

## An Overview of Neem, *Azadirachta indica* Research in Nigeria

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### Abstract

The Nigerian Government indicated interest to transform neem tree into wealth. To achieve this objective, literature search was carried out on the researches conducted on the neem tree and the extent of use in higher institutions and research centres. For fair evaluation, Nigeria was divided into four zones North central / Federal Capital Territory; North East/ North West; South West; South South and South/East. Data were collected by visiting selected Universities and Research Institutes, Libraries, Departments and contact with researchers located in each zone. It was observed that most researches were on use of the plant in Agriculture. The use of extracts of either the neem leaves or seed oil or bark of the root for soil amelioration and adjuvant in livestock, broilers, rabbits and rat feeds; Insecticidal, repellent and antifeedant effects of Neem extract were reported. Chemical studies conducted revealed the presence of carotene, vitamin C, alkaloids, flavonoid, anthraquinone, tannin, saponin, carbohydrates and sapogenins and some elements. On the medicinal use of neem, researchers reported antimalarial, antibacterial, antifungal and antioxidant activities. The toxicological studies conducted reported higher liver and kidney function biochemical parameters especially using fruits extracts. All the zones reported the agricultural uses of neem but there were more data from North East/ North West zone while more literature on the medicinal use and chemical composition were collected from South South and South/East but other zones examined all aspects of the uses of neem and the chemical composition of neem tree. The review revealed duplication of research efforts by researcher across the country and need for products formulation from neem.

### Introduction

Neem, *Azadirachta indica*, is a member of the mahogany family *Meliaceae* comprising fifty genera and five hundred species. The neem tree was thought to have originated from Assam in India and Burma where it is most widely used

(Oparaeke, 2004). *A. indica* belongs to a large family of wood species, height ranged from 15.4 to 46.0m. The buttress measures from 0.1m to 1.14m in height; while the bark relatively thin (Abdoulaye, 1997). For centuries, the people of India cleaned their teeth with neem twigs, topically applied neem-leaf juice to treat skin disorders, took neem tea as tonic, and placed neem leaves in their beds, books, grain bins, cupboards, and closets to keep away troublesome

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bugs (Board of Science and Technology for International Development, 1992). Extract from the tree had been reported to relieve pains, fever, infections and other complaints.

In Nigeria, neem is locally known as “dogonyaro”, “darbejiya” in Hausa, “igi-oba” in Yoruba and “ogwu-akom” in Igbo. The neem tree is common in the north-east, north-west and north central geopolitical zones of the country where it is used as shelter-belts to control desertification. The tree remain leafy except during extreme drought, when the leaves fall. Neem trees are found generally in every state of the country growing wild. Despite the abundance of this tree, its economic value has not been fully exploited (Yakubu, 2006).

This review is to determine the nature and the extent of research done on neem in Nigeria. The review aimed at establishing a "point assess" of researches conducted on neem in Nigeria and ascertain the sources of specific information. Such data collation will enhance the production of neem materials while reducing duplication of research efforts.

## Research Review

### Chemical studies

The chemical composition studies reported the presence off lavonoids, alkaloids and sterols (Eremiokhale, 2001), and tannin (Agishi, 1993). Flavonoids such as kaempferol and quercetin were reported isolated from the flowers (Adekale, 1999 and Kwada, 2006) and alcohol extracts of the flower showed that four glycosides and two aglycones were present (Abomeli, 2003). The ethanol extract of the stem showed the presence of elements which include Ca, S, Cl, K, Na, Mg, and Mn (Umukoro, 1998 Abomeli, 2003; Ndatu, 1991). Anthraquinone was present in neem ethanol extract of the bark (Bello, 2006) while carotene and vitamin C were present in neem seeds (Gomozo, 2006). The dried neem leaves extracted with mixture of water and methanol showed the presence of alkaloids, reducing sugar, and some cardiac glycosides (Ashien, 1999).

The peroxide value of neem seeds was found to be 125, saponification number 182.5, iodine value 80.6, acid value 19.6 and free-fatty acid 11.26 (Ibrahim, 2004; Menegbe, 2005).

Ekundayo (1983) biosynthesized nimbolide from *A. indica* leaves extracts. Ukponu (1985) reported that neem seed oil contained about 45% of the bitter substances (Nimbin, nimbidin and salannin), the stem bark yielded 0.04%, while the fruit pulp and leaves contained about 25%. The detergency property of neem seeds oil was reported by Shehu (2006).

### Medicinal properties

The antimalarial effect of different parts of neem tree was reported by many authors (Iwu, 1983; Isah *et al.*, 2003; Iwalewa *et al.*, 2005). The antimalarial activity was estimated to be equivalent to half the therapeutic dose of chloroquine sulphate on dry weight basis (Ade-Sera, 1983; Iwalewa *et al.*, 2005). There was a reduction in parasite count when the different parts of the plant extracts were tested on malaria parasites in chloroquine sensitive strain *Plasmodium berghei* injected in mice; the extracts also inhibited the growth of *Plasmodium falciparum* in mice (Ekanem, 1978; Abatan and Makinde, 1986; Isah *et al.*, 2003).

Okanlawon (1997) and Hussaini (2002). reported the antibacterial property of neem seed oil. Also, the acetone stem- back extract of *A. indica* was active on *Pseudomonas aeruginosa*, *Candida albicans*, *Salmonella spp*, *Proteus vulgaris*, *Escherichia coli*, *Klebsiella pneumoniae* and *Staphylococcus aureus* (Yusuf, 2000; Danjuma, 2002; Azoro, 2002; Sallubawa, 2005) while for the extract of neem seed the zones of inhibition were tested against *Trichophyton mentagrophyte*, *Trichophyton verrucosum*, and *Epidermophyton floccosum* (Aigbirior, 2004). Crude neem leaves extract was found to be effective on adult house fly and larvae of mosquito (Mansour, 2004) and the plant's extract was active against acute *Plasmodium yoellinigerriensis* (Iwalewa *et al.*, 1982).

### **Toxicological effects**

Trypanocidal potential of *A.indica* leaf extract against *Trypanosome brucei brucei* was reported and histopathology results showed no cellular infiltrations of mice organs (Noket *et al.*, 1993). In a study of the effect of cold water extract of neem oil on behaviour, body weight and organ size of selected tissues in rats, sedation, depression of motor activity and prostration were observed. Size of the livers from all the rats were also reduced (Asiegbu, 2007).

Neem was reported to significantly inhibited lipid peroxidation by paracetamol (Dinatu *et al.*, 2005; Tella and Ojo, 2005) The leaves extract of neem significantly increased serum alkaline phosphatase level in rats (Nwankwo, 1998). In a similar study using seeds, possible hepatocellular toxic effect of the extract was reported (Lawal *et al.*, 2005). Chronic administration of extract of neem leaves increased the level of creatinine (Gidado *et al.*, 2001).

The fruit extract of neem was toxic to rats and rabbits (Arrey, 1992 and Ibrahim, 1991). *Tilapia zilli* exposed to sub-lethal concentrations of crude neem extract showed abnormal behavioral responses, hence the authors discouraged the use of neem to kill fishes (Omoriegie and Okpanachi, 1992). The aqueous extract of *A. indica* leaves significantly increased generation of methemoglobin (by oxidation of hemoglobin) in an *in vitro* study (Iwu, 1983). Highly significant dose dependant mortality of cockerels was reported in cockerel chicks fed with neem seed kernels (Uko *et al.*, 2006).

### **Agricultural uses**

The mitocidal activity of neem was observed in infested rabbits (Napoleon, 1997). Neem extract was also reported to be effective in the control of insect pests of cowpea, *Vigna unguiculata* (L.) Walp (Oparaeke, 2004 and Oparaeke, 2005). Neem plant extract studied for the control of aphids revealed significantly high aphid mortality in the larvae but had little effect on adult lady bird beetles (Sadiq, 2004). The organic extract of neem was found to be effective against

termite destruction in wood (Gombi, 1997).

The powdered root bark of *A.indica* was reported to possess insecticidal activity against cowpea seed bruchid *Callosobruchus maculatus* (Ogunwolu and Idowu, 1994; Aliyu, 1997; Umaru, 1997). Anaso (2001) also reported the insecticidal property and higher yield of neem seed extract sprayed on crop as compared with unsprayed crop. Neem leaves and seed kernel were shown to be effective in the control of tsetse fly and mosquito (Onah *et al.*, 1991).

Neem leaves extract was effective in inhibiting the growth of *Fusarium*, *Penicillium Aspergillus* on the mycelial growth of ear rot disease pathogen on maize (Sani 1998). The use of neem oil in Adamawa State (Jimeta metropolis), Nigeria; against *Aonidiella orientallis* showed moderate efficiency (Moussa, 1997).

In a report, 20% incorporation of neem seed was effective as a component of livestock feed (Adedeji, 1989; Fajinmi *et al.*, 1990) while in broilers and rabbit, Salawu *et al* (1994) reported that 75% and 100% respectively were effective as component of feed.

Six authenticated provenances of (*Allahabad, Karnataka, Jodphur, Madinipur, Mukkambu, and Annur*) collected from India were appraised for survival in a degraded land in Kano, Nigeria; the research recommended *Allahabad and Mukkambu* for degraded land (Yakubu, 2006).

Some neem components have pesticidal properties with wide application in sustainable management of resources and soil fertility under agro-forestry systems. Agro-forestry systems are good for controlling soil erosion and desertification through wind breaks, shelterbelts and plantations. The process is also useful in reclaiming leached soil nutrients from deep soil strata and in refertilizing nutrient deficient soils (Yar'Adua, 2007). Neem tree was identified as one of the multipurpose tree species contributing to silvo-pastoral system in the semi-arid zone of Nigeria (Hassan *et al.*, 1988).

The wood can be used for construction and fencing after being treated (Malgwi, 2005).

All neem parts tested on the development of the root-knot nematode, *Meloidogyne incognata* on tomato significantly reduced their development (Garba, 1998).

Extracts of neem leaves inhibited juvenile survival of *Meloidogyne incognata*, the ethanol extract was effective in inhibiting egg – hatch (Fatoki, 2001). Neem wood seed extract was shown to be effective in the control of, *Callosobruchus maculatus*, the cowpea weevil (Sule and Aparusi, 1994).

Soil compaction and tar oil were shown to have significantly limited growth effect on neem tree (Tella, 2001). Tella *et al.* (2001) reported high amount of fixed carbon, charcoal yield, and heating value in heartwood.

Neem wood could be suitable for timber production (Akpan *et al.*, 2006) due to the significantly high heartwood (Akpan, 2006). Neem wood strength compared favourably with those of local wood species and could be suitable for structural application (Akpan *et al.*, 2006).

### **Conclusion and Recommendation**

The findings of the research survey showed that researches were conducted on all the parts of neem tree in Nigerian Universities. The reports on medicinal uses cut across the universities but mostly with crude extracts. Lack of standard or reference powder was obvious in the review as most works could not associate the effect to a particular compound isolated from neem. Researchers should purify extracts that are meant for works on medicinal properties in order to be sure of the constituent that exhibited observed effect.

The medicinal values of neem could be exploited and put into industrial uses in future with collaborative efforts from researchers across the country. The plant could be put into use to

produce soaps, lubricants, creams, dental products, shampoo and insect repellants as in Australia, China, India and Spain. Most studies so far both within and outside the country used animal model. There is an urgent need to isolate compounds of neem in Nigeria, establish the minimal lethal dose of the compounds in animals before clinical studies. Postgraduate students should be involved in such research because most of reports of this review were from undergraduate students projects. The research on the toxicological effects followed the same trend across the zones as researchers reported the hepatoprotective property of neem and toxicity of the neem fruits extract. All the zones reported the agricultural uses of neem. The application of interdisciplinary techniques will lead to the development of local pesticides and anti-infective agents as products of neem along this line. Veterinary drugs can also be developed from neem since it affected a variety of organisms including bacteria, fungi and protozoan parasites. Attention should now be focused on the development of neem products considering its properties in order to fully exploit the resources of neem for the improvement of quality of life.

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