

The active components of *Azadirachta Indica* and its beneficial role in health management

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Abstract: *Azadirachta Indica* (Neem) mainly cultivated in Indian subcontinent, is one of the most beneficial plant. It has been widely used in disease prevention as almost each part of this plant has some medicinal properties. Various constituents of neem like nimbin, nimbidin, nimbolide etc play significant role in treatment of various diseases. Thus neem is a valuable plant for developing medicine against various diseases and different industrial products. The present study is based on the biological activities of active constituents and their pharmacological action.

Keywords: Neem, Medicinal property. Pharmacology

1. Introduction

Neem is a well known evergreen tree, cultivated in various parts of Indian subcontinent. It is one of the most important traditional medicinal plants. It is largely accepted fact that numerous pharmacologically active drugs are derived from nature including medicinal plants (Zong et al. 2012). The role of herbs in management of different diseases is mentioned in different religious books. In this context Neem is found exclusively useful as every part of the tree has been used as traditional medicine for household remedies against various human ailments.

Table 1: Common names of *Azadirachta Indica*

| S. No. | Language | Common Name |
|--------|----------|-------------------------|
| 1 | Hindi | Neem |
| 2 | English | Margosa |
| 3 | French | Margosier |
| 4 | German | Grossblaettiger zedrach |
| 5 | Sanskrit | Aristha |
| 6 | Urdu | Neem |
| 7 | Bengali | Nim |
| 8 | Tamil | Aruhundi |
| 9 | Telgu | Nimbanuv |
| 10 | Gujrati | Kohumba |
| 11 | Marathi | Bal-nimb |

The importance of Neem plant can be understood very well by its Sanskrit name “Aristha” which means “reliever of sickness”. Therefore it is considered as “sarvarognivasini”. United Nation has declared neem tree as “Tree of 21st Century” and the U S National Academy of Science published a report in 1992 entitled “Neem: A tree for solving global problems” (Schmutter 1995). In Indian villages the neem tree is still regarded as “Village Dispensary”.

Table 2: Classification

| | |
|-----------------|---------------------------|
| Kingdom | Plantae |
| Division | Magnoliophyta |
| Class | Magnoliopsida |
| Order | Sapindales |
| Family | Meliaceae |
| Genus | <i>Azadirachta</i> |
| Spices | <i>A Indica</i> |
| Scientific Name | <i>Azadirachta Indica</i> |

The Neem tree was first described by De Jussien (Jussien 1830). So its botanical name can also be written as *A Juss.* The various ingredients present in Neem like nimbin, Nimbidin, Nimbolide, Limoids etc. are used in Ayurvedic, Unani, Homeopathy and modern system of medicine as Anti-inflammatory, Antipyretic, Gastroprotective, Antifungal, Antibacterial, Anticancer agent etc.

2. Bioactive components of *Azadirachta Indica*

The medicinal value of Neem tree is due to rich sources of various ingredients present in its different parts. The most useful active components present in Neem is Azadirachtin, While Nimbin, Nimbidin, Nimbolide, Nimbidic acid, Sodium nimbinat, Limoids, Gedunin, Quercetin, Margolone etc. are also present in different parts of Neem (Ali 1993, Hossain et al. 2011 & Kokate et al. 2010).

3. Role of Neem in health management

3.1. Anti-inflammatory, Antipyretic and Analgesic Properties

Different studies have confirmed that Neem leaves extract contains Nimbidin which shows significant Anti-inflammatory property (Chattopadhyay et al. 1998 & Mosaddek et al. 2008). Other studies also proved that bark extract, Neem seed oil, carbon tetrachloride extract of fruit skin of *Azadirachta Indica* shows significant Anti-inflammatory, Antipyretic and analgesic activity (Arora et al. 2011, Biswas et al. 2002, Kumar et al. 2012, Naik et al. 2014 & Ilango et al. 2013). Other components like Sodium nimbidate, Gallic acid, Catechin and Epicatechin present in bark of Neem tree is also found suitable in anti-inflammatory action (Bhargawa et al. 1970 & Pillai et al. 1981).

3.2. Antibacterial, Antiviral, Antifungal and Anti malarial activity

Several researches showed that Neem seed oil contains Nimbolide as antibacterial and antimalarial component and Gedunin (Khalid et al. 1989) as antifungal component. Other important components are Azadirachtin isolated from neem seeds and isomargolonone (Ara et al. 1989) isolated from bark of neem are found effective in Antibacterial action.

The various experiments confirmed that the growth of fungal infection was significantly inhibited and controlled with leaf extract of *A. Indica*. This Antifungal activity is due to the cyclic trisulphide and cyclic tetra sulphide components can be isolated from leaf extract of Neem (Pant et al. 1986). The antifungal action of Neem oil is also reported by several other researchers (Mondali et al. 2009).

Neem bark extract and leaf extract is also found significant in blocking virus entry in host cell (Yerima et al. 2012 & Tiwari et al. 2010) and thus showed antiviral activity against Vaccinia virus (Rao et al. 1969), Chikungunya and Measles virus (Gogati et al. 1989).

Various finding of researchers revealed that Neem leaf extract and Stem bark extract are very useful in treatment of malaria as Anti malarial component (Mulla et al. 1999 & Akin-osanaiya et al. 2013).

3.3. Antioxidant Activity

Antioxidants are those compounds which deactivate the free radicals or reactive oxygen species usually before they attack target cells. Antioxidant activity is mainly depends on phenolic compounds, alkaloids, terpenoids and their derivatives. It is evident from various studies that various parts like seed, fruit, leaf, oil, bark and roots of different plants are rich source of Antioxidant compounds and thus plays important role in diseases prevention (Rahmani et al. 2015).

The various antioxidant components present in *A. Indica* are Nimbolide, azadirachtin, ascorbate (Priyadarsini et al. 2009). An experiment made to evaluate the antioxidant activity of various part of Neem revealed that ethanoic extract of flower and seed oil at concentration of 200 µg/ml produced highest free radical inhibition activity (Nahak et al. 2011).

3.4. Anti carcinogenic activity

Various experiments and researches suggest that the biologically active components of Neem tree play role in modulation of various cells signalling pathway. Neem has been reported as good activator of tumour suppressor gene. The various constituents of Neem inactivate the activity of genes responsible for cancer development. It is evident that P⁵³ an important tumour suppressor gene, inhibit the proliferation of abnormal cell and thus check the progression of cancer. EFNL, ethanolic fraction of Neem leaf is found very effective in regulating the pro apoptotic genes and proteins including P⁵³,

BCI-2 associated death promoter proteins (BAD), BCI-2 associated X protein (BAX), phosphate and homolog gene (P^{TEN}) and C-Jun N-terminal kinase (JNK) (Arumugam et al. 2014 & Gupta et al. 2011). Other researches also confirmed the anti carcinogenic activity of *A. Indica* as Chatterjee et al. identified a compound in neem sulfons-quinovasyldiacyl glyceride and studies its cytotoxic activity and DNA binding properties.

Other researches and studies gave a brief knowledge about different type of anti carcinogenic activity of various components in different type of cancer cells like pancreatic cells (Kavitha et al. 2012), Breast cancer cells (Raja Singh et al. 2014) etc. Neem constituents also play a significant role in angiogenesis (Lavnya et al. 2015), Oncogene (Othman et al. 2012), different pathway like P13K/Akt pathway (Raja Singh et al. 2014), NF-κβ factor (Kavitha et al. 2012).

3.5. Other medicinal uses

Neem components also showed several medicinal properties like CNS related problems (Singh et al. 1987), Hepato-protective activity (Baligar et al. 2014), wound Healing effect (Barua et al 2010), anti-diabetic activity (Patil et al. 2013) etc. Beside this the efficacy of Neem in dentistry due to its anti gingivitis effect is also confirmed (Chatterjee et al. 2011).

Neem oil, leaf and bark extracts have been therapeutically used in traditional system of medicine to control leprosy, intestinal infection, respiratory disorders, constipation and also a general health promoter (Biswas et al. 2002). The treatment of Ulcer, Rheumatism, Chronic syphilitic sores has also been evident.

Table 3: Medicinal properties of Neem

| S. No. | Medicinal Properties | References |
|--------|------------------------|---|
| 1. | Anti-inflammatory | Chattopadhyay et al. 1998, Mosaddek et al. 2008, Bhargawa et al. 1970, Pillai et al. 1981, Naik et al. 2014, Ilango et al. 2013 |
| 2. | Antipyretic | Naik et al. 2014, Ilango et al. 2013 |
| 3. | Analgesic | Kumar et al. 2012 |
| 4. | Anti-bacterial | Ara et al. 1989 |
| 5. | Antifungal | Pant et al. 1986, Mondali et al. 2009 |
| 6. | Antiviral | Yerima et al. 2012, Tiwari et al. 2010, Gogati et al 1989, Rao et al. 1969 |
| 7. | Antimalarial | Khalid et al. 1989, Mulla et al 1999, Akin-osanaiya et al. 2013 |
| 8. | Antioxidant | Rahmani et al. 2015, Priyadarsini et al. 2009, Nahak et al. 2011 |
| 9. | Anti carcinogenic | Arumugam et al. 2014, Gupta et al. 2011, Kavitha et al. 2012, Lavnya et al. 2015, Raja singh et al. 2014, Othman et al. 2012 |
| 10. | CNS related problems | Singh et al. 1987 |
| 11. | Hepato-protective | Baligar et al. 2014 |
| 12. | Wound healing activity | Barua et al 2010 |
| 13. | Anti-diabetic | Patil et al. 2013 |

4. Conclusion

The medicinal value of various parts of *Azadirachta Indica* in disease cure and prevention with less or no side effect is briefly discussed in present article. The role of active components of Neem tree, their Anti-inflammatory, Antipyretic, Analgesic, Antibacterial, Antifungal, Antiviral, Anti malarial, Antioxidant, Anticarcinogenic activity etc. have also been discussed with their scientific evidences.

Modern drugs from Neem tree can be developed by the compounds isolated from its after extensive investigation of biological activity, Mechanism of action, toxicity, standardization and clinical trials as we are now moving towards nontoxic natural plant products which have traditional medicinal values.

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