2010 International Year of Biodiversity

THE WEALTH OF INDIA

RAW MATERIALS SERIES

A Ready Reckoner on Biodiversity and Bioresources of India

(A Wealth of information on Plants, Animals and Minerals of India)

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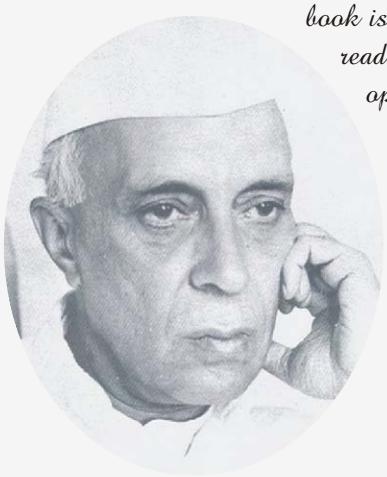
"The Wealth of India"– what a vision of past history and splendour it brings, when the Indies attracted adventurers in search of wealth and fortune from the most distant countries! ..... Nevertheless, India is wealthy and the wealth of India is there. But in spite of this wealth, the people are poor. The problem for us is t o utilize this stored–up wealth of the country in the soil and under the soil, for the benefit of Indian humanity. This book is a kind of encyclopaedia or dictionary, and dictionaries seldom make attractive reading, but I have found this particular dictionary rather fascinating and it has opened out vistas of thought to me. The pictures are good.



I have no doubt that this book, produced by many scholars and experts and after much labour, will be of great value to the builders of new India. It should be of value also in educating the average citizen, who should take interest in this fascinating land and its enormous potentialities.

New Delhi
21st December 1948

Jawaharlal Nehru

The National Institute of Science Communication and Information Resources (NISCAIR), a constituent of Council of Scientific and Industrial Research (CSIR), has been involved in dissemination of information for S&T community through its various scientific books, journals and magazines. The Wealth of India, launched in 1942 is an internationally acclaimed encyclopaedic publication comprising monographic articles on plants, animals and mineral resources of the country and the economic products derived from them. The encyclopaedia is a continuation of George Watt's Dictionary of Economic products of India. Policy-planners use the information to prevent bio-piracy. It has in recent past played a major role in preventing the US patent on turmeric.

The encyclopaedia, aptly named The Wealth of India amasses the renewable resources of the country including the rich biodiversity of plant and animal species as also the mineral wealth abounding in the Indian subcontinent. The plants are dealt with under their generic and specific names but articles on animals appear under the English names and minerals with their English names or scientific equivalents at appropriate places. There are also some polymerous entries, such as Algae, Bamboos, Corals, Fungi, Insects and Insect pests, Prawns, Shrimps and Lobsters, etc.

Correct identity of each plant has been ensured, its distribution in wild or occurrence as cultivated plant in India is provided, and the parts of economic importance have been adequately described. In the case of crop-plants, methods of cultivation, harvesting and storage are given, Diseases and pests and their control measures are also mentioned. The zoological entries give the habits and habitat of the animals, their status and important products derived from them. Regarding minerals, their occurrence and distribution in the country and methods of exploitation and utilization are given.

The main series consists of 11 volumes and 2 supplements: Fish & Fisheries and Livestock including Poultry. An exhaustive cumulative index in 4 parts, viz. botanical names, zoological names, active principles and other important compounds and names in regional languages, trade-names and common English names, covering more than 250 pages, is appended to the final volume. This cumulative index is immensely useful to users in locating the entries by scientific, trade as well as common English and vernacular names in available regional languages.

For facilitating easy access to information, each volume includes features such as cross-references, lists of books and journals cited and a meticulously made index of the synonyms of plants dealt with, cultivars of crops, common English, vernacular and trade names, drugs, products, active principles and important chemical compounds. Adequate references to the sources of information are provided at appropriate places, and the articles are well illustrated with halftone and coloured plates, line-drawings, charts, maps, etc.

In addition to 11 volumes of main series, 3 revised and updated (A, B and Ca-Ci alphabets) plus a supplement on Bird has been brought out. The revised volumes boasts of an elaborate use based index as an additional feature. Subsequently, supplements (covering information from 1982-1996) have been brought out in 8 volumes maintaining the style and format of the parent series and every effort have been made to give a cohesive presentation so as to easily blend with the parent volumes.

The complete set of 23 volumes of The Wealth of India-Raw Materials series is much sought after as a ready reference for its extensive, authentic coverage on distribution, cultivation, production, diseases and pest control measures, harvesting and post harvesting care, chemical composition, utility including community knowledge, conservation, statistical data, etc., especially in the search for natural resources in the life of living beings in broader prospective. Compiled and collated by a body of subject experts with the collaboration of specialists in various fields all over the country, the entire work is a treasure house of knowledge any natural raw material information.

The complexity, heterogeneity and voluminousness of this encyclopaedic work can be visualized from the fact that whole series covers more than 6000 plant-species, 52 articles on animals and their products and 73 articles on minerals.

The Wealth of India is indispensable to research workers especially beginners dealing with life sciences, chemical sciences, pharmacology, environmental sciences, students of economic botany, government departments and rural development agencies, planners, industrialists and all those interested in the availability of Indian raw materials, their production , value addition, exports and imports.

Important steps in the preparation of the articles for Wealth of India

List of entries

The list of entries in the Raw Materials series was prepared by scrutinizing important floras, monographs, books on economic botany, medicinal plants, trees, crops and other products like fibre, fodder, fuel, fruits, vegetables, oils/fats, etc. and primary and secondary journals. The list is continuously being updated and botanical names are scrutinized for their correctness.

Bibliographies

The bibliographies are prepared from primary and secondary journals and books by indexing Indian as well as foreign literature.

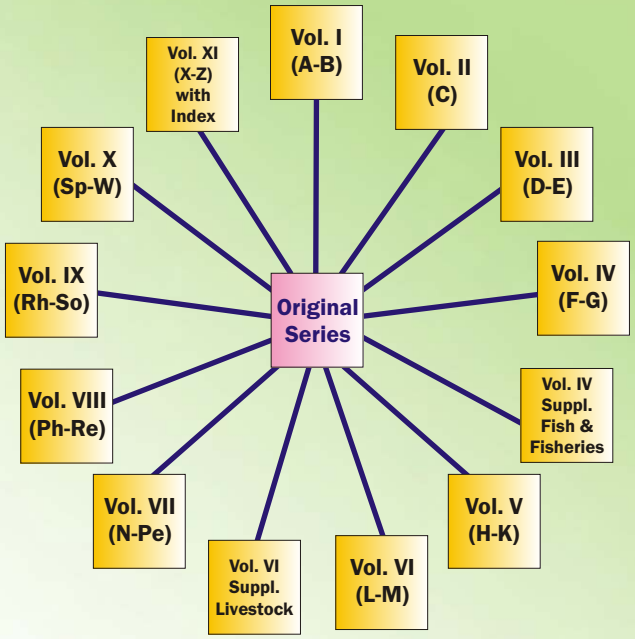
Ledger

The references collected from different sources are carefully studied, evaluated and abstracted by subject experts eg. botanists, chemists, zoologist and geologist. Whole literature collected in the form of hand written manuscripts, xeroxed copies, reprints, correspondence, etc. are filed to constitute the ledgers for each article (i.e. genera in case of plants). The scientific terminology and medical terms are properly understood before writing and collating information.

Manuscript preparation and production

The manuscripts particularly on plants are prepared by drafting available information on botany and chemistry both. The arrangement of information is maintained throughout the whole series and manuscripts are checked for style-editing and copy-preparation for the press.

A to Z of Wealth of India
Raw Material Series



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Price List
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The Wealth of India: A Dictionary of Indian Raw Materials & Industrial Products*

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		Price	Postage
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*Also available in Hindi entitled Bharat-ki-Sampada
**Vol. I & II of Original Series are not being printed as the updated information is available in the Revised Series of Vol. 1A, Vol. 2B, Vol. 3 (Ca-Ci) & First Supplement Series Vol.2 (Cl-Cy)
***Including revised version of major entries, viz. Cocos, Coffea, Curcuma, Cymbopogon, Corals, Crabs, Crocodiles, Clays, Cobalt, etc.

Killer plants for dengue fever mosquito

Aedes aegypti is the principal vector of dengue fever and dengue hemorrhagic fever and it is becoming more virulent and spreading the fever at alarming rate. The approaches for control of these mosquito-borne diseases include, the interruption of disease transmission by either killing, preventing mosquitoes to bite human beings (by using repellents or wearing full-sleeve shirts and long trousers to fully cover arms and legs with socks and shoes) or by causing larval mortality in a large scale at the breeding centers of the vectors (by cleaning, spraying insecticides and drying of breeding places). Due to the problem of pollution and vector resistance, safe plant products are being tested around the world as pest control agents. A survey of literature on larvicidal effects of plant products on mosquitoes indicates that most of the studies included well known horticultural, commonly grown herbs, shrubs or trees and weeds found in vast areas in plains and hilly regions.

Spraying synthetic pyrethroid – as a mosquito repellent has been reported to be effective and it keep mosquitoes at bay for nearly three months and it is generally harmless to human beings. Perhaps due to faster effects, until now the synthetic pesticides are commonly used to control mosquitoes breeding and eradication of malaria as well as dengue fever vectors, but some times the side effects are associated, therefore, precautions are required in using these chemical products. However, search and applications of alternative natural insecticides should also be explored. The results of several experimental studies on essential oils and various plants extracts have revealed good potential to be used as environmentally safe insecticides. In addition to traditionally and commercially used repellents, larvicides, oviposition inhibitors and mortality products based on Pyrethrum (***Chrysanthemum cinerariaefolium*** (Trev.) Bocc., Persian Lilac (***Melia azedarach*** Linn.), Neem (***Azadirachta indica*** A. Juss.), Tulsi, Holy Basil (***Ocimum sanctum*** Linn.), 30-40 plant extracts are reported to be effective against, dengue vector. Almost all these herbs, shrubs or trees are easily available and have shown 60-100% mortality against III/early IVth instar larvae and complete lethality at minimum doses. To explore these plants as potential bioresources for the development of new commercial eco-friendly biopesticides, further in-depth studies are required.

Azadirachta indica

Chrysanthemum cinerariaefolium

Based on information stored under various volumes and current literature compiled for supplements of this encyclopaedia, some common wild plants which possess insecticidal activity against *Aedes aegypti* have been identified to encourage further research. These plants, described below are found growing throughout the year in waste places, garden hedge, or in open fields.

Country Mallow, Hindi- *Kanghi, Abutilon indicum* (Linn.) Sweet

A shrub with small orange-yellow flower. It is common all over in hedges and waste places as a weed. The petroleum ether extract of the plant showed larval mortality (57%) after 24 hours exposure. The chemical compound, β-sitosterol, identified for the first time in this plant has been found to be a potential new mosquito larvicidal compound.

Bitter apple, Colocynth, Hindi-*Indrayan, Gadumba*, *Citrullus colocynthis* (Linn.) Schrad.

A perennial trailing herb bearing deeply 3-lobed leaves and yellow flowers. Grows commonly in sandy soil. Fruit is used medicinally for stomach disorders. Larval mortality has been found in whole plant petroleum ether extract after 24hour exposure.

Prickly chaff flower, Hindi–*Latjira, Chirchitta*, *Achyranthes aspera* Linn.

An erect undershrub. Leaves large, ovate; flowers greenish-white. Common in waste places, a troublesome weed when in fruits, due to its spiny bracteoles and pointed tepals. Larval mortality has been found in the ethyl acetate extract of the plant after 24 hour exposure. The plant also possesses many medicinal properties.

Milk bush, Hindi-S*ehund*, *Euphorbia tirucalli* Linn.

An unarmed shrub or a small tree with erect branches and smooth, cylindrical branchlets, naturalized in South India and grown in hedges throughout India. The insecticidal property of the plant

was tested against the early fourth instar larvae of *Aedes aegypti*. The larval mortality was observed after 24 hour of exposure. All extracts showed low larvicidal effects; however, the highest larval mortality was found in petroleum ether extract. The LC50 value of petroleum ether extracts of *E. tirucalli* was 4.25ppm. It is, therefore, suggested that this plant can be applied as an ideal potential larvicide against *A. aegypti* as ideal ecofriendly approach for the control of the dengue vector.

Eupatory, Sticky snakeroot, Catweed, Croton weed or Mexican devil, *Ageratina adenophora* (Spreng.) King & H. Rob.

It is a perennial herbaceous exotic shrub which may grow up to 1 or 2 m height. It has opposite trowel-shaped serrated leaves that are 6-10 cm long by 3-6 cm in width. The small compound flowers occur in late spring and summer, and are found in clusters at the end of branches. Each flower head is up to 0.5cm in diameter and creamy white in colour. They are followed by a small brown seed with a white feathery 'parachute.Found in the hilly regions of the Nilgiris district as weed plant. The LC50 value of its extract was found to be 356.70 ppm for *A. aegypti* and when compared to neem, the leaf extract of this plant is more toxic to both *A. aegypti* and *C. quinquefasciatus* and could be effectively used for the control of mosquito larvae

Lantana, *Lantana camara* Linn.

A straggling or climbing, aromatic spiny shrub, found throughout India in varied flower colours in waste places or as garden hedge. The methanol extract of its flowers along with coconut oil has been found to be dengue mosquito repellent. The leaf extract also showed larvicidal efficacy. Lethal concentration of leaf extracts were 203.49ppm.

African marigold, Hindi-*Genda*, *Tagetes erecta* Linn

Commonly cultivated in gardens for its ornamental orange or yellow cut flowers and beautiful dissected foliage. Acetone extract of the plant and steam distillated essential oil has shown larvicidal activity.

Black nightshade, Hindi-*Makoi*, *Solanum nigrum* Linn.

Branched erect or diffuse herb with white flowers, well known for its medicinal properties. Common in waste places and cultivated fields especially in shady places. Crude leaf extract possesses larvicidal activity.

***Bracteated birthwort*, Hindi-*Kiramar, Aristolochia bracteolata* Lam.**

A glabrous prostrate herb bearing dark purple flowers. It is extremely bitter plant, found in Delhi throughout the year. The roots of the plant are used as a substitute for *Aristolochia indica* Linn. (Hindi-Isarmul, Indian Birthwort) roots which yield aristolochic acid, used as an insecticide. The aristolochic acid is reported to be toxic to adult *Aedes aegypti* mosquitoes.

Madar or Ak, *Calotropis procera* (Ait.) R. Br. and *Calotropis gigantea* (Linn.) R. Br. ex Ait.

Both the species are found throughout the year in waste, sandy and dry places and are used similarly. An erect shrub bearing purplish-red, pale silvery outside flowers. All parts of the plant yield latex which is highly toxic to animals in large doses. The latex has shown strong ovicidal and larvicidal activities against *Aedes aegyptii* and other mosquitoes.

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Red Periwinkle, Hindi- *Sadabahar*, *Catharanthus roseus* G. Don

A beautiful plant found growing in gardens and as wild also. It is highly medicinal plants for various diseases especially known for anticancerous properties. The alcoholic extract of the shoot showed larvicidal activity against *Aedes aegyptii*.

Milfoil, Yarrow, Hindi-*Gandana, Achillea millefolium* Linn.

Aromatic herb, distributed in Himalayas from Kashmir to Kumaun at 1,050-3600m. Its flowers are white or pale pink. In Himachal Pradesh this herb is very common during May and June. It is also cultivated because of its high medicinal value. The ethanolic extract of the plant showed mosquito repellent activity against *Aedes aegypti*.

Carrot, Hindi-*Gajar*, *Daucus carota* Linn.

The seed oil of the common vegetable carrot is reported to be toxic to *Aedes aegyptii* and *Culex fatigans*.

Christmas flower or Poinsettia, *Euphorbia pulcherrima* Willd. ex Klotz.

A garden shrub bearing bright vermillon-red or crimson- scarlet bracteal leaves, planted in hedges. The leaf extract is reported to reduce the adult emergence of *Aedes aegypti* larvae significantly.

Congress grass, Gajar grass, *Parthenium hysterophorus* Linn.

The congress grass found throughout the country as a weed possesses useful properties also. Petroleum ether extracts of its leaves, stem and inflorescence at 500, 1000, 2000 and 5000 ppm concentrations showed toxic effects on the mean life span and progeny production of adults of the mustard aphid. Further studies revealed that it also has larvicidal activity against *Culex quinquefasciatus*, *Anopheles stephensi* and *Aedes aegypti*, i.e. it can work against all three mosquito species causing malarial as well as dengue fever.

Prickly poppy, Hindi-*Kateli* or *Satyanashi, Argemone mexicana* Linn.

A robust herb, leaves prickly, flowers yellow, capsules erect, spiny, seeds black, look like mustard seeds. It is common in waste places, fallow fields and roadsides. The acetone fraction of the petroleum ether extract of seeds exhibited larvicidal and growth inhibiting activity against the second in star larvae of *Aedes aegypti*. This activity occurred at higher concentrations (200, 100, 50 and 25 ppm). Chemosterilant activity, including reduction in blood meal utilization (27.70%), reduction in fecundity (19.00%), formation of larval-pupal intermediates, formation of pupal-adult intermediates, adult mortality and sterility of first generation eggs (100%), occurred at low concentration (10 ppm).

Jatropha curcas Linn., *Pedilanthus tithymaloides* Poit., *Phyllanthus amarus* Schum. & Thonn., *Euphorbia hirta* Linn. Are also weeds and their petroleum ether extracts have also showed low larvicidal effects on fourth instar larvae of *Aedes*

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