BIOPIRACY

Imitations Not Innovations

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WHAT IS BIOPIRACY?

Knowledge, in all its manifestations, is valuable. Of particular significance is the information inherent in the knowledge systems of rural and indigenous communities developed as a result of long and continuous interaction with the complex ecosystems which they inhabit. Referred to as Indigenous Knowledge or IK, this knowledge is actually a highly sophisticated technology and has been the mainstay of survival of communities especially in the key sectors of food and health. With developing countries being the repository of a major part of the world's biological resources it is not surprising that people and communities of these countries have been innovating, selecting, conserving and protecting local species for ages. Biodiversity, and the indigenous knowledge associated with it, is a special strength of the local communities that are found in today's developing countries.

The importance of indigenous knowledge can be understood when one realizes that there are no rice or wheat plants nor cotton nor mustard found lying around in the forest. What are found in the forest are wild plants, out of which communities of men and women over generations have bred the thousands of land races which are the basis of the world's agriculture. It is IK, which provides the know-how for developing crop varieties suited to the diverse climatic regions ranging from the cold desert in Ladakh to the scorching sands of Rajasthan and again from the flood prone belts of Bihar to the coastline of Andhra Pradesh. The role of indigenous knowledge in the realm of medicinal plants is even more obvious than in the case of crop varieties. Knowledge about the characteristics of a particular plant and its properties for healing, or stated differently, the technology of its use, is what gives medicinal plants their social and economic value. This technology of use has been acquired through thousands of years of experience, trial and error and incremental refinement. As a result of this, communities have developed their knowledge of the plant, animal and mineral world to a mature and scientifically sound technology, which exists in old traditions of healing like Ayurveda and Siddha. In addition to this, tribal communities, island communities and others have developed their own knowledge base about the flora, fauna and mineral wealth of their region.

The IK of communities represents the collective wealth of their experience and constitutes their intellectual property. One of its pertinent features is that it has no association with the concept of private ownership. Acquired and developed as a community effort, it is usually held collectively, although specific individuals or families within the community may hold certain types of knowledge, and use it for the benefit of the community. Access to and use of IK is generally governed by a wide variety of unwritten customary laws. Communities prefer concepts like 'stewardship' and 'custodianship' (rather than ownership), which imply responsibilities as well as rights.

This wealth of IK is under serious threat today from the callous neglect and deliberate misappropriation visible in national and international policy respectively. The central problem is that while knowledge created in laboratories is acknowledged, as the property of the innovator, that created in fields and forests is not recognized as the property of its creators.

IK has been developed and used by the local and indigenous communities over centuries, working under the local customs and laws. This knowledge has been passed on with incremental improvement over generations and plays an important role in meeting their requirements in healthcare and food. It still plays a critical role in the lives of millions of people in the developing world. However, its significance and value has been greatly underestimated by the western concept of science and intellectual property. Out of ignorance of IK the western scientific process incorrectly perceives this knowledge to be lacking scientific validation, even as the concept of intellectual property treats IK as information in the public domain and therefore freely available

Prompted by the scientific and technological developments during the industrial revolution in the West, private ownership rights over knowledge came to be conferred through the mechanism of intellectual property rights such as patents and copyright. The historical development of protection of intellectual property in the wake of the industrial revolution, and its subsequent jurisprudential justifications based on individual private property rights, has pushed IK and the innovative practices based on it, away from the formal intellectual property regime. The requirement of 'originality', 'novelty', 'utility' or 'non-obvious or inventive step' for an invention to be patented in the formal intellectual property system addressed only the scientific developments based on the western understanding of science and had a strong focus on industrial application. Similarly, the insistence on the identity of the inventor as the one who will be afforded intellectual property protection also reflects the individual private property jurisprudence underlying the

protection of intellectual property. This concept is at odds with the reality of how IK is generated, by many people or by communities, over a period of time. IK is evolving and dynamic, as against the one-off invention that is recognized by the patent system. These concepts keep IK and the products based on it outside the scope of the formal intellectual property system. Since there is no fit between the IPR system developed for western-style inventions and the broad-based inventive processes of indigenous communities' knowledge systems, IK is being treated as knowledge in the public domain.

One of the basic requirements for granting a patent in the western intellectual property system is that the invention should be 'new'. However either due to inadequacy or deliberate intent, the system is such that it allows 'inventions' based on indigenous knowledge to be patented. 'New' denotes that which has come into existence for the first time. That which belongs to the realm of IK cannot be said to be new since it has been in existence for several thousand years. In this case the knowledge behind the so-called 'inventions' is already part of indigenous knowledge. This failing of the current intellectual property system runs counter to the very basis of the requirement for the grant of intellectual property rights which is striking a balance between public and private interests. The domestic patent laws of countries like the US also discriminate against IK. For instance, while in the United Kingdom and Europe, the issue of prior art is considered on a global scale, the US considers prior art in domestic terms, whereby only if it is located within the US is the novelty element fulfilled. This undoubtedly facilitates the theft and patenting of IK from all other nations.

Additionally, although territoriality of patent rights precludes patent holders from exercising their rights outside the registered jurisdiction, the patent holder retains the right to prevent the importation of products made elsewhere containing the 'invention'. Consequently, holders of US patents can deny the native communities from where the bioresources originate, access to the lucrative US market.

The US tradition of ignoring issues of morality and equity has proved equally problematic and has led to a blinkered approach whereby US patent applications are presumptively valid on grounds of public policy and can only be declared invalid subsequently through purely domestic political action. Indigenous tribes are left without recourse to challenge the system and the financial implications of litigation remain beyond their minor means. Such a predicament produces a dangerous scenario where the scope of patentability is expanding while the role of moral standards and legal challenges becomes increasingly limited.

The provisions of the Trade Related Aspects of Intellectual Property Rights

(TRIPS) Agreement lays down the rules for commercial rights and obligations with respect to intellectual property in all fields of human activity. Almost all nations of the world are party to these rules. Whereas they include western-style IPR systems, they ignore other kinds of knowledge generation such as IK. This total disregard for IK is one of the major drawbacks of TRIPS. Despite being a body of knowledge generated by intellectual exercise, TRIPS does not recognise IK as the intellectual property of the communities that have generated it. As a result it has been made free for anyone to use, without acknowledgement or permission. This has facilitated the rampant use of IK in so called 'inventions', including 'biotechnological inventions', and private proprietary rights are being acquired over a vast body of knowledge which belongs to the realm of indigenous knowledge or is based on it. This usurpation of IK is popularly referred to as biopiracy. Even as the intellectual property of indigenous and tribal communities in developing countries is refused recognition, their knowledge systems are being misappropriated and their innovations pirated to generate wealth for developed countries.

While the Intellectual Property Rights (IPR) regime under the TRIPS Agreement does not expressly prevent member nations from according it recognition, the problem with TRIPS is that its provisions do not support effective implementation for the protection of IK. Since IK is not eligible for protection under the TRIPS Agreement, any attempt to grant rights to the rural and indigenous communities to control and regulate their knowledge is non-compliant with the Agreement. For instance the legitimate right of the rural and indigenous communities to a share in the benefit arising from the commercialization of their knowledge runs counter to the exclusive proprietary right of a patent holder. This is despite the fact that in the first instance, the patent on already existing knowledge constitutes a violation.

Another formal reason that facilitates the piracy of IK is the territorial jurisdiction of intellectual property laws. In other words, an intellectual property law, like the patent law of a nation, can be enforced only within the territories of that nation; the infringement of the provisions of that law in another nation cannot be acted upon unless the law of that country recognizes that as a violation and an infringement of legal provision. For example, the 2005 Patents Act of India provides that 'an invention which in effect, is traditional knowledge or which is an aggregation or duplication of known properties of traditionally known component or components' is not an invention. This provision will be effective in preventing the acquisition of rights over IK through a patent but

only within the territory of India. This provision cannot prevent the grant of a patent on indigenous knowledge in another country like the US whose patent law recognizes such subject matter as an invention. Therefore, in order to prevent instances of piracy of IK, it is imperative to bring about a comprehensive change in the intellectual property system the world over, through appropriate amendments in the TRIPS Agreement, which now codifies the rules for the protection of intellectual property internationally.

Biopiracy connotes any attempt to acquire proprietary rights over biological resources and its associated indigenous knowledge, or upon product(s) based on them, disregarding the consent and contribution of the holders of such resources and knowledge. The Action Group on Erosion, Technology and Concentration (ETC Group) defines biopiracy as 'the appropriation of the knowledge and genetic resources of farming and indigenous communities by individuals or institutions seeking exclusive monopoly control (usually patents or plant breeders' rights) over these resources and knowledge'.

The following have been described as 'biopiracy':

(a) The granting of 'wrong' patents. These are patents granted for inventions that are either not novel or are not inventive with regard to indigenous knowledge already in the public domain. Such patents may be granted deliberately due to oversight during the examination of the patent or because the patent examiner did not have access to the knowledge. This may also be because this knowledge is written down but not accessible using the tools available to the examiner, or because it is knowledge that exists in the oral tradition of communities.

(b) The granting of 'right' patents. Patents may be correctly granted according to the national law, on inventions derived from a community's IK or genetic resources. It could be argued that this constitutes biopiracy on the following grounds:

- Patenting standards are too low. Patents are allowed, for instance, for inventions which amount to little more than discoveries. Alternatively, the national patent regime (for example, as in the US) may not recognize some forms of public disclosure of IK as prior art.
- Even if the patent represents a genuine invention, however defined, no arrangements may have been made to obtain the prior informed consent (PIC) of the communities providing the knowledge or resource, and for sharing the benefits of commercialization to reward them appropriately

in accordance with the principles of the Convention on Biological Diversity 1992 (CBD), taking shelter behind TRIPS. This is not ethical conduct but technical adherence to the provisions.

Biopiracy has an effect on every aspect with which IK of biodiversity is concerned. There have been numerous cases of biopiracy in the past decade, with a large number of patents being granted on genetic resources and knowledge obtained from developing countries, without the consent of their original holders, the rural and indigenous communities. These patents have been obtained over resources without any actual innovation or novelty being added to the existing knowledge or resource. The examples of *turmeric*, neem and *ayahuasca* illustrate the issues that can arise when patent protection is granted to inventions relating to IK which is already in the public domain. Another example is the patent granted on a plant species called *'hoodia'*. Here, the issue was not whether the patent should or should not have been granted, but rather on whether the local people known as the San, who had nurtured the IK underpinning the invention, were entitled to receive a fair share of any benefits arising from commercialization. The San, one of Africa's oldest tribes have used Hoodia since prehistoric times to stave off thirst and hunger for long periods of time. It was patented in 1995 after being translated into a blockbuster obesity cure, P57, with a market potential of $6 billion. The particularly disconcerting aspect of this case is that it was a governmental organisation, the Council for Scientific and Industrial Research (CSIR), which took and patented the knowledge before licensing it to Phytopharm who subsequently sub-licensed to Pfizer, with none of the projected royalties being earmarked for the San. A claim was launched against the CSIR stating that it had failed to comply with the rules of the CBD, requiring prior informed consent. Consequently, a 'Memorandum of Understanding, was reached between the parties in March 2002, whereby the San would receive a share of any future royalties from the CSIR, along with offers of education programmes, computer training and employment cultivating the plant. Such an example represents a rare case where a bilateral agreement on access and benefit sharing has subdued the need for expensive and time-consuming litigation.

In the present day, there is an increasing demand from consumers in industrialized countries for herbal products. Accurate figures are hard to pinpoint but estimates for the turnover of the herbal sector are being pegged in the range of 10&15 trillion dollars by 2020. It is interesting to note that driven by this

demand, western science and industry is looking at indigenous systems of medicines and the knowledge present with the traditional healers of indigenous and local communities for leads to research and development. IK has been used particularly to facilitate bio-prospecting in the field of pharmaceuticals and agriculture. Bio-prospecting, which usually precedes biopiracy, is the systemic search for, and the development of, new sources of chemical compounds, genes, micro and macro-organisms and other valuable bio-products. Research-based industries have found it profitable to screen natural resources such as soil samples, marine waters, insects, tropical plants and animals in developing countries. As compared to the conventional system of screening millions of synthesized chemicals, bio-prospecting, especially if it is based on IK, may significantly cut costs of pharmaceutical R&D. In recent times, the cost of drug development has become astronomical. The figures put out by the drug industry say that it costs them about one billion US dollars to put a new product on the market. Along with the high cost is the growing incidence of side effects, often of a dangerous kind, as seen in the recent case of Vioxx, a drug produced by Merck which triggered heart problems in users or the infamous Viagra which can lead to blindness. The search for new molecules is, therefore, expensive, uncertain and runs the risk of huge payments in liability when things go wrong. Hence the pharma industry is looking increasingly at medicines and products that have been developed by local communities in older cultures like India, Africa and China where the centuries-old traditions of indigenous healing are still viable and in use. These healing practices and cures are rich hunting grounds for bio-pirates.

Today, one-fourth of all known medicines are based upon or derived from plants and about three-fourths of these have the same or similar use as identified by the native cultures in their healing practices. There are some instances of patent grants, which show direct derivation between the medicinal uses of plants in the indigenous system of medicine and the properties for which the patent has been granted to a 'modern' drug. A good example of such imitation patents is the patent granted on the drug developed from C*ommiphora mukul.* US Patent 6,113,949 was granted for a weight-control product and method of treating hyperlipidemia and increasing vigour. An examination of the above patent and its claims reveals that it is not an innovation that has been patented, but a mere imitation of the knowledge existing in ancient Indian medicinal texts with inconsequential advantages such as *increasing vigour and enhanced mood*

states being tagged on and highlighted as a novelty. In the traditional system of medicine, the plant is known as 'Medhuhara' meaning, 'fat destroying' and its lipid-lowering property is clearly derived from this. It is not only ancient Indian literature that details the fat-lowering property of the plant, but also modern Indian scientific texts (Indian Complete Specification No. 166998 discloses a method for the manufacture of a pharmaceutical composition of guggulipid in solid dosage form), along with many other modern investigations. Clearly, the so-called inventions on which such patents are granted are not innovations but mere imitations of existing IK.

A matter of concern is the fact that once a patent is granted, even the holders of the IK can be barred from using their knowledge to make products and commercially exploit them. This injustice leads to a situation where the rightful owners of the knowledge could end up paying exorbitant prices to the patent holder for use of and access to the patented product, which is based on their knowledge.

The phenomenon of biopiracy affects not just India but also other countries in Asia, Africa and Latin America. In the Indian context, the indigenous system of medicine exists at two levels: the classical with well-documented codified systems like Ayurveda, Siddha and Unani, which have treatises, and the informal system of folk medicine. The latter referred to as *'Lok Parampara'* (folk traditions) exists in communities and is passed on orally from generation to generation. It is not codified and has little documentation, and is not part of the official system of healthcare in India. These folk traditions are rich and diverse; the knowledge base is complex and is able to heal a wide range of ailments. The traditional healers or *vaidyas* engaged in traditional healing constitute the backbone of healthcare for almost 80 per cent of India's population. A similar situation exists in other developing countries also.

The grant of illegitimate patents on products derived from IK would have serious implications on such indigenous systems of medicine. A patent grant on turmeric would lead to the loss of opportunity for the practitioners of IK to further develop and commercially exploit the knowledge of the healing properties of turmeric. Any further research and development on the healing property of turmeric would entail high royalty payments to the patent holder, so that many Indian companies would not be able to afford to make turmeric-based products. It is important to note that this is a possible scenario despite the fact that the healing properties of turmeric have been known to the common Indian for centuries. A few such instances of attempted patenting, including the turmeric

case, are detailed below.

The Turmeric Patent

Turmeric (*Curcuma longa*) is a plant of the ginger family yielding saffron-coloured rhizomes used as a spice for flavouring Indian cooking. It also has properties that make it an effective ingredient in medicines, cosmetics and as a colour dye. As a medicine, it is traditionally used to heal wounds and rashes. In 1995, two Indian nationals at the University of Mississippi Medical Centre were granted US Patent 5,401,504 on 'use of turmeric in wound healing'. The Indian Council of Scientific and Industrial Research (CSIR) requested the US Patent and Trademark Office (USPTO) to re-examine the patents arguing that turmeric has been used for thousands of years for healing wounds and rashes and therefore its medicinal use was not novel. Their claim was supported by documentary evidence of IK, including an ancient Sanskrit text and a paper published in 1953 in the Journal of the Indian Medical Association. Despite arguments by the patentees, the USPTO upheld the objections made by CSIR and revoked the patent. The turmeric case was a landmark case as it was the first time that a patent based on the indigenous knowledge of a developing country had been successfully challenged. However, the process of revoking the patent and restoring turmeric to its rightful owners was time consuming (two years) and involved high legal costs.

The Neem Patent

In 1994, the European Patent Office granted European Patent 0436257 to the US Corporation W.R. Grace and USDA for a "method for controlling fungi on plants by the aid of a hydrophobic extracted neem oil". Neem (*Azadirachta indica*) is a tree from India and other parts of South and Southeast Asia. It is now planted across the tropics because of its properties as a natural medicine, pesticide and fertilizer. Neem extracts can be used against hundreds of pests and fungal diseases that attack food crops; the oil extracted from its seeds is used to treat colds and flu; and mixed in soap, it is believed to offer low-cost relief from malaria, skin diseases and even meningitis. A group of international NGOs and representatives of Indian farmers submitted a legal opposition against the patent in 1995. They submitted evidence that the fungicidal effect of extracts of neem seeds has been known and used for centuries in Indian agriculture to protect crops, and thus, the invention claimed was not novel. In 1999, the European Patent Office (EPO) determined that according to the evidence "all features of the present claim have been disclosed to the public prior to the patent application… and (the patent) was considered not to involve an inventive step". The patent was revoked by the EPO in 2000.

The Ayahuasca Patent

Inspired by India's success with the challenge to the turmeric patent, a challenge was launched made against the *ayahuasca* patent. For generations, shamans of indigenous tribes throughout the Amazon basin have processed the bark of *Banisteriopsis caapi* to produce a ceremonial drink known as "ayahuasca". The shamans use ayahuasca (which means "vine of the soul") in religious and healing ceremonies to diagnose and treat illnesses, meet with spirits and divine the future. An American, Loren Miller, obtained US Plant Patent 5,751 in June 1986, granting him rights over an alleged variety of *B.caapi* he called "Da Vine". The patent description stated that the "plant was discovered growing in a domestic garden in the Amazon rain-forest of South America". The patentee claimed that Da Vine represented a new and distinct variety of *B.caapi,* primarily because of the flower colour.

The Coordinating Body of Indigenous Organizations of the Amazon Basin (COICA) – an umbrella organization representing over 400 indigenous groups–learned of the patent in 1994. COICA objected to the patent because it purported to appropriate for a US citizen a plant that is sacred to many indigenous peoples of the Amazon, used by them in religious and healing ceremonies. On their behalf the Center for International Environmental Law (CIEL) filed a re-examination request of the patent with the US Patent and Trademark Office. CIEL protested that a review of the prior art showed that Da Vine was neither new nor distinct. They argued that granting the patent would be contrary to the public morality aspects of the Patent Act because of the sacred nature of *Banisteriopsis caapi* throughout the Amazon region. CIEL demonstrated that this knowledge was already known and in November 1999, the USPTO rejected the patent claim, agreeing that Da Vine was not distinguishable from the evidence of prior art presented by CIEL and the patent should never have been issued. The USPTO accepted the petitioners' arguments that the claimed plant variety was not distinctive or novel, but did not acknowledge the argument that the plant's religious value warranted an exception from patenting. It made its decision "final" in an office action dated April 14, 2000.

Though the rejection represented a victory for indigenous knowledge, the rejection itself was made on the narrowest legal ground under the statutory bar of section 102 (b) of the US Patent Law. This section of the US Patent Law prohibits the issuance of a patent when the invention was patented or described in a printed publication more than one year prior to the date of patent application. Thus, the historical use of the Ayahuasca tree was not acknowledged as prior art by the USPTO. Due to this legal technicality, Loren Miller appealed successfully and in early 2001, the USPTO went against its earlier decision and decided that the patent for the Da Vine variety of Ayahuasca was valid. The 'ayahuasca patent' expired on 17 June, 2003.

Partly as a result of these well-known cases, developing countries, holders of traditional knowledge, and campaigning organizations are pressing in a multitude of fora for IK to be better protected. Challenging patents granted on indigenous knowledge is not a solution to the problem because generally such patents go unnoticed and secondly, challenging such patents in foreign nations is expensive and time-consuming, which is a major problem for resource-poor developing nations. The solution to this problem must lie in action on the part the 'offending' nations, they should amend their intellectual property regimes so as to protect and recognize IK.

This situation calls for the regulation of access to bioresources and associated IK. A mandatory regulation of access to bioresources and associated knowledge according to the provisions of the Convention on Biodiversity (CBD) and other pro-community international agreements is a necessity to prevent the incidence of biopiracy. Such regulation would involve the consent of the rural and indigenous communities in cases where biological resources and/or knowledge are accessed. As a corollary to this regulation, it would also involve benefit-sharing (monetary and/or non-monetary) with these communities in the benefit accruing out of the use of biological resources and associated IK.

In the wake of the advances in biotechnology and the extension of patent protection to living organisms, both developed and developing countries realized the importance of regulating access to bioresources. This was the basis for the conclusion of the CBD in 1992. The Convention on Biological Diversity, 1992, *inter alia,* recognizes the sovereign rights of States over their biological resources; the close and traditional dependence of many indigenous and local communities embodying traditional lifestyles on biological resources; the desirability of sharing equitably benefits arising from the use of traditional knowledge; and innovations and practices relevant to the conservation of biological diversity and the sustainable use of its components. Article 8(j) of the CBD provides that "Each contracting party shall, as far as possible and as appropriate, subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices". Further, Article 15 of the CBD lays down provisions for the access of genetic resources, according to which access is subject to Prior Informed Consent (PIC) from the donor state on Mutually Agreed Terms (MAT) between donor and recipient. It also requires

parties to take legislative, administrative or policy measures with the aim of sharing in a fair and equitable way the results of the research and development and the benefits arising from the commercial and other utilization of genetic resources with the party providing such resources. Such sharing shall be upon mutually agreed terms.

Realizing the importance of IK and the objective of the CBD with regard to benefit-sharing, the Conference of Parties to the CBD, in its sixth meeting (COP 6) in 2002, adopted the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization. It provides the guidelines for developing legislative, administrative or policy measures on access and benefit-sharing. One of the stated objectives of the guidelines is to contribute to the development of mechanisms and access and benefit-sharing regimes that recognize the protection of IK, innovations and practices of indigenous and local communities.

One earlier attempt for the protection of IK was made in 1994 through the United Nations Draft Declaration on the Rights of Indigenous People. There is a clear provision in the Declaration to recognize the ownership of the IK of the indigenous communities. Article 29 mandates the recognition of the full ownership, control and protection of their cultural and intellectual property. This includes human and other genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions, literature, designs and visual and performing arts. They are also given rights to manage them.

The International Labour Organization (ILO) also emphasized the rights of indigenous people and the need for their recognition. The Indigenous and Tribal Peoples Convention (Convention 169), 1989, recognized the aspirations of these peoples to exercise control over their own institutions, ways of life and economic development, and to maintain and develop their identities, languages and religions within the framework of the States in which they live. The Convention provides that the Government shall be responsible and take action for promoting the full realization of the social, economic and cultural rights of these peoples with respect to their social and cultural identity, their customs and traditions and their institutions [Article 2.2(b)]. The Convention further states that the rights of these peoples related to the natural resources pertaining to their lands shall be specifically safeguarded. These rights include that of participation in the use, management and conservation of these resources [Article 15(1)].

More recently, in 2003, IK of the farming community was sought to be protected and recognized through the Food and Agricultural Organization (FAO)

International Treaty on Plant Genetic Resources for Food and Agriculture. The objectives of the treaty are the conservation and sustainable use of plant genetic resources for food and agriculture, and the fair and equitable sharing of the benefits arising out of their use, in harmony with the CBD, for sustainable agriculture and food security. Though this treaty deals specially with the indigenous knowledge related to food and agriculture, it reflects the importance and recognition accorded to IK per se.

Despite the fact that efforts are being made in various international fora for the protection and recognition of IK, corresponding efforts are not being reflected in intellectual property regimes of the user nations. In the near absence of national legislation on bio-prospecting, the commercialization of biotech products and processes, based on genetic resources obtained from developing countries, continues to be based on free market principles of demand and supply.

By definition, patents cannot be granted for substances that exist in nature as these do not fulfil the criterion of novelty or inventive step. However, the procedures followed in determining the novelty of patentable inventions differ even among industrialized countries. Developing countries rightly believe that patent systems that do not provide searching for the written and oral prior art for worldwide novelty (such as is the case in US) and that do not insist on disclosure of the origin and proof of prior informed consent, as few countries do today, for the use of the biological materials or IK on which the invention is based, help in perpetuating the inequitable system. One prime cause for this situation is that the international agreements/treaties relevant to the protection and recognition of IK lack mechanisms required for its enforcement. International conventions and treaties dealing with IK are characterized by the fact that they are not binding. Every clause that deals with benefit-sharing is contested and refused. ILO Convention No. 169, which says a lot about legal standards for indigenous rights, fails to protect the IPR of indigenous people. Whereas the UN Declaration on the Rights of Indigenous People recognizes the rights and aspirations of the Indigenous People, it is a non-binding document, which cannot be legally enforced. In the International Treaty on Plant Genetic Resources, developed nations have successfully blocked the international recognition of Farmers' Rights. They also contest any notion of paying for the use of traditional germplasm in a benefit-sharing arrangement. The CBD, which has attempted to push through the interests of IK, has been thwarted by the American refusal to ratify it and accept its conditions. International agreements of this kind are not binding on the nations signatory to them nor are there any provisions that would compel the nations to implement provisions of these agreements. The

TRIPS Agreement remains the only binding international treaty of relevance, and therefore to be meaningful, any move to protect IK and bioresources will have to be reflected in its provisions.

In one of the most coherent demands made of developed countries, India along with Brazil, China, Cuba, Dominican Republic, Ecuador, Pakistan, Thailand, Venezuela, Zambia and Zimbabwe had in 1996, in the WTO Committee on Trade and Environment, demanded an amendment to Article 29 of TRIPS, to impose conditions on patent applicants that would require adequate disclosure of country of origin of the bioresources or IK. Apart from disclosure, developing countries want the inclusion of provisions for proof that prior informed consent has been obtained from the owners of the genetic material and IK. In addition to this, proof of agreement on benefit-sharing with owners of genetic resources and IK, has to be given by the patent seekers. All these requirements shall be conditions to be fulfilled for the grant of patent. Examples of national patent legislation incorporating disclosure of origin include that of India, Andean Communities and Costa Rica. In India, Section 10 of the Patents Act, 1970, provides that the applicant must disclose the source and geographical origin of any biological material deposited in lieu of a description. Also section 25 (opposition to grant of patent) now allows for opposition to be filed on the ground that "the complete specification does not disclose or wrongly mentions the source or geographical origin of biological material used for the invention".

The nature of IK is such that most of it is transmitted orally rather than in written form. This poses particular problems when parties not authorized by the holder of that knowledge seek to obtain IPRs over it. In the absence of any accessible written record, a patent examiner in another country is unable to access documentation that would challenge the novelty or inventiveness of an application based on IK. The only option for the aggrieved party, that is, the holders of the knowledge, is to challenge the patent during the granting process or after grant, where national laws permit. For instance, this is what the Indian Government achieved by overturning the patents on *basmati* rice and turmeric in the US. The presence of administrative or quasi-judicial patent opposition or re-examination procedures has facilitated the overturning of these patents. In the absence of such procedures it would have been necessary to initiate proceedings before the relevant court with the inherent cost and time implications. Even with such procedures, it is extremely difficult and expensive for developing countries to monitor and challenge IPRs issued all around the world.

One defence against biopiracy is the documentation of IK. To address this problem, WIPO and a number of developing countries led by India and China

are seeking to develop traditional knowledge digital libraries. In 1999, following the ultimately successful, but expensive, Indian challenge of turmeric and *basmati* patents granted by USPTO, it was agreed that the Indian National Institute of Science Communication (NISCOM) and the Department of Indian System of Medicine and Homoeopathy (ISM&H) would collaborate to establish a Traditional Knowledge Digital Library (TKDL). The TKDL Project is initially targeting Ayurveda and proposes to document the knowledge available in public domain in digitized format. Information from about 35,000 *slokas* and formulations will be put into a database, and it is expected that the website will have approximately 140,000 Ayurveda pages. The data will be available in several international languages (English, Spanish, German, French, Japanese and Hindi).

Documentation constitutes one important and accepted way of validating IK and granting it protection from biopiracy. Once it is documented and put into the public domain, it should become protected from patent claims. Unfortunately that is a premise that the US continues to defy as it grants patents on well-known compounds derived from IK, like those from neem and turmeric. However, pressure from civil society and governments in developing countries is attempting to tackle this problem of biopiracy by several efforts, one of which is documentation of IK. The greater documentation of indigenous knowledge may not only be of value in preventing the granting of unwarranted patents but also, more importantly, it may contribute to the preservation and promotion of IK. In this respect, it is crucial that the documentation process does not prejudice possible IPRs in the material being documented. India's National Innovation Foundation provides an example to address these issues. The National Innovation Foundation seeks to obtain the Prior Informed Consent (PIC) of local innovators and indigenous knowledge holders before disseminating their innovations or knowledge to third parties. During discussions in WIPO on the documentation of IK, differences were evident among developing countries as to the type of data that could or should be included in any database. Some countries, for example, argued that such databases are appropriate only for information that was already publicly available in a codified form. Others indicated that IK that had not yet been codified could also be included.

The realm of IK is vast, and hence, the effort required for its documentation is immense, which includes efforts by governmental agencies, communities and non-governmental organizations working in this field. There is substantial work going on in India, supported by the government and being executed by NGOs, to document IK. Preparation of village-wise Community Biodiversity Registers (CBRs) for documenting knowledge, innovations and practices has been

undertaken in a few states.

Gene Campaign has undertaken documentation of IK of biodiversity in various parts of the country in order to establish prior art to challenge biopiracy and to secure the rights of local communities to a share in the benefits derived from the commercial use of biological resources using IK. The documentation aims at establishing and placing on record the body of knowledge that exists in the public domain. Also, this is done to ensure that this knowledge and the biological resources are the property of the indigenous people. Placing and establishing the source of this knowledge as that belonging to the indigenous communities will be the strongest evidence against the patent claims made by the corporate sector and also prevent private companies from exploiting the knowledge of the indigenous communities without paying them anything in return. It is important to establish their claim to a share in the profits made from different products like herbal drugs, cosmetics etc. which use indigenous knowledge. Gene Campaign has documented biodiversity and IK in Jharkhand, Madhya Pradesh and Uttaranchal. The work was focussed on three tribal populations: the Mundas in Jharkhand; the Bhils of Madhya Pradesh; and the Tharus of the Terai region of Uttaranchal. The Department of Science and Technology of the Indian Government supported the documentation. A large number of villages were covered in the documentation exercise. For example, 50 villages of the Tharu community of Uttaranchal were included. The fieldwork was carried out by trained members of the community. In addition to a standardized, structured questionnaire, techniques such as semi-structured questionnaires, informal interviews and group discussions were used for the collection of data. Group discussions exclusively for women were also conducted. In some villages it was found that the women were more curious and enthusiastic about the documentation work than their male counterparts.

Each community has been assured that the data would remain their property and its misuse would not be permitted. Only the community itself would have the power to grant permission for commercial use of the IK contained in the documents. The data is presently being kept in the safe custody of the Department of Science and Technology, Government of India, but this does not confer ownership on the Department or the Government. This has been done to ensure that this documentation does not end up facilitating biopiracy in the absence of legal protection to such data under the national legislation of India with the Biological Diversity Act being also inadequate in this respect.

Gene Campaign has also conducted a survey in selected locations in Assam with the purpose of documenting bioresources and indigenous knowledge to

assess the potential for income generation. The study was conducted in three communities of Assam — Ahom, Mishing and Tiwa. The Ahoms who practise wet paddy cultivation have been found to possess a rich knowledge of the use of herbs as medicines. The knowledge medicinal herbs and treatment of ailments has been found to be rather specialized, limited to a few members of the community. Most of the old women know the use of herbal medicines to cure diseases related to childbirth, menstruation etc. A total of 120 plants were found to be used by the Ahoms for various medicinal purposes. The Mishings, the second largest group of Scheduled tribes in Assam, also practise agriculture. The Mishing villages are located in far-flung riverine areas and have to depend mostly on their IK of herbs to deal with various diseases and illnesses. A total of 190 plants were mentioned in the survey questionnaires as being used by them for medicinal purposes. The Tiwas who practice shifting or *jhum* cultivation in the hills and paddy cultivation in the plains have been found to use about 135 plants for medicinal purposes. However, this knowledge is gradually eroding among the plain Tiwas who have forgotten their languages and their overall living pattern has changed because of close interaction and assimilation with non-tribals.

Another thing to be kept in mind for the prevention of piracy of bioresources and associated IK is that legal protection be granted to them in both the provider and user countries. This aspect has been touched upon earlier. For instance, the Patents Act of India, 2005 provides that mere discovery of any living thing or non-living substances occurring in nature shall not be considered to be an invention. The Act further provides that an invention which in effect is traditional knowledge or which is an aggregation or duplication of known properties of a traditionally known component or components shall not be considered to be an invention. However, if India, in a given situation, is a provider country of bioresource and/or associated IK, then these well-meaning provisions will be of no use unless the legal system of the user country has legal provisions that also acknowledge this. The weakness in the system is that intellectual property law has only domestic jurisdiction, and the intellectual property concept enunciated under the TRIPS Agreement does not compel its member nations to acknowledge provisions like disclosure of origin and prior informed consent.

As a first step, action is needed at the national level, in policy and legislation, in different countries to protect IK.

There is a lot of debate on the systems of protection that can be adopted to provide legal protection to the intellectual property of indigenous people and communities. Most of these discussions have tried to adapt the existing forms of

IPRs such as patents, trade secrets, copyrights etc. to the field of IK and bioresources. This is not likely to work because of the inherent mismatch between the protection that was created for finite, inanimate objects coming out of industrial activity and the flowing, mutable and variable properties of biological materials. How can a patent, with its life of 20 years, be applied to an intellectual property that has existed for several hundred years! Case law in India has shown that copyrights are not adequate to protect IK. Rulings have said that the idea is not important, just the mode of expression of the idea. The court has ruled to say that even if the defendant in a suit has used a common stock of knowledge, no action can be brought.

An approach that has been strongly advocated by some academics and many NGOs is the development of a *sui generis* regime, that is, a legal regime "of its own kind" which is specifically adapted to the nature and characteristics of IK. Though this approach has received considerable attention in the literature, little progress has been made in terms of actually implementing this kind of protection.

Despite action at the national level, the phenomenon of biopiracy shows no signs of abating. Genetic resources, the valuable raw materials of the booming herbal industry and the threshold agri-biotechnology industry have become coveted and sought after. The dilemma is that these resources are the property of the world's farming and tribal communities, located largely in the south and the industries are largely multinational or located in the industrial north. Biopiracy is the expedient with which the industry has decided to help itself to valuable resources without paying anything for them. This clearly unethical situation continues even as national governments chase patent grants in the US and more recently, Europe, and spend thousands of dollars to present a challenge. In the case of turmeric, the patent was struck down and in the case of *basmati* rice; there was a sort of compromise. Chasing patents in foreign patent offices is a clearly untenable situation. The governments of developing countries need to join hands to force an international agreement against patents on biological materials that clearly belong to communities in the south. A start has been made by a joint submission in the TRIPS Council by India and other developing countries that under the WTO patent regime, it should be mandatory to declare the source of the biological material, proof of prior informed consent and agreements for benefit sharing, before the grant of a patent. Not surprisingly, the US, backed by the MNCs, is opposing this move but this is where future negotiations and actions must focus. It is equally important that UN organizations, primarily the WIPO, take appropriate initiative.

In conclusion, what emerges is that apart from national-level work in individual countries, international action is needed to formally recognize the

contributions of local communities. International treaties and undertakings have so far failed to create legally binding undertakings that would make it mandatory to recognize and compensate the use of IK. This unjust situation has to be corrected.

The text of the book will help appreciate the need for a change in the current intellectual property rights regime at the national and international level as the current system is turning into a tool for the unjust exploitation of bioresources and associated IK of the rural and indigenous communities.

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INSTANCES
OF
BIOPIRACY

1. ACHYRANTHES ASPERA

Other names: *Latjira* in Hindi, *Apamargah* in Sanskrit, *Apang* in Bengali, *Katalati* in Malyalam, *Nayurivi* in Tamil, *Uttaren* in Telugu, *Prickly-chaff flower plant* in English.

Description of the plant and its location: It is a stiff erect herb about 1m in height with angular, ribbed and branched stems, thick leaves, greenish white flowers with a tinge of reddish purple and sub-cylindrical seeds truncated at the apex. It is found throughout India, along roadsides as well as on hills up to 900 m.

Part/s used: Whole plant.

Action and indigenous use of the plant: The plant is acrid, bitter, thermogenic, expectorant, revulsive, carminative, digestive, stomach ache, laxative, anodyne, anthelmintic, diuretic, linthontriptic, sudorific, demulcent, haematinic and anti-inflammatory. It is useful in cough, asthma, bronchitis, dyspepsia, flatulence, colic, painful inflammations, dropsy, opthalmopathy, vomiting, leprosy, skin diseases, pruritus, strangury, renal and vesical calculi, cardiac disorders, anaemia and general debility.

Modern use as patented: There are patents granted by the USPTO in which the plant appears as one of the constituents of the prepared drug and these include:

US Patent 6,080,40: Enhancement of the curative action of the drugs

US Patent 5,609,873: Preparation of cosmetics

There are also Japanese patents on the use of the plant in (a) formulations prepared to increase the shelf-life of perishables such as vegetables, fish and shells and (b) a composition used as a food preserving agent.

Some Chinese patents have been granted for the use of the plant (a) as a component of a mixture that is used for relieving the effects of radiation therapy given for nasopharyngeal cancer and also (b) a component of a medicine that is used for curing swelling resulting from soft tissue injury and (c) a drug component that promotes blood circulation.

Derivation observed:	
Indigenous use	**Modern use**
• Skin diseases	Cosmetics
• Anti-inflammatory	Swelling resulting from injury
• Cardiac disorders	Blood circulation

2. ACORUS CALAMUS

Other names: *Bach* in Hindi and Bengali, *Vacha* in Sanskrit, *Vekhand* in Gujarati and Marathi, *Vasa* in Telugu, *Vasambu* in Tamil, *Baje gida* in Kanada, *Vavambu* in Malayalam.

Discription of the plant and its location: A semi-aquatic herb with a creeping and branched aromatic rhizome. It is found wild as well as cultivated throughout India and found ascending to 2000 m.

Part/s used: Rhizomes.

Action and indigenous use of the plant: The dried rhizome, which contains yellow aromatic oil, is known to have emetic and anti-spasmodic properties and also gives good results in dyspepsia and chronic diarrhoea. It is useful in vitiated conditions of stomatopathy, hoarseness, colic, flatulence, dyspepsia, helminthiasis, menstrual disorders, nephropathy, calculi (stone), strangury, cough, bronchitis, odontalgia, pectoralgia, hepatodynia, otalgia, inflammations, gout epilepsy, delirium, amentia, convulsions, depression and other mental disorders, tumours, dysentry, hyperdipsia, haemorrhoids, intermittent fevers, skin diseases, numbness and general debility.

In action the root stock is aromatic, anti-spasmodic, anthelmintic, aphrodisiac, astringent bitter, carminative, diuretic, expectorant (cough medicine), emetic (substance that causes vomiting), emmenagogue, insecticide, nervine tonic, sedative, tonic and tranquilliser. Indicated in anti-periodic fevers, calculus (stone) affections, constipation, colic, capillary epilepsy, fever, flatulence, hysteria and neuralgia (nerve related), insanity, piles and teething troubles and used as a memory sharpener and longevity enlarger.

Modern use as patented: There are a large number of patent applications that have been filed, including Russian, Chinese, Japanese and Indian patent applications.

RU 02141328CI: The Russian patent involves the use of the roots and rhizomes for several different applications/uses as antiseptic, anti-inflammatory and immuno-stimulating.

RU 02142235CI: Tea drink.

RU 0213908CI: Anti-ulcer and anti-acid compositions and sedative formulations.

RU 02142235CI: Drug for chronic hepatitis.

WO09508318A2: A Russian patent application dealing with the medicinal substance of anti-infection properties and for use in the treatment of infertility and protection of pregnancy.

The Chinese patent applications that have been filed by the Shanghai Institute of Materia Medica, Chinese Academy of Science, Neijiang Pharmaceutics Factory and individuals involves the use of the plant, as a medicine pillow, oral medicine for nervous system disorders and queen cell high-efficient health care tonic wine.

There are six Japanese applications on the use of the plant (i) as lypolysis promoter, (ii) as part of a cosmetic composition, (iii) in a formulation for preventing and improving visual impairment and (iv) for skin external preparations.

There is one Latvian application and three Indian applications, out of which one is filed in India and the other two, are PCT applications. Both these applications relate to herbal compositions for improving overall mental performance in children, adults and mentally deficient people.

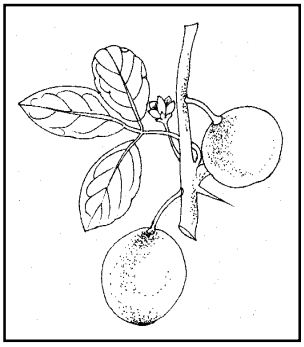
Patents granted by the USPTO include the following:

US Patent 6,270,752: Cosmetic formulations for the prevention and therapy of hair loss.

US Patent 5,439,891: Process for preparation of pharmaceutical composition with enhanced activity for treatment of tuberculosis and leprosy.

Derivation observed	
Indigenous use	**Modern use**
• Inflammations	Anti-inflammatory
• Tranquillizer	Sedative formulations
• Emmenagogue	Infertility and protection of pregnancy
• Mental disorders, hysteria, neuralgia	Oral medicine for nervous system
• Skin diseases	Cosmetic formulations

3. AEGLE MARMELOS



Other names: *Bel* in Hindi, Assamese, Bengali and Marwari, *Bili* in Gujarati, *Koovalam* and *Kulakam* in Malayalam, *Belo* in Oriya, *Bilva* and *Sriphal* in Sanskrit, *Belva* and *Vilvam* in Tamil, *Bilavamu* and *Maredu* in Telugu and *Bael* in English.

Description of the plant and its location: A moderate sized, slender aromatic tree, 6–7.5 m in height and 90-120 cm girth. The plant grows wild in the deciduous forests of India and is also cultivated.

Part/s used: Roots, fruits and leaves.

Action and indigenous use of the plant: An important medicinal plant in the indigenous system of medicine. The roots are sweet, astringent, bitter and febrifugal. They are useful in diarrhoea, dysentery, dyspepsia, stomachalgia, cardiopalmus, seminal weakness, uropathy, vomiting, intermittent fever, swellings and gastric irritability in infants. The leaves are astringent, laxative, febrifugal and expectorant, useful in ophthalmia, deafness, inflammations, catarrh, diabetes and asthmatic complaints. The unripe fruits are bitter, acrid, sour, astringent and digestive useful in diarrhoea, dysentery, and stomachalgia. The ripe fruits are astringent, sweet, aromatic, cooling, febrifugal, laxative and tonic, useful in dyspepsia and good for the heart and brain.

Modern use as patented: There exist not many patents existing, related to the plant. However, the few patents granted by the USPTO include:

US Patent 6,080,40: Herbal and pharmaceutical drugs enhanced with probiotics.

US Patent 5,886,029: Use in preparing a formulation for an anti-diabetic composition along with other herbs.

Derivation observed:

Indigenous use	**Modern use**
• Diabetes	Anti-diabetic composition

4. ALOE VERA

Other names: *Ghritakumari, Ghikwar* and *Gwarpata* in Hindi, *Korfad* in Marathi, *Kanwar* in Gujarati, *Kottoli* in Tamil, *Gusamsaram* in Telugu, *Indian aloe* in English.

Part/s used: Leaf juice.

Description and location of the plant: It is a herbaceous plant, with thick fleshy leaves and red flowers and appears on old plants at the end of the winter season. An introduced variety, but now runs wild throughout drier India and has been naturalised in Florida, Central America and Asia.

Action and indigenous use of the plant: The plant is abortifacient, anthelmintic, aperient, blood purifying, carminative, cathartic, cooling, deobstruant, depurative, digestive, diuretic, emmenagogue, ophthalmic and purgative. It is useful in amenorrhoea, atonic, dyspepsia, burn, cold and cough, colic (abdominal pain), improvement of eyesight, glandular enlargement and spleen diseases, skin disorders hair tonic for hair growth, jaundice, uteriae disorders menstrual suppressions, piles, rectal fissures, sexual power restoration, dispersal of swellings and dispelling of worms.

Modern use in the patent: There are over 1,000 patents granted by the USPTO that are related to this plant, which include:

US Patent 6,375,992: Methods of hydrating mammalian skin comprising oral administration of a defined composition.

US Patent 6,372,791: Method of promoting skin cell metabolism.

US Patent 6,372,234: Products for topical applications comprising oil bodies.

US Patent 6,368,639: Herbal skin care formulation and a process for the preparation thereof.

US Patent 6,365,200: Topical skin sensitizer.

US Patent 6,358,516: One-step system for cleansing, conditioning, and treating the skin.

Antimicrobial treatment for herpes simplex virus and other infectious diseases.

US Patent 6,352,997: Method of improving in-vitro fertilization.

US Patent 6,352,691: Therapeutic aftershave care lotion.

US Patent 6,350,784: Antimicrobial prevention and treatment of human immune-deficiency virus and other infectious diseases.

US Patent 6,350,734: Methods and kits for removing, treating, or preventing lice with driable pediculostatic agents.

US Patent 6,348,199: Skin treatment cream.

US Patent 6,346,519: Method and composition for treating arthritis.

US Patent H2, 013: Skin care compositions.

US Patent 6,338,855: Cleansing articles for skin and/or hair which also deposit skin care actives.

US Patent 6,333,356: Compounds for treating skin conditions

US Patent 6,333,039: Opaque skin sanitizing composition

US Patent 6,321,750: Condom lubricants with zinc salts as anti-viral additives

Derivation observed:

Indigenous use	**Modern use**
■ Skin disorders	Skin sentisizer, skin hydration, skin treatment, condom lubrication and other skin care products and formulations
■ Glandular enlargement and spleen diseases	Antimicrobial prevention and treatment of human immune-deficiency virus and other infectious diseases
■ Menstrual problems, uterine disorders	Method of improving in-vitro fertilization
■ Hair tonic for hair growth	Cleansing articles for hair
■ General debility	Nutritional composition

5. AZADIRACHTA INDICA

Other names: *Neem*, *Nim* and *Nimb* in Hindi, *Turakabevu*, *Huccabevu Cikkabevu* in Kannada, *Veppu, Aryaveppu* and *Aruveppu* in Malayaalam *Nimbah*, *Prabhadrah*, *Vempu* and *Veppu* in Tamil, *Kondavepa* and *Turakavepu* in Telugu.

Description and location of the plant: Attractive tropical evergreen medium to large sized trees 15-20 m in height and living up to two centuries. called **Azad Darakht** (meaning 'free tree') in Persian, it is indigenous to the Indian subcontinent, but over the past century it has been introduced into and now flourishes in many countries of Africa, Central and South America, Caribbean and Asia.

Part/s used: Bark, leaves, flowers, seeds, oil.

Action and indigenous use of the plant: Neem has been mentioned in many ancient texts and traditional Indian medical authorities as being at the pinnacle of their pharmacopoeia. Its bark is acrid, used as an astringent, refrigerant (coolant), depurative and liver tonic. It is useful in vitiated or degraded conditions of hyperdypsia, leprosy and skin diseases among others. It has been used for centuries in agriculture as an insect and pest repellent, in human and veterinary medicine, toiletries and cosmetics. The bark, leaves, flowers, seeds and fruit pulp are used to treat a wide range of diseases and complaints, ranging from leprosy and diabetes to ulcers, skin disorders and constipation. Neem twigs are used by millions of Indians as an antiseptic toothbrush. Its oil is used in the preparation of toothpaste and soap and is known to be a potent spermicide. The tree is venerated in the cultures, religions and literature of the region.

Neem oil is also used as lamp oil, while the fruit pulp is useful in the manufacture of methane.

Nimba, the great medicine for the cure of pitta, aggravations and for blood purifications.

—Priyanighantu Haritakyadivarga

Modern use in the patent: A patent was granted jointly to the USDA and the US chemical major W.R Grace (Patent no. 0436257 B1) on a fungicide

formation from the seeds of the Indian medicinal tree neem by the EPO. The patent concerns a hydrophobic e*xtract*ed neem oil - a fungicide from neem seed that exhibits the ability to control various fungi. A legal opposition to this patent was lodged and the patent was revoked on 11 May, 2000 after evidence was shown to prove that this technique that was sought to be patented was well known to local farmers and lacked any inventive step.

Other patents related to neem granted by the USPTO:

US Patent 6,336,949: Slow release urea fertilizer composition and a process for the preparation of the said composition.

US Patent 6,264,982: Dietary supplement composition for the treatment of haemorrhoids.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder

US Patent 5,906,825: Polymers containing antimicrobial agents and methods for making and using same.

US Patent 5,886,029: Method and composition for treatment of diabetes.

US Patent 5,885,600: Natural insect repellent formula and method of making same.

US Patent 5,827,521: Shelf stable insect repellent, and insect growth regulator insecticidal formulations prepared from technical azadirachtin isolated from the kernel extract of *Azadirachta indica*.

US Patent 5,730,986: Process for the isolation of an active principle from *Azadirachta indica* useful for controlling gastric hyperacidity and gastric ulceration.

US Patent 5,602,261: Triterpene derivatives of azadirachtin having insect antifeedant and growth inhibitory activity and a process for extracting such compounds from the neem plant.

US Patent 5,591,436: Composition for a dietary supplement for the treatment of haemorrhoids.

US Patent 5,501,855: Neem oil as a male contraceptive.

US Patent 5,472,700: Combinations of neem seed extract and bifenthrin for control of ectoparasites on animals.

US Patent 5,370,873: Therapeutic compounds derived from the neem tree.

US Patent 5,352,697: Storage stable pesticide compositions comprising azadirachtin and epoxide.

US Patent 5,298,247: Neem oil fatty acid distillation residue based pesticide.

US Patent 5,047,242: Azadirachtin derivative insecticides.

US Patent 4,960,791: Salannin derivative insect control agents.

US Patent 4,943,434: Insecticidal hydrogenated neem extracts.

US Patent 4,556,562: Stable anti-pest neem seed extract.

US Patent 4,536,496: Polysaccharides N9GI, their preparation and

therapeutic compositions containing them.

Derivation observed:	
Indigenous use	**Modern use**
• Constipation	Haemorrhoids
• Antiseptic toothbrush	Herbal tooth powder
• Diabetes	Diabetes
• Insect repellent	Insect repellent
• Ulcers, hyperdipsia astringent	Gastric hyperactivity and ulceration
• Contraceptive	Male contraceptive
• Insecticides, pest repellent	Ectoparasites, pesticides

6. BANISTERIOPSIS CAAPI

Other name/s: *Ayahuasca*.

Description and location of the plant: It is found in the rainforests of the Amazon forests.

Part/s used: bark.

Action and indigenous use of the plant: Its bark is used by the shamans or wise men of the indigenous tribes in the Amazon Basin, in the preparation of a ceremonial drink *ayahuasca* along with other rainforest plants and used to treat diseases.

Modern use in the patent: The challenge to the *ayahuasca* patent was inspired by India's successful challenge of the turmeric patent. A patent was granted by the USPTO to Loren S. Miller of the United States over an alleged variety of the Amazonian vine, *Banisteriopsis caapi* called is "Da Vine". The plant, which he called used by the traditional healers of the indigenous tribes of the Amazon in the preparation of a ceremonial drink called *ayahuasca*. This patent was challenged by the CIEL (Centre for International Environmental Law) on behalf of the Co-ordinating Body of Indigenous Organizations of the Amazon Basin (COICA) and the Coalition for Amazonian Peoples and Their Environment (Amazon Coalition). Even though the patent claim was initially rejected, the decision was reversed and the patent restored to the inventor in April 2001.

7. CASSIA FISTULA

Other names: *Suvarnak* in Sanskrit, *Amaltas* in Hindi, *Sonaru* and *Sondal* in Bengali, *Bhava* in Marathi, *Konnai* in Tamil, *Indian laburnum* or *Purging cassia* in English.

Description of the plant and its location: A mediumsized tree with compound leaves and large shining, dark green leaflets. With bright yellow flowers hanging on the branches, it is found throughout India in deciduous forests and also in Sri Lanka and Burma.

Action and indigenous use of the plant: In action the drug is emetic, febrifugal, laxative and purgative. It is useful in the treatment of boils, pustules, leprosy, ringworm, colic, gripes and flatulence, dyspepsia, constipation, indigestion, fever and heart diseases and has been effectively used in the treatment of pyoderma and other skin diseases. The resin obtained from the pod is used to treat dysentery in children.

Modern use in the patent: There are several patents granted on the plant by the USPTO, which include:

US Patent 5411733: The preparation of antiviral agent containing crude drug.

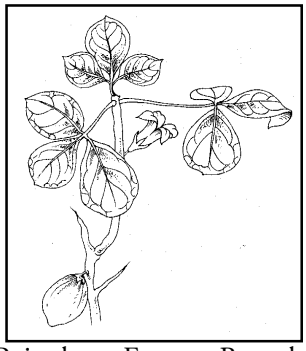
EP 0568001: Antiviral drug containing crude drug

CH 505900: Controlling bacteria in cultivation media

Derivation observed:

Indigenous use	**Modern use**
• Prevention of dysentery in children	Controlling bacteria in cultivation media

8. COMMIPHORA MUKUL



Other names: *Guggul* in Hindi, Gukkal and *Maishakshi* in Tamil, *Guggul* in Telugu, *Indian bdellium* in English.

Description of the plant and its location: It is a small round tree with spinescent branches and ash-coloured roughbark, peeling off in flakes. A pale yellow or brown aromatic gum resin is obtained from the bark. the gum resin consists of irregular, reddish masses of varying sizes. With a slow growth, the tree has a life span sometimes as long as 500 years. It is naturally found in Western Madhya Pradesh, Gujarat, Rajasthan, Eastern Bengal, Mysore and Assam.

Part/s used: Resinous gum.

Action and indigenous use of the plant: In the traditional medicine system, the plant is known to be "medhuhara" meaning "fat destroying" and its lipid lowering property is clearly derived from this. The plant gives out a resinous gum from its bark and branches, which is known as "guggul". The gum is acrid, bitter, astringent, thermogenic, aromatic, expectorant, digestive, anthelmintic, anti-inflammatory, anodyne, depurative, antiseptic etc. It is used as a nervine tonic, demulcent, aphrodisiac, alterative, stimulant, liver tonic, detergent, anti-spasmodic, emmenagogue, haematinic, diuretic, lithontriptic and rejuvenating, general tonic and for the treatment of gout, scrofula, sciatica, facial paralysis, diplegia, leprosy leucoderma, dyspepsia, cough, asthma, bronchitis, pectoral and hepatic disorders, otorrhoea, epilepsy, fever, strangury, haemorrhoids, dysmenorrhoea, wounds, ulcers, cardiac disorders, coronary thrombosis anaemia, stomatopathy, pharyngopathy, spermatorrhoea, urinary calculus, diabetes, trichosis and skin diseases.

Modern use in the patent: There are many patents granted by the USPTO related to this plant, which include:

(US Patent 6,113,949) Weight control product and method of treating hyperlipidemia and increasing vigour with the product.

A patent has been granted on a guggul composition with some salts,

showing synergistic activity in reducing body weight and body fat in mammals. This guggul extract reduces body plasma levels and cholesterol in overweight hyperlipidaemic humans.

A closer examination of the above patent and its claims suggest that it is not a innovation that has been patented, but a mere reproduction of the knowledge existing in the ancient Indian medicinal texts with consequential advantages such as increasing vigour and enhanced mood states being highlighted as a novelty. It is not only the ancient Indian literature that details the fat lowering property of the plant, but also modern Indian scientific text (Indian Complete Specification No. 166998 discloses a method for the manufacture of a pharmaceutical composition of guggululipid in solid dosage form), along with many other modern investigations. The patent document reads that "while prior art discloses the use of guggulsterones to reduce blood plasma lipid content and the use of phosphates to decrease triiodothyronine and increase resting metabolic rate, there is no suggestion or disclosure of combining these materials to achieve a synergistic effect in weight control and the surprising benefits of enhanced mood states and increased vigour". It is seen that the patent is based on prior art knowledge of the plant's lipid lowering property and the surprising benefits of enhanced mood states and increased vigour are nothing but an obvious consequence of optimum/ near optimum body weight and hence improved mental health.

US Patent 6,258,344: Skin lightening compositions.

US Patent 6,242,491: Use of creatine or creatine compounds for skin preservation.

US Patent 6,193,975: Use of potentilla erecta extract in the cosmetic and pharmaceutical field.

US Patent 6,184,247: Method of increasing cell renewal rate.

US Patent 5,993,787: Composition base for topical therapeutic and cosmetic preparations.

US Patent 5,980,92: Topical compositions for regulating the oily/shiny appearance of skin.

US Patent 5,972,341: Products extracted from a plant of the genus Commiphora, particularly the *Commiphora mukul* plant, extracts containing the same and applications thereof, for example in cosmetics

US Patent 5,821,237: Compositions for visually improving skin.

US Patent 5,700,451: Sunscreen composition.

US Patent 5,691,327: Use of salicylic acid for regulating skin wrinkles and/ or skin atrophy (US Patent 5,686,088) Antimicrobial wipe compositions.

Derivation observed:

Indigenous use	**Modern use**
• Lowering body fat	Method of treating hyperlipidemia
• Skin diseases	Skin lightening compositions, skin preservation and cosmetics

9. CROTON SUBLYRATUS

Other name: *Plao-noi*

Description and location of the plant: A Thai herbal plant.

Indigenous/local use of the plant: The healing property of this plant has been recorded in traditional palm leaves scriptures Thai.

Part/s used:

Modern use in the plant: A patent has been granted on the active ingredient extracted from the plant, called 'plaonotol' after the plant itself, to a Japanese company and a medicine in tablet form called 'Kelnac' has been created and is being sold to treat ulcers.

Derivation observed:	
Indigenous use	**Modern use**
• Healing	Treatment of ulcers

10. CURCUMA LONGA

Other names: *Haldi* in Hindi, *Manyyal*, *Paccamannal*, and *Varattumannal* in Malayalam, *Haridra* in Sanskrit, *Manycal* in Tamil, *Turmeric* in English.

Description of the plant and its location: A seasonal herb, 60-90 cm in height, with a short stem and tuft of erect leaves. The rhizome is cylindrical and orange coloured.

Part/s used: Rhizomes (both dried as well as raw).

Action and indigenous use of the plant: The rhizome is bitter, acrid, thermogenic, emollient, anodyne, anti-inflammatory, vulnerary, depurative, antiseptic, an appetiser, carminative, anthelmintic, laxative, diuretic, expectorant, haematinic, styptic, anti-periodic, alterative, alexeteric, detergent, stimulant, febrifugal, and ophthalmic. It is useful in inflammations, ulcers, wounds, leprosy, skin diseases, pruritus, allergic conditions, and discoloration of the skin, anorexia, flatulence, colic, helminthiasis, constipation, strangury, cough, asthma, bronchitis, hiccough, catarrh, anaemia, haemorrhages, fever, giddiness, urethrorrhea, dropsy, hysteria, epilepsy, ringworm, amenorrhoea, gonorrhoea, jaundice, conjunctivitis, general debility and diabetes. The rhizome is used both raw as well as dried.

Modern use in the patent: A controversial patent on turmeric was successfully challenged by India, thereby forcing the issuing authority to revoke it. This patent highlights the lacunae existing in the patent system with regards to indigenous knowledge and technology related to bioresources and their misappropriation under the current Intellectual Property Rights system.

On 28 December 1993, an application for a patent was filed before the USPTO. The patent was filed on the use of turmeric in "wound healing". The patent (US Patent 5,40, 504) was granted on 28 March 1995. The main claim of the patent: a method of promoting healing of a wound in a patient consists essentially of administering a wound-healing agent consisting of an effective amount of turmeric powder to the patient. This patent was challenged by India, which applied to the USPTO for a re-examination of the patent. The basic thrust of the challenge was that turmeric is known to be beneficial for wound

healing, it has been used for such purposes in India for centuries, and that the inventors have added nothing new to this knowledge. India claimed that the patent did not fulfil the legal requirement of novelty and India proved this by means of documents showing that the claimed new use of the turmeric had in fact been in use in India long before the filing of the patent application. The challenge succeeded and the patent was revoked. The interest in turmeric, however, still continues, the result of which are some of the following patents:

US Patent 6,355,279: Composition improving lipid metabolism.

US Patent 6,352,728; Extracts of celery seed for the prevention and treatment of pain, inflammation and gastrointestinal irritation.

US Patent 6,346,539: Treatment of skin conditions.

US Patent 6,287,583: Low-pH, acid-containing personal care compositions which exhibit reduced sting.

US Patent 6,277,881: Turmeric as an anti-irritant in compositions containing hydroxy acids or retinoids.

US Patent 6,274,176: Herbal compositions and their use as anti-inflammatory agents for alleviation of arthritis and gout.

US Patent 6,270,752: Cosmetic formulations for the prevention and therapy of hair loss.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

US Patent 6,258,368: Antimicrobial wipes.

US Patent 6,238,682: Anhydrous skin lotions having antimicrobial components for application to tissue paper products which mitigate the potential for skin irritation.

US Patent 6,224,871: Dietary supplement for nutritionally promoting healthy joint function.

US Patent 6,217,887: Leave-on antimicrobial compositions which provide improved immediate germ reduction.

US Patent 6,183,766: Skin sanitizing compositions.

US Patent 6,162,438: Herbal compositions and their use as agents for control of hypertension, hypercholesterolemia and hyperlipidemia.

US Patent 6,126,942: Herbal compositions for hepatic disorders.

US Patent 6,048,560: Process for the preparation of a flavouring component.

Derivation observed:	
Indigenous use	**Modern use**
• Wound healing	Wound healing
• Skin diseases, discolouration of skin allergic conditions	Skin conditions, anti-irritant, anti-inflammatory agents
• Jaundice	Hepatic disorders

11. HOODIA

Other name:

Description of the plant and its location: Cactus variety with cucumber-like stem. This hoodia variety of cactus grows in the Kalahari desert, which stretches over Botswana, Namibia, Angola and South Africa

Part/s used: Stems.

Action and indigenous use of the plant: It is used by the San Bushmen to keep hunger and thirst at bay during their hunting expeditions.

Modern use in the patent: A UK-based company, Phytopharm, isolated the hunger and thirst suppressant from the hoodia and entered into a licensing agreement with CSIR, a public research institute in South Africa. A drug known as P57 was duly patented (US patent 6.376, 657), titled "Pharmaceutical compositions having appetite suppressant activity" with no benefits going to the San Bushmen community, who have been using this knowledge of the plant for generations. Pfizer, a major pharmaceutical company, bought the rights to market and develop a drug or a pharmaceutical composition, which contains an extract obtainable from a plant of the genus Trichocaulon, or hoodia, containing an appetite suppressant agent.

Derivation observed:	
Traditional use	**Modern use**
• Hunger suppressant	Hunger suppressant

12. LAGERSTROEMIA SPECIOSA

Other name: *Banaba*

Description of the plant and its location: It is a well-known herb used in the Cordillera highlands and other parts of the Philippines.

Part/s used:

Indigenous/local use of the plant: It is known to be used by traditional heelers to treat fever, diarrhoea and diabetes and to act as a purgative and stimulant. The treatment is documented in national literature.

Modern use in the patent: A patent has been awarded to a Japanese company called Itoen KK for an anti-diabetic drug based on this plant.

Derivation observed:	
Indigenous use	**Modern use**
• Treatment of diabetes	Anti-diabetes drug

13. MOMORDICA SPP.

Other name: *Bird droppings gourd* in Thai.

Description of the plant and its location: It is a small-sized bitter gourd found in Thailand.

Piracy: A research conducted by the Thai scientists on a native strain of Thai bitter gourd led to compounds that work against AIDS. American scientists copied their work and also got it patented.

14. NIGELLA SATIVA

Other names: *Kalajira*, *Mugrela* and *Kalonji* in Hindi, *Mungrela* in Bengali, *Kalonji-jiram* in Gujarati, *Nella-jeelakaira* in Telugu, *Karunjiragam* in Tamil, *Karejirage* in Kannada, *Karunchiragam* in Malayalam, *Small fennel* and *Black cumin* in English.

Description of the plant and its location: A small, pretty herb, 30-60 cm in height. It is a native of Syria and Lebanon, but also cultivated in the states of Assam, Bihar, Himachal Pradesh and Punjab. The herb is also mentioned in the *Hadiths* (preachings of Prophet Mohammed).

Part/s used: Seeds.

Action and Indigenous use of the plant: The seeds of the plant are acrid, bitter, thermogenic, aromatic, carminative, diuretic, emmenagogue, anodyne, antibacterial, anti-inflammatory, deodorant, appetising, digestive, anthelmintic, constipating, sudorific, febrifugal, stimulant, galactogogue and expectorant. In traditional Indian medicine, we find the plant is used in the treatment of skin diseases, haemorrhoids, cephalalgia, jaundice, inflammation, fever, cough, paralysis, ophthalmia, halitosis, anorexia, dyspepsia, flatulence, diarrhoea, dysentery, helminthiasis especially tapeworms, strangury agalactia and menstrual problems.

In the black seed is the medicine for every disease except death.

—An Arab saying

Modern use in the patent: The patents granted and those pending relate to the medicinal use of the plant by itself or in combination with other plants or herbs in the form of pharmaceutical compositions and herbal formulations.

The patents granted by the USPTO include:

US Patent 6,042,834: Herbal composition for diabetes and method of treatment.

US Patent 5,653,981: Pharmaceutical composition to increase the immune

function, with the composition containing an extract of the plant *Nigella sativa*.

US Patent 5,648,089: Herbal formulation for the treatment of viral and hepatitis diseases.

Some patent applications filed with the PCT that are awaiting approval (as of year 2000) include the following:

PCT WO 0051580 A2: Pharmaceutical composition used in asthma/allergy therapy that targets T-lymphocytes and or eosinophilis.

Japanese patents:

JP60054312A2: on a composition of herbs, which has the plant and is effective against dental caries.

JP7138126A2: Antioxidant formulation effective against chapped skin and springiness and gloss of the skin.

Derivation observed:

Indigenous use	**Modern use**
• Halitosis	Dental caries
• Jaundice	Treatment of hepatitis
• Skin diseases	Chapped skin

15. OCIMUM SANCTUM

Other names: *Tulsi* in Hindi, *Kari tulasi* in Kannada, *Trittavu* in Malayalam, *Ajaka*, and *Brinda* in Sanskrit, *Thulasi* in Tamil, *Tulasi* in Telugu, *Holy basil* and *Sacred basil* in English.

Description of the plant and its location: Tulsi is a venerated plant among the Hindus, grown in their homes throughout the country, often running wild too. It is a much-branched; aromatic, erect herb, with toothed leaves and dotted with minute glands, small flowers; purplish; seeds are black and short with a woody stem.

Parts used: Whole plant.

Action and indigenous use of the plant: Tulsi is used in the treatment of various ailments in the indigenous system of medicine. The plant is bitter, acrid, aromatic, demulcent, diaphoretic, digestive, diuretic, expectorant, febrifugal, vermifugal and alexeteric. It is useful in cardiopathy, homeopathy, leucoderma, asthma, bronchitis, catarrhal, fever, otalgia, hepatopathy, leucoderma, asthma, hiccough, opthalmia, gastropathy in children, genito-urinary disorders, ringworm, verminosis and skin diseases. Root decoction is given in malarial fever.

Modern use in the patent: Several patents related to tulsi have been granted by the USPTO, which include:

US Patent 6,264,995: Herbal composition for reducing inflammation and methods of using the same.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

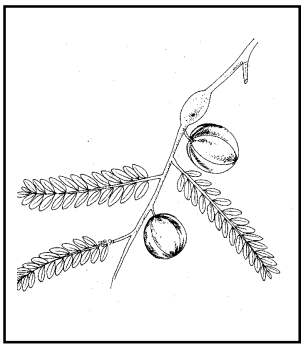
US Patent 6,200,570: Herbal formulation useful as a therapeutic and cosmetic applications for the treatment of general skin disorders.

US Patent 5,980,903: Composition for the treatment of viral infections including HIV.

Derivation observed:

Indigenous use	**Modern use**
• Skin diseases	Therapeutic and cosmetic applications for general skin disorders
• Hepatic problems	The treatment of viral infections including HIV

16. PHYLLANTHUS EMBLICA / EMBLICA OFFICINALIS



Other names: *Amla* in Hindi or Bengali, *Adiphala*, *Dhatri* and *Amalaka* in Sanskrit, *Amali* in Gujarati, *Amalakamu*, and *Usirika*i in Telugu, *Nelli* in Tamil and Kannada, *Nellikka* in Malayalam, *Indian gooseberry* in English.

Description of the plant and its location: It is a small genus of trees, native to India, Sri Lanka, Malaysia and China, with wide cultivation in some Indian states. The tree is found in deciduous forests, on hill slopes up to 200 m.

Part/s used: Root bark, trunk bark, leaves and fruits.

Action and indigenous use of the plant: There are many known applications of the plant and its various products in the Indian system of medicine. The root bark is astringent and is useful in ulcerative stomatitis and gastrohelcosis. The trunk bark is useful in gonorrhoea, jaundice, diarrhoea and myalgia. The leaves are useful for conjunctivitis, inflammation, dyspepsia, diarrhoea and dysentery. The fruits are sour, astringent, bitter, acrid, sweet, cooling, anodyne, ophthalmic, carminative, digestive, laxative, alterant, alexeteric, aphrodisiac, diuretic, antipyretic, tonic and trichogenous. The are useful in diabetes, cough, asthma, bronchitis, cephalalgia, ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcer, erysipelas, skin diseases, leprosy, haematemesis, inflammations, anaemia, emaciation, hepatopathy, jaundice, strangury, diarrhoea, haemorrhages, menstrual problems, cardiac disorders, intermittent fevers and greyness of hair. The amla fruit is a very good source of vitamin C and it is said that one amla fruit has vitamin C equivalent to 20 oranges. Also used in the preparation of juices, chutneys etc.

Modern use in the patent: Patents granted by the USPTO in which the plant appears include the following:

US Patent 6, 124,268: Natural anti-oxidant compositions, method for

obtaining some cosmetic, pharmaceutical and nutritional formulations.

US Patent 6,210,738: Composition of herbal tea (freeze-dried ginseng berry tea) in which amla is one of the ingredients along with many other ingredients including arjuna, clove, cinnamon, turmeric and Ocimum bascilium.

US Patent 5,405,613: Composition comprising shilajit (used for restoring energetic balance or intensity to enhance a bioenergetics field in a mammal). Amla as a constituent of triphala (an ayurvedic formulation of three fruits, i.e. harre, bahera, and amla, which is used in the treatment of ailments related to the eyes, stomach etc) has been used to purify the shilajit extracts.

US Patent 6,290,996: Method of inhibiting blood platelet aggregation.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

Among the patents granted by the Japanese patent office is one (JP9110661) on a grey hair dyeing composition.

Derivation observed:

Indigenous use	**Modern use**
• Skin diseases	Cosmetic formulations
• Greyness of hair	Grey hair dyeing composition
• Health tonic	Nutritional formulations

17. PIPER MYTHESTICUM

Other names: *Kava*.

Description of the plant and location: It is a hardy, slow-growing perennial shrub with heights of more than 3 mt. It is endemic to the South Pacific, with a long and extensive history of traditional use in the Pacific Ocean societies. For over 1,000 years, farmers have selected for desired traits and developed 118 cultivars, which have been refined over generations. It is native to Melanesia, Polynesia, Micronesia, including the countries of Papua New Guinea, the Solomon Islands, Fiji and Vanuatu.

Part/s used: Leaves.

Action and indigenous use of the plant: It is pre-eminently a mind and mood altering substance of Oceania, alleviating stress and anxiety and rejuvenating the mood. It occupies a central place in the culture and social customs of the region. It is also used medically to treat uro-genital inflammation and cystitis, gonorrhea, asthma and tuberculosis, to relieve headaches, restore vigour, soothe the stomach and cure whooping cough. It can also be applied topically to treat fungal infections and soothe skin inflammations (Kilham, 1998; 1996: summary of ethanobotanical studies in Lebot *et al,* 1997). In addition to its secular function, kava is linked to religious inspiration and its use can involve the invocation of ancestral spirits. (Lebot *et al,* 1997).

Modern use in the patent: There are various patents granted including:

PAT NO. AU 4860800: Herbal composition to relieve pain.

US 6159473: Sore throat spray.

WO 0072861: Pharmaceutical preparations of bioactive substances extracted from natural resources.

US 6143300: Fem-Ease, a supplement for the symptoms of cystitis, urinary tract infections and premenstrual syndrome.

DE 19907586: Nutritional supplement for ensuring good health.

US 6080410: Method for reducing daily stress and anxiety in adults

DE 19858741: Use of kava as medicament for treating extrapyramidial motor disorders such as neuroleptic-induced dyskinesia and Parkinson's Disease.

DE 19847134: Treating withdrawal symptoms after addiction to alcohol or drugs, using kava extract.

Derivation observed:	
Indigenous use	**Modern use**
• Headaches	Herbal composition to relieve pain
• Asthma, tuberculosis, whooping cough	Sore throat spray
• Uro-genital inflammation and cystitis, gonorrhea	Fem-Ease, a supplement for the symptoms of cystitis, urinary tract infections and premenstrual syndrome.
• To Restore vigour and soothe the	Nutritional supplement for ensuring good stomach health.
• Alleviation of stress and anxiety	Method for reducing daily stress and anxiety in adults

18. PIPER NIGRUM

Other names: *Kalimirch* and *Golmirich* in Hindi, *Golmorich* in Bengali, *Mire* in Marathi, *Kalamari* in Gujarati, *Milagu* in Tamil, *Miriyala tige* in Telugu, *Black pepper* in English.

Description and location of the plant: A robust woody climber, with large woody ovate or round leaves, flowers on spike and globose immature fruit, much wrinkled and brown black in colour. It is cultivated in the states of Karnataka and Kerala in India.

Part/s used: Fruits.

Action and indigenous use of the plant: The fruits are acrid, bitter, anthelmintic, carminative, alterant, aphrodisiac, alexeteric, antiperiodic, deobstruant, diuretic, digestive, emmenagogue, rubefacient and ache. They are useful in arthritis, pharyngodynia, asthma, fever, cough, catarrh, dysentery, dyspepsia, flatulence, hiccough, haemorrhoids, urethrorrhea and dermatopathy. As a constituent of pipla it is used to increase the availability of certain administered drugs. It is also a important constituent of the dry condiments used in Indian cuisine.

Modern use in the patent: The patents granted by the USPTO related to the plant include:

US Patent 6,346,539: Treatment of skin conditions.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

US Patent 6,224,871: Dietary supplement for nutritionally promoting healthy joint function.

US Patent 6,203,839: Flavorant compositions.

US Patent 6,159,474: Animal repellent containing oils of black pepper and/or capsicum.

US Patent 6,121,234: Use of essential oils to increase bio-availability of

orally administered pharmaceutical compounds.

US Patent 6,080,401: Herbal and pharmaceutical drugs enhanced with probiotics.

US Patent 6,017,932: Pharmaceutical compositions containing at least one NSAID having increased bio-availability.

US Patent 5,972,382: Use of piperine as a bio-availability enhancer.

US Patent 5,698,199: Lipolysis acceleration method.

US Patent 5,525,597: Synergistic insecticidal compositions comprising capsicum and insecticidal use thereof.

US Patent 5,470,589: Hardening agent for affected tissues of the digestive system.

US Patent 5,439,891: Process for preparation of pharmaceutical composition with enhanced activity for treatment of tuberculosis and leprosy.

US Patent 5,273,754: Appetite suppressant composition and method relating thereto.

US Patent 4,820,517: Process for obtaining a pepper extract with insecticide activity.

Derivation observed:	
Indigenous use	**Modern use**
• Dermatopathy	Treatment of skin diseases
• Arthoritic diseases	Dietary supplement for nutritionally promoting healthy joint function
• Constituent of the dry condiments used in Indian cuisine	Flavourant compositions
• Used in the preparation of pipla	Use of piperine as a bio-availability enhancer
• Stomach ache, dyspepsia and flatulence	Hardening agent for affected tissues of the digestive system

19. RAUWOLFIA SERPENTINA

Other names: *Chandrabhaga* in Hindi, *Dhanmareva* in the some areas of Bihar, *Chandra* in Bengali, *Harkaya* in Marathi, *Amilpodi* and *Avilpodi* in Gujarati, *Paataalagani* in Telugu, *Chivan amelpodi* in Tamil, *Chuvannavilpori* in Malayalam.

Action and indigenous use of the plant: A perennial tuberous herb, with whorled leaves and white or pinkish flowers. It is found practically throughout India and now extensively cultivated also.

Part/s used: Roots

Indigenous use of the plant: The root is said to be hot, acrid, and bitter. It is considered an anthelmintic, expectorant, febrifuge, hypnotic and useful in insanity, epilepsy, insomnia, high blood pressure, dyspepsia, painful affections of the bowel, intestinal worms, and sexual aggressions. It has been tried and used effectively in cases of high blood pressure, insanity and schizophrenia. And also used as an antidote to snake venom. The decoction of the root is reported to be useful to increase uterine contractions and in promoting the expulsion of the foetus.

Modern use in the patent: This is probably one of the most important contributions of the ancient Indian medicine to the world health care system, with a great demand in the international market.

There are many patents granted by the USPTO related to this plant including:

US Patent 6,323,236: Use of sulfamate derivatives for treating impulse control disorders.

US Patent 6,323,226: Treatment of heart disease with cox-2 inhibitors.

US Patent 6,110,448: Method for causing skin lightening.

US Patent 5,613,958: Transdermal delivery systems for the modulated administration of drugs.

US Patent 4,895,845: Method of assisting weight loss.

Derivation observed:

Indigenous use	**Modern use**
• Epilepsy, schizophrenia	Treating impulse control diseases
• High blood pressure	Treatment of heart diseases

20. RUBIA CORDIFOLIA

Other names: 'Manjistha' in Sanskrit, 'Manjistha' in Bengali, 'Manjestha' in Marathi, 'Taamaravalli' 'Chiranji' in Telugu, 'Shevelli' and 'Manjitti' in Tamil, 'Siomalate' 'Siragatti' in Kannada, 'Poont' and 'Majetti' in Malayalam, 'Barheipani' and 'Manjistha' in Oriya.

Description of the plant and location: The plant is a climber with a long jointed stem and leaves that look like frogs. It is seen in the evergreen forests of peninsular India. Its presence is also reported from Greece, Africa and other Asiatic countries like China, Japan, Afghanistan, Vietnam and Malasiya.

Part/s used: Roots.

Action and indigenous use of the plant: It is alterative, antiseptic, astringent, bitter, pigment stimulator. It is used in the diseases of the blood, dysentary, ear and eye diseases, ulcers, inflammations and swellings, poison cases, leprosy and other skin diseases, and urinogenital disorders. It clears the voice, improves the complexion, and cures hepatic obstruction, indigestion, jaundice and paralytic affections. The root paste is used in the treatment of freckles, external inflammmations, ulcers and discolouration of the skin.

Modern use in the patent: The USPTO has granted over 100 patents related to the plant, which include:

US Patent H2, 013: Skin care compositions.

US Patent 6,333,356: Compounds for treating skin conditions.

US Patent 6,284,802: Methods for regulating the condition of mammalian keratinous tissue.

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

US Patent 6,258,344: Skin lightening compositions.

US Patent 6,242,491: Use of creatine or creatine compounds for skin preservation.

US Patent 6,238,678: Methods of regulating skin appearance with vitamin B3 compound.

US Patent 6,164,281: Method of making and or treating diseases characterized by neovascularization.

US Patent 6,150,403: Topical compositions for regulating the oily/shiny appearance of skin.

US Patent 6,139,854: Skin lightening compositions

US Patent 5,869,470: Compositions for regulating skin wrinkles and/or skin atrophy.

US Patent 5,821,237: Compositions for visually improving skin.

Derivation observed:

Indigenous use	**Modern use**
• Skin diseases	Skin care compositions
• Paralysis	Neo-vascularization

21. TAMARINDUS INDICA

Other names: *Imli* and *Amli* in Hindi, *Tentul* and *Anbli* in Bengali, *Chinch* and *Chicha* in Marathi, *Amli* in Gujarati, *Chintachettu* and *Sintachettu* (tree) *Chintapandu* (fruit) in Telugu, *Puli* and *Amilam* in Tamil, *Huli* and *Amli* in Kannada, *Puli* in Malayalam, *Tentuli* and *Konya* in Oriya, *Tentuli* in Assamese, *Imbli* in Punjabi, *Tamarind* in English.

Description of the plant and its location: A large handsome evergreen tree, with pinnate leaves; the flowers yellow striped with red. It is a native of tropical Africa, but now India is perhaps the largest producer of tamarind in the world. The ancient medical treatise *Charaka Samhita* mentions this as one of the flora for medicinal use.

Parts/s used:

Action and indigenous use of the plant: It is a multipurpose plant having many useful applications. The fruit pulp is an important ingredient of Indian cuisine. It is sweet, sour, cooling, carminative, digestive, laxative, antiscorbutic and antibilious. The bark, leaves and seeds are astringent. Tender leaves and flowers are cooling and antibilious. It is used in constipation, colic, cough, dyspepsia, fever, flatulence, gastrointestinal diseases and urinary infection. The pulp of the fruit as well as the poultice of the leaves is recommended for external applications to inflammatory swellings to relieve pain. The ripe pulp is considered an effective laxative in habitual constipation and is a part of many ayurvedic preparations. An infusion of the leaves is used as a gargle for aphthous sores, sore throat and washing indolent ulcers. Poultice of flowers is useful in inflammatory affections in conjunctiva. The tamarind seed has many uses, especially TKP (Tamarind Kernel Powder), which is used in the industrial sector as a gum and binding agent. The drink made from the ripe fruit is good for cardiac health.

Modern use in the patent: There are many tamarind related patents granted by the USPTO, some of them being:

US Patent 5,474,791:Beverages using tamarind extract and method of making such beverages.

US Patent 5,073,387: Method for preparing foods containing less calories.

US Patent 6,350,594: Cultured plant cell gums for food, pharmaceutical, cosmetic and industrial applications

US Patent 6,294,190: Antiobestic agent containing procyanidin as the active ingredient.

US Patent 6,197,318: Composition for external use.

US Patent 6,004,558: Methods for treating cancer with legume plant extracts.

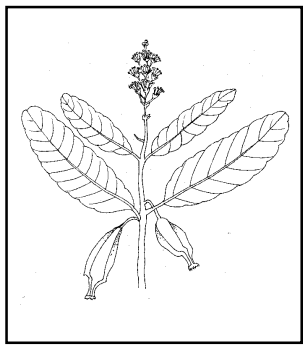
US Patent 5,863,775: Control of parasites.

Nippon Oil Company Ltd. Japan, 1985: Wound-covering materials

Derivation observed:

Indigenous use	**Modern use**
• Fruit drink	Beverages
• Boiled seeds are used as poultice to boils	Wound-covering materials
• Refrigerant, anti-inflammatory action	Food, pharmaceutical, cosmetic and industrial applications

22. TERMINALIA ARJUNA



Other names: *Arjuna* in Hindi, *Yerramaddi* in Telugu, *Vellamatta* in Tamil, *Matta* in Kannada, *Arjun* in Assamese.

Description of the plant and its location: It is a large tree with whitish bark and found almost throughout India, chiefly near water channels, stream banks and in moist places.

Part/s used:

Action and indigenous use of the plant: The plant is used as a cardiac tonic, deobstruant, diuretic, expectorant, febrifuge, haemostatic, lithnotriptic and stimulant. It is useful in bilious affections, blood dysentery, blood pressure, earache, fever, fractures of bone, heart diseases, inflammatory conditions, leueorrhoea, sores and as an antidote to poisons.

Modern use in the patent: The patents granted by the USPTO include:

US Patent 6,358,208: Assessment of cardiovascular performance using ultrasound methods and devices that interrogate interstitial fluid.

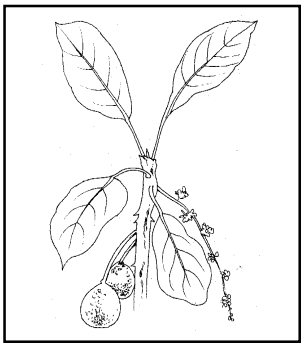
US Patent 6,162,438: Herbal compositions and their use as agents for control of hypertension, hypercholesterolemia and hyperlipidemia.

US Patent 5,411,733: Antiviral agent containing crude drug.

Derivation observed:

Indigenous use	**Modern use**
• Cardiac tonic, heart diseases	Assessment of cardiovascular performance
• Blood pressure	Control of hypertension, hypercholesterolemia and hyperlipidemia
• Useful in bilious affections	Antiviral agent

23. TERMINALIA BELLIRICA



Other names: *Bahera* in Hindi, Marathi and Gujarati, *Bhairah* in Bengali, *Tani* in Tamil, *Tandrakaya* in Telugu, *Belliric myrobalan* in English.

Description of the plant and location: A large deciduous tree with thick, dark grey bark. Leaves are crowded towards the end of the branchlets. The tree is found throughout India in the plains and foothills, chiefly in forest up to 900 m elevation. Also found in Sri Lanka, Thailand, Burma, Indochina and Malaysia.

Part/s used:

Action and indigenous use of the plant: It is bitter, acrid, aperient, antipyretic, attentuant, astringent, digestive, laxative, narcotic and ophthalmic in action. Useful in biliousness, diarrhoea, dropsy, dyspepsia, enlargement of the spleen, eye troubles, headaches, fever, hoarseness, sore throat, tuberculosis and the impurities of the blood, skin diseases, leprosy and piles. It also helps abundant growth of hair. The plant is a constituent of the triphala, which is prescribed for ailments related to the eyes, stomach and also in the treatment of anaemia, cough, fever etc.

Modern use in the patent: Some of the patents granted by the USPTO include:

US Patent 6,264,926: Formulation useful as a natural herbal tooth powder.

US Patent 6,210,738: Freeze-dried ginseng berry tea.

US Patent 6,187,313: Composition and method for treating and preventing *helicobactor pylori*-associated gastritis, ulcers and cancer.

US Patent 6,136,316: Hepatoprotective compositions and composition for treatment of conditions related to hepatitis B and E infection.

US Patent 6,080,401: Herbal and pharmaceutical drugs enhanced with probiotics.

US Patent 5, 693,327: Herbal compositions.

(US Patent 5,529,778) Ayurvedic composition for the prophylaxis and

treatment of AIDS, flu, TB and other immuno-deficiencies and the process for preparing the same.

US Patent 5,411,733: Antiviral agent containing crude drug.

US Patent 5,405,613: Vitamin/mineral composition.

Derivation Observed:

Indigenous use	**Modern use**
• Germicidal	Herbal tooth powder
• Aperient, attentuant, astringent, digestive, laxative; used for piles and dyspepsia	Composition and treatment and prevention of and preventing *Helicobacter pylori*-associated gastritis, ulcers and cancer
• Enlargement of the spleen	Treatment of conditions related to hepatitis B and E infection
• Tuberculosis	AIDS, flu, Tuberculosis and other immuno

24. TERMINALIA CHEBULA

Other names: *Harad* and *Harra* in Hindi, *Haritaki* in Bengali, *Hirda* in Marathi, *Kandakai* in Tamil, *Kandukai* in Telugu, *Chebubulic myrobalan* in English.

Description and location of the plant: A large deciduous tree, with thick, dark brown bark. It is found in the outer Himalayas, ascending up to 1600 m, from Kangra to Bengal and throughout the Central and South India.

Part/s used: Fruits.

Action and indigenous use of the plant: In action it is alternative, astringent, dentifrice, purgative, and tonic. Useful in apathae, ascites, asthma, bile, trouble, bleeding and ulceration of the gums, blood pressure, burns and scalds, carious teeth, cardiac tonic, cooling wash for the eye, cough, dysentery and diarrhoea, enlarged spleen of liver, fever, flatulence, heart diseases, piles and vaginal discharges, skin diseases, sores, stomach complaints, ulcers, vomiting and worms.

Modern use in the patent: The patents related to this plant, granted by the USPTO, include:

US Patent 6,187,313: Composition and method for treating and preventing *Helicobacter pylori*-associated gastritis, ulcers and cancer.

US Patent 6,136,316: Hepatoprotective compositions and composition for treatment of conditions related to hepatitis B and E infection.

US Patent 6,080,401: Herbal and pharmaceutical drugs enhanced with probiotics.

US Patent 5,980,903: Composition for the treatment of viral infections including HIV.

US Patent 5,916,919: Retrovirus protease inhibitors.

US Patent 5,693,327: Herbal compositions.

US Patent 5,529,778: Ayurvedic composition for the prophylaxis and treatment of AIDS, flu, TB and other immuno-deficiencies and the process for preparing the same.

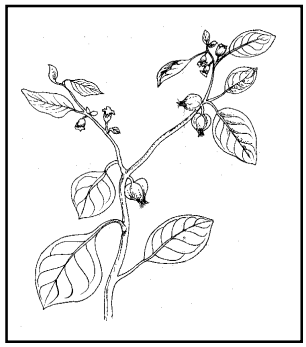
US Patent 5,411,733: Antiviral agent containing crude drug.

US Patent 5,405,613: Vitamin/mineral composition.

Derivation observed:

Indigenous use	**Modern use**
• Stomach ache, dysentery and diarrhoea, stomach complaints, ulcers, vomiting and worms. Flatulence	Composition and method for treating and preventing *Helicobactor pylori*-associated gastritis, ulcers and cancer

25. WITHANIA SOMNIFERA



Other names: *Ashwagandha* in Sanskrit, Hindi, Bengali and Marathi, *Ghoda* in Gujrati, *Pulivendrum* in Telugu, *Amukkura* in Tamil, *Viremadd-linagadde* in Kannada, *Asgand* in Punjabi.

Description of the plant and its location: A small undershrub, which stem and branches are covered with minute, star-shaped hairs. Only the roots of the cultivated variety are used in the preparation of medicine. The Nagori variety is the best for medicinal use. It is found in the drier regions of India.

Part/s used: Seeds, roots.

Action and indigenous use of the plant: It is a well-known plant in India and has been a constituent of many therapeutic formulations for a very long time. The roots are most frequently used as an adaptogenic, aphrodisiac, and diuretic. It helps in restoring loss of memory and is used in cases of nervous exhaustion and senile debility. Useful in carbuncles, cough, debility from old age, dropsy, emaciation of children, general weakness, urinary problems rheumatism, scrofula, senile decay, ulcers and inflammations.

Modern use in the patent: The patents existing related to the plant granted by the USPTO include:

US Patent 6,274,176: Herbal compositions and their use as anti-inflammatory agents for alleviation of arthritis and gout.

US Patent 6,210,738: Freeze-dried ginseng berry tea.

US Patent 5,683,698: Formulation for alleviating symptoms associated with arthritis.

US Patent 5,494,668: Method of treating musculoskeletal disease and a novel composition therefore.

An Indian patent on a process for the preparation of *jeevani*, a novel immunoenhancing anti-fatigue, anti-stress and hepatoprotective herbal drug, has been granted to TBGRI (Tropical Botanical Garden Research Institute),

India.

Some of the patent applications that are as of the year 2000 pending are:

- Preparation of an anti-diabetic herbal drug from the plants *Trichopus Zeylanicus, Withania Somnifera* and *Piper longum*. The patent has been filed by TBGRI, India, at the Indian Patent office in 1996.
- Japanese applications, filed at the PCT (Patent Co-operation Treaty) in the year 2000 are related to the use of *ashwagandha* as skin ointment for cosmetic purpose.

Derivation observed:	
Indigenous use	**Modern use**
• General weakness	Anti-fatigue / stress
• Rheumatism	Arthritis

26. (I) WITHANIA SOMNIFERA, (II) BOSWELLIA SERRATA, (III) CURCUMA LONGA AND (IV) ZINGIBER OFFICINALE

Other names:

- **Withania somnifera:** See plant no. 25.
- **Boswellia serrata:** *Salai* in Hindi, Bengali and Gujarati, *Kunduru* and *Sallak*i in Sanskrit *Mukul-salai* in Gujarati, *Parangisambarani* in Tamil and Telugu, *Madi* in Kannada, *Guggulumaram*, *Parangisaambarani* in Malayalam.
- **Curcuma longa:** See plant no. 10.
- **Zingiber officinale:** *Adrak* and *Ada* in Hindi, *Ardraka* in Sanskrit, *Ada* in Bengali, *Ale* in Marathi, *Allamu* and *Sonthi(dry)* in Telugu, *Allam* and *Inji* in Tamil, *Hasisunti* in Kannada, *Andrakam* and *Inchi* in Malayalam.

Description of the plants and their location:

- **Withania somnifera:** See plant no. 25.
- **Boswellia serrata:** A medium-sized deciduous tree, with ash-coloured papery bark peeling off in thin flakes.
- **Curcuma longa:** See plant no. 10.
- **Zingiber officinale:** It is a perennial shrub with a stout, horizontal, tuberous, jointed and aromatic root-stock having several lateral tubers and an erect stem. The plant is widely distributed all over the warm regions of India.

Part/s used:

- *Withania somnifera*: Seeds, roots.
- *Boswellia serrata*: Barks, gum-resin.
- *Curcuma longa*: Rhizome (dry as well as raw).
- *Zingiber officinale*: Rhizome (fresh as well as raw).

Action and indigenous use of the plants:

- *Withania somnifera:* See plant no. 25.
- *Boswellia serrata*: The bark is sweet, acrid, cooling and tonic. It is good for

vitiated conditions of dysentery, ulcers, haemorrhoids and skin diseases. The gum resin is sweet, bitter, astringent, antipyretic, anti-dysenteric, expectorant, diaphoretic, diuretic, and emmenagogue. It is useful in fevers, diaphoresis, convulsions, dysentary, urethrorrhea, orchiopathy, bronchitis, asthma, cough, stomatitis, syphilitic diseases, chronic laryngitis, jaundice and arthritis.

- *Curcuma longa*: See plant no. 10.
- *Zingiber officinale*: The rhizome is very popular in the kitchen, as a part of the condiments, curries, pickles and syrup. It is hot, acrid, anodyne, antirheumatic, carminative, cooling, cordial, diuretic and aphrodisiac. It promotes digestive power, cleanses the throat and tongue, dispels cardiac disorders and cures vomiting, ascites, cough, dyspnoea, anorexia, fever, anaemia, flatulence, colic, constipation, swelling, elephantiasis and dysuria. It is also used in diarrhoea, cholera, dyspepsia, and neurological diseases, diabetes, eye diseases, tympanitis etc. In indigenous medicine, it is extensively used for its specific action in rheumatism and inflammation of the liver.

Modern use in the patent: A patent has been granted on the method of treating degenerative musculoskeletal diseases such as rheumatoid arthritis and osteoarthritis in humans. It has been granted by the USPTO (United States Patent 5,494,668) to Patwardhan *et al*, on 27 February, 1996. It comprises administering in a convenient dosage form, a therapeutically effective amount of the beneficiated extracts of the above plants.

Derivation observed	
Indigenous use	**Modern use**
• Arthritis and rheumatism	Rheumatoid arthritis and osteoarthritis

27. (I)MELIA AZADIRACHTA AND (II) CENTRATHERUM ANTHELMINTICUM

Other names:

- *Melia azadirachta:* See Plant no. 5.
- **Centratherum anthelminticum:** *Somraj* and *Buckshi* in Hindi, *Somaraji* in Sanskrit, *Somraj* and *Kali-ziri* in Bengali, *Kalenjiri* in Marathi, *Kalijiri* in Gujarati, *Kattu-shiragam* in Tamil, *Adavijilakara* in Telugu, *Kadu-jirage* in Kannada and *Kattu-jirakam* in Malayalam.

Description of the plant and location:

- *Melia azadirachta*: See no. 5
- *Centratherum anthelminticum*: A medium-sized tree with alternate leaves. It is a native of the Western Himalayas, and is naturalized in China, Burma, India, Pakistan, Iran and Turkey.

Part/s used:

- *Melia azadirachta:* See Plant no. 5.
- *Centratherum anthelminticum*: Fruits.

Action and indigenous use of the plant:

- *Melia azadirachta*: See Plant no. 5.
- *Centratherum anthelminticum*: Achenes are accredited with anthelimintic properties and are effective against thread worms even if their administration is not followed by a purgative.

Modern use in the patent: The present invention relates to the preparation and use of compositions for the treatment of skin disorders such as psoriasis, eczema and lichen planus, as well as for the promotion of good health and the alleviation of stress. The compositions are based on extracts from the plants *Melia azadirachta* and/or *Centratherum anthelminticum*. The patent has been awarded by the USPTO (US Patent 5,693,327) in 1997.

Derivation observed:

Indigenous use	Modern use
• Skin disorders and general health	Skin disorders and general health

28. (I)ZINGIBER OFFICINALE, (II) ARECA CATECHU (III) PIPER NIGRUM AND (IV) NICOTIANA TABACUM

Other names:

- *Zingiber officinale*: See under chapter 26.
- **Areca catechu:** *Supari* in Hindi, *Adike* in Kannada, *Kavunnu*, *Kamunnu* and *Ataykkamarm* in Malayalam, *Pugah* in Sanskrit, *Pakkumaram* in Tamil, *Vakka* and *Poka* in Telugu and *Arecanut tree* and *Betelnut tree* in English.
- **Piper nigrum:** See no.18.
- **Nicotiana tabacum:** *Tamaku* and *Tambaku* in Hindi, *Hogesoppu* and *Tambaku* in Kannada, *Pukayila* and *Pokala* in Malayalam, *Pugaiyilai* in Tamil, *Pogaku* in Telugu, *Tobacco* in English.

Part/s used:

- *Zingiber officinale*: Rhizomes (fresh as well as raw).
- *Areca catechu*: Roots, leaves and nuts'.
- *Piper nigrum*: Fruits.
- *Nicotiana tabacum*: Leaves.

Description of the plant and its location:

- **Zingiber officinale:** See under chapter 26.
- **Areca catechu:** A tall slender unbranched palm with a crown of leaves. It is cultivated throughout India.
- **Piper nigrum:** See plant no. 18.
- **Nicotiana tabacum:** A glandular, pubescent erect herb with few branches; leaves are simple and ovate. It has many seeds, many with fluted ridges, and is cultivated in the hotter parts of India.

Action and indigenous use of the plant:

- **Zingiber officinale:** See under chapter 26.
- **Areca catechu:** A decoction of the root is recommended for sore lips. The juice of tender leaves is mixed with oil and is used as an embrocation in

cases of lumbago. The nuts are used either raw or cured. They are cooling, astringent, diuretic, digestive, anthelminthic, aphrodisiac and nervine tonic and emmenagogue. They are useful in urinary disorders, anorexia and general debility. Chewing of the nuts facilitates salivation and prevents decay of teeth. The juice of tender nuts in small doses is a good laxative. The burnt nut is often used as a dentifrice.

- *Piper nigrum*: See plant no. 18.
- *Nicotiana tabacum*: The leaves are bitter, acrid, thermogenic, sedative, narcotic, anodyne, anti-inflammatory, anthelminthic, carminative, laxative, emetic, abortifacient, styptic, mental stimulant and tonic. They are useful in odontalgia, dental caries, inflammation, heliminthiasis, dyspepsia, flatulence, haemorrhages, bronchitis, asthma, scabies, skin diseases, ulcers, painful tumours, strangulated hernia, purulent discharge from the nose and tubercular glands of the neck.

Modern use in the patent: The USPTO has granted a patent (US Patent 4,374,824) on a dentifrice composition comprising ginger, catechu, pepper seed(any liquid, powder or paste for cleaning the teeth) and shell of sweet almond, pyrethrum, mastic, and tobacco, and the use thereof.

Derivation observed:	
Indigenous use	**Modern use**
• decay of teeth, odontalgia, dental caries	dentifrice

29. I) SYZYGIUM CUMINII, II) GYMNEMA SYLVESTRE, III)MOMORDICA CHARANTIA AND IV) SOLANUM MELONGENA

Other names:

- **Syzygium cuminii:** *Jamun* in Hindi, *Nerale* in Kannada, *Naval* in Malayalam, *Jambuh* in Sanskrit, *Kottainaval* and *Naval* in Tamil, *Neereedu* in Telugu. *Black plum* in English.
- **Gymnema sylvestre:** *Gur-mar* in Hindi, *Mera-singi* in Bengla, *Cherukurinja* in Tamil, *Kadhasige* in Kannada, *Cakkarakkolli* and *Madhunasini* in Malayalam, *Mesesmgi* and *Madhunasini* in Sanskrit, *Sirukurumkay* and *Sakkaraikkolli* in Tamil, *Podapatri* in Telugu and *Periploca of the woods* in English.
- **Momordica charantia:** *Karela* in Hindi, *Karate* and *Hagalakayi* in Kannada, *Kaypa* and *Paval* in Malayalam, *Karavellam* in Sanskrit, *Pavvakay*, *Paval* and *Pakar* in Tamil, *Kakara* in Telugu, *Bitter gourd* and *Carilla fruit* in English.
- **Solanum melongena:** *Baingan* in Hindi, *Begun* in Bengali, *Vangi* in Marathi, *Ringni* in Gujarati, *Chirivanga* in Telugu, *Kathirikai* in Tamil, *Vazhuthana* in Malayalam, *Jati bengani* in Assamese, *Eggplant* and *Brinjal* in English.

Description of the plant and its location:

- *Syzygium cuminii*: It is a medium-to large-sized tree, 15-30 m in height. It is found throughout India, in forests up to 1800 m usually along the river banks and moist localities; also cultivated as shade trees.
- *Gymnema sylvestre*: A large woody plant, this branched climber has simple leaves. It is found throughout India, in dry forests up to 600 m.
- *Momordica charantia*: A much-branched climbing annual with angled and grooved stems, hairy parts and simple tendrils. It is cultivated throughout India, up to an altitude of 1,500 m.
- *Solanum melongena*: It is a gray prickly, pubescent undershrub, with simple leaves. It is distributed throughout the tropical regimes of India in the plains.

Part/s used:

- *Syzygium cuminii:* Dry seed kernels
- *Gymnema sylvestre*: Dried vine with leaves
- *Momordica charantia*: Fruit
- *Solanum melongena*: fruit

Action and indigenous use of the plant: The extracts of the above have been reported to have shown hypoglycemic (low blood sugar) properties. The fruits leaves and roots of *Momordica charantia* have been long used in India as a traditional remedy for diabetes mellitus. The leaves of *Gymnema sylvestre* are useful in the management of maturity onset diabetes and are an important ingredient in ayurvedic formulation for diabetes. (Ref: 1. *Wealth of India*, Vol 5, 1990-94, 2. *Compendium of Indian Medicinal Plant,* Vol 1-5, 1962-98, 3. *Treatise of Indian Medical Plants,* Vol 4, 1995).

Modern use in the patent: A patent has been granted on edible herbal compositions, comprising mixtures of at least 2 herbs selected from the above plants useful as hypoglycemic agents. The patent was granted to Cromak Research Inc. (US Patent 5,900,240).

Derivation observed:	
Indigenous use	**Modern use**
• Diabetes	Diabetes

30. CANANGA ODORATA

Other name: *Ilang-ilang.*

Description and location of the plant: It is native to many Southeast Asian countries, with large-scale cultivation especially in Philippines.

Piracy: This native plant has been used by a French fashion house called Yves St. Laurent in the preparation of its perfumes and they have been thus importing it from Philippines for more than 20 years. A patent has been obtained by Yves St. Laurent on a perfume formula based on this native Filipino species. Furthermore, the fashion house has now stopped importing the plant from Philippines and has instead started growing its requirement in Africa.

31. TEMPEH (SOYABEAN PREPARATION)

Description and location: The soul food of the Javanese people, it is a unique feature of Indonesia's culinary heritage.

Indigenous/local use: It is eaten daily, by rich and poor alike. With a high vitamin B12 content the concoction serves as a cheap substitute for animal proteins. The processing of tempeh is based on fermentation of soyabeans and is considered one of the oldest food technologies in the history of Javanese people, documented as early as the 16th century.

Modern use in the plant: Japan has taken several patents on the making of tempeh.

Derivation observed:	
Indigenous use	**Modern use**
• Method of processing	Method of processing