

Arthropods and their products as aphrodisiacs – review of literature

B. PAJOVIC¹, M. RADOSAVLJEVIC², M. RADUNOVIC³,
N. RADOJEVIC⁴, B. BJELOGRLIC⁵

¹Urology and Nephrology Clinic, Clinical Centre of Montenegro, Faculty of Medicine, University of Montenegro, Podgorica (Montenegro)

²Department of Surgery, Public Hospital Kotor, Kotor (Montenegro)

³Surgery Clinic, Clinical Centre of Montenegro, Faculty of Medicine, University of Montenegro, Podgorica (Montenegro)

⁴Department of Forensic Medicine, Clinical Centre of Montenegro, Podgorica (Montenegro)

⁵Institute of Forensic Medicine, School of Medicine, University of Belgrade, Belgrade (Serbia)

Abstract. – After a short review of impotence, the definitions of erectants and aphrodisiacs are presented. The Authors propose division of arthropods according to the places of effect. The description of particular arthropods with their pictures and nomenclature, is followed by certain or probable mechanisms of achieving the aphrodisiac and sometimes toxic effect, that were available in the literature since 1929 till nowadays. We mention the most usual locations, mainly in Asia, where they are found and consumed, but also, we describe the manner of preparing and intake. The review includes the following arthropods: lobster, Arizona bark scorpion, deathstalker, banana spider, Mediterranean black widow, Burmeister's triatoma, giant water bug, diving-beetle, Korean bug, diacina, flannel moth, Spanish fly, migratory locust, red wood ant and honeybee.

Key Words:

Aphrodisiac, Arthropod, Beetle, Bug, Lobster, Penile erection, Scorpion, Spanish fly.

Introduction

The word aphrodisiac comes from the name of the Greek Goddess of sexual love and beauty, Aphrodite.

Impotence in a wider sense of the word, besides the loss of libido, implies the inability to achieve and hold an erection, and the inability of ejaculation or even an early ejaculation. It is a very widespread phenomenon, present in almost 40% of men in sexually active couples¹. Some

Authors even claim that 10% of male population is impotent². Two similar types of medications are used in treatment of this state. Erectants are substances which cause or facilitate penile erections³. Aphrodisiacs are medicines that induce certain, drug dependent, arousal of sexual desire and the ability to perform the sexual act, which, ideally, lasts a few hours⁴. American neuropharmacologists consider that an ideal aphrodisiac is a two hours' erectant⁵.

We consider that the division of aphrodisiacs according to the place of effect is the most suitable:

1. Stimulators of the lower abdomen and pelvis structures, especially the ones of the urogenital tract (cantharidin, papaverine, prostaglandin E1, phosphodiesterase-5-inhibitors)
2. Stimulators of the spinal cord (strychnine, damiana active principles)
3. Brain stimulators
 - Specific stimulators (naloxone, metaqualon, marijuana, sex hormones)
 - Modifiers of brain neurotransmission
 - Serotonin related (parachlorophenylalanine, danitracene, methysergide)
 - Dopamine related (apomorphine, L-DOPA, amantadine, bromocriptine)⁶.

In the animal kingdom (Regnum Animalia) systematisation, one Phylum is consisted of Polymeria, which are divided into Anellidae and Arthropoda. Some representatives of arthropods are used as aphrodisiacs for many millennia, especially in Asia, so many of these have passed the test of time. Nowadays, they can be found in

different forms in market places or at street merchants. They are used as spice in food, as a main course, or as a medicine.

In text below, the most famous species of arthropods or their products used as aphrodisiacs are described: lobster, Arizona bark scorpion, deathstalker, banana spider, Mediterranean black widow, Burmeister's triatoma, giant water bug, diving-beetle, Korean bug, diaclina – Panzer's darkling beetle, flannel moth, Spanish fly, migratory locust, red wood ant and honeybee.

Lobster

Supraclassis: Crustacea
Classis: Crustacea
Subclassis: Malacostraca
Familia: Palinuridae
Genus: Palinurus
Species: Palinurus sp.

In the Middle Ages, boiled lobsters were very highly appreciated aphrodisiacs^{7,8}. Also, Sansoni's encyclopedic dictionary puts lobsters in aphrodisiacs⁹. Lobster's meat is soft, very tasteful and known as an exceptional delicacy. It has been proved that occasional abundant lobster meals of high quality can cause hyperaemia in abdominal and pelvic organs, and thus bring to an aphrodisiac effect. Besides that, the enjoyment in such high value food rises general mental state and so produces stimulation of libido^{7,8,10-12}. This is the probable mechanism of the lobster's aphrodisiac effect.

There is also a very interesting fact concerning lobster's fertility. It does not slow down or weaken with age. Actually, older lobsters are more fertile than younger lobsters. Telomerase is an enzyme that repairs DNA, so it may be the key fact to avoid the aging as the way of immortality. Intake of those whose characteristics are wanted, may be the point of lobster's aphrodisiac effect.

Arizona Bark Scorpion

Supraclassis: Chelicerata
Classis: Arachnida
Ordo: Scorpiones
Familia: Buthidae
Subfamilia: Buthinae
Genus: Centruroides
Species: Centruroides sculpturatus (Ewing)

It is a small brown scorpion, whose habitat is Northern America, where it is of a toxicological importance, as the most venomous scorpion, but

very rarely with deadly outcome. Besides severe pain, numbness, tingling, sometimes paralysis, convulsions and difficult breathing which are the symptoms of scorpionism in humans that may last up to 72 hours, penile erection is also very common in all age¹³. People who were stung report that it felt like getting struck with a bolt of lightning or electrical current.

Venom deposited via the intravenous route can cause symptoms only 4-7 minutes after the injection, with a peak tissue concentration in 30 minutes and an overall toxin elimination half-life of 4-12 hours through the urine. Scorpion venom may contain multiple compounds in varying concentrations of neurotoxin, cardiotoxin, nephrotoxin, hemolytic toxin, phosphodiesterases, phospholipases, glycosaminoglycans, hyaluronidases, histamine, serotonin, tryptophan, etc. From the mentioned, neurotoxin is the most potent with neuromuscular, neuroautonomic and local tissue effects. It alters voltage-dependent sodium channels, which lead to prolonged excessive neuronal and neuromuscular activity, such as erection. It causes stabilization of voltage-dependent sodium channels in the open position, leading to continuous, prolonged, repetitive firing of the somatic, sympathetic, and parasympathetic neurons. This repetitive firing results in autonomic and neuromuscular over excitation symptoms, and it prevents normal nerve impulse transmissions¹⁴.

Deathstalker

Supraclassis: Chelicerata
Classis: Arachnida
Ordo: Scorpiones
Familia: Buthidae
Subfamilia: Buthinae
Genus: Leiurus seu Buthus
Species: Leiurus quinquestriatus (Hector)

Scorpionism caused by the sting of this North American scorpion is often characterised by pathological erections – the priapism¹⁵⁻¹⁷. Almost complete symptomatology produced by the neurotoxin poisoning if these Buthoidae is a consequence of the autonomic nervous system stimulation^{14,15,17,18,19}. The poison consists of four components: chlorotoxin, charybdotoxin, scyllatoxin and agitoxins. The venom stimulates sacral parasympathetic nerves which leads to changes in peripheral non-adrenergic and non-cholinergic transmission in vascular and nonvascular smooth muscles. The main transmitter is vasoactive intestinal polypeptide (VIP). It is released from the VIP-re-

leasing nerves located most densely around the pudendal artery and the erectile tissue of human corpus calosum. The released VIP is the strongest relaxant of the penile vascular and smooth muscle structures, leading to tumescence and erection of the penis²⁰. This is the most probable mechanism for the erection caused by the Buthoidae venom. Other components of deathstalker's toxin cocktail are a potential in treatment of brain tumors and insulin regulation in diabetes.

Banana Spider

Classis: Arachnida

Ordo: Araneae

Subordo: Labidognatha

Familia: Ctenidae

Genus: Phoneutria

Species: Phoneutria nigriventer (Keyserling)

In past centuries spiders were often used as aphrodisiacs. In South America women mix spiders in the food they give their impotent spouses to increase their sexual desire²¹.

In Brasil, Phoneutria nigriventer is called the "aranha armadeira" because of its defensive-aggressive posture in the state of fright. It is also called the "brasilian wandering spider" or "banana spider". Adult specimens have up to 4 cm long trunk and 12 to 15 cm wide leg span. Subcutaneous application of sublethal doses of this spider's toxin induces penile erection in dogs. It lasts for hours, often longer than 24 hours.

This spider's venom also causes erections in mice. The relation between the dose and the following erection is different in dogs and mice. In dogs, only high doses induce erection, while in mice the relation is inversely proportional. The higher the dose the smaller number of mice has an erection. Mice which receive smaller doses of the venom demonstrate only penile erection²². An interesting fact is that children with this araneism often mention erection as a symptom.

It is considered that the erections in this araneism are a consequence of higher nervous system stimulation, because it can be induced in dogs with cut spinal cord at twelfth thoracic vertebra. It is thought that the erection is not a result of reflexes produced by urogenital stimulation²².

Mediterranean Black Widow

Familia: Theridionidae

Genus: Latrodectus

Species: Latrodectus mactans (Fabricius)

Subspecies: Latrodectus tredecimguttatus (Rossi)

Latrodectus genus is spread all over the world. The most venomous is the European – Mediterranean spider. The ancient Authors, even Avicenna, noticed that erections, priapism and libido arousal appeared in contrast to the bad general condition of patients with latrodectism²³. The priapism itself and libido enhancement, as the symptoms of latrodectism, have been described by many Authors^{21,24-30}. Latrodectism induced erections and priapism are a consequence of lumbosacral parasympathetic structure stimulation²⁷. Maretti considers that, beside the autonomic nerve stimulation, blood viscosity lays a certain role^{21,24}.

Bettini and Cantore²⁷ reported about a patient who was treated in hospital for latrodectism, in a phase of severe pain experienced erection and a compelling sexual desire. In that condition he ran to his wife to satisfy his lust.

Burmeister's Triatoma

Supraclassis: Tracheata seu Antennata

Classis: Insecta

Ordo: Hemiptera seu Rhynchocha

Subordo: Heteroptera

Familia: Reduviidae

Subfamilia: Triatominae

Genus: Triatoma

Species: Triatoma phyllosoma (Burmeister)

Inhabitants of a Mexican province Nayarit eat a bug called "chinche decompostela" to achieve aphrodisiac effect³¹⁻³³. It is a big winged bug from the family of Kissing bugs, which lives in animal lairs in the southern parts of North America, Central and South America. It also feeds on human blood, and when attached inflicts a very painful bite. As a vector of Trypanosoma cruzi, the causative agent of Chagas disease, it is also medically significant^{31,33}. Butanoic acid derived from the Brindley's scent glands is a strong irritant^{31,34}, found in butter and parmesan cheese as a product of anaerobic fermentation (also found in body odor). It has an unpleasant smell and acrid taste, with a sweetish aftertaste. It can be detected by mammals with good scent detection abilities (such as dogs) at 10 ppb, whereas humans can detect it in concentrations above 10 ppm³⁵. Subjects describe the bite of Triatoma as virtually painless with a slight tingling sensation. It is assumed that consuming of this insect produces an aphrodisiac effect by irritating abdominal and pelvic organs, or it acts as pheromone – natural sexual attractant.

Giant Water Bug

Classis: Insecta
Ordo: Hemiptera seu Rhynchot
Familia: Belostomatidae
Genus: Belostoma seu Lethocerus
Species: Lethocerus indicus (Lepeletier et Serville)

Belostomatidae are big water insects with a flattened body. They are the biggest representatives of the Hemiptera order, reaching the length of 12 cm³⁵. We found several specimens of this bug in the southern Adriatic coast. Their bite can be very painful, similar to a wasp's one³⁴. In Singapore and Kuala Lumpur, feces of this bug as it itself, dried, are sold as aphrodisiac^{38,41}. Vietnamese people really love to use their metasternal scent glands as spice³⁸. These glands produce some alkenol esters which serve them in defense or as pheromone, sexual attractant^{34,40,41}.

Diving-Beetle

Classis: Insecta
Ordo: Coleoptera
Familia: Dytiscidae
Genus: Dytiscus
Species: Dytiscus marginalis (Linnaeus)

Diving-beetle specimens are sold and used as aphrodisiac in Singapore³⁸. It is proved that in defense purposes, beetles from Dytiscidae family in their two prothoracal glands produce and excrete steroid molecules and even sex hormones like: testosterone, estrone, progesterone and some androsterones⁴²⁻⁴⁵. Many Authors claim that sex hormones even in microdoses significantly stimulate libido and sexual function in humans (46-48). Androgens and estrogens do not differ in the process of achieving the aphrodisiac effect. Free fraction of testosterone is transformed metabolically in estradiol-17 (E2) by aromatisation in all sexually competent tissues. E2 is circa hundred times more effective than testosterone itself and is considered to be sexually active in the brain⁴⁸. Having this in mind, we think that Dytiscidae achieve their aphrodisiac effect by stimulating the central nervous system.

Korean Bug

Classis: Insecta
Ordo: Coleoptera
Subordo: Polyphaga
Familia: Tenebrionidae
Genus: Martianus
Species: Martianus seu Palembus dermestoides (Farmaire)

Korean bug is used in Malaysia, Singapore, Sumatra and Java as aphrodisiac. In Indonesia, it is called "bobok", and it is eaten alive or in gelatinous capsules. Swingers of the Singapore jet-set highly appreciate and pay well for this insect⁴². For now, it is proved that it is a vector of causative agent of a hymenolepiasis^{39,49}. If it possesses a true aphrodisiac effect, it is achieved by catharidin, inhibition of phosphodiesterase, protein phosphatase activity and stimulation of -adrenergic receptors, inducing vascular congestion and inflammation.

The effect of catharidin is described in Spanish fly chapter, in the text below.

Diaclina – Panzer's Darkling Beetle

Classis: Insecta
Ordo: Coleoptera
Subordo: Polyphaga
Familia: Tenebrionidae
Subfamilia: Ulominae
Genus: Diaclina
Species: Diaclina fagi (Panzer)

Diaclina is used as aphrodisiac in China and Korea, under a local name "young-chun". It is consumed after fed by some Chinese aphrodisiac plants. Chinese Authors consider that in this way, the curative power of the plants is enhanced up to ten times. Consumers claim that it tastes like pepper. If many bugs are taken at once, the upper respiratory and alimentary system can be irritated. Recommended dose is five to seven insects that are chewed slowly with some other food and drink, just before going to bed. The dose can be increased up to ten pieces, three times a day⁵⁰. The aphrodisiac effect is probably achieved by stimulating the urogenital structures.

Flannel Moth

Classis: Insecta
Ordo: Lepidoptera
Familia: Megalopigyidae
Genus: Megalopyge
Species: Megalopyge lanata (Stoll et Cramer)

Native inhabitants of South America use caterpillars of some butterflies (erucacae) in libidos ceremonies. The erucism, a reaction to envenomation from certain poisonous caterpillar spines, in those regions is caused by six families of phanerotoxic moth. The caterpillar of night moths from the Megalopigyidae family is known as "tatorana" or "cuy machucuy" – the flaming caterpillar. They are protected by long slightly

curved piles of which some are connected with glands localised in cutis and subcutis. The glands excrete defense substances that cause urticaria. Hyperaemia, erythema and itching on skin and mucosa are symptoms of this erucism in humans⁶⁸. Locally applied on the outer genitals, these caterpillars have erectile effect by irritating urogenital system through the skin.

Spanish Fly

Classis: Insecta

Ordo: Coleoptera

Familia: Meloidae

Genus: *Lytta*

Species: *Lytta vesicatoria* (Fabricius)

This is the most important and most commonly studied arthropod with aphrodisiac effect. Representatives of this family are found in all continents, where they are often used as aphrodisiacs. The most famous are: Spanish fly – *Lytta vesicatoria* Fabricius⁵⁰⁻⁶⁰, Chinese cantharide – *Mylabris cichorii* Fabricius^{52,60}, Chinese blister fly – *Mylabris sidae* Fabricius³⁸, Eastern-Indian or Blue cantharide – *Lytta gigas* Fabricius⁶³, CMR bean beetle (“CMR” refers to the Cape Mounted Rifle Corps, a police force in the old Cape Colony whose uniforms sported black and yellow bands that resemble the colors of this beetle) – *Mylabris oculata* Thunberg⁵⁸ and *Epicauta vittata* Fabricius⁵⁶.

The use of these insects as aphrodisiacs is mentioned the famous Greek physician Dioskurid in the 1st century A.D. The second milestone in the impotence therapy, Meloidae achieve in 13th century, when they helped Louis XV and Ferdinand the Catholic to cure impotence⁵⁶. At the beginning of the 18th century Markiz de Sade used and propagated these insects in his brothel⁵². There is a PhD thesis from 1713, in which Quistorp described aphrodisiacs of that time, with a special attention to these insects¹¹. During the last century, they were very popular in impotence therapy, but studies about their toxic repercussions dominate in the literature^{52-56,58,59,61-63}. In the 70ies of the last century, the cantharidin (active principle of these flies) was considered as a first choice medicine in treatment of impotence in men in their fifties⁶⁴.

The active principle of dried and smashed Meloidaea bodies is cantharidin, the anhydride of cantharidin's acid. Cantharidin is found in blood, ovaries and soft tissues of these flies. Males produces cantharidin in the accessory glands of gen-

ital organs, which is used as pheromone, a sexual attractant^{65,66}. Almost all of the Meloidaea species use cantharidin as a defense toxin⁵¹.

Cantharidin is an unreliable and unsafe aphrodisiac, whose effect is based on stimulation of the urogenital tract, strong pelvic hyperaemia with consequent erection, possibly priapism^{11,55,57-60,67}. The therapeutic width is very narrow. Peroral lethal dose for humans is also not exact and is in range from 10 to 50 mg^{56,59}, but survival after 175 mg has also been noticed⁵⁵. Toxic effect can be seen after ingestion of 600 mg od smashed Meloidae, while death occurs after 1.5 to 3 g⁵⁸. It is proved it can lead to gastrointestinal hemorrhage and hematuria⁶². Cases of acute renal failure and pseudopolycythaemia^{72,73}, neurological disorders as flaccid paralysis – Guillain-Barré²⁴, and even deadly outcome have been described.

Migratory Locust

Classis: Insecta

Ordo: Orthoptera

Subordo: Caelifera

Familia: Acrididae

Subfamilia: Oedipodinae

Genus: *Pachytylus* seu *Locusta*

Species: *Locusta migratorius* (Linnaeus)

Subspecies: *Locusta migratoria migratoroides* (Reiche)

Ridley claims that consumption of migratory locust's ovipositors (organs used by some animals for oviposition, the laying of eggs) has aphrodisiac effect, and is used on Malay peninsula³⁸. Two species of locusts are eaten there, while *Locusta migratoroides* Reiche is more often used than *Oxya velox* Thunberg. The mechanism of this effect can be related to the stimulation of gastrointestinal tract.

The migratory locust is polyphenic. It transitions between two main phenotypes in response to population density; the solitary phase and the gregarious phase. As the density of the population increases the locust transforms progressively from the solitary phase towards the gregarious phase. Mature males release several volatiles, among them phenylacetonitrile, which are reported to accelerate sexual maturation in young males. Comprehensive studies have demonstrated that phenylacetonitrile is used by mature gregarious males as a courtship inhibition pheromone to enhance mate guarding⁷⁴. Besides females locusts, males also produce substance(s) with aphrodisiac effect but with different way of action.

Red Wood Ant

Classis: Insecta
 Ordo: Hymenoptera
 Familia: Formicidae
 Genus: Formica
 Species: Formica rufa (Linnaeus)

Red wood ant is commonly found throughout much of Europe in both coniferous and broad-leaf broken woodland and parkland. Workers can measure 8-10 mm in length.

Quistorp's PhD thesis from the 18th century about real aphrodisiacs mentions the use of ants in that manner¹¹. Dufour's gland opens into the dorsal vaginal wall and its secretion have been "somewhat of a mystery". In ants these glands excrete formic acid, the strongest among saturated alkane acids, a nonspecific irritant, used in defense. Formic acid was first extracted in 1671 by the English naturalist John Ray by distilling a large number of crushed ants of this species.

The ant cocoons are very nutrient and tasteful. Nowadays, it is locally applied on the genital region for sexual stimulation and orgasm enhancement (formicofilia)^{69,70,71}.

Honeybee

Classis: Insecta
 Ordo: Hymenoptera
 Familia: Apidae
 Genus: Apis
 Species: Apis mellifica (Linnaeus)

Honey is also known as the nectar of Aphrodite. In ancient times the tradition was to present the newlyweds with honey to help them enjoy their first sexual act and help conceiving a child. Even Hippocrates prescribed honey for sexual endurance. Sheikh Nefzawi, in his masterpiece from the 16th century, the classic of Islamic erotic literature, "The Perfumed Gardens", honey is mentioned as a medicine that directly improves the semen quality and enhances sexual pleasure¹⁰. Two centuries later, honey mixed with linen seed (*Linum usitatissimum* Linnaeus) and pepper (*Piper nigrum* Linnaeus) was used to arise libido¹¹. The use of honey as an aphrodisiac is also mentioned in the Kama Sutra, where it is said that honey spiced with nutmeg is said to heighten an orgasm. This faith in honey as an aphrodisiac and energy booster is connected to the ancient tradition of the honeymoon when couples went into seclusion, drinking a honey mixture until the first new moon of their marriage. Attila the Hun drank a lot of honey on his honeymoon.

Honey is a bee product consisted of 80 to 85% highly nutrient carbohydrates, mostly inverted mono-saccharides. As it is a high quality food, the aphrodisiac effect might be achieved in the same way as in lobsters^{7,8,10-12}, but it is also rich in B vitamin complex and amino acid content boosting energy and stamina. Honey provides a quick shot of natural sugar.

Conclusions

According to the division stated in the introduction, we can classify the arthropods in the table below (Table I). The difference between inner and outer irritants of lower abdominal and pelvic stimulators is that the inners are taken per os, while the outers are applied on the skin of the genitals.

Most arthropod species are used as aphrodisiacs in Asia and South America. This phenomenon is especially present in subcultural environments, but even high social groups benefit from this kind of impotence therapy. Their medical use may have at least three consequences: aphrodisiac effect, poisoning or parasitic infestation.

Arthropods and their products are present in impotence treatment even nowadays, due to centuries long tradition, easy availability and high diversity. Some of the described arthropods re-

Table I. Division of arthropods as aphrodisiacs according to the places of effect.

Aphrodisiacs achieving effect by irritating the lower abdominal and pelvic structures	
<i>Internal irritants</i>	Palinurus sp. Triatoma phyllosoma Leithocerus indicus Martianus dermestoides Diaclina fagi Lytta vesicatoria
<i>External irritants</i>	Megalopyge lanata Formica rufa
Aphrodisiacs achieving effect by irritating the spinal cord	
	Centruroides sculpturatus Leiurus quinquestriatus Phoneutria nigriventer Latrodectus tredecimguttatus
Aphrodisiacs achieving effect by irritating the brain	
	Dytiscus marginalis Palinurus sp. Apis mellifica



Lobster (*Palinurus sp.*)



Arizona bark scorpion (*Centruroides sculpturatus*)



Deathstalker (*Leiurus quinquestriatus*)



Banana spider (*Phoneutria nigriventer*)



Mediterranean black widow (*Latrodectus tredecimguttatus*)



Burmeister's triatoma (*Triatoma phyllosoma picturata*)



Giant water bug (*Lethocerus indicus*)



Diving beetle (*Dytiscus marginalis*)



Korean bug (*Palembus dermestoides*)



Diaclina - Panzer's darkling beetle (*Diaclina fagi*)



Flannel moth caterpillar (*Megalopyge lanata*)



Spanish fly (*Lytta vesicatoria*)



Migratory locust (*Locusta migratoria migratoroides*)



Red wood ant (*Formica rufa*)



Honeybee (*Apis mellifica*)

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quire detailed chemical and pharmacological research, all in the aim of scientific rejection of their aphrodisiac effect hypothesis or acceptance with possible adequate chemical modification to be used as proven aphrodisiacs.

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