

Assiut University Journal of Multidisciplinary Scientific Research (AUNJMSR)  
Faculty of Science, Assiut University, Assiut, Egypt.  
Printed ISSN 2812-5029  
Online ISSN 2812-5037  
Vol. 52(2): 188- 194 (2023)  
<https://aunj.journals.ekb.eg>



## Bee venom and its medicinal benefits

Leila H. Sayed<sup>1</sup>

<sup>1</sup>Zoology Department, Faculty of Science, Assiut University, 71516 Assiut, Egypt.

E-mail: [leilahassan40@yahoo.com](mailto:leilahassan40@yahoo.com)

### ARTICLE INFO

#### Article History:

Received: 2023-04-04

Accepted: 2023-04-19

Online: 2023-04-30

#### Keywords:

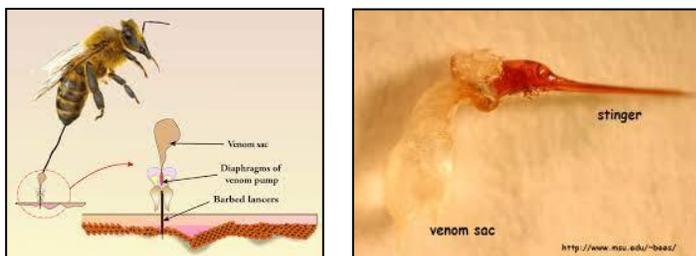
Bee venom, antioxidants, tumors, melittin, skin disease.

### ABSTRACT

Natural antioxidants are the most widely used adjuvants in the treatment of numerous illnesses and have been utilized as therapeutic instruments for a variety of diseases due to their safety, and efficacy. The bee venom gland located in the abdominal cavity produces bee venom (BV), which contains a variety of physiologically active peptides such as degranulating peptide, adolapin, melittin, mast cell-degranulating phosphate A2, apamin, and enzymes (hyaluronidase and phospholipase A2 (PLA2)) in addition to non-peptide constituents, such as dopamine, norepinephrine and histamine. Venom contains similar amounts of glucose, fructose, and phospholipids as bee blood. BV exerts therapeutic benefits for a number of disorders, including arthritis, diseases of the neurological system, defects of cardiovascular system, and skin diseases. Moreover, BV has recently been used to treat cancers as well as several immune-related disorders. Research should be expanded to discover their unique constituents and target action in order to take advantage of the prospective function of BV therapy.

### INTRODUCTION

The bee venom is stored in large glands called alveoli before being conveyed by a duct to the base of channeled or tubular fangs through which it's ejected.



### **Components of Bee Venom**

BV contains more than 20 different compounds, which are mostly proteins and polypeptides. BV has numerous active molecules like enzymes and peptides containing melittin (a main constituent of (BV), mast cell inhibitor, adolapin, degranulating peptide, apamin, and enzymes (hyaluronidase and PLA2) [1, 2]. Melittin, which makes up about 50% of the dry venom, and PLA2, which makes up around 12%, are the main constituents [3]. BV is a substance with a specific weight of 1.1331 and is regarded to be a rich source of enzymes, peptides, and biogenic amines. Nevertheless, it has a variety of very volatile substances that are quickly lost during collection [4]. Water represents 88% of BV. Venom contains similar amounts of glucose, fructose, and phospholipids as bee blood [5]. BV is a complex collection of peptides, proteins and low-molecular-weight substances. Recently, its constituents have been identified. Proteins and peptides constitute the majority of its compositions. The main difference between the compositions of fresh and dried BV is in the volatile components, but the overall biological activity is identical [5, 6].

### **The benefits of bee venom in medicine**

Because of its anti-oxidants, anti-inflammatory, anti-coagulants properties, and bioactive components such as melittin and PLA2, BV is primarily used to treat a variety of

inflammatory disorders, including cancer, nervous system diseases, arthritis, skin diseases, defects in the cardiovascular systems, and others [7]. Furthermore, BV exerts many diverse pharmacological effects as anti-nociceptive radioprotective, anti-mutagenic [8], cytoprotective, anti-hepatotoxic [9], anti-viral, anti-microbial, neuroprotective [10], anti-arthritic [11], anti-metastatic [12]. Additionally, BV is used therapeutically to treat conditions like postherpetic neuralgia, osteoarthritis, rheumatoid arthritis, multiple sclerosis, Lyme disease, bursitis, tendonitis, the dissolution of scar tissue and microbial infections [13, 14].

### **1. Anti-arthritis effects of BV**

BV is used to treat arthritis by preventing the production of pro-inflammatory chemicals such as cytokinine, NO, tumour necrosis factor (TNF-2), and cyclooxygenase 2, as well as by reducing the growth of rheumatoid synovial cells [15]. Likewise, BV is used in the treatment of a variety of pain problems, including those that cause knee osteoarthritis, neck discomfort, low back pain, ruptured lumbar and disc pain, shoulder pain following a stroke, acute ankle and wrist sprains, and rheumatoid arthritis [16].

### **2. Anti-Cancer effects of BV**

Melittin and PLA2 have been identified and characterized as the primary components of BV that exhibit anti-cancer effects. Although melittin and PLA2 are the two main constituents in the venom of the species *Apis mellifera* and numerous publications have describing their antitumoral effects [17]. Melittin is a multifunctional component of BV that lowers membrane surface tension and stabilises it. It also has anti-inflammatory activity in very small doses that enhances smooth muscles, stimulates the hypophysis and

adrenal glands, increases capillary permeability, which improves blood flow and lowers blood clotting, protects against radiation, affects the central nervous system, and has anticancer properties [5].

### **3. Effects of BV on Skin Disease**

Regarding impacts of BV Therapy on skin disease researches revealed that BV has therapeutic impacts against a wide range of skin conditions, including dermatitis, psoriasis, eczema, cicatrices, baldness, acne, and other disorders [18].

### **4. Impact of BV on Nervous System**

BV is used to treat a variety of neurological illnesses, including Multiple Sclerosis (MS), Amyotrophic Lateral Sclerosis, and other neurological disorders that affect the central and peripheral nerve systems (ALS) such as Parkinson's and Alzheimer's [19].

### **5. Therapeutic impacts of BV on abnormalities of the heart and blood system**

BV promotes blood microcirculation, slows and stimulates the heart at different doses, decreases blood pressure, inhibits blood clotting and fibrinolysis, and stimulates the production of red blood cells. It also boosts coronary and peripheral blood circulation [20]. It is also used to treat angina pectoris, arrhythmia, endarteritis (chronic inflammation of the inner layer of arteries), hypertension, and arteriosclerosis [15].

## **CONCLUSION**

Proteins, peptides, and low molecular weight substances form the main constituents of complex mixture of BV. Proteins and peptides are the primary constituents. The

therapeutic uses of BV include the treatment of bursitis, tendonitis, the removal of scar tissue, the treatment of post-herpetic neuralgia, rheumatoid arthritis, osteoarthritis, multiple sclerosis and Lyme disease. Although BV is safe for use in treating humans, it should only be used under the guidance of a trained healthcare professional.

## REFERENCES

- [1] R. Wehbe, J. Frangieh, M. Rima, D. El Obeid, J. M. Sabatier, & Z. Fajloun, Bee Venom: Overview of Main Compounds and Bioactivities for Therapeutic Interests. *Molecules* 24 (2019) 2997.
- [2] M. Moreno & E. Giralt, Three valuable peptides from bee and wasp venoms for therapeutic and biotechnological use: Melittin, apamin and mastoparan. *Toxins* 7 (2015) 1126–1150.
- [3] G. Gajski, & V. Garaj-Vrhovac, Melittin: A lytic peptide with anticancer properties. *Environmental Toxicology and Pharmacology*, 36 (2013) 697–705.
- [4] M. A. Ali, Studies on bee venom and its medical uses. *International Journal of Advanced Research and Technology*, 1 (2) (2012) 69- 83.
- [5] S. Bogdanov, Bee venom: Composition, health, medicine: A review. *Peptides*, 1 (2015) 1–20
- [6] H. Zolfagharian, M. Mohajeri, & M. Babaie, Honey Bee Venom (*Apis mellifera*) Contains Anticoagulation Factors and Increases the Blood-clotting Time. *Journal of Pharmacopuncture*, 18 (4) (2015) 007- 011.

[7] J. I. Castro, B. Mendez-Lnocenio, J. Omidvar, J. Omidvar, H. S. Santilli, A. P. Jr Nielsen, J. R. Pavot, J. A. Richert, & Bellanti, "A phase I study of the safety of honeybee venom extract as a possible treatment for patients with progressive forms of multiple sclerosis". *Allergy and Asthma Proceedings*, 26 (6) (2005) 470- 476.

[8] L. Cornara, M. Biagi, J. Xiao, & B. Burlando, Therapeutic properties of bioactive compounds from different honeybee products. *Frontiers in Pharmacology*, 8 (2017) 412.

[9] S. A. Hassan, R. S. Alazragi, & N. A. Salem, Potential Therapeutic effect of Bee Venom on Cisplatin-Induced Hepatotoxicity. *Journal of Pharmaceutical Research International*, 33 (2021) 200–210.

[10] M. Carpena, B. Nuñez-Estevez, A. Soria-Lopez, & J. Simal-Gandara, Bee Venom: An Updating Review of Its Bioactive Molecules and Its Health Applications. *Nutrients*, 12 (2020) 3360.

[11] O. Ahmed, H. Fahim, A. Mahmoud, & E. A. Eman Ahmed, Bee venom and hesperidin effectively mitigate complete Freund's adjuvant-induced arthritis via immunomodulation and enhancement of antioxidant defense system. *Archives of Rheumatology*, 33 (2017) 198–212.

[12] N. Oršolić, Bee venom in cancer therapy. *Cancer and Metastasis Reviews*, 31 (2012) 173–194.

[13] S. K. M. Ram, N. Jayapal, P. Nanaiah, G. S. Aswal, B. K. Ramnarayan, & S. M. Taher, The therapeutic benefits of bee venom. *International Journal of Current Microbiology and Applied Sciences*, 3 (11) (2014) 377-381.

- 
- [14] S. Zhang, Y. Liu, Y. Ye, X. R. Wang, L. T. Lin, L. Y. Xiao, P. Zhou, G. X. Shi, & C.Z. Liu, Bee venom therapy: Potential mechanisms and therapeutic applications. *Toxicon*, 148 (2018) 64–73.
- [15] V. Krylov, A. Agafonov, N. Krivtsov, V. Lebedev, L. Burimistrova, L. Oshevskii, & S. Sokolski, (2007) Theory and agents of apitherapy (in Russian).
- [16] J. D. Lee, H. J. Park, Y. Chae, & Lim, S. An overview of bee venom acupuncture in the treatment of arthritis. *Evidence-based complementary and alternative medicine*, 2 (1) (2005) 79- 84.
- [17] C. L. Ownby, J. R. Powell, M. S. Jiang, & J. E. Fletcher, Melittin and phospholipase A2 from bee (*Apis mellifera*) venom cause necrosis of murine skeletal muscle in vivo. *Toxicon*, 35(1) (1997) 67-80.
- [18] J. Y. Kim, W. R. Lee, K. H. Kim, H. J. An, Y. C. Chang, S. M. Han, Y. Y .Park, S. C. Pak, & K. K. Park, Effects of bee venom against *Propionibacterium acnes*-induced inflammation in human keratinocytes and monocytes. *International Journal of Molecular Medicine*, 35 (2015) 1651-1656.
- [19] D. S. Hwang, S. K. Kim, & H. Bae, Therapeutic effects of bee venom on immunological and neurological diseases. *Toxins*, 7 (7) (2015) 2413-2421.
- [20] K. Savilov, Bee venom: physico-chemical properties. Biological and pharmacological effects. Use in medical practice (in Russian), In Rakita, D; Krivtsov, N; Uzbekova, D G (eds) *Theoretical and practical basics of apitherapy (Russian)*, Roszdrav; Ryazan, (2010) 135-162.