

CHAPTER V

BIO-PIRACY:

A THREAT TO TRADITIONAL MEDICINE

India boasts a wide variety of flora and fauna which are diversified in nature. The faunal and floral richness has been one of the biggest assets of India. Available data place India in the tenth position in the world and fourth in Asia in plant diversity. With this India has long been a victim of bio-piracy¹.

Bio-piracy refers to the process through which the rights of indigenous cultures to these resources and knowledge are erased and replaced by monopoly rights. There is no accepted definition of bio-piracy. In the recent past there have been several cases of bio-piracy of Traditional Knowledge², particularly from the developing world. Developing countries, especially Latin America and Asia are rich in biological diversity and the wide genetic variability in these countries in many times exploited by the developed countries. This process of transferring of biological wealth of the third world without paying for it has come to be known as bio-piracy.

The issue of IPRs is thus getting closely related to the issue of bio-piracy and intellectual piracy of western style IPR regimes. The lack of legal protection of our biological and cultural heritage has made the indigenous communities of the third world vulnerable to bio-piracy and intellectual piracy as in the cases of neem etc. The existing patent regimes based on western paradigms are biased in favor of large Trans National Corporations with interests cutting across pharmaceuticals and agri-chemicals.

1. Definition of Bio-piracy

There is no accepted definition of bio-piracy. Even though the Action Group on Erosion, Technology and Concentration³ (ETC Group) defines it as⁴;

“...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.”

2. Bio-piracy of Traditional Medicine

Bio-piracy of TRM comprises mainly⁵;

Collection and use of;

- The unauthorized use of TRM
- The unauthorized use of TRM acquired by deception or failure to fully disclosure the commercial motive behind the acquisition
- The unauthorized use of TRM acquired on the basis of a transaction deemed to be exploitative
- The unauthorized use of TRM acquired on the basis of a conviction that all such transactions are inherently exploitative (all bio prospecting is bio-piracy)
- The commercial use of TRM on the basis of a literature search

Patenting;

- The patent claims TRM in the form in which it was acquired

- The patent covers a refinement of the TRM
- The patent covers an invention based on TRM

3. The Main Effects of Bio-piracy

The main effects of bio-piracy are;

3.01. Intellectual Poverty

The usurpation of indigenous innovation by western corporations robs intellectual contributions of another country and worth creating intellectual poverty.

3.02. Resource Poverty

Patents based on bio-piracy divert biological resources away from local communities to global markets creating scarcity and resource poverty.

3.03. Market Exclusion

Bio-piracy allows the market control to shift to the pirates who then exclude others from market access through the exclusion built into Intellectual Property Rights.

4. Exploitation of Traditional Ceremonies and Spiritual Practices

According to Battiste and Henderson⁶;

“With Respect to IK, we stress the necessity of recognition and respecting, in both national legislation and international law, the principle that any acquisition, publication, scientific use, or commercial application of IK must be in accordance with the Customary Laws of the peoples concerned, as determined by them”.

A critical debate taking place within Indigenous communities on a global scale involves concerns over the transformation of ceremony, ritual and healing into commodities⁷. We are now entering a new era with the selling of what was traditionally considered sacred knowledge offered to all for a fee.

There is not enough research or literature to fully examine the issue of commodification of ceremony⁸. There is some historical documentation on performing ceremonies for trade or a fee in early ethnographical literature. One of the earliest written accounts regarding ceremony in exchange for money involved a fur trader and a trapper. While the fur trader was sceptical of the abilities of the medicine man to locate his 'lost fur traders,' he was desperate enough to barter the exchange⁹. The medicine man did perform the shaking tent ceremony and did locate (accurately) the fur traders, and received some goods and money for his service. The accounts of medicine men or women engaging in ceremony for wages can be found in early ethnographies.

The issue of exchanging ritual services for wages is not new. According to Gunn Allen¹⁰;

“Traditional ceremonies and spiritual practices... are precious gifts given to Indian people by the Creator. These sacred ways have enabled us as Indian people to survive miraculously the onslaught of five centuries of continuous effort by non- Indians and their government to exterminate us by extinguishing all traces of our traditional ways of life. Today, these precious sacred traditions continue to afford American-Indian people of all nations the strength and vitality we need in the struggle we face every day; they also offer us our best hope for a stable and vibrant future. These sacred traditions are an enduring and indispensable 'life raft' without which we would be quickly overwhelmed by the

adversities that still threaten our survival. Because our sacred traditions are so precious to us, we cannot allow them to be desecrated and abused”.

The concern about traditional ceremonies being transformed into a commodity for sale erodes traditional ideals and values¹¹. The traditional practice of offering a gift to practitioners, usually in the form of food or other practical items, is no longer sufficient in a wage economy¹². Few of the articles reviewed discussed the impact of wage economy on TRM. However, IPR are a major concern for Indigenous people, Battiste and Henderson state¹³;

“The various legal regimes that we call *Intellectual Property* attached exclusive property rights to this autonomous culture to enhance its commodification-culture could then be bought and sold in the marketplace.”

The marketing of TRM poses one of the central concerns for traditional healers, knowledge carriers and Elders¹⁴. Commodification of ceremony and TRM will continue to frame the discourse of TRM in public domains for the capitalist markets. As cited in testimony of the Report of the Royal Commission on Aboriginal Peoples¹⁵;

“We have also come across many self-proclaimed healers who have abused and exploited traditional spirituality in their Aboriginal people”.

Jock argues that the role of authenticity and lineage descent of what he calls, ‘plastic medicine men’, are not always falsely claimed identity¹⁶. The consumerism by new age enthusiasts and others of native spirituality holds real consequences for Indigenous cultural survival that includes spirituality and healing. Jock articulates that the reaction to commodifying culture from traditional practitioners or community is uniform, as is the ostracism of those who sell sacred

knowledge for profit. The Union of Yagé Healers of the Columbian Amazon gathered to deal with many of these issues; they resolved that¹⁷;

“Non-Indigenous people are realizing the importance of our wisdom and the value of our medicinal and sacred plants. Many of them profane our culture and our territories by commercializing yage and other plants; dressing like indigenous people and acting like charlatans. We view with concern a new type of tourism being promoted...”.

5. Citations on Bio-piracy Across the Globe

Bio-piracy has been continuing all over the world. Some examples are;

5.01. Issues in India-‘God’s Own Country’

Country with a rich variety of plant and animal species, India has been victim of bio-piracy over many decades and need to protect our bio-resources and TK¹⁸. A few among many bio-pirated resources in India area discussed below.

5.01.01. Neem

Neem tree is also called as the ‘curer of all ailments’ in Sanskrit, the Neem tree is used for medicinal, agricultural, pesticidal, contraceptive, cosmetic and dental applications.¹⁹ There are approximately 14 million Neem trees (*Azadirachta indica*) in India. Access to Neem products was very cheap (if not free) and easy to get. It is a tropical evergreen, related to the mahogany, which mainly grows in arid regions of India and Burma and Southwest Asia and West Africa²⁰. When temperatures do not drop below freezing, it may grow up to 50 feet tall. They are estimated to live up to 200 years²¹.

The Neem tree has many versatile traits that can be traced back to the Upavanavinod, an ancient Sanskrit treatise dealing with agriculture²². This treatise cites the Neem tree as a cure for ailing soil, plants and livestock. The tree has been referred to as the 'curer of all ailments' and the 'blessed tree' by both the Hindu and Muslim population in India²³. The leaves and the bark have been used to treat illnesses such as leprosy, ulcers, diabetes and skin disorders. It has also been used to make spermicides and pesticides. The Neem tree is known as the tree for all seasons because of its versatility. The main uses of Neem are²⁴;

- **Medicine:** Neem is mentioned in many ancient texts and traditional Indian medical authorities place it at the pinnacle of their pharmacopeia. 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.
- **Toiletries:** Neem twigs are used by millions of Indians as an antiseptic tooth brush. Its oil is used in the preparation of toothpaste and soap.
- **Contraception:** Neem oil is known to be a potent spermicide and is considered to be hundred percentage effective when applied intra-vaginally before intercourse. Intriguingly, it is also taken internally by ascetics who wish to abate their sexual desire.
- **Timber:** Besides being hard and fast growing, its chemical resistance to termites makes Neem a useful construction material.
- **Fuel:** Neem oil is used as lamp oil, while the fruit pulp is useful in the manufacture of methane.

- **Agriculture:** The *Upavanavinod*, an ancient Sanskrit treatise dealing with forestry and agriculture, cites Neem as a cure for ailing soils, plants and livestock. Neem cake, the residue from the seeds after oil extraction, is fed to livestock and poultry, while its leaves increase soil fertility. Most importantly, Neem is a potent insecticide, effective against about 200 insects, including locusts, brown plant-hoppers, nematodes, mosquito larvae, Colorado beetles and boll weevils.

From 1992 to 1995, W.R. Grace and Co. received several U.S. and European patents for applications relating to the Neem seed²⁵. Although the U.S. Patent and Trademark Office (PTO) has permitted Neem patents to stand, the European Patent Office has revoked its Neem patent on the basis of bio-piracy²⁶. The Neem tree case highlights the fact that varying national patent standards can lead to different outcomes when patents based on local knowledge are challenged²⁷. The Neem tree is perhaps the most prominent of a number of cases involving local knowledge in India²⁸.

5.01.02. Turmeric

The turmeric²⁹ plant (scientific name *curcuma longa* L., Zingiberaceae) is a flowering plant with a rhizomatic root structure that is thought to be indigenous to South and South-East Asia. Its root structure is typically ground into a powder and used both as a cooking spice and in traditional medical systems, such as Ayurveda, to prevent inflammation and infection. The main uses of turmeric are³⁰:

- Turmeric is used for epilepsy and bleeding disorders, skin diseases, to purify the body-mind, and to help the lungs expel 'Kapha'.

- Activities of Turmeric include: Alterative, analgesic, antibacterial, anti-inflammatory, anti-tumor, anti-allergic, antioxidant, antiseptic, antispasmodic, appetizer, astringent, cardiovascular, carminative, cholagogue, digestive, diuretic, stimulant, and vulnerary.
- Therapeutic uses of Turmeric: Anemia, cancer, diabetes, digestion, food poisoning, gallstones, indigestion, Irritable Bowel Syndrome, parasites, poor circulation, staph infections, and wounds.
- Turmeric helps to regulate the female reproductive system and purifies the uterus and breast milk, and in men it purifies and builds semen, which is counterintuitive for a pungent bitter.
- Turmeric reduces fevers, diarrhoea, urinary disorders, insanity, poisoning, cough, and lactation problems in general.
- Turmeric is used to treat external ulcers that respond to nothing else. Turmeric decreases watery discharges like leucorrhoea, and any pus in the eyes, ears, or in wounds, etc.

The patent for turmeric was based upon the research of two Indian-born faculty at the University of Mississippi Medical Center Dr. Suman K. Das and Dr. HariHar P. Cohly. In a discussion with Science published September 5, 1997, Das admitted he had known of the traditional uses for turmeric in India and had decided to test its efficacy using biomedical metrics³¹. His first research on turmeric was conducted with rats and showed promising results. The research then moved to the second stage in which Das and Cohly organized a clinical trial involving human patients³². Upon the findings of the last study, which showed that the use of turmeric could be used to improve some previously untreatable conditions in humans³³, Das and Cohly decided to apply for patent protection. In the application Das and Cohly were identified as the inventors³⁴.

Knowledge of the grant of the turmeric patent soon reached both members of the media and bureaucrats in the Government of India (GOI) sparking confusion that such a claim was possible to a widely known practice that had existed for thousands of years. The confusion quickly turned to outrage and India's CSIR, with the backing of other government agencies, decided to mount a challenge to the turmeric patent. This challenge, often described in the press as a complex legal battle fought by CSIR, provides an interesting insight into patent reexamination³⁵ and revocation practices at the end of the twentieth century.

5.01.03. *Phyllanthus niruri*

*Phyllanthus niruri*³⁶ is a traditional treatment for various forms of hepatitis and other liver disorders in India for centuries³⁷. Its use is common knowledge and well documented³⁸. Even though the use of *Phyllanthus niruri* for treatment of jaundice has been an ancient and well recorded innovation in the Indian systems of medicine, the Fox Chase Cancer Centre of Philadelphia, US applied for patent for its use in curing hepatitis³⁹. The patent claim is for the manufacture of a medicine for treating hepatitis B and the patent is allowed.

5.01.04. Other Cases

Growing awareness in the west of the efficacy of Ayurvedic herbs and formulations has led to controversy and battles with the western pharmaceutical companies trying to patent these herbs. Only recently, discovered in the west, Ayurvedic herbs such as Neem, Ashwagandha⁴⁰, *Tusli*⁴¹, *Shatavari*⁴², Turmeric, *Amalakai*⁴³ and *Brahmi*⁴⁴ as well as traditional preparations such as *Triphala*⁴⁵ and *Trikatu*⁴⁶ have long been known to have significant medicinal value without adverse side effects⁴⁷. Several pharmaceutical companies and academic institutions in the West have come into conflict with Indian academic institutions and traditional Ayurvedic practitioners over the Intellectual Property Rights of herbal products researched by the western agencies⁴⁸. The ayurvedic practitioners have known about the efficacy of such products for centuries and so contend that they carry precedence with regards to patent rights on such products⁴⁹. Thus Indian farmers, traditional

practitioners, and traders lose their market share in local, national and global markets. For example, recently the U.S. government granted a patent for the anti-diabetic properties of Karela, Jammun and Brinjal to two non-resident Indians, Onkar S. Tomer and Kripanath Borah and their colleague Peter Gloniski⁵⁰. Yet the use of these substances for control of diabetes is everyday knowledge and practice in India.

This problem is deep and systemic. And it calls for a systemic change, not case by case challenges. The potential costs of bio-piracy to the third world poor are very high since two-thirds of the people in South depend on free access to biodiversity for their livelihoods and needs. 70 percent of seeds in India is saved or shared farmers' seed, 70 percent of healing is based on TRM using local plants.

5.02. Issues in Africa

The main issues relating to the misappropriation of the knowledge of Traditional Medicine are;

5.02.01. Ayahuasca (Banisteriopsiscaapi Mort.)

For generations, shamans of indigenous tribes throughout the Amazon basin have processed the bark of B.caapi Mort. to produce a ceremonial drink known as 'Ayahuasca'. The Shamans use 'Ayahuasca' (which means 'wine of the soul') in religious and healing ceremonies to diagnose and treat illness, meet with spirits, and divine the future⁵¹. American, Loren Miller obtained US patent (No. 5, 751 issued in 1986), granting him rights over an alleged variety of B.caappi Mort which he had collected from a domestic garden in Amazon and had called 'Da Vine', and was analyzing for potential medicinal properties⁵². The patent claimed that Da Vine represented a new and distinct variety of B caapi Mort primarily because of the flower colour. The coordinating Body of Indigenous Organisations of the Amazon Basin (COICA), which represents more than 400 indigenous tribes in the Amazon region, along with others, protested about a wrong patent that was

given on a plant species⁵³. They protested the ‘Ayahuasca’ had been known to natives of the Amazon rainforest and it is used in TRM and cultivated for that purpose for generations, so Miller could not have discovered it and should not have been granted such rights, which in effect, appropriated indigenous Traditional Knowledge⁵⁴. On re-examination, USPTO revoked this patent on 3rd November 1999. However, the inventor was able to convince the USPTO on 17th April 2001, the original claims were reconfirmed and the patent rights restored to the innovator.

5.02.02. Rosy Periwinkle

A number of cases of uses of African local knowledge are also subjected to misappropriation, including ‘Rosy Periwinkle’, ‘Hoodia cactus’, and ‘rooibos tea’. The case of Rosy Periwinkle illustrates the potential difficulty of sorting out proprietary claims to some types of local knowledge⁵⁵. This was originally native to the island of Madagascar. The Rosy Periwinkle was used to develop two pharmaceutical drugs for treating Hodgkin’s disease and juvenile leukemia. The rosy periwinkle used to develop these drugs was eventually grown almost entirely in Texas and not in Madagascar⁵⁶. Eli Lilly and Co. has profited from the sale of the anticancer drugs Vinblastine and Vincristine extracted from the rosy periwinkle. Although Eli Lilly earned millions of dollars per year from these drugs, no compensation has been given to Madagascar⁵⁷. As anthropologist Michael Brown has pointed out, however, the story of the rosy periwinkle may not be quite as simple as is sometimes presented and illustrates the potential difficulties in ascribing ownership rights with respect to certain types of cultural knowledge.

5.02.03. Hoodia Cactus

For thousands of years, African tribesmen have eaten the ‘Hoodia cactus’ to stave off hunger and thirst on long hunting trips⁵⁸. The Kungbushmen, San who live around the Kalahari Desert in Southern Africa used to cut off a stem of the cactus about the size of a cucumber and munch it⁵⁹. Hoodia is now at the centre of bio-piracy row. In 1995, South African CSIR patented Hoodia’s appetite-suppressing element (P57) and hence, its potential cure for obesity. In 1997 they

licensed P57 to British Biotech Company, Phytopharm. In 1998, Pfizer acquired the rights to develop and market P57 as a potential slimming drug and cure for obesity (a market worth more than £ 6 billion), from Phytopharm for \$ 32 million⁶⁰. The San people eventually learned of this exploitation of their TK, and in June 2001, launched legal action against South African CSIR and the pharmaceutical industry on grounds of bio-piracy⁶¹. They claimed that their TK has been stolen, and South African CSIR had failed to comply with the rules of the Convention on Biodiversity, which requires for PIC of all stakeholders, including the original discoverers and users. Phytopharm conducted extensive enquiries but were unable to find any of the knowledge holders⁶². The remaining San were apparently at the time living in a tented camp 1500 miles away from their tribal lands. The South African CSIR claimed that they have planned to inform the San of the research and share the benefits, but wanted to make sure that the drug proved successful⁶³. The two sides entered into negotiations for a benefit sharing agreement, despite complications regarding who should be compensated the person who originally shared the information, their descendants, the tribe or the entire country. After the San threatened to sue under the CBD, the CSIR entered into a benefit –sharing arrangement with the San.

5.02.04. Rooibos Tea

Reflecting some of the issues that have arisen in the basmati rice case with respect to uses of names, the rooibos case involves naming rights with respect to tea derived from a bush that grows in South Africa⁶⁴. The rooibos tea case involves a U.S. trademark acquired by an American company from a South African company for the mark ROOIBOS. Rooibos, which means “red bush,” is a plant indigenous to South Africa that is used to make a number of products, including tea. A recent settlement has been made with respect to this case and the trademark has been abandoned by the U.S. Company that had purchased it⁶⁵. Other cases in the African context include *Maytenusbuchananii*, the endod berry, Monellin, and Thaumalin.

5.03. In South America

The misappropriated Traditional Medicines from South America are;

5.03.01. Quinine

A number of narratives of appropriation are also discussed in the South American context. ‘Quinine’⁶⁶, a treatment for malaria, is derived from Cinchona bark, which has long been used by indigenous groups in the Andes as a cure for fevers⁶⁷. In 1630, Peruvian indigenous peoples gave Jesuit priests information about the use of cinchona bark to treat fevers and malaria⁶⁸. Since the initial disclosure of this knowledge, a number of pharmaceutical drugs have been developed, including quinine (isolated in 1820), its synthetic derivative, and quinidine for treating arrhythmia.

5.03.02. The Enola Bean

‘The Enola bean’ case involves the issuance of a patent for the yellow variety of a common field bean. The patent holder bought a variety of seeds in Mexican markets and bred and patented the yellow beans from this broader range of seeds. The patent holders have since attempted to block imports of mixed beans from Mexico that contain the yellow variety⁶⁹.

5.03.03. Pozol

‘Pozol’ is used by the Maya in Mexico for nutritional purposes and prevention of intestinal ailments, including giardiasis and amoebiasis. In 1999, Quest International, a Dutch corporation, and the University of Minnesota were granted a patent for the active component in pozol, giving no acknowledgement or recognition to knowledge upon which the patent was based⁷⁰.

5.03.04. Quinoa

‘Quinoa’ is a staple food crop for millions in the Andes, especially Quechua and Aymara people who have bred a multitude of quinoa varieties. Two Colorado State University researchers

acquired a patent for quinoa based upon knowledge of Bolivian farmers, who shared seeds from their quinoa crop with the researchers. The researchers abandoned the quinoa patent after confronting global opposition to their attempt to assert proprietary rights, including a plea at the U.N. General Assembly. The researchers failed to pay a fee to the PTO, thus allowing the patent to lapse⁷¹.

5.03.05. Tamate

The ‘tamate’, a small cylindrical tomato, was used by Amazonian Indians in Ecuador for its cancer-fighting properties. The active ingredient in the ‘tamate, lycopene, was isolated by a multinational pharmaceutical company that now sells lycopene as a cancer treatment⁷².

In this circumstances as mentioned, the need to protect TRM has arisen in many instances in the context of claims relating to the unauthorized appropriation of TRM-based products, processes and the biological resources on which they are based.

6. Conclusion

The multinational companies are in a hurry to get control of valuable bio-products and are seeking patents on everything under the sun. The patent system has been corrupted to such levels that multinational companies can now easily get patents on limitations as well. There is an increasing demand from consumers in industrialized countries for herbal products. The driven pharmaceutical companies seek possible leads in indigenous systems of medicine and the information present with the traditional healers of indigenous and local communities. India and other developing countries rich in bio-resources and IK are favorite targets and victims of bio-piracy.

Ultimately, global bio-piracy seeks to reconstruct a framework for understanding how the doctrines, principles, and cultural dimensions of patent law facilitate and legitimize the theft and appropriation of indigenous peoples’ knowledge on TRM. The relationship between patent law and

indigenous peoples' knowledge is inherently predatory and harmful to the interests, worldviews, and self-determination of the Third World.

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- ¹ A.Wood, S.E. Pamela and M. Johanna, *The Root Causes of Biodiversity Loss* London: Earthscan (2000)
- ² *Ibid*
- ³ ETC Group is dedicated to the conservation and sustainable advancement of cultural and ecological diversity and human rights. To this end, ETC Group supports socially responsible developments of technologies useful to the poor and marginalized and it addresses international governance issues and corporate power. ETC Group works in partnership with civil society organizations (CSOs) for cooperative and sustainable self-reliance within disadvantaged societies, by providing information and analysis of socio-economic and technological trends and alternatives. Available at <http://www.etcgroup.org/en/about> Accessed on 23 January (2011)
- ⁴ See <http://www.etcgroup.org/en/issues/bio-piracy> Accessed on 23 March (2011)
- ⁵ *Ibid*
- ⁶ Battiste Marie and James Youngblood Henderson, *Protecting Indigenous Knowledge and Heritage: A Global Challenge* Saskatoon: Purich Publishing Ltd. (2000)
- ⁷ J. Kirkland, H.F. Mathews, C.W. Sullivan and K. Baldwin, "Herbal and Magical Medicine" 2 *Traditional Healing Today* 21 (1992)
- ⁸ Daniel Gervais, "Traditional Knowledge and *Intellectual Property*: A TRIPS Compatible Approach" 140 *Michigan State Law Review* 110 (2005)
- ⁹ *Ibid*
- ¹⁰ Gunn Allen and Paul, *The Sacred Hoop: Recovering the Feminine in American Indian Traditions* Boston: Beacon Press (1986)
- ¹¹ D.M. Raup, "The Role of Extinction in Evolution" 91(15) *Proceedings of the National Academy of Sciences* 6758 (1994)
- ¹² *Ibid*
- ¹³ *Ibid*
- ¹⁴ *Ibid*
- ¹⁵ Castellano and Marlene Brant, "Updating Aboriginal Traditions of Knowledge" in George J. Dei, Budd L. Hall, and Dorothy Goldin Rosenberg (Ed) *Indigenous Knowledge In Global Contexts* Toronto: University of Toronto Press (2000)
- ¹⁶ Ajeet Mathur, "Who Owns Traditional Knowledge?" 38 *Economic and Political Weekly* 4471 (2003)
- ¹⁷ UMIYAC, *The Beliefs of the Elders, Codes of Ethics for Indigenous Medicine of the Colombian Amazon* Mocoa: UMIYAC (1999)
- ¹⁸ Paul Gepts, "Who Owns Biodiversity, and How Should the Owners Be Compensated?" 134(4) *Plant Physiology* 1295 (2004)
- ¹⁹ See Pollyanna E. Folkins, "Has the Lab Coat Become the Modern Day Eye Patch? Thwarting Bio-piracy of Indigenous Resources by Modifying International Patenting Systems" 13 *Journal of Transnational Law* 339 (2003)
- ²⁰ *Ibid*
- ²¹ Emily Marden, "The Neem Tree Patent: International Conflict Over the Commodification of Life" 22 *Journal of International And Company Law Review* 279 (1999)
- ²² C. Karasov, "Who Reaps the Benefits of Biodiversity?" 109 *Environmental Health Perspectives* 12 (2001)
- ²³ *Ibid*
- ²⁴ Vandana Shiva, *Biodiversity: Social and Ecological Perspective* London: Zed Books (1991)
- ²⁵ See U.S. Patent No. 5,409,708 (Filed Jan. 31, 1994 and issued Apr. 25 1995) (Relating to novel fungicide compositions prepared from Neem seeds); U.S. Patent No. 5,356,628 (Filed Dec. 2 1993 and issued Oct. 18 1994)

(Covering fungicidal applications of Neem); U.S. Patent No. 5,405,612 (Filed Dec. 2 1993 and issued Apr. 11 1995) (Covering applications of Neem as an insecticide); U.S. Patent No. 5,368,856 (Filed Aug. 2 1993 and issued Nov. 29 1994) (Disclosing a novel method of controlling fungi through the use of a Neem oil fungicide derived from a Neem seed extract); U.S. Patent No. 5,124,349 (Filed Oct. 31 1990 and issued June 23 1992) (Granting patent for the storage of stable pesticide compositions comprised of Neem seed extracts); Eur. Patent No. 494067 (Issued Aug. 13 1997 (Granting patent for novel pesticide preparations derived from Neem oil and Neem wax fractions)); Eur. Patent No. 436257 (Filed Dec. 20 1990 and published Sept. 14 1994) (Granting patent for insecticide derived from a neem seed extract comprising neem oil).

²⁶ Case No. T0146/01-3.3.2, Method for Controlling Fungi on Plants by the Aid of a Hydrophobic Extracted Neem Oil (B.A. Eur. Patent Office Mar. 8 2005) (Upholding on final appeal the 2001 revocation of European Patent Office Neem patent). See Linda Bullard, "Freeing the Free Tree" Available at <http://www.womenandlife.org/WLOE-en/information/globalization/neembriefmar05.html> Accessed on 29 March (2011)

²⁷ See Vandana Shiva, *Patents, Myths and Reality* India: Penguin (2001)

²⁸ U.S. Patent No. 5,900,240 (Filed Mar. 6 1998 and issued May 4 1998) (Covering uses of two herbs from list as an edible dietary supplement intended to reduce glucose levels in the blood of mammals, including human beings with diabetes) (Noting that Phyllanthusamarus is a medicinal plant used in India to treat jaundice, that tests showed effectiveness against Hepatitis B and E, and that the Fox Chase Cancer Center was awarded a patent for a pharmaceutical preparation containing an extract of the plant) (Noting that Karela juice is used in India for treatment of diabetes and that a herbal mixture containing Karela and other ingredients was the basis for a patent obtained by a New Jersey company). See Miriam L. Quinn, "Protection for Indigenous Knowledge: An International Law Analysis" 14 *St. Thomas Law Review* 287 (2001)

²⁹ See U.S. Patent No. 5,401,504 (Filed Dec. 28 1993 and issued Mar. 28 1995) Granting original turmeric patent

³⁰ See http://www.turmeric.co.in/turmeric_ayurvedic_use.htm Accessed on 12 April (2011)

³¹ R.A. Mashelkar, "Intellectual Property Rights and The Third World, Special Section: Science in The Third World" 81 *Current Science* 959 (2001)

³² *Ibid*

³³ C. M. Correa, "Implementing the TRIPS Agreement in the Patents Field: Options For Developing Countries" 1(1) *The Journal of World Intellectual Property* 75 (1998)

³⁴ *Ibid*

³⁵ Reexamination Certificate U.S. Patent No. 5,401,504 B1 (Requested Oct. 28 1996) (Issued Apr. 21 1998) (Canceling all claims in original patent)

³⁶ Some of the medicinal properties suggested by preclinical trials are anti-hepatotoxicity, anti-lithic, anti-hypertensive, anti-HIV and anti-hepatitis B. However, human trials do not show efficacy against hepatitis B virus. The plant has long been used in Brazil and Peru as a supposed herbal remedy for kidney stones. Research among sufferers of kidney stones has shown that, while intake of Phyllanthus niruri didn't lead to a significant difference in either stone voiding or pain levels, it may reduce urinary calcium, a contributing factor to stone growth. One study conducted on rats showed that an aqueous solution of Phyllanthus niruri may inhibit kidney stone growth and formation in animals that already have stones. See A.M. Freitas, N. Schor and M.A. Boim, "The effect of Phyllanthus niruri on Urinary Inhibitors of Calcium Oxalate Crystallization and other Factors Associated with Renal Stone Formation" 89(9) *BJU International* 829 (2002)

³⁷ D.S. Fabricant and N.R. Farnsworth, "The Value of Plants Used in Traditional Medicine for Drug Discovery" 1 *Environ. Health Pers.p* 69 (2001)

³⁸ *Ibid*

³⁹ R.P. Labadie, "Problems and Possibilities in the Use of Traditional Drugs" 15 *J. Ethnopharmacol* 221 (1986)

⁴⁰ *Withania somnifera*, also known as Ashwagandha, is a plant in the *Solanaceae* or nightshade family. It grows as a short shrub (35-75 cm) with a central stem from which branch extend radially in a star pattern and covered with a dense mat of wooly hairs. See M.H. Mirjalili, E. Moyano, M. Bonfill, R.M. Cusido and J. Palazón, "Steroidal Lactones From *Withania Somnifera*- An Ancient Plant For Novel Medicine" 14(7) *Molecules* 2373 (2009). The flowers are small and green, while the ripe fruit is orange-red and has milk-coagulating properties. The plant also has long brown tuberous roots that are used for medicinal purposes. It is cultivated in many of the drier regions of India such as Manasa, Neemuch, and Jawad tehsils of the Mandsaur District of Madhya Pradesh, Punjab, Sind, and Rajasthan. In Ayurveda, it is claimed to possess aphrodisiac, sedative, rejuvenative and life prolonging properties. It is traditionally used to treat the following symptoms and conditions, although there are few scientific studies of the health benefits of Ashwagandha. See P. Scartezzini and E. Speroni, "Review on Some Plants of Indian Traditional Medicine With Antioxidant Activity" 71(1-2) *Journal of Ethnopharmacol* 23 (2000). It is a medicine for chronic fatigue, dehydration, bone weakness, muscle weakness and tension, loose teeth, thirst, impotency, premature ageing, emaciation, debility, constipation, senility, rheumatism, nervous exhaustion, memory loss, neurodegenerative disorders, spermatorrhoea. See L. Lu, Y.Liu and W.Zhu, "Traditional Medicine in The Treatment of Drug Addiction" 35(1) *Am J Drug Alcohol Abuse* 1 (2009). The berries can be used as a substitute for rennet, to coagulate milk in cheese making. The berries and leaves are traditionally used a topical treatment for tumors and tubercular glands, carbuncles and ulcers. See A. Chopra, P. Lavin, B. Patwardhan and D. Chitre, "A 32-Week Randomized, Placebo-Controlled Clinical Evaluation of RA-11-An Ayurvedic Drug, on Osteoarthritis of The Knees" 10(5) *J Clin Rheumatol* 236 (2004). While Ashwagandha is claimed to have a wide variety of health benefits, there have been few clinical trials to test these claims. Studies completed so far support that *w. somnifera* may possibly be beneficial for easing drug withdrawal symptom, reducing anxiety, reducing arthritis pain in the knee, In addition, there are registered clinical trials in progress to determine if *W. somnifera* is useful for treating Tuberculosis, Parkinsons Disease, Bone Cancer, Bipolar disorder, Diabetes, improve the well-being of the elderly and breast cancer patients undergoing chemotherapy. (India, World Health Organization International Clinical Registry Program, CTRI/2008/091/000047 (Available at <http://apps.who.int/trialsearch/Trial.aspx?TrialID=CTRI/2008/091/000047> Accessed on 12 June (2011)

⁴¹ *Ocimum tenuiflorum* (tulsi) is an aromatic plant in the family Lamiaceae which is native throughout the Old World tropics and widespread as a cultivated plant and an escaped weed. (Staples, George, S. Michael and Kristiansen, *Ethnic Culinary Herbs* University of Hawaii Press, USA (1999)). It is an erect, much branched subshrub 30-60 c.m. tall with hairy stems and simple opposite green leaves that are strongly scented. P.K. Warriar, *Indian Medicinal Plants* Orient Longman, (1995). Leaves have petioles, and are ovate, up to 5 cm long, usually slightly toothed. Flowers are purplish in elongate racemes in close whorls. There are two main morphotypes cultivated in India-green-leaved (Sri or Lakshmi tulsi) and purple-leaved (Krishna tulsi). See T. Suanarunsawat, T. Boonnak, W.D Na Ayutthaya and S. Thirawarapan, "Anti-Hyperlipidemic and Cardioprotective Effects of *Ocimum Sanctum* L. Fixed Oil In Rats Fed A High Fat Diet" 21(4) *J Basic Clin Physiol Pharmacol* 387 (2010). Tulsi is cultivated for religious and medicinal purposes, and for its essential oil. It is widely known across South Asia as a medicinal plant and an herbal tea, commonly used in Ayurveda, and has an important role within the Vaishnavite tradition of Hinduism, in which devotees perform worship involving tulsi plants or leaves. Recent studies suggest that tulsi may be a COX-2 inhibitor, like many modern painkillers, due to its high concentration of eugenol (1-hydroxy-2-methoxy-4-allylbenzene). One study showed Tulsi to be an effective treatment for diabetes by reducing blood glucose levels. The same study showed significant reduction in total cholesterol levels with tulsi. Another study showed that tulsi's beneficial effect on blood glucose levels is due to its antioxidant properties. Tulsi also shows some promise for protection from radiation poisoning and cataracts. The fixed

oil has demonstrated anti-hyperlipidemic and cardioprotective effects in rats fed high fat diet. Experimental studies have shown that an alcoholic extract of Tulsi modulates immunity, thus promoting immune system function. Some of the main chemical constituents of tulsi are: Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool, and β -caryophyllene. T. Suanarunsawat, T. Boonnak, W.D. Na Ayutthaya and S. Thirawarapan, "Anti-Hyperlipidemic and Cardioprotective Effects of *Ocimum Sanctum* L. Fixed Oil In Rats Fed A High Fat Diet" 21(4) *J Basic Clin Physiol Pharmacol* 387 (2010).

⁴² *Asparagus racemosus* (Shatavari) is a species of asparagus common throughout India and the Himalayas. It grows one to two meters tall and prefers to take root in gravelly, rocky soils high up in piedmont plains, at 1,300 - 1,400 meters elevation. It was botanically described in 1799. Due to its multiple uses, the demand for *Asparagus racemosus* is constantly on the rise. Due to destructive harvesting, combined with habitat destruction, and deforestation, the plant is now considered 'endangered' in its natural habitat. See M.S. Parihar and T. Hemnani, "Experimental Excitotoxicity Provokes Oxidative Damage in Mice Brain And Attenuation By Extract of *Asparagus Racemosus*" 111(1) *Journal of Neural Transmission I* (2004). *Asparagus racemosus* (Shatavari) is recommended in Ayurvedic texts for the prevention and treatment of gastric ulcers, dyspepsia and as a galactagogue. *A. racemosus* has also been used successfully by some Ayurvedic practitioners for nervous disorders. N. Bopana and S. Saxena, "Asparagus Racemosus- Ethnopharmacological Evaluation and Conservation Needs" 110(1) *Journal of Ethnopharmacology I* (2007). *Asparagus racemosus* is an important medicinal plant of tropical and subtropical India. Its medicinal usage has been reported in the Indian and British Pharmacopoeias and in traditional systems of medicine such as Ayurveda, Unani and Siddha. It is mainly known for its phytoestrogenic properties. The plant has been shown to aid in the treatment of neurodegenerative disorders and in alcohol abstinence-induced withdrawal symptoms. In Ayurveda, *Asparagus racemosus* has been described as a rasayana herb and has been used extensively as an adaptogen to increase the non-specific resistance of organisms against a variety of stresses. Besides use in the treatment of diarrhoea and dysentery, the plant also has potent antioxidant, immunostimulant, anti-dyspepsia and antitussive effects. The roots are used in Ayurvedic medicine, following a regimen of processing and drying. It is generally used as a uterine tonic, as a galactagogue (to improve breast milk), in hyperacidity, and as a general health tonic. It is also used as an anodyne and aphrodisiac. Shatavari is considered to be the main Ayurvedic rejuvenating female tonic for overall health and vitality. The reputed adaptogenic effects of Shatavari may be attributed to its concentrations of saponins, known as Shatavarins. In Sanskrit, Shatavari means 'she who possesses a hundred husbands.' G.K. Singh, D. Garabadi, A.V. Muruganandam, V.K. Joshi and S. Krishnamurthy "Antidepressant Activity of *Asparagus Racemosus* in Rodent Models" 91(3) *Pharmacology, Biochemistry and Behavior* 176 (2009)

⁴³ In traditional Indian medicine, dried and fresh fruits of the plant are used. All parts of the plant are used in various Ayurvedic or Unani medicine (*Jawarish amla*) herbal preparations, including the fruit, seed, leaves, root, bark and flowers. According to Ayurveda, amla fruit is sour (*amla*) and astringent (*kashaya*) in taste (*rasa*), with sweet (*madhura*), bitter (*tikta*) and pungent (*katu*) secondary tastes (*anurasas*). Its qualities (*gunas*) are light (*laghu*) and dry (*ruksha*), the postdigestive effect (*vipaka*) is sweet (*madhura*), and its energy (*virya*) is cooling (*shita*). See S.A. Qureshi, W. Asad and V. Sultana" 8(2) *Pakistan Journal of Nutrition* 125 (2009). According to Ayurveda, amla is specific to *pitta* due to its sweet taste and cooling energy. However, amla is thought to balance *vata* by virtue of its sour taste, and *kapha* due to its astringent taste and drying action. It may be used as a *rasayana* (rejuvenative) to promote longevity, and traditionally to enhance digestion (*dipanapachana*), treat constipation (*anuloma*), reduce fever (*jvaraghna*), purify the blood (*raktaprasadana*), reduce cough (*kasahara*), alleviate asthma (*svasahara*), strengthen the heart (*hrdaya*), benefit the eyes (*chakshushya*), stimulate hair growth (*romasanjana*), enliven the body (*jivaniya*), and enhance intellect (*medhya*). See K. Tarwadi and V. Agte, "Antioxidant and Micronutrient Potential of Common Fruits

Available in the Indian Subcontinent” 58(5) *Int. J Food Sci. Nutr.* 341 (2007). In Ayurvedic polyherbal formulations, Indian gooseberry is a common constituent, and most notably is the primary ingredient in an ancient herbal *rasayana* called *Chyawanprash*. This formula, which contains 43 herbal ingredients as well as clarified butter, sesame oil, sugar cane juice, and honey, was first mentioned in the Charaka Samhita as a premier rejuvenative compound. T.P. Rao, N. Sakaguchi, L.R. Juneja, E. Wada, and T. Yokozawa, “Amla (*Emblca officinalis* Gaertn.) Extracts Reduce Oxidative Stress in Streptozotocin-induced Diabetic Rats” 8(3) *J Med Food* 362 (2005).

⁴⁴ This plant has a number of uses in Ayurveda, as one of the herbs used in Rasayanas. It is a traditional treatment for epilepsy and asthma. It has antioxidant properties, reducing oxidation of fats in the bloodstream. However, anti-epilepsy properties seem to be in very high toxic and near lethal doses, so it's only used-at much lower non-toxic dosage-as an additive to regular epilepsy medication. Studies in humans show that an extract of the plant has anti-anxiety effects. See S. Ghosal and S.K. Bhattacharya, “Anxiolytic Activity of A Standardized Extract of *Bacopa Monniera* in An Experimental Study” 5 *Phytomedicine* 133 (1980). It is listed as a nootropic, a drug that enhances cognitive ability. In India, this plant has also been used traditionally to consecrate newborn babies in the belief that it will open the gateway of intelligence. Laboratory studies on rats indicate that extracts of the plant improve memory capacity and motor learning ability. Recent studies suggest *Bacopa* may improve intellectual activity. The sulfhydryl and polyphenol components of *Bacopa monniera* extract have also been shown to impact the oxidative stress cascade by scavenging reactive oxygen species, inhibiting lipoxygenase activity and reducing divalent metals. This mechanism of action may explain the effect of *Bacopa monniera* extract in reducing beta amyloid deposits in mice with Alzheimer's disease. *B. monnieri* has a demonstrated ability to reverse diazepam-induced amnesia in the Morris water maze test. The mechanism of this action is unknown. In some trials, *Bacopa* extract did not restore or enhance memory formation, but improved retention. In others including a randomized clinical trial of 98 healthy older people (over 55 years) *Bacopa* significantly improved memory acquisition and retention. See C. Stough, J. Lloyd, J. Clarke, L. Downey, C. Hutchison, T. Rodgers and P. Nathan, “The Chronic Effects of An Extract of *Bacopa Monniera* (Brahmi) on Cognitive Function in Healthy Human Subjects” 156(4) *Psychopharmacology* 481 (2001). *B. monniera* has antifungal activity against the dermatophytic fungi namely *Aspergillus niger*, *Aspergillus flavus*, *Trichophyton rubrum* and *Microsporum*. Its many active compounds include: alkaloids (brahmine and herpestine), saponins (d-mannitol and hersaponin, acid A, and monnierin), flavonoids (luteolin and apigenin). Also in significant amounts: betulinic acid, stigmastanol, beta-sitosterol, *Bacopa*saponins (bacosides A, bacosides B, *Bacopa*side II, *Bacopa*side I, *Bacopa*side X, *Bacopa*saponin C, *Bacopa*side N2 and the minor components were *Bacopa*saponin F, *Bacopa*saponin E, *Bacopa*side N1, *Bacopa*side III, *Bacopa*side IV, and *Bacopa*side V). In rats, bacosides A enhance antioxidant defenses, increasing superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPX) activity. When a preparation of the plant was evaluated for safety and tolerability it showed no adverse effects but there were some reports of mild gastrointestinal symptoms. See S.R. Ayyappan, R. Srikumar, R. Thangaraj, R. Jegadeesh and L. Hariprasath, “Antifungal Activity of *Bacopa Monniera* Against Dermatophytic Fungus” 31(1) *Biomedicine* 74 (2011).

⁴⁵ *Triphala* is an Ayurvedic herbal *rasayana* formula consisting of equal parts of three myrobalans, taken without seed: *Amalaki* (*Emblca officinalis*), *Bibhitaki* (*Terminalia bellirica*) and *Haritaki* (*Terminalia chebula*). The word *triphala* means literally ‘three fruits’. In traditional Ayurvedic medicine, *Triphala* is used for immune system stimulation, improvement of digestion, relief of constipation, gastrointestinal tract cleansing, relief of gas, treatment of diabetes, treatment of eye disease. Test-tube studies have suggested that *Triphala* offers antioxidant, bacteria-killing, and immune-enhancing benefits. And in animal-based research, scientists have shown that the herbal blend may help keep cholesterol in check. See T.C. Reddy, P. Aparoy, N.K. Babu, S.K. Kalangi and P. Reddanna, “Kinetics and Docking Studies of a COX-2 Inhibitor Isolated from *Terminalia bellerica* Fruits” 17(10) *Protein Pept. Lett.* 1251 (2010)

⁴⁶ It is an herbal compound that contains a natural support system for gastric functions. 'Trikatu' is very beneficial and safe for digestive, carminative, anti-flatulent and dyspepsia. The root of this herb is very beneficial for digestive system. This herb is wonderful in curing various health problems like it helps in improving metabolism, increases internal warmth, improve the taste buds, immune system, yeast Candida, parasites, worms, constipation, bad breathe, nausea and also helps in breaking up the harmful toxins from the body. This herb is also helps to maintain the flow of blood circulation in the body and also increases the absorption of nutrients; 'Trikatu' is also helps to get rid from the indigestion and improves the loss of appetite. 'Trikatu' is a Sanskrit word which means 'three spices'. This herb is used in ayurvedic treatments from ages. It consists of black pepper fruits (piper nigrum), Indian long pepper (piper longum) and rhizomes of ginger (zingiber officinalis). It is mostly helps to maintain the digestive and respiratory system. 'Trikatu' is also very helpful in treating gastric problem and also helps to get rid from the urinary tract problem. It is the mixture of three spices which is the superb remedy to get rid from various abdominal problems. 'Trikatu' is very beneficial which helps to restores the lipids and also controls the cholesterol level in the body. This herb is also helps to give relief from pain and inflammation. Trikatu is also act as the anti-obesity drug. 'Trikatu' is very effective to deal with congestion, cough, high triglycerides, hypothyroid and various inflammatory. This herb is the superb for overall health and keeps you away from all the health diseases because it contains the three most common spices and ingredients. This herb is also shows the great result in curing the acidity and also helps to reduce the risk of colon cancer. 'Trikatu' also helps keep the body in shape and reduce the weight. 'Trikatu' is also act as the anti-mucus which helps to improve the gastric functions and respiratory functions. This is an herb which is very beneficial for lungs and also strengthens reproductive functions. See A.K. Nadkarni, *Indian Materia Medica* Mumbai: Popular Press (1976)

⁴⁷ Dauskardt, "Traditional Medicine: Perspectives and Policies in Health Care Development" 7 *Development Southern Africa* 351 (1990).

⁴⁸ *Ibid*

⁴⁹ *Ibid*

⁵⁰ U.S. Patent No. 5,900,240 was granted recently to Cromak Research Inc., based in New Jersey. The assignees are two non-resident Indians, Onkar S. Tomer and Kripanath Borah, and their colleague, Peter Gloniski. The use of 'karela', 'jamun' and brinjal for control of diabetes is common knowledge and everyday practice in India. Their use in the treatment of diabetes is documented in authoritative treatises such as the 'Wealth of India', the 'Compendium of Indian Medicinal Plants' and the 'Treatise on Indian Medicinal Plants'. This indigenous knowledge and use consists of 'prior art'. No patent should be given where prior art exists, since patents are supposed to be granted only for new inventions on the basis of novelty and non-obviousness. These criteria establish inventiveness, and patents are exclusive rights granted for inventions. The claim to the use of 'Karela' or 'Jamun' for anti-diabetic treatment as an invention is false since such use has been known and documented widely in India. See Vandana Shiva, "U.S. Economic Pirates Make Americans Seem Corrupt, Heartless, U.S. Monopolists Continue Bio-piracy Against India" *The Progress Report* Available at <http://www.progress.org/patent03.htm> Accessed on 13-June (2011).

⁵¹ R.A. Pankhurst, "Historical Examination of Traditional Ethiopian Medicine" 3 *Ethiopian Medical Journal* 151 (2007)

⁵² *Ibid*

⁵³ C.M. Correa, *Integrating Public Health Concerns into Patent Legislation in Developing Countries* Geneva: South Centre (2000)

⁵⁴ *Ibid*

⁵⁵ Michael F. Brown, "Who Owns Native Culture?" 6 *Economic Law Review* 136 (2003) suggesting that assertions about rosy periwinkle conceal a much more complex story by pointing out the potential difficulty of disentangling proprietary claims originating in folk traditions.

⁵⁶ *Ibid*

⁵⁷ *Ibid*

⁵⁸ *Ibid*

⁵⁹ See <http://www.tkdil.res.in/tkdil/langdefault/common/Bio-piracy.asp?GL=Eng> Accessed on 28 August (2011)

⁶⁰ J. Homsy, E. Katabira, D. Kabatesi, F. Mubiru, L. Kwamya, C. Tusaba, S. Kasolo, D. Mwebe, L. Ssentamu, M. Okello and R. King, "Evaluating Herbal Medicine for the Management of Herpes Zoster in Human Immunodeficiency Virus-Infected Patients in Kampala, Uganda" 6(1) *Journal of Alternative and Complementary Medicine* 1 (2000)

⁶¹ *Ibid*

⁶² *Ibid*

⁶³ See R.R Chaudhury "A Clinical Protocol for the Study of Traditional Medicine and Human Immunodeficiency Virus-related Illness" 7(5) *The Journal of Alternative and Complementary Medicine* 553 (2001)

⁶⁴ Rakesh Amin, Mark Blumenthal and Wayne Silverman, "Rooibos Tea Trademark Dispute Settled" 68 (2005) Available at <http://www.herbalgram.org/herbalgram/articleview.asp?a=2891> Rooibo Tea: Noting that '(r)ooibos, otherwise known as red bush. Accessed on 12 July (2011)

⁶⁵ Republic of Tea, Inc. v. Burke-Watkins, No. 4:03CV1862 HEA (E.D. Mo. Jan. 27 2005); see also U.S. Patent & Trademark Office, Latest Results for Registration No. 1,864,122, Available at <http://www.uspto.gov> Accessed on 12 July (2011)

⁶⁶ Quinn: Noting that the U.S. National Cancer Institute collected more than twenty-five tons of Maytenusbuchananii plant, which is traditionally used by the Digo of Kenya as an anti-cancer agent, but did not acknowledge the origins of this material; Roht-Arriaza: noting that the Endod berry, related to soapwort, is used in Ethiopia as a laundry soap, fish intoxicant, and medical treatment for schistosomiasis, and that the endod berry was the basis for a patent granted to the University of Toledo on account of the endod berry's "crustacean killing properties. Spier: Noting that patents for products incorporating Monellin and Thaumalin have resulted in \$900 million a year in profits in the low calorie sweetener market). See *Supra* n. 60

⁶⁷ See Walter H. Lewis and Veena Ramani, "Ethics and Practice in Ethnobiology: Analysis of the International Cooperative Biodiversity Group Project in Peru" (Unpublished manuscript at 2, on file with the Wash. Univ. School. of Law for Interdisciplinary Studies) available at <http://law.wustl.edu/centeris/confpapers/PDFWrdDoc/lewisramani.pdf>. Accessed on 12 July (2011)

⁶⁸ See *Ibid*

⁶⁹ See U.S. Patent No. 5,894,079 (Filed Nov. 15 1996) (Issued Apr. 13 1999) (Granting Enola bean patent); Gillian N. Rattray, "The Enola Bean Patent Controversy: Bio-piracy, Novelty and Fish-and-Chips" *Journal of Technology Review* 8(2002) Available at http://www.law.duke.edu/journals/dltr/articles/PDF/2002DLTR_0008.pdf. Accessed on 5 July (2011)

⁷⁰ See Marcia E. De Geer, "Bio-piracy: The Appropriation of Indigenous Peoples' Cultural Knowledge" 20 *Journal of Intellectual Property Law* 179 (2003)

⁷¹ See U.S. Patent No. 5,304,718 (Filed Feb. 3 1992) (Issued April 19 1994) (Relating to cytoplasmic male sterile quinoa)

⁷² *Supra* n. 8