

Indian Medicinal Plants Possessing Anti-Malarial Activity

Nidhima Sharma, Jaspreet Kaur*

*School of Pharmaceutical Sciences, Lovely Professional University, Phagwara, 144411,
India*

Abstract:

Malaria is a mosquito borne disease that affects the humans and other animals. Malaria is the one of the most deadly disease in all over the globe. Malaria transmission occurs in five WHO region. Globally, estimates 3.4 billion peoples are affected by this disease and 92 countries in the world are at the menace of being effected by the malaria. It is generally produced by the single celled Plasmodium and spread through the man through the Anopheles mosquitoes. India is the country, which is predominantly characterized by unstable malaria transmission. Transmission is generally increased by intensity due to rains. At least, hundred million people are suffered from malaria in India and this can lead to about one million deaths annually in all over the country. In now a days most of the peoples refers the Herbals Drugs in India. More than 50% of the conventional drugs are synthesized from the medicinal plants. The plant based medicines are used alone or sometime with the combination with another drugs. Almost all the herbal drugs are having the less side effects as compared to the modern drugs. Drugs which are mentioned in this review will be used as an antimalarial drugs in India, which is found in many regions. In India, many areas and tribes were used the herbal or Ayurveda medicines for the treatment of various disease. In India, approximately 1200-1800 plants are reported in Ayurveda, which possess therapeutic properties.

1. Introduction

Malaria is the leading issue nowadays [1]. It is a parasite-borne ailment produced by *Plasmodium* species. The female Anopheles mosquitoes are responsible for the transmitting of malaria [2]. *P. falciparum* is one of the fatal species among all the five parasite species such as *P. falciparum*, *P. malariae*, *P. ovale* and *P. knowlesi* that cause malaria in humans [3]. Estimate 98 million cases of malaria was found in 2013, which further lead to 584,000 deaths. Artemisinin Combination Therapies (ACT) are the primary management to cure *P. falciparum* induced malaria [4]. In order to decrease the resistance of artemisinin, it can be joint with another drugs [5-8]. In the case of falciparum (95%) and non-falciparum malaria, ACT treatment is highly recommended [9-11]. However, its efficiency is reduced by various

causes like low convenience in remote areas, low class of anti-malarial drugs and treatment-seeking behaviour for traditional medicines [12,13].

Recent studies have shown that artemisinin from leaves of *Artemisia annua* and quinine from *Cinchona officinalis* bark are the two source of antimalarial drugs from herbal medicines [14,15]. Relevance, usage and applicability of traditional knowledge have proven by reverse pharmacological approach applied to malaria treatment [16,17]. This approach has revealed that phytomedicines have discovered faster and cheaper than modern drugs [17]. But the growth of these drugs can take upto 15 years and cost upto \$800 million. Along with it, their accessibility and affordability is very challenging for the poor patients specifically in certain areas, where severely funded schemes are not prevalent [18, 19]. Nowadays herbal medicines are extensively used in the treatment of malaria, in spite of the general enhancement in quality-assured ACTs around the globe [2, 20]. Due to the deficiency of availability and affordability of ACTs and delicate health-care systems, more than thousand plants are being used globally as potent antimalarial drugs [21]. To solve the problem of increasing level of drug resistance, clinically efficient plants possessing antimalarial property can be an essential and sustainable cause of treatment [22, 23]. Moreover, herbal medicines are possessing fewer adverse effects as compared to conventional antimalarial drugs [24]. Herbal plants are good alternative to conventional antimalarial drugs because of their lower cost and side effects. So, quality research is required to identify the effective isolated molecules from the plants possessing antimalarial activity. Few examples of antimalarial plant based constituents are quinine and artemisinin.

2. Plants used in the treatment of malaria

Various herbal drugs used these days to treat malarial are generally plant based and this traditional knowledge further become the basis of future research. Crude drugs or isolated phytoconstituents are therefore called as major precursor of various conventional medicines. Here, we discuss some traditional medicinal plants assessed scientifically against malaria.

2.1. *Azadirachta indica*: It is commonly known as Neem and majorly found in the areas of India, Pakistan, Bangladesh, Sri Lanka, Burma, Malaysia, Thailand and Australia. It is an evergreen tree belongs to the family of Meliaceae. This traditional herbal drug is uses in all over the globe to treat various ailment for more than 4000 years. Traditionally, parts of neem tree is used for the treatment of skin problems, chicken pox, ulcers, cancer, respiratory and

digestive problems. *A. indica* contain highly valuable phytoconstituents including isoprenoids and non-isoprenoids, highly potential anti-oxidants flavonoids and Genistein 7-O-glucosides [25]. Leaf extract of *A. indica* at the dose of 5000 mg/kg is practically safe, non-toxic and well tolerated [26].

2.2. *Ocimum sanctum*: It is an Ayurvedic drug used for the thousands of the years due to its diverse healing properties, commonly known as Tulsi. The extract of leaves of *O. sanctum* shows exceptional antimalarial property due to the presence of various active phytoconstituents in the ethanol extract [27]. Therapeutic studies show that Tulsi possess various pharmacological activities such as anti-malarial, anti-oxidant, anti-inflammatory and so on [28, 29, 30, 31]. These properties of plant is help to manage various physical and psychological functions [32].

2.3. *Andrographis paniculata*: It belongs the family Acanthaceae and commonly known as Kalmegh. *A. paniculata* is mainly found in India, Pakistan, Malaysia, Thailand, China and Hong-Kong. Traditionally, it is used in the treatment of fever, bug bite, snake bite, diabetes and malaria. In Ayurvedic and Unani system of medicines, this is drugs is one of the most used in medicinal plants [33]. *A. paniculata* is used for the assessment for anti-malarial activity as traditionally, it used as anti-pyretic. Some therapeutic activities such as anti-cold, hepato-protective and anti-malarial of Kalmegh are well documented [34]. The extract of this plant contains lactones, flavonoids, glycosides and diterpenoids [35]. Traditionally, *A. paniculata* plays a vital role in the treatment of various liver diseases. These interpretations confirm that plant extracts of the *A. paniculata* exert permanent inhibitory activity on the ring stage of the parasite [35].

2.4. *Lantana camara*: Wild sage and red sage lantana weed are the common name of the plants. The various parts of the plant extract are used in several diseases such as tonic, anti-spasmodic, wounds, ulcer, swelling, anti-inflammatory, anti-malarial, gastrointestinal disorders, antipyretic and skin diseases [36]. Major phyto-constituents of *L. camara* were recognized as triterpenes like alkaloids, flavonoids, saponins, tannins and valencene, which is the main component of the plant. It is a native plant of India majorly found in Tamilnadu [37].

2.5. *Calotropis gigantea*: It is a plant which have several medicinal properties. It is a flowering plant. It is found throughout the tropical and subtropical parts of the Asia and Africa. This plants are basically known as milkweed and native to the countries of Bangladesh, Myanmar, China, India, Indonesia, Pakistan, Philippines, Thailand and Sri-Lanka. It is a large shrub up to 4m 13ft tall. It has cluster of waxy flower that are either white or lavender in colour. Each flower consist of pointed petals and a small, elegant “crown” rising the centre, which hold the stamens. *C. gigantea* contain many phytochemical constituents such as alkaloids, saponins, cardiac glycosides, anthocyanins, triterpenoids, resins and flowers contains terpenes and cyclisadol. The plant extract which showed potent *in vitro* antimalarial property was further tested for *in vitro* antimalarial activity in experimental mice [38].

2.6. *Rauwolfia serpentine*: The root of this herb is used in India for the treatment of several diseases. The drug is reported to possess sedative and hypnotic properties. The plant is found in the regions of Himalayas, Himachal Pradesh, Uttaranchal, Jammu Kashmir and at moderate altitude in Sikkim, North Bihar, Patna, Uttar Pradesh, Assam, Burma, Bengal, Sri Lanka, Andaman. Cultivation of *Rauwolfia* is started in different states of India as Dehradun, Lucknow, Jammu and Indore [39]. Phytochemical screening of *R. serpentine* reveals the presence reserpine, serpentine, deserpidine, indobidine, reserpiline. The main alkaloid of the plant is reserpine. *Rauwolfia serpentine* are also rich in macro and micro nutrients which supports its therapeutics properties i.e. Calcium, phosphorous, potassium, magnesium, sodium, iron and zinc [40].

3. Discussion

Malaria is the most fatal disease spreading all over the globe. Instead of various prevention curriculums in several countries, there has been very less development to manage this parasitic disease and infection is reduced. Cycle of malaria started with the infected mosquitoes which injects the sporozoites in the human and animals.

India is the most predominantly characterized by the unstable malaria transmission. Transmission is seasonally increased due to the rain. In Punjab, the land of the five rivers Sutlej, Ravi, Beas, Chenab and Jhelum generating the major breeding ground for the malarial vector. Punjab is the most populous province with the population of estimated 29.6 million according to the 2017 census.

Plant is always the key source of the drugs and treatment of the disease with using different strategy in different types of medicine system. These mentioned plants or its extract have substantial result in *in vitro* and *in vivo* antimalarial activity.

4. Conclusion

Herbal medicines play an essential role in the management of health, specifically in rural and remote areas. Availability of phytoconstituents in clinical practice will help to achieve the target “health for all”. Most of the traditional herbs having anti-malarial property have substantial result *in vitro* and *in vivo* anti-malarial activity. Hence, malaria can be treated by giving medicinal plants which is already using as a traditional knowledge, nevertheless there is further need of documentation by experimental and clinical study.

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