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Review Article

Antitoxic effect of herbal drugs mentioned in Ashtang Hridaya in the context of insect bites

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ABSTRACT

There is an immense variety of species, such as flies, bees, wasps, ants, lice, butterflies, dragonflies, and mosquitoes. These insects make up more than half of all known living organisms and could potentially account for over 90% of the distinct life forms on Earth. Insects frequently come into contact with humans, and their bites can trigger various symptoms due to their poisonous effects. Out of eight branches of Ayurveda, Agada tantra has the centre of interest in the description of various types of poison and the treatments dealing with poison, i.e., Agad (antidotes/antitoxic formulation). The Acharyas have documented various medicinal plants and Agad formulations specifically designed to treat Keet Visha (Insect bite poison) and its associated symptoms in their Samhitas. In a group of antitoxic drugs (*Vishaghna Mahakashay*), the drugs which are mentioned are used in various combinations or individually for the cure of poisoning or the symptoms related to poisoning. In these studies, we aim to offer an evidence-based approach to the choice of anti-toxic effect of herbal drugs, which is mentioned in the Ashtanga Hriday in the context of insect bites like Tagara, Nagkeshar, Haridra, Daruharidra, Manjishtha, and Patang. The data was sourced from Ayurvedic treatises and various textbooks on Agadatantra. Research papers published online were accessed using search engines like PubMed, Scopus, Google Scholar, AYUSH Research Portal, and DHARA. The reviewed Antitoxic drugs Haridra, Daruharidra, Patang, Manjishtha, Tagar and Nagkeshar all have antimicrobial and antibacterial activity, which may help to prevent the infection by killing the bacteria and can promote healing. Reviewed studies show most of the drugs are blood purifiers, some having antioxidant, anti-inflammatory, anti-pyretic, anti-virulence, analgesic, antihistaminic, and anti-microbial properties. The diverse pharmacological properties and actions of these ingredients make them valuable not only for treating insect bites but also for other conditions such as pain, inflammation, skin issues, gastroenteritis, and fever. Further research is essential to fully understand their efficacy in treating poisoning and related symptomatic conditions. This review aims to compile comprehensive knowledge of all antitoxic drugs with its constituents, highlighting their therapeutic, pharmacological and medicinal uses.

Keywords: Antitoxic effect, Ashtang Hridaya, Insect bite

INTRODUCTION

In today's understanding, insects are arthropods classified under the class Insecta. This class includes an immense variety of species such as flies, bees, wasps, ants, lice, butterflies, dragonflies, and mosquitoes. Insects make up more than half of all known living organisms and could potentially account for over 90% of the distinct life forms on Earth.[1]

Insects frequently come into contact with humans, and their bites can trigger various symptoms due to their poisonous effects. Common symptoms include pain in the affected area or muscles, swelling, fever, redness, itching, numbness, or tingling. The venom injected from an insect's

bite or sting prompts the immune system to respond. Typically, the body's immediate reaction involves pain, redness, and swelling at the site of the bite or sting. Minor delayed reactions may include itching and soreness. For individuals highly sensitive to insect venom, bites and stings can result in a potentially life-threatening condition known as anaphylactic shock.[2]

Acharya Sushrut has documented 67 types of Keet (insects) under the category of Jangam Visha (animate poison) in the Keet Kalpa Adhyaya of Kalpasthana, detailing their signs and symptoms.[3] Acharya Charak and Acharya Vagbhatta have also extensively described Keet (insects) and Keet Visha Dansha Lakshan (insect bite-associated symptoms) in their treatises.[4,5] Common symptoms of Keet Visha Dansha (insect bite poison) include Vedana (pain), Shopha (inflammation), Kandu (itching), and Jwara (fever). Out of eight branches of Ayurveda, Agada tantra has a centre of interest in the description of various types of poison and the treatments dealing with poison, i.e., Agad (antidotes/anti-toxic formulation).

The Acharyas have documented various medicinal plants and Agad formulations specifically designed to treat Keet Visha (insect bite poison) and its associated symptoms in their Samhitas.[6]

Agada (antitoxic formulation) is the combination of drugs that counterbalance the venomous effects of poison. Antitoxic formulation can be administered through various routes like local, oral, and inject containing on action of poison. In a group of antitoxic drugs (*Vishaghna Mahakashay*), the drugs which are mentioned are used in various combinations or individually for the cure of poisoning or the symptoms related to poisoning.

The current study aims to get information about the antitoxic effect of herbal drugs, which are mentioned in Ashtanga Hriday in the context of insect bites like Tagara, Nagkeshar, Haridra, Daruharidra, Manjishtha, and Patang.

METHODS

The data was sourced from Ayurvedic treatises and various textbooks on Agadatantra, as well as articles from different journals. An extensive literature search was manually conducted using various reference books on Ayurveda (Sushruta Samhita, Charaka Samhita and Ashtanga Hridaya) and textbooks on Agadatantra. Research papers published online were accessed using search engines like PubMed, Scopus, Google Scholar, AYUSH Research Portal, and DHARA.

The information was categorised, modified, compiled and thoroughly examined to investigate the review of anti-toxic drugs.

RESULTS

Haridra-Curcuma longa

Curcuma longa has anti-inflammatory, antioxidant, anti-microbial, anti-arthritis, anti-cancer, anti-asthmatic, anti-microbial, anti-fungal, and anti-viral activity. Curcuma shows antimicrobial activity against methicillin-resistant *Staphylococcus aureus* (MRSA), *Escherichia coli*, *Klebsiella pneumoniae*, and *Acinetobacter baumannii* bacteria.[7-15]

Daruharidra-Berberis aristate

Berberis aristate showed antimicrobial activity against different bacterial strains like *E. coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus pneumonia*. And also, anti-diabetic, anti-cancer, anti-lipidemic, anti-HIV, anti-pyretic, and anti-inflammatory action.[16]

Berberis root species are used as a diaphoretic, antipyretic anti-periodic, and their action was believed to be as powerful as quinine. Also, this plant is well proven for antimicrobial, cardiovascular, hepatoprotective, and anti-cancerous activities.[17]

Tagar-Valeriana wallichii

The essential oil of *Valeriana wallichii* and components of valerian were tested against the pine wood nematode Bursaphelenchus xylophilus.[18] Chloroform fraction and hexane fraction showed good activity against *S. aureus* and *B. subtilis*. Different root extracts like water, methanol, and chloroform of *Valeriana wallichii* showed antileishmanial activity against L. major amastigotes.[19] Leaves of *Valeriana wallichii* showed significant ($p<0.001$) dose-dependent anti-inflammatory activity.

The antispasmodic and hypotensive effects of *Valeriana wallichii* are mediated, possibly through K_{ATP} channel activation, which justifies its use in gastrointestinal and cardiovascular disorders.[20]

The essential oil and alcohol extract of *Vlerina wallichi* have good peripheral analgesic action via inhibition of prostaglandin synthesis on acetic acid-induced writhing.[21]

Manjishtha-Rubia cardifolia

Rubiadin, a 1,3-dihydroxy 2-methyl anthraquinone, is a powerful phytoconstituent of *Rubia cardifolia* which has anti-inflammatory, antimalarial, antiviral, antifungal, antibacterial, antioxidant, anticancer, antiosteoporosis, and hepatoprotective activities.

Anthraquinones (AQ) have been reported as antioxidant, antitumour, anti-inflammatory, diuretic, antiarthritic, antifungal, antibacterial, antimalarial activities, and antiviral action.[22-29]

The studies have shown that Rubiadin and RBME have antimalarial activity. The number of *Plasmodium falciparum* parasites decreased significantly, indicating the potential to be developed as anti-anti-plasmodial agent. Rubiadin inhibits HBV DNA replication and lowers hepatitis B e antigen (HBeAg) and HBcAg levels, suggesting a promising anti-HBV drug candidate.[30]

Nagkeshar-Mesua ferrea

Mesuaferrone B and Rhusflavanone are the anti-virulence components from *M. ferrea* which inhibit the activity of Salmonella and the results with the study shows promising potential for use of *Mesua ferrea* in the treatment of bacterial infection through anti-virulence pathway.[31]

Mesuol and Measuone are two phytoconstituent of *Mesua ferrea* have antibiotic activity, mesuol is more active than mesuone against *Mycobacterium phlei.* Ethanolic extract of whole plant excluding root showed antibacterial activity, other pharmacological activities are hypotensive, antispasmodic, anti-anaphylactic, antifungal, anthelmintic, anti-asthmatic, anti-implantation, anti-inflammatory, and insecticidal.[32]

Patang-Caesalpinia sappan

Study shows that *Caesalpinia sappan* extract (CSE) have anti-inflammatory activity in OA chondrocytes and human macrophages.[33]

Brazilin is a major active principal of *Caesalpinia sappan* and it possesses an antibacterial activity against both Gram positive and Gram-negative bacteria. Many studies show the *Caesalpinia sappan* has potential for antioxidant, anti-inflammatory and antibacterial activity.[34]

DISCUSSION

The potential benefits of plants and plant extracts in the treatment and possible prevention of many leading health concerns are becoming more widely recognised within the medicinal community.

Antitoxic drugs work by neutralizing the venom or toxins introduced by insect bites, thereby alleviating the symptoms caused by the bite. Here's how they act on different symptoms.

Antitoxic drugs can help reduce pain by blocking the action of venom components that cause pain and inflammation. Haridra, Daruharidra, Tagar, Patang, Manjishtha, and Nagkeshar have proved anti-inflammatory action, which can be useful to reduce the inflammation caused by the insect bite.

Antihistamines are a common component of antitoxic drugs; they counteract the histamines released by the body in response to the bite, thereby reducing itching.

Antioxidant has a significant impact on the symptoms of insect bites by reducing inflammation od oxidative stress. After an insect bite, there is a release of free radicals' other reactive oxygen species in the affected area, which leads to tissue damage and oxidative stress. Haridra, Patang, and Manjishtha Nagkeshar have a proven antitoxic effect, which will help to neutralise these free radicals will prevent cellular damage, and promote healing.[35]

Antimicrobial activity of antitoxic drugs can help treat or prevent the infection that may arise after an insect bite. When an insect bites, they can introduce microorganisms or bacteria into the skin, leading to infection. Antimicrobial action of antitoxic drugs may work by targeting and killing these bacteria. Further, it may help to prevent the infection and promote healing. The reviewed antitoxic drugs Haridra, Daruharidra, Patang, Manjishtha, Tagar, and Nagkeshar all have antimicrobial and antibacterial activity, which may help to prevent the infection by killing the bacteria and can promote healing.[36]

Daruharidra Nagkeshar has proved antipyretic action, and Haridra has specific antiviral action, and also Manjishtha has proved anti-malarial action, so the antipyretic action of these antitoxic drugs will help to reduce fever that can sometimes be accompanied by severe insect bites, especially if there is a systemic reaction.[37]

Introduction of venom or toxins into the bloodstream can lead to a range of systemic symptoms, causing widespread inflammation and other immune responses. Manjishtha has proved cardioprotective effects on the body. Nagkeshar and Patang have additional hepatoprotective properties.

A combination of antitoxic drugs can be highly effective in treating insect bites by targeting various symptoms simultaneously. After reviewing the published articles and the textbook, we learned that most of the drugs are blood purifiers, some drugs have antioxidant, anti-inflammatory, anti-pyretic, anti-virulence, analgesic, antihistaminic, and antimicrobial properties.

CONCLUSION

Insects are essential to our ecosystems for several reasons. Their roles make insects indispensable for maintaining the balance and health of our ecosystems. They support a vast array of life forms and contribute to biodiversity. Their role in sustaining wildlife is invaluable. Therefore, it's common for humans to encounter insects. When bitten, various symptoms can arise due to the toxic effects of their venom.

Each drug is easily available, and almost all the drugs possess antimicrobial, anti-inflammatory, antioxidant, and antipyretic action, and these are the primary symptoms of insect bite.

The combination of all these drugs will be effective in alleviating poisoning symptoms and thanks to its diverse and numerous properties and actions.

Introduction of venom or toxins into the bloodstream can lead to a range of systemic symptoms, causing widespread inflammation and other immune responses. Manjishtha has proved cardioprotective effects on the body. Nagkeshar and Patang have additional hepatoprotective properties. A combination of antitoxic drugs can be highly effective in treating insect bites by targeting various symptoms simultaneously.

The diverse pharmacological properties and actions of these ingredients make them valuable not only for treating insect bites but also for other conditions such as pain, inflammation, skin issues, gastroenteritis, and fever. Further research is essential to fully understand their efficacy in treating poisoning and related symptomatic conditions.

This review aims to compile comprehensive knowledge of all antitoxic drugs with their constituents, highlighting their therapeutic, pharmacological, and medicinal uses.

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