

Traditional medicine used for malaria in India

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Abstract

Malaria is one of the most common major health problem in tropical and developing countries of sub-Saharan Africa and south East Asia including India. It is a Mosquito borne & parasitic disease caused by Plasmodium Falciparum, Vivax, Malarea & Ovale. Traditional Vaidya & Tribal Community uses traditional medicine for malaria effectively in India, but matter is scattered & have to need to collect & explained scientifically. Most of the mentioned herbs having Bitter-Pungent, Anti-Microbial and Anti-Pyretic property which help to displace or kill the parasite by Interrupting Nature by decreasing Vitiated Phlegma and Faeces on which these microorganisms lodges, flourish, grows in increase in numbers, thus leading to disease. Out of some herbs showed significant result in Clinical, in Vitro & in Vivo study. Malaria can be treated by giving herbal drug which is already using by Traditional Practiser and Tribes in India.

Keywords: Malaria, Traditional Medicine, Folk Medicine, Antimalarial Herb

1. Introduction

The World Malaria Report 2012 summarizes data received from 104 malaria-endemic countries and territories for 2011. Ninety-nine of these countries had on-going malaria transmission. According to the latest WHO estimates, there were about 219 million cases of malaria in 2010 and an estimated 660 000 deaths.^[1]

India is predominantly characterized by unstable malaria transmission. Transmission is seasonal with increased intensity related to rains. Due to the low and unstable transmission dynamics, most of the population has no or little immunity toward malaria. As a result, the majority of Indians living in malarious areas are at risk of infection with all age groups affected. However, surveys have shown that in some foci, mainly in forested areas, transmission is so intense that the disease burden is to a large extent concentrated in children. Screening of fever cases for malaria is done under NVBDCP covering about 10% of the population annually, of which about 1.5 to 2.0 million are positive for the malarial parasite.^[2]

Malaria has been known in India from times immemorial. J.A. Sinton, the first Director of the

Malaria Institute of India estimated in 1935 that at least 100 million people suffered from malaria in India and about one million deaths occurred annually in endemic areas.^[3]

Ayurveda has also mentioned Malaria & its Management under the heading of Irregular Fever (*Vishhamjar*) specially Tertian (*Trutiyaka*) & Quartan (*Chaturtak*).^[4] The tribal community distributed all over India has been using the herbs to treat malaria since indefinite duration & Most of the herbs used undergone in Vitro & Clinical Trial found satisfactory output. AYU-64 proved significant potent to clear the malarial parasite, which developed by CCRAS containing herb like *Ghanasatva* of *Katuki*, *Saptaparna* and *Kiratitaka* and powder of *Kuberakshi*.^[5] This Article highlighted on Herbs e.i.

Traditional medicine used for the treatment of malaria used by Various Tribal Community in India.

Aims & Object

1. To collect, elaborate & discussion of Traditional medicine used for the treatment of malaria used by Various Tribal Community in India.
2. To discuss the practical utility of anti-malarial folk herbs.

Material & Method

All primary ethno botanical studies from book and journals, Research Paper of different Universities & Institute of India were collected from internet & library of National Institute of Ayurveda for information about folk medicine & plant species used for malaria. Only peer review journal & book having ISSN No. were included to collect the matter. This article is based on Review of Journal & personal experiences about anti-malarial folk herbs used by Various Tribal Community in India. The material related to folk medicine used for the treatment of malaria used by Various Tribal Community in India are collected from Indian Journal of Traditional Knowledge, Int. J. Med. Plants, Indian Journal of Fundamental and Applied Life Sciences, American-Eurasian Journal of Sustainable Agriculture, J. Nat. Prod. Plant Resources, British Journal of Pharmaceutical Research, IJRAP, Indian Journal of Experimental Biology, J. Clinical Biochemistry of Nutrition, Asian Journal of Traditional Medicines, International Journal of Recent Trends in Science and Technology Modern Texts & various websites to collect information on the relevant topics have referred.

Traditional Medicine

The term Traditional medicine refers to healing practices and ideas of body physiology & health preservation known to a limited segment of the population in a culture, transmitted

informally as general knowledge, and practiced or applied by anyone in the culture having prior experience. Folk medicine may also be referred to as Traditional medicine, Alternative medicine, Indigenous medicine, Complementary medicine, Natural medicine. In fact, out of these terms perhaps only indigenous medicine and Traditional medicine are the terms well congruent with folk medicine. [6]

Folk medicine is the mixture of traditional healing practices and beliefs that involve herbal medicine, spirituality and manual therapies or exercises in order to diagnose treat or prevent an ailment or illness. The World Health Organization states that it is mostly practiced by indigenous or native

populations and as much as 80% of the population in certain countries within Asia and Africa rely on it for primary care. [7]

Result

Malaria is one of old disease of human being & found since ancient time. All the main Text Book of *Ayurveda* have more description under the heading of Irregular Fever (*Vishhamjar*) especially Tertian (*Trutiyaka*) & Quartan (*Chaturtak*). There are near about 654 Tribes being notified in various state & Territory in India. [8] They are using folk medicine to treat many diseases on the basis of traditional knowledge given from their ancient.

Table 1: Traditional Medicine used for Malaria in India

Sr	Latin Name	Family Name	Sanskrit Name	Part Used
1	<i>Aconitum ferox</i>	Ranuncu-laecae	Vatsanabh	Rhizome
2	<i>Alstonia scholaris</i>	Apocynaceae	Saptaparna	Powder of stem bark
3	<i>Andrograpis paniculata</i>	Acanthaceae	Kalmegh	Whole part
4	<i>Artemisia vulgaris</i>	Asteraceae	Damnaka	fresh leaf
5	<i>Artemisia annua</i>	Asteraceae	Sweet wormwood	Herb/ Leaves & plant oil
6	<i>Ageratum conyzoides</i>	Asteraceae	Visamustih	Leaf juice
7	<i>Aralia montana</i>	Aralliaceae	Kota bell	Leaf decoction
8	<i>Azadirachta indica</i>	Meliaceae	Neem	Leaves, fruits, seeds & Stem bark
9	<i>Adhatoda zeylanica</i>	Acanthaceae	Vasa	leaves and root
10	<i>Berberis aristata</i>	Berberidaceae	Daruharidra	Bark, root bark and stem.
11	<i>Bauhinia racemosa</i>	Caesalpiaceae	Kanchnar	Leaf, seed and Stem bark
12	<i>Bidens tripartita</i>	Asteraceae	Komenayi	Leaves
13	<i>Casaelpinia bonduc</i>	Caesalpiaceae	Kanta- Karanj	Seed Powder
14	<i>Clerodendron colebrookianum</i>	Lamiaceae	Gung, Pipe tree	Leaves Decoction
15	<i>Clerodendran Viscosum</i>	Verbenaceae	Barhibarha	leaves
16	<i>Cleome viscosa</i>	Caparaceae	Pasugandha	Whole Plant
17	<i>Calotropis gigantean</i>	Asclepiadaceae	Aak	Whole plant
18	<i>Celosia argentea</i>	Amaranthaceae	Sitivara	piece of root
19	<i>Ceasulia axallaris</i>	Asteraceae	Meyera orientalis	Whole Plant Extract
20	<i>Citrus sinesis</i>	Rutaceae	Serthlum	Leaf Decoction

Malaria in Sikkim. [9] *Alstonia scholaris* bark is given in Karnataka [10] & 1gm Powder of stem bark given in Mizoram with Luke warm water twice a day for seven days. [10, 11] *Andrograpis paniculata* is important herb for Malaria, which is given leaves paste in West Bengal and decoction of plant in Maharashtra & Madhya Pradesh. [12, 13, 14, 15] Gonds of Andhra Pradesh are uses the root & leave extract and Whole Plant Powder with Honey. [16, 17] Crushed raw leaves are taken orally for two day twice with ½ glass of Milk in Arunachal Pradesh. [18] Whole plant or 10gm powder of dry leaves or 25 gm dry seeds will be soaked in 250ml of water overnight & then filtered 2 teaspoonful of filtrate is given thrice a day for 7 days in Assam. [18, 19, 20] 20-25 gms of fresh leaf of *Artemisia vulgaris* boiled in 200 ml water till reduced 50 ml & taken twice a day before meal & 10gms of fresh leaf of *Aralia montana* in water is used thrice a day for one week or till relief in Mizoram. [21] Herb/ Leaves & plant oil of *Artemisia annua* is used in Uttarakhand. [22] *Alstonia scholaris* Leaf juice or 50gm of powdered stem bark mixed leaf juice of *Ageratum conyzoides* & *Memoridica charantia* is given in Assam. [23, 24] *Azadirachta indica* is also widely used herb in various parts of India, Meena Tribes in Rajasthan are also uses its Seeds/leaf, Tribe in Dhule-Jalgaon District Maharashtra are uses Bark. [25, 26, 27] In Assam Leaves/fruits/seeds & Stem bark will be

pounded together & small globules (approx. 5gm each) is given thrice a day for 1 month. [28] Tribes in Mizoram uses Decoction of leaves and root of *Adhatoda zeylanica*. [29] *Berberis aristata* is also widely used herb in various parts of India. [30] Leaves Decoction of *Bauhinia racemosa* in Mizoram & Leaf/seed and Stem bark in Maharashtra is used to cure Malaria. [31, 32] Naga Tribes gives *Bidens tripartite* Leaves along with *Eupatorium adenophorum* and *Citrus reticulata* are boiled and its decoction once daily to malarial patient particularly in Nagaland. [33] *Casaelpinia bonduc* Seed Powder with Black Pepper is used twice a day for 7 day in West Bangal. [34] Leaves Decoction of *Clerodendron colebrookianum* is used in Nagaland & Mizoram. [35, 36] Decoction of tender shoot and root or 250gm leaves of *Clerodendran viscosum* will be boiled in 250ml water & given 2 teaspoonful of filtrate thrice a day after meal in Assam. [37, 38] *Cleome viscosa* whole plant is uses for Malaria in Primary Health Care Karnataka. [39] Meena Tribes in Rajasthan uses the Whole Plant of *Calotropis gigantean* to cure the Malaria. [40] Small piece of *Celosia argentea* root will grind with equal water given orally twice a day, till the relief by Bhil Tribe. [41] *Ceasulia axallaris* Whole Plant Extract will be given for Malaria in Orrisa. [42] Leaf Decoction of *Citrus sinesis* uses in Mizoram. [43]

Table 2: Traditional Medicine used for Malaria in India

Sr	Latin Name	Family Name	Sanskrit Name	Part Used
21	<i>Croton tiglium</i>	Euphorbiaceae	<i>Jamalgota</i>	Plant powder
22	<i>Curcuma Aromatica</i>	Zingiberaceae	<i>Tavakshira</i>	Rhizome Juice
23	<i>Dendrophthoe falcata</i>	Loranthaceae	<i>Vrukshadani</i>	Aerial parts
24	<i>Enicostemma axillare</i>	Gentianaceae	<i>Chota chirayata</i>	whole plants
25	<i>Eranthemum roseum</i>	Acanthaceae	<i>Rosy Eranthemum</i>	Root Ground
26	<i>Ephedra gerardiana</i>	Ephedraceae	<i>Somlata</i>	Herb/ Stem
27	<i>Gmelina arborea</i>	Verbenaceae	<i>Madhumati</i>	Stem or Root Bark
28	<i>Hodgsonia macrocarpa</i>	Cucurbitaceae	<i>Hati Karela</i>	Root & Seed Infusion
29	<i>Helminthostachys zeylanica</i>	Helminthostachyaceae	<i>Tukod-langit (Tag.)</i>	Rhizome
30	<i>Lantana camara</i>	Verbenaceae	<i>Ghaneri</i>	Whole plant
31	<i>Enicostemma littorale</i>	Gentianaceae	<i>Nagajihva</i>	Whole plant
32	<i>Memordica charantia</i>	Cucurbitaceae	<i>Karavella</i>	leaves
33	<i>Murraya koenigii</i>	Rutaceae	<i>Krishnanimba</i>	flower
34	<i>Nyctanthes arbo-stritis</i>	Oleaceae	<i>Sheuli or Parijat</i>	Leaf Juice
35	<i>Oroxylum indicum</i>	Bignoniaceae	<i>shayonak</i>	Dried seeds
36	<i>Ocimum sanctum</i>	Lamiaceae	<i>Tulasi</i>	Leaves
37	<i>Ocimum canum</i>	Lamiaceae	<i>Nai Thulasi</i>	Leaves
38	<i>Piper longum</i>	Piperaceae	<i>Pippali</i>	Fruit
39	<i>Piper mullesus</i>	Piperaceae	<i>Pipli/ pan</i>	Leaves or Dried plant
40	<i>Piper nigrum</i>	Piperaceae	<i>Marich</i>	Black paper
41	<i>Picroriza kurroa</i>	Scrophularia-ceae	<i>Katuka</i>	Rhizome

Plant powder of *Croton tiglium* is given in a glass of water twice a day till Cure in Arunachal Pradesh. [44] Juice extracted from Rhizome of *Curcuma Aromatica* equal amount with *Zingiber officinale* (~3 teas spoonful of filtrate) is given thrice a day after meal in Assam. [45] *Dendrophthoe falcata* will be used in Kerala to manage Malaria. [46] *Enicostemma axillare* 50 gm whole plants or 10 gm dried plants are crushed and added 200 ml water and boiled until it reduces to 50 ml & Decoction gives orally twice a day for two weeks in Buldhana District Maharashtra. [47] Bhils & its Subtribes in Madhya Pradesh used root of *Eranthemum roseum* after grinding with glassful of water & given 1/6 glass twice a day for 3day orally. [48] *Ephedra gerardiana* herb/ stem uses for Malaria in Uttarakhand. [49] Naga Tribe gives Stem/ Root Bark Decoction of *Gmelina arborea* & Root/ Seed Infusion of *Hodgsonia macrocarpa* in Nagaland. [50] *Helminthostachys zeylanica* Rhizome is given in Arunachal Pradesh. [51] Whole plant of *Lantana camara* is given in wayanadu district of kerala. [52] Whole plant of *Enicostemma littorale* is used in Churu district in the Thar Desert, Rajsthan. [53] In Assam 50 gm leaves of *Memordica charantia* will be pounded with 50 gm leaf of *Murraya koenigii* & Juice is given twice daily for 1 week & also 25 gm flower of *Murraya*

koenigii will be boiled in 200 ml of water for ½ hr. & given 20 ml filtrate twice a day for 2 week. [54] Tribe in Purulia District West Bengal uses *Nyctanthes arbo-stritis* Leaf Juice with common Salt 20 ml, twice a day. [55] Bark, Leaves & Pods Decoction of *Oroxylum indicum* is used in Nagaland by Naga Tribe & Stem bark in Mizoram to cure Malaria. [56, 57] 50 gm dried seeds pounded in 200 ml water & given thrice a day for 10 day in Assam. [58] The Leaves of *Ocimum sanctum* mixed with *Kalimirch* & *Adrak* in equal quantity crushed & is given 5 gm twice a day for 5 day in Uttarakhand. [59] About 10 ml decoction of root is given orally twice daily until cure & 3 teaspoonful of *Tulasi* juice with equal amount of *Piper nigrum* given thrice a day after meal in Assam. [60, 61] Leaves of *Ocimum canum* (*Nai Tulasi*) is given in Tamilnadu. [62] *Piper longum* is also useful herb for Malaria which is used in various part of India. [63] Leaves or Dried plant *Piper mullesus* is used in Arunachal Pradesh. [64] *Piper nigrum* is recommended to be given with the juice of the leaves of *Ocimum sanctum*/*Leucas linifolia* or taken along with *Allium cepa* orally in Assam or Decoction of *Piper longum* crushed fruit mixed with jaggery and ginger powder is taken and *Picroriza kurroa* Rhizome is used to cure Malaria in various part of India. [65]

Table 3: Traditional Medicine used for Malaria in India

Sr.	Latin Name	Family Name	Sanskrit Name	Part Used
42	<i>Phyllanthus fratermus</i>	Euphorbiaceae	Bhumyamalaki	Whole plant
43	<i>Phyllanthus virgatus</i>	Euphorbiaceae	Bhuii amalaa	whole plant
44	<i>Passiflora nepalensis</i>	Passifloreceae	Nauavimu	Root Decoction
45	<i>Phlogacanthus thyrsoflorus</i>	Acanthaceae	Tita phul	flowers or leaves
46	<i>Rauwolfia serpentina</i>	Apocyanaceae	Sarpagandha	Root
47	<i>Scoparia dulcis</i>	Scrophularia-ceae	Chireita	Leaf Paste
48	<i>Spilentes paniculata</i>	Asteraceae	Jati malkathi	fresh leaves
49	<i>Solanum torvum</i>	Solanaceae	Tita-bhekuri	Burnt Fruit
50	<i>Stephania japonica</i>	Menispermaceae	Rajapatha	Tuber powder
51	<i>Tinospora cordifolia</i>	Menispermaceae	Giloya	Stem juice
52	<i>Terminalia bellirica</i>	Combretaceae	Vibhitak	Fresh fruit
53	<i>Vitex negundo</i>	Verbenaceae	Sindhuvara	Decoction of leave
54	<i>Ventilago calyculata</i>	Rhamnaceae	Pitti	Leaf
55	<i>Xanthium strumarium</i>	Asteraceae	Sarpakshi	Extract of leaf
56	<i>Zizyphus jujube</i>	Ramnaceae	Badara	Bark Decoction

Phyllanthus fraterculus whole plant is used in Rajasthan by Meena community & Extract of the whole plant of Phyllanthus virgatus is used by Tribals of Dhar District, Madhya Pradesh.^[66, 67] Root Decoction of Passiflora nepalensis is used in Mizoram for Malaria.^[68] Phlogacanthus thyrsoiflorus 8-10 flowers or 20-30 leaves (fresh or dried) boiled in water and half cup of decoction taken twice daily for 15-20 days in Assam.^[69] Root of Rauvolfia serpentina used in Assam for Malaria.^[70] Scoparia dulcis Leaf Paste with Honey is used in South Orissa to cure malaria.^[71] 250 ml juice extracted from fresh leaves of Spilanthes paniculata will be boiled with equal amount of water for few minute & given 2 teas spoonful twice a day for a week in Assam.^[72] Burnt Fruit of Solanum torvum & Sun dried tuber powder of Stephania japonica with boil water is used twice a day for more than 4 day or till cure in Arunachal Pradesh.^[73] The juice of Tinospora cordifolia mixed with honey and Ventilago calyculata Leaf is taken orally in Assam for malaria.^[74] 5-6 fresh fruit along with 10-12 fresh fruit of Terminalia chebula, Phyllanthus embilica and 15-20 tender shoots of Phyllanthus fraternus, filtrated and mixed with 250 ml of water and boiled. 2 teaspoonful decoction is given thrice daily for 15 days.^[75] Decoction of Vitex negundo leave is given with Piper longum in Assam.^[76] Ventilago calyculata Leaf is given in malaria in all over India.^[77] The Tribes of Kinvat Forest of Nanded District, Maharashtra applies Extract of Xanthium strumarium leaf on the body.^[78] Bark Decoction of Zizyphus jujube is given for malaria in Goa.^[79]

In Vitro & Vivo Anti-Plasmodial Activity of Traditional Medicine: In Vitro study of Methanol, Petroleum Ether, Water & Ethanol Extract of Swertia chirata leaves and stem, Rind-Pulp of unripe fruit of Carica papaya and Rind of ripe fruit of Citrus sinensis shows each extract produced discrete morphological changes in plasmodium. In the presence of the ethanolic extract of S.chirata, the trophozoites were smaller in size compared with controls. These abnormal trophozoites failed to develop into schizonts. The petroleum ether extract of C. papaya pulp caused a delay in the development of the ring stage as seen at the end of 24 hr. of incubation with the extract. The petroleum ether extract of C. papaya rind produced vacuolation and a reduced size of the trophozoites.^[80] The in vitro anti-malarial activity of crude extracts Swertia alata has tested at dose levels of 50 and 100 µg/ml. All extracts showed some activity with per cent inhibition ranging from 34 to 50. Methanol extract exhibited maximum per cent inhibition (50%) at 100 µg/ml dose level. The activity of three xanthenes ranged from 38 to 52 per cent inhibition. The xanthenes were more active at higher dose of 100 µg/ml and 1, 8-dihydroxy-3, 7-dimethoxyxanthone was the most active showing 42 and 52% inhibition at a dose of 50 and 100 µg/ml respectively. The isolated compound 1, 8-dihydroxy-3, 7-dimethoxyxanthone, which showed maximum in vitro activity, has subjected to in vivo assay at three dose levels (1, 5, 10 mg/kg). The compound produced significant reduction in parasitaemia and a noticeable increase in activity has observed when the dose was increased from 1 to 5 mg/kg. The most significant reduction (17.60%, $p < 0.05$) in parasitaemia was noted with a dose of 10 mg/kg. The in vivo results were complementary to in vitro findings were also the higher dose showed better activity.^[81] The 50% inhibitory concentration (IC₅₀) of AP (7.2 µg/ml) has found better than HC (10.8 µg/ml). Combination of these two herbal drugs showed substantial enhancement in their antimalarial

activity. Combinatorial effect of each of these with curcumin also revealed anti-malarial effect. Additive interaction between the plant extracts (AP + HC) and their individual synergism with curcumin (AP+CUR, HC+CUR) were evident from this study. Increased in vivo potency has also observed with the combination of plant extracts over the individual extracts and curcumin. Both the plant extracts were found to inhibit the ring stage of the parasite and did not show any in vivo toxicity, whether used in isolation or in combination.^[82] Extract of roots of P. kurroo used in the present study has significantly inhibited the propagation of the parasite and the percent infection in extract treated animals was less as compared to untreated control group.^[83] Chloroform extract of H. antidysenterica (HA-2) and petroleum ether extract of V. canescens (VC-1) plants significantly reduced parasitaemia in P. berghei infected mice. The extract HA-2 showed in vitro anti-plasmodial activity with its IC₅₀ value 5.5 µg/ml using pLDH assay and ED₅₀ value 18.29 mg/kg in P. berghei infected Swiss albino mice. Similarly petroleum ether extract of V. canescens (VC-1) showed in vitro anti-plasmodial activity with its IC₅₀ value 2.76 µg/ml using pLDH assay and ED₅₀ 15.8 mg/kg in P. berghei infected mice. The extracts coded as HA-2 at 30 mg/kg and VC-1 at 20 mg/kg exhibited parasite inhibition in mice: 73.2% and 63.0% respectively.^[84]

Clinical Efficacy of Traditional Medicine in Malaria: Nyctanthes arbor-tristis administered as a Paste of 5 flesh leaves, thrice in a day for 7 days lead to parasitic clearance 76.7% within 7 days.^[85] Swertia Chirata Powder 25 mg/kg twice a day, administered to 18 Malaria Positive patients. Out of 12 (66%) were parasite free on 6th day & 6 (33%) had significant response in term of reduction of parasite load.^[86] 3 grams of dry powder of Caesalpinia crista in capsule form (2 Cap. TID) were administered in three divided doses, orally after food, with warm water for 10 days & it was revealed that 13 patients (65%) were cured, 3 patients (15%) were having partial response and no improvement was found in four patients (20%).^[87] AYUSH- 64 is well known drug having contain of 1 part *Ghana Satva* of Alstonia scholaris, Swertia chirata, Picrorhiza kurroa and 2 part of seed of Caesalpinia bonducella has proved significant effect on Malaria clinically.^[88, 89, 90] OMARIA having contain of *Dalimba* dermis powder 100% (100 mesh) taken either w/w @500 mg/Cap., press-filled in '00' size gelatin capsule & administered 1cap thrice daily at an approximate interval of 8hrs, for 3 consecutive days; (empty stomach) proved effective to cure Malaria.^[91] *Indukantha Ghritam* having ingredients of (1) Decoction of *Putika* (*Putikaranja*), *Devadaru*, *Dasamula* (2) Cow's ghee, Cow's milk and (3) *Kalka dravyas: Pippali, Pippalimulam, Chavya, Chitraka, Sunti and Saindhava*, given 20ml per day with Luke warm water or milk for 30 days have proved effective prophylactic for Malaria.^[92]

Discussion

Folk medicine will be used in all over India by Traditional Practiser or Tribes for Malaria, but generally practice of folk medicine found in rural, tribal & backward region. *Andrographis paniculata*, *Swertia Chirata*, *Caesalpinia crista*, *Alstonia scholaris* and *Nyctanthes arbor-tristis* are found used frequently by Traditional Practiser or Tribes to cure malaria in all over India. Asteraceae family is most useful & using frequently by Traditional Practiser or Tribes to cure malaria.

These mentioned plants or its extract have significant result in in vitro & vivo anti-plasmodium activity as well as clinical efficacy. Most of the plants have alkaloid as a major chemical constituent & active principle. Alkaloids have an anti-microbial property which helps to act as a parasitocidal or parasitostatic action. But alkaloids from bitter plant have more intense anti-microbial activity than other. Acharya Charak has also stated that *Tikta Rasatmak Dravya* (Bitter Drugs) is acts as a *Krimighna* (anti-microbial) along with *Jvaraghna* (anti-pyretic) [93]. Even most of the herbs mentioned by *Charak* for *Vishama Jwar* have bitter property [94]. The maximum plants are used by Traditional Vaidyas or Tribes having also *Katu*, *Tikta Rasa & krimighna* in property which help to kill or displace the parasite. *Prakriti Vighata* is a very unique medicament described by *Charaka* that uses the drugs which stops growth of disease producing microbes by creating an unfavourable condition of growth of these organisms. In *Prakriti Vighata Katu, Tikta, Kashaaya, Ushna* drugs causes inhibition of *kled* (dampness) due to which these microorganisms cannot flourish & grows. Increase in number of microorganism is very important step in infective diseases, as increased number of the microbes will increase toxin load and also uses body physiological mechanism in increasing the number more, thus disease progress and if this chain is blocked at this level, disease even though occurs will be of mild form, requires very less medication, reduces toxicity & complications and early recovery.

Conclusion

Most of the mentioned traditional herbs used for Malaria have significant result in vitro & vivo anti-plasmodium activity as well as clinical efficacy and also justified the concept of *Ayurveda*. Hence it can be stated that Malaria can be treated by giving anti-malarial herbal drug which is already using by Traditional Vaidya & Tribes in India, though there is further need of documentation by experimental & clinical study.

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