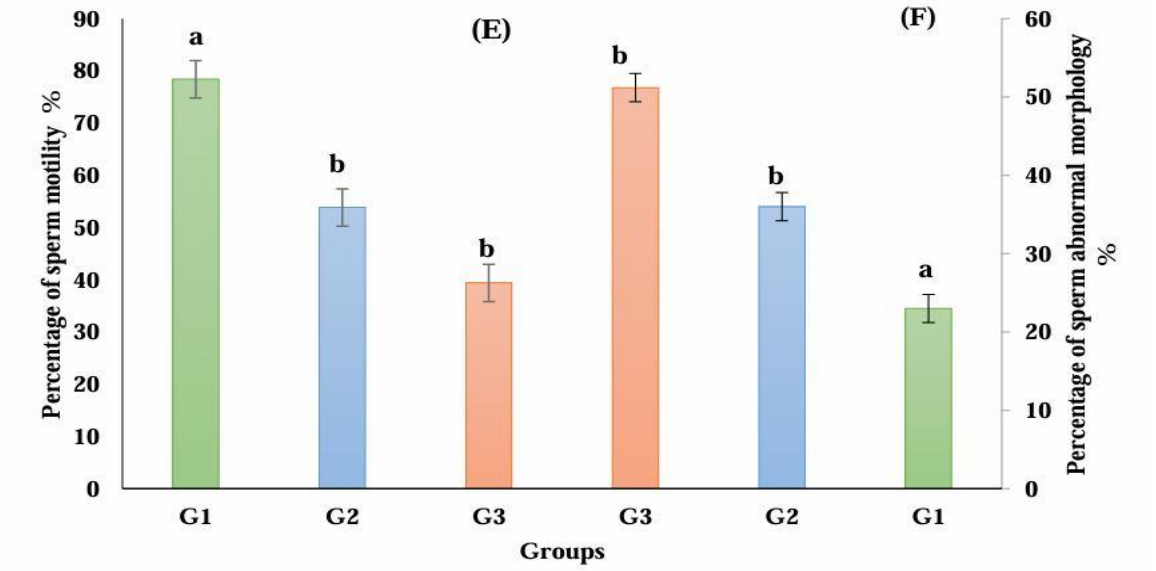

Fig. 3.E.F The Effect of BCext. on sperm motility and morphology.

The different letters symbolize a significant (P≤0.001) difference between experimental groups.
The symmetric letters symbolize non-significant (P>0.05) difference between experimental groups.
The values indicate the mean± SEM.

Effect of BCext. on hormonal profile.

The data demonstrated that, BC ext. administration induced a significant (p≤0.001) reduction in T, FSH and LH levels of male mice of G2 and G3 compared to control G1 table 1

Table 1. Effect of BCext. on serum hormones levels.

Exp. groups	T ng. ml^{-1}	FSH mIU.ml^{-1}	LH mIU.ml^{-1}
G1	2.2±0. 19 ^{a}	1.2±0.07 ^{a}	1.6±0.13 ^{a}
G2	1.3±0.18 ^{b}	0.7±0.08 ^{b}	0.8±0.11 ^{b}
G3	1.0±0.22 ^{b}	0.6±0.09 ^{b}	0.6±0.14 ^{b}

The values indicate the mean± SEM.
The different letters symbolize a significant (P≤0.001) difference between experimental groups.
The symmetric letters symbolize non-significant (P>0.05).

Effect of BCext. on oxidative stress "OS" status

Findings displayed that, there was a significant (p≤0.05) increase in the concentration of testicle and caudal epi. MDA in treated groups G2 andG3 compared to control G1 .Meanwhile, there was a significant (p≤0.05) reduction in the activity of anti-oxidant agent CAT enzyme activity in G2 andG3 compared to control G1 and when comparing between G2 andG3 Table 2.

Table 2. Effect of BCext. on testicular and caudal epi. oxidative markers of experimental groups.

Tissue	Testicular tissue		Caudal epis. tissue	
Exp. groups	MDA con. µmol.L^{-1}	CAT activity Uml^{-1}	MDA con. µmol.L^{-1}	CAT activity Uml^{-1}
G1	3.50±0.03^{a}	12.20±0.03^{a}	5.09±0.04^{a}	14.12±0.01^{a}

G2	19.51±0.10[b]	6.10±0.02[b]	16.00±0.22[b]	7.50±0.31[b]
G3	30.70±0.02[c]	2.21±0.05[c]	27.06±0.30[c]	1.20±0.04[c]

The values indicate the mean± SEM.
The different letters symbolize the a significant (P≤0.05) difference between groups.

Effect of BCext. on testicular and caudal epi. total protein concentration "TPC"

The results showed that, the testicular and caudal epi. TPC reduced significantly in BCext.- treated mice "G2 and G3" than control "G1"(P≤0.001).And, the reduction was significant (P≤0.001) in G3 compared to G2 Table 3.

Table 3. Testicular and caudal epi. total protein concentration of experimental groups.

Tissue Exp. groups	Testicular tissue TPC. mg.g^{-1} tissue	Caudal epis. tissue TPC. mg.g^{-1} tissue
G1	20.51±0. 79 [a]	16.44±0.69 [a]
G2	15.51±0.52 [b]	13.79±0.50 [b]
G3	11.38±0.54 [c]	12.34±0.53 [c]

The values indicate the mean± SEM.
The different letters symbolize a significant (P≤0.001) difference between experimental groups.

3. Discussion

It was known that weight of reproductive organs was an indicator of their maturity. In this regard, Spears et.al (2013) mentioned that, the weight of testicles was a valuable indicator of their growth, and it was related to the number of germ cells that made up the testes [23]. Therewith, the weight reduction in the weights of testes and caudal epi. of treated groups could be represented atrophy resulting from adverse structural and functional changes in both treated organs. We could able to link the low weight of these organs to hormonal disorder "T,FSH, and LH" (as revealed by the current study) given to their important role in the maturation and function. Hence, the decrease in serum T hormone levels of treated groups "G2and G3 "confirmed the decline of the structural and functional organs followed by their weight loss, because of its anabolic role in reproductive organs. Wherein, [24] mentioned the crucial role of T hormone in the development and function of testis. Additionally, it was known that, the epididymis growth and its function controlled by androgen through interaction with its receptors in the epithelial and stromal layers of all epididymal regions. Also, [25] referred to the formation and function of the epididymis was androgen dependent. As, it was possible to link the decrease in both FSH and LH levels to a decrease to the low weight of testes and caudal epi. given their crucial role in the maturity of these organs. Whereas, [26] reported that FSH was responsible of testicular development and maintenance by stimulated the growth of germ cells and reducing the cell death of them. While, [27] reported that, LH stimulated steroidogenesis by leydig cells to produce androgen. Meanwhile, the low weight of studied organs could be explained depending on the status of BC ext. induced testicle and caudal epi. oxidative stress (OS) that increased with high BC ext. concentration as showed by this study. And so, the OS status could be negatively affected the cellular components, including their membranes, proteins and DNA of testes and caudal epi.as well as, the decrease in total protein concentration of tissues of these organs confirmed this interpretation.
The reduction in the studied sperm parameters reflect the toxic effect of the beetle cocoon extract on the male reproductive organs . Apparently, the reduction in the weight of testes and caudal epi. of treated groups was indicator of decline in the capability of germ cells to produce sperm and deterioration in sperm quality(reduction in sperm concentration, motility, viability, and morphology). Furthermore, the regressed in sperm quality of BC ext.-treated groups could be linked to a shortage in the hormonal concentration of "T,FSH, and LH" which is necessary for the production of normal sperm as noted in this study. Whereas, the study of [28] revealed the importance role of intratesticular

testosterone in modifying the molecular mechanism that directly participates in spermatogenesis, spermiogenesis, spermation, sperm quality control and sperm motility. Also, other study [29] reported that, LH/T and FSH were necessary for quantitatively normal spermatogenesis. Ditto, [30] mentioned that an excessive or deficiency of FSH and T levels affected sperm quantity and quality leading to male infertility. Additionally, our findings could be attributed to the elevation of testicle and caudal epi. oxidative stress "OS" status (as shown in this study) which, negatively affected sperm parameters because these organs represented the necessary environments for production and maturation. Wherein, [31] reported that, low epididymal sperm density was one of the indicators of a decline in spermatogenesis resulting from any toxic factors. Therefore, sperm in BCext.-treated groups may have been directly affected by increased oxidative stress (a high ROS level) due to their sensitivity to those extrinsic source of ROS, given to a lack of their anti-oxidant defense systems owing to the small amount of sperm cytoplasm. As it was known, sperm membranes with a high polyunsaturated fatty acids "PUFAs", hence ROS could be attacked the sperm membranes by lipid peroxidation "LP" which made the membranes lose their integrity, Also, ROS could be attacked the sperm protein and DNA causing protein oxidation "PO" and DNA fragmentation . Thus, the LP and PO may be responsible for motility failure of G2 and G3 because each of these oxidation resulting in passive influence in fluidity of sperm membranes and decrement of ATP production which necessary for sperm motility. Wherein, [13] reported that, the negative of LP on structural and functional integrity of sperm membranes led to a reduction in sperm motility. Also, [32] reported that, MDA in plasma membrane caused a decrease in sperm motility, count and viability and increase the morphological abnormalities via oxidative damage of lipids in biological membranes. Many previous studies confirmed the positively correlated between the reduction of sperm viability and DNA fragmentation. Whereas [33] emphasized use of sperm viability testing due to its low cost instead of expensive DNA fragmentation testing to ensure male fertility potential.

The present study established that, the BCext. could induced hormonal imbalance in treated groups as a reflection of its toxic effect . This finding indicated a dysfunction of hypothalamic –pituitary-gonads "HPG " axis, contrary to what was previously well known that the secretion of these hormones were regulated by HPG axis via a negative feedback mechanism as scientifically proven [34]. The cause of this dysfunction may be attributed to direct or indirect negative impact of byproducts (excessive ROS)and the final products "MDA" of OS in the hypothalamus or pituitary and gonads leydig cells i.e. (the source of T hormone production) which preventing GnRH or Gn and T hormone secretion. Whereas, [35] mentioned that, OS led to a defect on adenohypophysis. As [26] indicated that, it was possible a high oxidative stress in the blood suppressed FSH production. And it was reported that, chronic stress had an suppressive effect on the HPG axis by inhibiting secretion of GnRH which inhibited the releasing of LH [36] .Furthermore, the high MDA concentration in BCext. treated groups may caused a lesion in the cellular components of HPG axis which led to a shortage in the hormones of this axis. Wherein, it was referred that, MDA could react on cellular protein or DNA causing biomolecular damage [37].

The current study demonstrated that, the BCext. induced oxidative stress in reproductive organs, resulting in redox imbalance between pro-oxidant and antioxidant. Accordingly, the significant elevation of MDA concentration in the testicular and caudal epi. tissues of treated groups with BCext. G2 and G3 than G1 can be explained by the fact that –as established in previous study –it is one of the major end product of excessive lipid peroxidation. This process requires an over production and intracellular accumulation of types of reactive oxygen species "ROS" such as $O\bullet_2^-$, •OH, NO• and $ONOO^-$ which possess highly reactive unpaired electrons that drive lipid peroxidation, consequently MDA serves as a key biomarker for oxidative stress [38,39,40]. Meanwhile, living cells contain various endogenous enzymatic and non- enzymatic antioxidant that regulate ROS levels, such as catalase "CAT", Superoxide dismutase "SOD", and Glutathione peroxidase "GPX"[41,42,43]. The important role of CAT was to prevent damage caused by accumulation of ROS in cells by converting H_2O_2 in to H_2O and O_2 "[44,45].

While, a significant decrease in antioxidant CAT activity indicated by the administration of Beetle cocoon extract "G2 and G3", indicates to a failure defense system against oxidant agents. Thus, the significant elevation of MDA concentration, coupled with a marked decreases in antioxidant CAT activity, provides evidence of sever oxidative stress within the testes and caudal epididymides tissue.

And severity of the observed oxidative stress status followed a dose- dependent manner, being significantly higher at 400 mg.k $^{-1}$b.w. dose compared to the 200 mg.k -1b.w. dose.
Paradoxically, despite the established antioxidant properties of beetle cocoon extract, the administration dose induced significant toxicity in the treated mice. This result is attributed to the" antioxidant paradox" where high concentration of antioxidants can shift the cellular environment toward pro-oxidant state, causing oxidative damage instead of protection.
Proteins have been played a vital role in maintaining the structural and functional integrity of reproductive organs. It was well known the importance of proteins for tissues and organs, so the previous studies revealed that the gene expression of protein had structural and functional importance in the testes, epididymides and sperm of human and rodents [39,46,47,48,49,50].However, the results of the present study revealed a significant decline in TPC following BCext. administration .This reduction was closely linked to the triggered state of oxidative stress, where ROS-mediated protein oxidation. Accordingly, the reduction in TPC may be due to the observed high concentration of MDA in treated groups which may had instigated changes in chemical properties of proteins that led to its loss. Wherein, the previous studies confirmed the negative properties of MDA on cellular activity due to its toxicity and being a predisposition to oxidation[45,51]. On the other hand , the reduction in TPC could be attributed to the OS-induced low T hormone in treated groups"G2 and G3", given the role of hormone in enhancement of protein synthesis.Wherein, other study [52] reported that the promotion of T hormone in tissue protein synthesis would be via androgen receptors. Despite what some studies have confirmed that Beetle cocoon extract " Tihan" as an antioxidant, the current finding reveal a biphasic effect, where high dose yielded paradoxical outcomes. The deterioration in sperm quality and reproductive organs (testes and caudal epi.) weights demonstrates the pro-oxidant effect of Beetle cocoon extract at high concentration, evidenced by elevation of MDA and the reduction in CAT activity. Furthermore, this impairment could be attributed to direct disruption of hypothalamic-pituitary-gonadal (HPG) axis or the induction of reproductive stress, which interfered with vital physiological processes of the reproductive tissues independently of the expected antioxidant pathway.

4. Conclusion

It can be concluded that, the high dose induced a state of oxidative stress, as evidence by imbalance between MDA concentration and CAT enzyme activity. This oxidative state negatively impacted the other studied hormonal, biochemical and physiological parameters, ultimately leading to the observed decline in sperm quality and the reduction in reproductive organs weight. This study recommend avoiding the long- term or high dose consumption remedy without medical supra-physiological dose trigger oxidative stress that adversely affect the reproductive system. Subsequent research could be focus on histopathological study to investigate testicular and epididymal structural alternations induced by BCext.- treated oxidative stress.

Acknowledgement

The authors would like to thank the department of Biology, College of Education for Pure Sciences/Ibn Al-Haitham, for offering facilities and their assistance during the study. The present study has not been supported financially.

References

[1] R. Hoenders, R. Ghelman, C. Portella, S. Simmons, A. Locke, H. Cramer, and M. Jong, "A review of the WHO strategy on traditional, complementary, and integrative medicine from the perspective of academic consortia for integrative medicine and health," *Frontiers in Medicine*, vol. 11, p. 1395698, 2024. doi: 10.3389/fmed.2024.1395698.

[2] N. Tuasha, S. Fekadu, and S. Deyno, "Prevalence of herbal and traditional medicine in Ethiopia: a systematic review and meta-analysis of 20-year studies," *Systematic Reviews*, vol. 12, no. 1, p. 232, 2023. doi: 10.1186/s13643-023-02398-9.

[3] D. A. Efa, "Animal and their products used for treatment and prevention of disease practiced by traditional healers in Jimma Arjo district, East Wollega Zone, Western Ethiopia," *Veterinary Medicine and Science*, vol. 9, no. 6, pp. 2660–2675, 2023. doi: 10.1002/vms3.1277.

[4] M. Evans, A. Shaw, E. A. Thompson, S. Falk, P. Turton, T. Thompson, and D. Sharp, "Decisions to use complementary and alternative medicine (CAM) by male cancer patients: Information-seeking roles and types of evidence used," *BMC Complementary and Alternative Medicine*, vol. 7, no. 1, p. 25, 2007. doi: 10.1186/1472-6882-7-25.

[5] A. Hamedi, S. Farjadian, and M. R. Karami, "Immunomodulatory properties of Trehala manna decoction and its isolated carbohydrate macromolecules," *Journal of Ethnopharmacology*, vol. 162, pp. 121–126, 2015. doi: 10.1016/j.jep.2014.12.064.

[6] I. N. Tawfiq, "Toxicopathological study of aqueous extract of beetle cocoon Larinus maculatus F. on some internal organs in male albino mice," *The Iraqi Journal of Veterinary Medicine*, vol. 36, pp. 315–321, 2012. doi: 10.30539/iraqijvm.v36i0E.439.

[7] M. A. Jawad, A. J. Kadhim, and S. Y. Hasan, "Histological study of the effect of aqueous extract of the beetle cocoon on liver tissue of male mice," *Archives of Razi Institute*, vol. 76, no. 5, pp. 1561–1564, 2021. doi: 10.22092/ari.2021.356080.1773.

[8] Z. T. Alasady, H. S. Al-Shmgania, and M. S. M. Jwad, "The effect of Larinus maculates F. cocoon aqueous extract in some immunological aspects of male albino mice," *Ibn Al-Haitham Journal for Pure and Applied Science*, pp. 153–159, 2018. doi: 10.30526/2017.IHSCICONF.1783.

[9] E. N. Tawfeeq, "Study the effect of hot aqueous extract of beetle cocoon Larinus maculatus F. on some physiological parameters in male albino mice," *Pharmaceutical and Biological Sciences*, vol. 13, no. 1, pp. 61–64, 2018. doi: 10.9790/3008-1301026164.

[10] A. Matsukawa, T. Yoshimura, T. Maeda, T. Takahashi, S. Ohkawara, and M. Yoshinaga, "Analysis of the cytokine network among tumor necrosis factor alpha, interleukin-1beta, interleukin-8, and interleukin 1 receptor antagonist in monosodium urate crystal-induced rabbit arthritis," *Laboratory Investigation*, vol. 78, no. 5, pp. 559–569, 1998.

[11] H. S. Al-Shmgani, Z. T. Alasady, E. M. Ali, and M. J. Al-Jassani, "Antioxidant, cytotoxicity and phytochemical analysis of Larinus maculates F. cocoon aqueous extract against lung cancer," *Journal of Physics: Conference Series*, vol. 1879, no. 2, p. 022025, 2021. doi: 10.1088/1742-6596/1879/2/022025.

[12] E. R. James, D. T. Carrell, K. I. Aston, T. G. Jenkins, M. Yeste, and A. Salas-Huetos, "The role of the epididymis and the contribution of epididymosomes to mammalian reproduction," *International Journal of Molecular Sciences*, vol. 21, no. 15, p. 5377, 2020. doi: 10.3390/ijms21155377.

[13] Y. Wang, X. Fu, and H. Li, "Mechanisms of oxidative stress-induced sperm dysfunction," *Frontiers in Endocrinology*, vol. 16, 2025. doi: 10.3389/fendo.2025.1520835.

[14] M. J. Panga and Y. Zhao, "Male reproductive toxicity of antifouling chemicals: insights into oxidative stress-induced infertility and molecular mechanisms of zinc pyrithione (ZPT)," *Antioxidants*, vol. 13, no. 2, p. 173, 2024. doi: 10.3390/antiox13020173.

[15] G. R. De Foliart, *The Human Use of Insects as a Food Resource: A Bibliographic Account in Progress*. Wisconsin: University of Wisconsin, 2002.

[16] H. J. Bearden and J. W. Fuquay, *Applied Animal Reproduction.* Reston, VA: Reston Publishing Co., 1981, pp. 157–165.

[17] A. Hinting, "Methods of Semen Analysis in Assessment of Human Sperm Fertilizing Ability," Ph.D. dissertation, Dept. ECE, Michigan State University, 1989, pp. 281–288.

[18] L. J. D. Zaneveld and K. L. Polakoski, "Collection and physical examination of the ejaculate," in *Techniques of Human Andrology*, E. S. E. Hafez, Ed. Amsterdam: Elsevier/North-Holland Biomedical Press, 1977, pp. 147–172.

[19] P. Raghuvanshi and P. Mathur, "The anti-androgenic effect of continuous intake of microwave exposed food on swiss albino mice," *Asian Journal of Pharmaceutical and Clinical Research*, vol. 6, no. 1, pp. 106–108, 2013.

[20] B. Guidet and S. V. Shah, "Enhanced in vivo H_2O_2 generation by rat kidney in glycerol-induced renal failure," *American Journal of Physiology-Renal Physiology*, vol. 257, no. 3, pp. F440–F445, 1989. doi: 10.1152/ajprenal.1989.257.3.F440.

[21] H. Aebi, "Catalase in vitro," in *Methods in Enzymology*, vol. 105, New York: Academic Press, 1984, pp. 121–126.

[22] N. W. Tietz, *Textbook of Clinical Chemistry*, 3rd ed. C. A. Burtis and E. R. Ashwood, Eds. Philadelphia, PA: W. B. Saunders Company, 1999, pp. 1245–1250.

[23] J. Spears, A. Matthews, and S. Hartwig, "Evaluation of noninvasive methods of predicting testicular weight and development in an inbred and outbred strain of laboratory mouse," *Theriogenology*, vol. 79, no. 3, pp. 566–573, 2013. doi: 10.1016/j.theriogenology.2012.11.014.

[24] I. Arato, G. Grande, F. Barrachina, C. Bellucci, C. Lilli, M. Jodar, and D. Milardi, "In vitro effect of different follicle-stimulating hormone preparations on Sertoli cells: Toward a personalized treatment for male infertility," *Frontiers in Endocrinology*, vol. 11, p. 401, 2020. doi: 10.3389/fendo.2020.00401.

[25] M. Wittayarat, K. Kawanishi, H. Ohata, M. Nagahara, R. Sambuu, O. Sambuu, and Y. Sato, "Aberrant Expression Levels of Androgen Receptor and SRD5A2 in Epididymal Epithelial Cells of Crossbred Infertile Cattle–Yak," *Animals*, vol. 15, no. 5, p. 660, 2025. doi: 10.3390/ani15050660.

[26] S. Roychoudhury, S. Chakraborty, A. P. Choudhury, A. Das, N. K. Jha, P. Slama, and K. K. Kesari, "Environmental factors-induced oxidative stress: Hormonal and molecular pathway disruptions in hypogonadism and erectile dysfunction," *Antioxidants*, vol. 10, no. 6, p. 837, 2021. doi: 10.3390/antiox10060837.

[27] A. Sawaied, B. E. Levy, E. Arazi, E. Lunenfeld, Q. Shi, and M. Huleihel, "Follicle-stimulating hormone and testosterone play a role in the regulation of Sertoli cell functions following germ cell depletion In vitro," *International Journal of Molecular Sciences*, vol. 26, no. 6, p. 2702, 2025. doi: 10.3390/ijms26062702.

[28] G. Grande, F. Barrachina, A. Soler-Ventura, M. Jodar, F. Mancini, R. Marana, and D. Milardi, "The role of testosterone in spermatogenesis: Lessons from proteome profiling of human spermatozoa in testosterone deficiency," *Frontiers in Endocrinology*, vol. 13, p. 852661, 2022. doi: 10.3389/fendo.2022.852661.

[29] L. Naznin, T. Parveen, M. Parvin, S. Giti, A. Ahmed, S. S. Khan, and M. R. Islam, "FSH, LH and Testosterone status and Categorization of Infertile Azoospermic Males–a Single Centre Cross Sectional Study," *Bangladesh Journal*, vol. 2, no. 1, pp. 28-33, 2022.

[30] B. Singla, "Role of follicle-stimulating hormone (FSH) and testosterone in abnormal sperm parameters: A review article," *Medical Research Archives*, vol. 13, no. 11, 2025. doi: 10.18103/mra.v13i12.7075.

[31] R. Poon, M. Rigden, I. Chu, and V. E. Valli, "Short-term oral toxicity of pentyl ether, 1,4-diethoxybutane, and 1,6-dimethoxyhexane in male rats," *Toxicological Sciences*, vol. 77, no. 1, pp. 142–150, 2004. doi: 10.1093/toxsci/kfg251.

[32] I. Khan, "Sperm quality parameters and oxidative stress: Exploring correlation in fluoride intoxicated rats," *Journal of Human Reproductive Sciences*, vol. 15, no. 3, pp. 219–227, 2022. doi: 10.4103/jhrs.jhrs_65_22.

[33] M. K. Samplaski, A. Dimitromanolakis, K. C. Lo, E. D. Grober, B. Mullen, A. Garbens, and K. A. Jarvi, "The relationship between sperm viability and DNA fragmentation rates," *Reproductive Biology and Endocrinology*, vol. 13, no. 1, p. 42, 2015. doi: 10.1186/s12958-015-0035-y.

[34] L. M. de Sousa, V. A. Vicente, and J. Donato Jr, "Negative feedback loops and hormonal factors that regulate GH secretion," *Endocrinology*, vol. 166, no. 10, p. bqaf139, 2025. doi: 10.1210/endocr/bqaf139.

[35] M. Darbandi, S. Darbandi, A. Agarwal, P. Sengupta, D. Durairajanayagam, R. Henkel, and M. R. Sadeghi, "Reactive oxygen species and male reproductive hormones," *Reproductive Biology and Endocrinology*, vol. 16, no. 1, p. 87, 2018. doi: 10.1186/s12958-018-0406-2.

[36] D. Banerjee, J. Mukherjee, P. K. Das, P. R. Ghosh, and K. Das, "Impact of chronic stress on reproductive functions in animals," *Indian Journal of Animal Health*, vol. 63, no. 2, pp. 94–101, 2024. doi: 10.36062/ijah.2024.spl.03324.

[37] A. Ayala, M. F. Muñoz, and S. Argüelles, "Lipid peroxidation: Production, metabolism, and signaling mechanisms of malondialdehyde and 4-hydroxy-2-nonenal," *Oxidative Medicine and Cellular Longevity*, vol. 2014, p. 360438, 2014. doi: 10.1155/2014/360438.

[38] P. L. Minciullo, A. Inferrera, M. Navarra, G. Calapai, C. Magno, and S. Gangemi, "Oxidative stress in benign prostatic hyperplasia: A systematic review," *Urologia Internationalis*, vol. 94, no. 3, pp. 249–254, 2015. doi: 10.1159/000366210.

[39] B. Całyniuk, E. Grochowska-Niedworok, K. W. Walkiewicz, S. Kawecka, E. Popiołek, and E. Fatyga, "Malondialdehyde (MDA)–product of lipid peroxidation as marker of homeostasis disorders and aging," *Annales Academiae Medicae Silesiensis*, vol. 70, 2016. doi: 10.18794/aams/65697.

[40] V. P. Reddy, "Oxidative stress in health and disease," *Biomedicines*, vol. 11, no. 11, p. 2925, 2023. doi: 10.3390/biomedicines11112925.

[41] D. D. Mruk, B. Silvestrini, M. Y. Mo, and C. Y. Cheng, "Antioxidant superoxide dismutase-a review: Its function, regulation in the testis, and role in male fertility," *Contraception*, vol. 65, no. 4, pp. 305–311, 2002. doi: 10.1016/S0010-7824(01)00320-1.

[42] K. Muthukumar, S. Rajakumar, M. N. Sarkar, and V. Nachiappan, "Glutathione peroxidase3 of Saccharomyces cerevisiae protects phospholipids during cadmium-induced oxidative stress," *Antonie Van Leeuwenhoek*, vol. 99, no. 4, pp. 761–771, 2011. doi: 10.1007/s10482-011-9550-9.

[43] G. H. Gershner, C. Calkins, A. Golubkova, C. Schlegel, A. Massahi, M. Lerner, and C. J. Hunter, "The role of GPX enzymes, lipid profiles, and iron accumulation in necrotizing enterocolitis," *International Journal of Molecular Sciences*, vol. 26, no. 13, p. 6077, 2025. doi: 10.3390/ijms26136077.

[44] M. G. Traber and J. F. Stevens, "Vitamins C and E: Beneficial effects from a mechanistic perspective," *Free Radical Biology and Medicine*, vol. 51, no. 5, pp. 1000–1013, 2011. doi: 10.1016/j.freeradbiomed.2011.05.017.

[45] Z. Rasheed, "Therapeutic potentials of catalase: Mechanisms, applications, and future perspectives," *International Journal of Health Sciences*, vol. 18, no. 2, p. 1, 2024.

[46] M. Jänne, H. K. Deol, S. G. Power, S. P. Yee, and G. L. Hammond, "Human sex hormone-binding globulin gene expression in transgenic mice," *Molecular Endocrinology*, vol. 12, no. 1, pp. 123–136, 1998. doi: 10.1210/mend.12.1.0050.

[47] M. P. Greenbaum, W. Yan, M. H. Wu, Y. N. Lin, J. E. Agno, M. Sharma, and M. M. Matzuk, "TEX14 is essential for intercellular bridges and fertility in male mice," *Proceedings of the*

National Academy of Sciences, vol. 103, no. 13, pp. 4982–4987, 2006. doi: 10.1073/pnas.0505123103.

[48] K. Purandhar, P. K. Jena, B. Prajapati, P. Rajput, and S. Seshadri, "Understanding the role of heat shock protein isoforms in male fertility, aging and apoptosis," *The World Journal of Men's Health*, vol. 32, no. 3, pp. 123–132, 2014. doi: 10.5534/wjmh.2014.32.3.123.

[49] K. F. Arroteia, M. F. Barbieri, G. H. M. F. Souza, H. Tanaka, M. N. Eberlin, S. Hyslop, and L. A. V. D. Pereira, "Albumin is synthesized in epididymis and aggregates in a high molecular mass glycoprotein complex involved in sperm-egg fertilization," *PLoS One*, vol. 9, no. 8, p. e103566, 2014. doi: 10.1371/journal.pone.0103566.

[50] N. Li, W. Wang, H. Zhou, Q. Wu, M. Duan, C. Liu, and Q. Tang, "Ferritinophagy-mediated ferroptosis is involved in sepsis-induced cardiac injury," *Free Radical Biology and Medicine*, vol. 160, pp. 303–318, 2020. doi: 10.1016/j.freeradbiomed.2020.08.009.

[51] S. Słuczanowska-Głąbowska, M. Laszczyńska, M. Wylot, W. Głąbowski, M. Piasecka, and D. Gącarzewicz, "Morphological and immunohistochemical comparison of three rat prostate lobes (lateral, dorsal and ventral) in experimental hyperprolactinemia," *Folia Histochemica et Cytobiologica*, vol. 48, no. 3, pp. 447–454, 2010. doi: 10.2478/v10042-010-0074-3.

[52] W. M. Meyers and G. L. Hammond, "Evolution of sex hormone-binding globulin gene expression in the primate testis," *bioRxiv*, 2024. doi: 10.1101/2024.08.05.606716.

Journal of Basrah Researches (Sciences) **52**(1), 191 (2026)
DOI: https://DOI.org/10.56714/bjrs.52.1.14

تأثير مستخلص شرنقة الخنفساء (Larinus maculates F.) على المعايير الوظيفية والكيموحيوية للخصى والبرابخ في الفئران.

نهلة جاسم محمد الشاهري، رنا حنان خضير الربيعي*

جامعة بغداد كلية التربية للعلوم الصرفة / ابن الهيثم قسم علوم الحياة.

معلومات البحث

الاستلام 02 اذار 2026
المراجعة 03 نيسان 2026
القبول 05 نيسان 2026
النشر 30 حزيران 2026

الكلمات المفتاحية

لارينوس ماكولاتوس، مستخلص شرنقة الخنفساء، الخصيتان؛ البربخ؛ معايير الحيوانات المنوية

Citation: N. J. M. S. Al-Shahery, R. H. K. Al-Rubaye., J. Basrah Res. (Sci.) **52**(1), 191 (2026).
DOI:https://DOI.org/10.56714/bjrs.52.1.14

الملخص

أُجريت هذه الدراسة للكشف عن تأثير تجريع مستخلص شرنقة الخنفساء .BCext (وهو مستخلص شائع الاستخدام في الطب التقليدي لعلاج بعض الأمراض) على وظائف بعض أعضاء الجهاز التناسلي الذكري في الفئران. قسمت ذكورالفئران البالغة إلى ثلاث مجاميع (عشرة فئران في كل مجموعة) كما يلي: G1: جرعت المجموعة الاولى فمويا بجرعة 0.1 مل من ماء الشرب لمدة أربعة أسابيع. G2: جرعت المجموعة الثانية فمويا بجرعة 0.1 مل من مستخلص شرنقة الخنفساء.BCext بتركيز 200 ملغم/كغم من وزن الجسم لمدة أربعة أسابيع.G3 : جرعت المجموعة الثالثة بجرعة 0.1 مل من مستخلص شرنقة الخنفساء (BCext) بتركيز 400 ملغم/كغم من وزن الجسم لمدة أربعة أسابيع.

أدى التجريع بمستخلص .BCext إلى انخفاض معنوي ($P\leq0.001$، $P\leq0.05$) في معدل اوزان الخصى و البرابخ ، ومعالم النطاف ، ومستويات هرمون الشحمون الخصوي ، والهرمون المنبه للجريبات ، والهرمون الملوتن في مصل الدم ، ونشاط إنزيم CAT، بينما ارتفع تركيز MDA معنويا ($P\leq0.05$) مقارنةً بمجموعة السيطرة. كما لوحظ وجود انخفاض معنوي ($P\leq0.001$) في التركيز الكلي للبروتين في الخصى والبرابخ في المجموعتين G2 وG3. أكدت هذه الدراسة وجود فروقات معنوية في بعض الخصائص المدروسة للخصى واذناب البرابخ في المجاميع المعاملة، مما يشير إلى أن انخفاض في هذه الخصائص كان معتمدا على الجرعة

***Corresponding author email:** rana.h.k@ihcoedu.uobaghdad.edu.iq

ISSN: 1817-2695 (Print); 2411-524X (Online)
Online at: https://jou.jobrs.edu.iq