

PATENTING PROSPECTS OF AZADIRACHTA. INDICA AND CURCUMA LONGA . L

Nachiket .S. Dighe^{1*}, Shashikant R. Pattan¹, Sunil.A. Nirmal², Ravi.S. Jadhav²,

Pradip.D. Ghule¹, Deepak S Musmade¹

¹Deaprtment of Pharmaceutical Chemistry, Pravara Rural College of Pharmacy Pravaranagar (413736), M.S. India.

²Deaprtment of Pharamcognosy, Pravara Rural College of Pharmacy Pravaranagar (413736), M.S. India.

Summary

Neem and Turmeric have distinct chemical constituents and their medicinal Properties have helped to cure many human ailments. Neem and Turmeric are the well-known folk medicine for mankind from generation together. These are indigenous to India, Western countries like America are keen to explore the new properties of these herbs and patent them by modifying, hybridizing, reproducing asexually and claim on distinct property of the plant. In this review we described the chemical constituents of Neem and Turmeric and their medicinal importance and the patenting of the plant products are highlighted.

Key words: Patents, *Azadirachta indica*, *Curcuma longa*.

*Address for Correspondence:

Prof. Nachiket.S. Dighe,

Dept of Medicinal Chemistry,

Pravara Rural College of Pharmacy, Pravaranagar

Maharashtra..

E-mail:nachiket1111@rediffmail.com

Introduction

History of medicine goes back to the existing of human being; nature has its own contribution to produce a various novel chemical constituents through plant kingdom. India is blessed by many of such nature's gifts. If few of them are Neem and Turmeric, which have created new landmark in the recent years .It is the interest of western countries to exploit the medicinal importance of such natural species. Nevertheless the ancient wisdom has been in modern day and in modern ways to capture the things in the name of patent. Patent is intellectual property right for an individual or firm by which one has to take prior permission to use the patented things for their investigation, characterization, etc.

The famous proverb says, "Undocumented work is unknown work" since Neem and turmeric, which are traditional medicine of country, but the rights of its properties are owned by others. Hence western countries wants to snatch our folk remedy in highly sophisticated manner what is called a plant patent. Global trade. WTO. GATT agreements have provoked western to claim the property of right of the various products of agriculture, ayurvedic medicine ,raw materials etc .As a result we are on the verge of loosing the property right of "Basmati rice" hence the strong controversy emerged out when America again attempted to patent Indian Neem and Turmeric .Our review is confined to illuminate the potential constituent, medicinal importance, parts of the plants used, scope and future prospectus of Neem and Turmeric to the scientific world which is privilege honour and the birth right of India.

Parts of plant to praise NEEM

- a) **Uncrushed leaves:** From the petroleum ether extract of fresh uncrushed leaves, a crystalline hydrocarbon fraction was obtained; from which eight saturated hydrocarbons namely docosane, pentacosane, hectacosane, triacontane, bentriacontane, dotriacotane and nonacosane have been identified through GC-MS, the last one has been reported from neem blossoms³. The hydrocarbon fraction is toxic against mosquitoes and also acts as insect growth regulator, and for pest control.
- b) **Dried neem leaves:** The hydrocarbon fraction obtained here, possessed larvicidal activity against mosquitoes.
- c) **Undried, uncrushed, ripe fruits of neem:** The ethanolic extract of the coat has yielded a tetracyclic triterpenoid azadirol and a known triterpenoid kulactone had subjected for antibacterial activity against seven gram positive organisms. It showed little significant activity.
- d) **Leaves:** Two fractions of the leaves obtained by acetone extraction showed reduction in respiratory rate, body limb tone and induced passivity, piloerection, diuresis and hypothermia after oral administration in mice, or neuropsychopharmacological effect. These are due to depression of central and autonomic nervous system Antidiabetic effect is also seen to produce hypoglycemic effect in normal rats.⁸ Orally administered leaf water extract produce some hypoglycemic effect in normal rats, while diabetic rats showed a decrease in blood sugar level (BSL).
- e) **Neem seed:** A study on the head space volatile constituent of neem seed, identified as **inter alia**, several di-tri and tetrasulphides with di-propyl disulphide have been found⁹. It produces the significant decrease in glycogen content in liver and kidney and increase in adrenals.¹⁰
- f) **Neem Oil :** It is an effective oral antifertility agent. It decreases the pregnancy advances. Neem oil showed a post-coital contraceptive effect reported earlier. It does not involve estrogen or progesterone hence can be considered as non-hormonal effect. Neem oil would be expected to exhibit less side effects than the steroidal contraceptives.¹⁰ An odourless and volatile fraction of neem oil (N1M-76) was investigated for its anti-fertility activity in rats, rabbits and rhesus monkeys¹² It appears to be a promising vaginal spermicide. Oil possesses active constituent which are capable of lowering blood glucose in both normal and hyperglycemic animals.¹³
- g) **Heart wood:** 24-methyl elenelophenol⁴ a steroid is identified.
- h) **Miscellaneous :** The extract of *A indica* had shown anti-pyretic and anti-inflammatory activity,¹⁵ hence extract of neem seed showed immunocontraceptive activity,¹⁰ Neem is also having some cosmetic properties, Immunomodulatory effect of a volatile fraction from neem oil, acts through cell mediated mechanism by activating macrophages and lymphocytes.¹⁶

Turmeric:**Rhizome and Leaves**

Curcumin which is one of the most significant constituent. Extracted from the rhizome of *curcuma longa* L. It is most active and high exploited entity which possesses some unbelievable, mind blowing activities with it. Anti E-coli activity of leaf and rhizome oil has been established by the turmeric leaf and rhizome oils extracted by hydrodistillation.¹⁸ Curcumin on radiation with visible light, proves to be phototoxic for *Salmonella typhimurium* and *E.coli*. Antifungal activity of turmeric oil and curcumin isolated from *curcuma longa*, against 15 isolates of dermatophytes and 4 pathogenic fungi were inhibited.²⁰ Curcumin has been found to produce antioxidant effect on mouse brain, heart, liver, kidney, spleen etc.²¹ The dietary turmeric and some synthetic curcuminoids showed antitumor activity.²² Where the same dietary turmeric used as adjuvant chemoprevention of experimental cancer for both for stomach and oral cancer inhibitory activity.²³ Curcumin inhibits all branches of arachidonic acid cascade and hence, a good anti-inflammatory agent.²⁴⁻²⁵ Ethanolic extract of rhizome showed, gastric and duodenal anti-ulcer activity.¹⁶ Bile expelling drug – *C. longa* L as a source of bile expelling drugs.²⁷ Cosmetic - Curcumin is used to formulate a skin lotion and showed many skin compatible property,³⁰ hence bears potential application in cosmetic industry. Colourant or dye curcumin is a natural, non-toxic food constituent,¹ compatible as natural colourant for pharmaceutical syrups" it is useful against chemically induced carcinogenesis.¹¹ Recent testing showed it possible anti-fertility constituent and it reduces edema.³¹ It inhibits lipid peroxidation³², superoxide dismutase, serum cholesterol, iron dependent lipid peroxidation, and liver superoxide dismutase (SOD), primaquine and hydrogen peroxide induced lysis of human RBC^{JJ}. Curcumin induced reduction of Fe^{3+} to Fe^{2+} and in oxygen radical reaction curcumin is essential in both redox and in the scavenging of oxygen and hydroxyl radicals. The most active constituent of turmeric, Curcumin may be preferable in thrombosis patients prone to vascular thrombosis and requiring antiarthritic therapy. Wound healing activity is proved.

Table 1. Various phytoconstituents isolated from *A.indica*.

Chemical Class	Constituents	Isolated from	Drug
1) Terpenoids			
a) Tricyclic diterpenoid	Nimosone, Nimbosone, dimethylnimbionol, Methylnimbionone, nimbosodione, nimbisonol.	Steam bark	A. Indica ^{34,35}
b) Isomeric diterpenoid	Nimbonone and Nimbonolone	Bark	A. Indica ³⁶
c) Diterpenoids	Margosone, Margosolone, Margolone Margolonone, Isomorgolone	Steam bark	A.Indica ³⁷
d) Tetranorterpenoids	Nimbanol and 3-acetyl derivative of Salannol	Seed	A.India ³⁸
e) Triterpenoids	Azadirol, Kalactone, New-limocinol, limocin A and B	Undried uncrushed ripe fruits	A.Indica ^{39,40}
2) Steroids	24-methyl enelophenol	Heart wood	A.Indica ¹⁴
3) Hydrocarbons	Docosane, Pentacosane, hetaconane, Octacosane, Triacontane and Hentriacosane, Nonacosane.	Uncrushed Leaves	A Indica ³ A.Indica ⁴¹
4) Sulphur compounds	di-tri & tetra sulphides with di-proyl disulphide	Seed	A Indica ⁷
5) Phenolics	Methyl grevillate	Steam bark	A Indica ⁴¹
6) Polymers	Melia-azadirachta and peptidoglycon s-melia-azadirachta	Bark	A Indica ⁴² A Indica
7) Miscellaneous	Azadiractin, nimbolid and 28 deoxonim bolide	Bark	A.indica ⁴³
8) Fatty acid	-	Seed oil	A Indica ⁶⁷

Table 2. Medicinal importance and pharmaceutical application of *A. indica*.

Aliments	Used drug part details
Anti-arthritis	: Seed oil ⁴⁹
Anti-diabetic effect	Leaves ^{8,13}
Anti-pyretic and anti-inflammatory	Seed ^{15,49}
Anti-malarial	Leaves ⁵⁰
Anti-viral	Leaves ⁵¹
Anti-ulcer	Neem ⁶¹
Induced conjunctivitis	Dried neem leaves ⁵
Cardiovascular effects like hypotension, negative chronotropic effect, dysarrhythmia.	Crude extract of leaves ⁵²
Decrease of glycogen content in liver and kidney	Seed ¹⁰
Hypoglycemic	Oil, leaves ^{13,8}
Contraceptive activity	Oil ¹⁶
Immunomodulatory effect	NIM-76, fraction of neem oil ¹
Neuro psychopharmacological effect	Leaves ⁷
Oral anti-fertility agent	Oil ⁸
Post - coital contraceptive	Leaves ⁶
Reversal of Diabetic retinopathy.	Leaves. ⁶⁴

Aliments	Used drug part details
Dermatophytosis	Leaves and seed ⁶⁶
Spermicidal and contraceptive	Polyherbal pessary ⁵⁶
Antihepatotoxic	Leaves ⁵⁷
Larvicidal (<i>Epilachna vigintioctopunctata</i>) coccinellidae	Neem oil ⁵⁹
Diabetes mellitus	
Fatty acid as antiulcer	Neem oil ⁶¹
Antiulcer	Leaves ⁶²
Antiulcer,antibacterial and spermicidal.	Salanin. ⁶³

Table 3. Medicinal importance and pharmaceutical application of *C. longa*.

Applications	Used parts details
Antibacterial	Oil ^{19, 48}
Anticancer	Turmeric powder
Anti <i>E.coli</i>	Leaf and rhizome ¹⁹
Antifungal	Oil ²⁰
Antiinflammatory	Curcumin ^{24, 77}
Anti-oxidant	Powder ^{21, 77}
Anti-tumor	Curcumin ^{22, 77}
Anti-ulcer	Ethanollic extract ²⁶
Bile expelling drug	Turmeric ²⁷
In cosmetic industry and as colourant in pharmaceutical syrup	Circumin ^{28, 30, 19}
Cyclooxygenase (COX) inhibitor	Oil ⁴⁸
Hypolipidemic	Oil ⁴⁸
Lipooxygenase inhibitor	Oil ⁴⁸
Lipid peroxidase inhibitor	Oil ⁴⁸
Protease inhibitory effect	Oil ⁴⁸
Reduction of edema	Curcumin ³¹
Oral cancer	Dietary turmeric powder ²³

Wound healing	
Antidyspeptic	Root extract ⁷²
Cytotoxicity(H-ras-transformed MCF human breast epithelial cell.)	Curcumin ⁷³
Antibacterial and antifungal	Curcuminoids ⁷⁵
Tyrosinase inhibition	Extract ⁷⁶
Cytotoxicity, antioxidant and anti-inflammatory.	Curcumins I – III. ⁷⁷
Macrophage TNF – alpha inhibitor	Curcuminoids and sesquiterpenes. ⁷⁸
Diabetes mellitus	Compound drug Nishamalki. ⁶⁸
Hypoglycemic, hypolipidemic, antioxidant.	Extract ⁶⁹

Table 4. Various chemical constituents isolated from *C. longa*.

Chemical Class	Constituents	Isolated from
Curcumin	Curcumin I,II,III, dimethoxy curcumin, bisdemethoxy curcumin	Rhizome
Curcuminoids	Curcuminoids, cyclocurcumin	Rhizome
Essential oils	Monoterpenes, sesquiterpenes, sesquiterpenes Ketone	Leaf and rhizome
Miscellaneous	Arturmerone	Turmeric oil
	Turmerone	Volatile oil
	dl-ar-turmerone	Oil
	P- cymene – 8 – ol	Flower oil
	Alpha phelandrene	Leaf oil
	Ar – turmerone	Rhizome and root

Conclusion

A. Indica and *C. Longa* L may be regarded as most valuable biological source for the rationalization of use to cure many chronic diseases. These active constituents can be properly exploited for anti mutagenic, anti –HIV, anti tumour, anti cancer and many more threat full diseases. Hence the need of time is to open our eyes and let our selves get associated and to know the medicinal importance of our common folk medicines. Apart from these there are many more herbal drugs indigenous to India, which have to be explored for their potential activities for betterment of mankind. It is alarm of western to Indian scientific society to make the proper research efforts to highlight the medicinal importance of these drugs. Thus neem and turmeric can be used appropriately for developing newer, safer and more effective drugs in future.

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