

India's Fight Against Agricultural and Medicinal Plants' Biopiracy: Its Implications on Food Security, Traditional Rights and Knowledge Degradation

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ABSTRACT

At present, about two-third of the Indian population relies on indigenous knowledge of biological resources and have conserved their knowledge and culture through their traditional lifestyles and local economies. More than 7500 species of plants are utilized for the traditional purposes in India. The economic value of traditional knowledge in the herbal medicine and pharmaceutical sector is estimated to reach around 5 trillion by 2020. Since Indian agriculture is highly rich in biodiversity, it becomes an easy prey of biopiracy in agriculture-based business corporations. Biopiracy term is generally used when multinational corporations or companies profit from the medicinal and agricultural uses of plants known to indigenous or native societies and fail to compensate those communities. Traditional Knowledge (TK) plays a key role in the preservation and sustainable use of biodiversity. There is a threat to the future of TK due to globalization of production systems and the distance between the holders of knowledge and its exploiters. Many cases have been registered in India where attempts have been made to steal the indigenous knowledge from India due to its easy access which affect food security, livelihood of indigenous people and even cause changes in consumers' choice. Indian government challenged many patents in the last two decades by providing numerous research papers predating those patents and these patents were thus rejected. India is the pioneer country in the world to have set up an institutional mechanism – the Traditional Knowledge Digital Library (TKDL) – to protect its TK.

Highlights

- This paper addresses the issue of biopiracy of agricultural crops and medicinal plants and its implications on food security, indigenous rights and knowledge degradation.

Keywords: Biopiracy, Biodiversity, Traditional Knowledge, TKDL

Biopiracy in the Indian Agricultural Sector

A major fraction of the world's population, mostly the underdeveloped areas and rural communities, still rely on the indigenous medicinal knowledge of locally available plants for not just their medical requirements (Shankar 1997; Bhattacharya 2014), but also for food and agriculture (Bhattacharya 2014). Traditional knowledge not only includes the recorded knowledge of plants for medicinal use, but also takes into account the oral knowledge that

has been passed on from ancestors (Bhattacharya 2014). There has been great scientific interest in the lifestyle, knowledge and culture of indigenous people since the traditional knowledge acquired by rural communities over a number of years forms their basic cultural identity. The people living in local communities maintaining fairly traditional lifestyles are termed as "indigenous people" (Andrews 2012). A majority of the Indian population (70%) is dependent on land-based occupations, forests, wetlands and marine habitats for ecological and



cultural sustenance (Kothari and Patel 2006). With an estimated 163 horticultural and crop varieties which have originated in the country, India is one of the world's eight major centers of crop diversity and has centuries' old traditional knowledge (Sudha 2014). Even today, about two-third of Indian population relies on indigenous knowledge of biological resources and have conserved their knowledge and culture through their traditional lifestyles and local economies. More than 7500 species of plants are utilized for the traditional purposes in India. The plant genetic resources were considered to be a common heritage until the last century (Brush 2005). Common heritage refers to "the treatment of genetic resources as belonging to the public domain and not owned or otherwise monopolized by a single group or interest" (Brush 2005; Andrews 2012).

Biopiracy and food security

Biopiracy will increase the dependence of farmers on corporations for their agricultural inputs such as seeds, fertilizers, pesticides and herbicides. Developing countries would face the challenges even more, since farmers of such nations cannot afford to buy seed each year and segregate a fraction of their harvest for planting in the next growing season (Yusuf 2010; Bhattacharya 2014). Biopiracy can have a devastating effect on the economy and food security of the farmers in developing countries which can ultimately destroy the locally adapted, traditional crop varieties which are cheaper alternatives (Bhattacharya *et al.* 2013). Since Indian agriculture is highly rich in biodiversity, it becomes an easy prey of biopiracy in agriculture based business corporations. For instance, Monsanto tried to extend their reach to the Indian population by selling genetically modified brinjals in the form of Bt Brinjals, in spite of the fact that India itself grows more than 2500 unique varieties of brinjals. The Indian National Biodiversity Authority (NBA) filed a legal action against Monsanto (and their collaborators) for accessing local eggplant varieties for development of their genetically engineered version of eggplant without taking any prior consent of the competent authorities, which is considered an act of biopiracy. The law mandates that "when biodiversity is to be accessed in any manner for commercial, research and other uses,

local communities who have protected local varieties and cultivars for generations, must be consulted and if they consent benefits must accrue to them as per the internationally applicable Access and Benefit Sharing Protocol." (Ministry of Environment and forests 2010; Bhattacharya 2014).

DISCUSSION

Traditional Knowledge Degradation

The people using the Traditional Knowledge (TK) are the same who are actually holding it, using it sustainably through generations and communities. It is closely related and intertwined with the communities involved and the resources available in the environment around them. Modern system of knowledge (which is actually developed through years and not generations) and its exploitation are a result of the industrialization process, where production and not sustainable utilization is the answer (Kaushik 2004; Gupta *et al.* 2015). Both modern and traditional knowledge are prevailing factors in production; thus, local communities and people are been exploited in an unsustainable and inequitable manner. The holders of TK lack the awareness to protect it through modern legal systems and they do not even seek due compensation for its use (Kaushik 2004). These situations in today's world when combined together may lead to the unfortunate consequence of disappearance of overall TK (Kaushik 2004 and Gupta *et al.* 2015). There is a threat to the future of TK due to globalization of production systems and the distance between the holders of knowledge and its exploiters.

Another known aspect highlighted in both the Convention on Biological Diversity (CBD) and the International Undertaking on Plant Genetic Resources (IU) of the Food and Agriculture Organization (FAO) is that the TK plays a key role in the preservation and sustainable use of biodiversity. Numerous activities and production based on TK are the important sources of income, food, and healthcare for large parts of the populations and communities, trailing to development of the country also. Thus, TK is being rapidly lost as traditional communities are integrated into the wider societies, and the local ecosystems are been degraded (Twarog and Kapoor 2004).



India's Combat against Biopiracy

Many cases have been registered in India where attempts have been made to steal the indigenous knowledge from India due to its easy access which affect food security, livelihood of indigenous people and even cause changes in consumers' choice. The persons involved in plundering natural resources from the developing and less developed countries prosper, while the persons from whom benefits are derived suffer since they are paid only petty amounts and sometimes are not even paid at all (Bhattacharya 2014). 'Biopiracy' term is generally used when multinational corporations or companies profit from the medicinal and agricultural uses of plants known to indigenous or native societies and fail to compensate those communities" (Dwyer 2008; Andrews 2012). Alternatively, it refers to "appropriation, generally by means of patents, of legal rights over indigenous biomedical knowledge without compensation to indigenous groups who originally developed such knowledge" (Sudha 2014). There have been a number of cases of biopiracy of traditional knowledge from India, commonly observed in plant varieties such as *Haldi* (Turmeric), *Basmati*, *Neem* etc. (Bhattacharya 2014). According to a study conducted in 1999, global market value of industries using biological and genetic material is estimated between \$500-800 billion. The economic value of traditional knowledge in the herbal medicine and pharmaceutical sector is estimated to reach around 5 trillion by 2020 (Sudha 2014; Shah 2014). A few instances of biopiracy have been presented in Table 1.

Dr. V.K. Gupta, Senior Advisor & Director of India's Traditional Knowledge Digital Library (TKDL) at the Indian Council of Scientific and Industrial Research (CSIR) (India's largest state-owned research body), has evolved Traditional Knowledge Resource Classification (TKRC), an innovative structured classification system for systematic arrangement, dissemination and retrieval. TKDL is a unique tool that plays a critical role in protecting the country's traditional knowledge. The TKDL has been patterned on the International Patent Classifications and has been ratified by the World Intellectual Property Organization. TKDL has now become a database containing 34 million pages of formatted information on some 2,260,000 medicinal formulations in multiple languages, bridging the

linguistic gap between traditional knowledge expressed in languages like Sanskrit, Arabic, Persian, Urdu and Tamil, and those used by patent examiners of major intellectual property (IP) offices. These have been translated into English, French, German, Japanese and Spanish (Gupta 2011).

India is the pioneer country in the world to have set up an institutional mechanism – the TKDL – to protect its TK. India's TKDL is a powerful weapon in the country's fight against erroneous patents, also referred to as "biopiracy" (Gupta 2011). Now, India is in a position of global leadership in the area of Traditional Knowledge & Intellectual Property Right. Several other countries are seeking India's support in establishing similar systems for themselves like Republic of South Korea, Thailand, South Africa, Mongolia, Cambodia, Nigeria, African Regional Industrial Property Office, SAARC member states, etc.

International and National conventions and acts related to Biopiracy

The problem of unfair exploitation of bioresources and traditional knowledge of indigenous communities and disregard to their customary laws and practices has been arising and this makes it even more important to respect and protect the rights of such communities over such resources. Initiatives are being taken at both national and international levels to frame policies and acts for designing a protection system that does not compromise with the indigenous values, cultural heritage and free sharing of knowledge, resources and innovations over such resources that have been transferred from one generation to another. Communal control of such knowledge need to be emphasized and each country should find its own options that can only be governed by the international frameworks (Shamama 2008).

Patenting of edible plant resources, mainly wheat, maize, rice, and potato, which constitute more than 70% of our food supply will pose a threat to the consumers. The problem of intrusion of national sovereignty arises due to biopiracy when a government or a corporation from other countries utilizes and benefits from the patent varieties of genetic resources which are derived from the traditional knowledge acquired from another sovereign state. However, in the past few years,

**Table 1:** List of Biopiracy cases of India

Sl. No.	Common name	Indigenous use	Patentee	Action by the Indian Government
1	<i>Haldi / turmeric (Curcuma longa)</i>	Treatment for sprains, inflammatory conditions and wounds	Two scientists from the University of Mississippi were granted US patent 5,401,504 on the use of turmeric in 1995	The US Patent and Trademark office rejected all patent claims related to turmeric after the Indian government challenged the patent by providing numerous research papers predating the patent, proving that turmeric has long been used to heal wounds in India.
2	Neem (<i>Azadirachta indica</i>)	As an air purifier and effective medicine for almost all types of human and animal diseases because of its insect and pest repellent properties	A US timber importer began importing neem seeds to his company headquarter in Wisconsin since 1971 after he studied its curing properties. Using neem extract, he successfully extracted a pesticidal agent called Margosan-O. In 1985, the bio-pesticide derived from neem tree received clearance from the US Environmental Protection Agency (EPA).	In May 2000, a coalition of groups successfully overturned the patent held by the US company, WR Grace and the US Department of Agriculture over the Indian neem tree. The Patent granted to WR Grace & Co. UK and US department of Agriculture was revoked on Challenge.
3	Rice (Basmati)	Unique Aroma and flavour	On 2 September 1997, Texas based RiceTec Inc. was granted patent number 5663484 for a new plant variety that is a cross between American long-grain rice and Basmati rice. RiceTec claimed that the new varieties have the same or better characteristics as the original Basmati rice and can be successfully grown in specified geographical areas in North America.	By mid 2000, the Indian government challenged some of the claims of the RiceTec patent and the world's largest importer of Basmati rice, Saudi Arabia (UK recognized that Basmati rice is unique to Northern India and Pakistan).
4	Jamun/ blackberry	Control of diabetes	Cromak Research Inc. (US Patent 5900240). The edible herbal compositions comprising the mixtures of the mentioned plants are used to reduce sugar levels.	The medicinal use of jamun; bitter gourd or karela; brinjal or eggplant has been clearly indicated in the Wealth of India, compendium of Indian medicinal plants, and <i>Treatise on Indian Medicinal Plants I</i> which has no reference in the patent granted.
5	Karela/ bitter gourd			
6	Baingan/Brinjal (Eggplant)			
7	Aswagandha (<i>Withania somnifera</i>)	Treatment of insomnia, depression, gastric ulcers and convulsions	Natreon Inc., US Multi National (EP 1906980) Patent granted to Relive International Inc. as a supplement for healthy joints, US patent office also granted a dozen patents on Aswagandha centered findings	Out of several patents granted in favour of Ashwagandha, India was successful in revoking only one. In order to crush their attempt, Indian authorities replied back on 6 th July 2009 by submitting evidences from Traditional Knowledge Digital Library (TKDL) and some documents dating back to 12 th century. As a result of the breathless efforts, on 25 th march 2010, EPO decided to dismiss the American's firm claims over the Indian Ginseng.
8	Tea		Patent applied by George Williamson & Co. UK (Method of manufacturing and packaging)	All the Indian tea majors had filed their objections at the concerned patent office in Chennai in 2012. The case has also evoked strong resistance from the tea industry. (Mahuya Paul 2013).
9	Hessian (Jute Cloth)	Use of hessian cloth to cover waste and dumping grounds	Patent granted to UK firm by the European Patent Office	The patent was revoked on challenges by Jute Industrial research Association of India.



10	Ginger (<i>Zingiber officinale</i>)	Treatment against cough and cold	Patent granted by US patent office on eight ginger formulation, Nicholas John Larkins	The five year old attempt to pirate India's traditional knowledge was struck down by UK patent office in 2011 when Department of Ayush and Council of Scientific Industrial Research (CSIR) intervened with evidences with age-old ayurveda and unani books dating back to 18 th century. Kounteya Sinha, 2012.
11	Indian Wheat variety, Nap Hal		Monsanto, the biggest seed corporation was assigned the patent (No. EP 0445929 B1) on wheat on May 21 st , 2003 by the EPO under the simple title, "plants"	On January 27 th , 2004. The Research Foundation for Science, Technology and Ecology along with Greenpeace and Bharat Krishak Samaha filed a petition at the EPO challenging the patent rights given to Monsanto, leading to the patent being revoked. (Vandana Shiva 2012).
12	Atta (Chakki)	A staple food and ingredient within India.	ConAgra filed a "novel" patent (patent no 6,098,905) claiming the rights to an atta processing method, and was granted the patent on August 8 th , 2000.	The method that ConAgra is claiming to be novel has been used throughout South Asia by thousands of atta chakkis, and so cannot justly be claimed as a novel patent. (Vandana Shiva 2012).
13	Mint and Andrographis	Novelty in utility for the therapy of H5N1 avian influenza	Livzon Pharmaceutical Group Inc, Guangdong, a Chinese company (European patent # 1849473)	India thwarted a major attempt at bio-piracy by successfully blocking Chinese bid to patent by providing proofs of formulations from ancient Ayurveda and Unani scripts were excavated dating back to 9 th century by the joint venture of CSIR and India's TKDL.
14	Gheekawaar (Aloe vera)	Treatment of obesity	Cognis IP Management GmbH, Germany	TKDL evidences based on Rasendrachintamani (time of origin 16 th century) and other Ayurveda and Siddha books were submitted on 20 th July, 2009. The applicant withdrew its claims/patent application on 27 th November, 2009.
15	Anar (<i>Punica granatum</i>)	Anti-diarrhoea	Toyoharu Hozumi, Takao (Matsumoto): US Patent 5411733	—
16	Herbal Products: Amla, vasabr, saptrangi, bel etc.	—	Natreon Inc was granted patents for 13 claims of Amla by US Patent Office, application also filed with European Patent Office.	—
17	Pepper	Treatment of skin conditions	Patent granted by US patent office to Raman; Amala Lin; Zhixiu Robert; Charles Hider	—

Source: Shiva 2012; Mathew 2013; Bhattacharya 2014, Verma et al. 2014 and Gupta et al. 2015.

developing countries have voiced their concern in the international arena.

With the advent of technological interventions and globalization, the intellectual property rights of indigenous people have been treated as a vital issue. Patent protection for plant varieties is provided

by various international conventions such as the International Convention for the Protection of New Varieties of Plants (1961, as revised in 1972, 1978 and 1991), the International Undertaking on Plant Genetic Resources for Food and Agriculture (1983), the Food and Agriculture Organization



(FAO) Resolution 5/89, the 1994 Trade Related Aspects of Intellectual Property (TRIPS), and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGR), 2001 and The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits, 2010 (Andrews 2012; Sudha 2014) Additionally, the Convention on Biological Diversity (CBD) was adopted at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (Brazil) in the year 1992, which aims at conserving biodiversity through economic incentives and is considered as a powerful tool that can be employed for enforcing the rights of indigenous people. This convention “recognizes the intimate relationship between preservation of biodiversity and the protection of the traditional knowledge of indigenous populations” (Powell and Chavarro 2008) and considers plant genetic resources as tradable commodities which are subject to national sovereignty rights (Aoki 2009). It also includes the concept of national sovereignty over plants and animals as a basis for informed consent and benefit sharing (Andrews 2012). It is the first international treaty which provides opportunities to biodiversity rich countries to recognize benefits arising out of the utilization of their bioresources (Bhattacharya 2014).

At the National level, India enables provisions for protecting the traditional knowledge through the Biological Diversity Act, 2002. Other acts include The Patents (Amendment) Act, 2005 and The Protection of Plant Varieties and Farmers’ Rights Act of 2001 (PPVFR Act) (Sudha 2014).

CONCLUSION

Patenting of vital plant resources poses a threat to the consumers and with the advent of technological interventions, the intellectual property rights of indigenous people have become a vital issue. However, with spread of awareness, the patent protection for various plant varieties has been provided by several national and international acts and conventions in the recent past.

REFERENCES

Andrews, D. 2012. Traditional Agriculture, Biopiracy and Indigenous Rights, 2nd World Sustainability Forum, 1-30 November, 1-12.

- Anup, S. 2002. Food Patents–Stealing Indigenous Knowledge? Genetically Engineered Food, <http://www.globalissues.org/EnvIssues/GEFood/FoodPatents.asp> (Retrieved on 03-07- 2018)
- Aoki, K. 2009. Symposium: When Worlds Collide: Intellectual Property at the Interface Between Systems of Knowledge Creation: Panel II: Knowledge Creations Systems on the National Stage: “Free Seeds, Not Free Beer”: Participatory Plant Breeding, Open Source Seeds, and Acknowledging User Innovation in Agriculture. 77. *Fordham L. Rev.* 2275.
- Bhattacharya, S. 2014. Bioprospecting, biopiracy and food security in India: The emerging sides of neoliberalism. *International Letters of Social and Humanistic Sciences Online* 23: 49-56.
- Bhattacharya, S., Chattopadhyay, D.J. and Mukhopadhyay, A. 2013. Changing Dimensions of Food Security in a Globalized World: A Review of the Perspectives for Environment, Economy and Health. *International Research Journal of Environmental Sciences*, 2(3): 67-73.
- Brush, S.B. 2005. Biodiversity, Biotechnology, and the Legal Protection of Traditional Knowledge: Protecting Traditional Agricultural Knowledge. 17 *Wash. U. J.L. & Pol’y* 59.
- Gupta, V.K. 2011. Protecting India’s Traditional Knowledge. In *World Intellectual Property Organization (WIPO) Magazine*, ed Catherine Jewell C, 3, 5-8. https://www.business-standard.com/article/specials/uk-firm-seeks-patent-for-ancient-indian-tea-process-198021301052_1.html, UK Firm Seeks Patent For Ancient Indian Tea Process, Mahuya Paul, 26th February, 2013 (Retrieved on 13-08-2018)
- <http://www.law.kyushu-u.ac.jp/programs/english/newdelhi/india/VKGuptaCV.html> (Retrieved on 18-06-2018)
- http://www.tkd1.res.in/tkd1/PressCoverage/Timesofindia_Ahmedabad.pdf, Kounteya Sinha, India foils British pharma firm’s bid to patent ginger, *Times Nation*, 4th January 2012 (Retrieved on 03-07- 2018)
- <http://www.thecitizen.in/index.php/en/newsdetail/index/1/7840/biopiracy-from-neem-to-rice-to-atta-gates-and-monsanto-influence-ipr-policy>. Biopiracy From Neem to Rice to Atta! Gates and Monsanto Influence IPR Policy, Vandan Shiva 31st May, 2016 (Retrieved on 03-07- 2018)
- <https://www.thehindu.com/2004/10/12/stories/2004101203391400.htm>. India wins patent case on jute, Indrani Dutta, 12th October 2004 (Retrieved on 13-08- 2018)
- http://www.tkd1.res.in/TKDL/Conference/pdf_files/Report_of_Conference.pdf (Retrieved on 18-06-2018)
- Kothari, A. and Patel, A. 2006. Environment and Human Rights. National Human Rights Commission, New Delhi, pp. 55.
- Mathew, B. 2013. Traditional Knowledge Misappropriation and Biopiracy in India: A Study on the Legal Measures to Protect Traditional Knowledge. *International Journal of Marketing, Financial Services & Management Research* 2(12): 202-210.



- Ministry of Environment and forests. 2010. National consultations on BT brinjals: A primer on concerns, issues and prospects. Centre for environment education, India (Retrieved on 13-07- 2018)
- Powell, S.J. and P.A. Chavarro. 2008. Seventh Annual Conference on Legal & Policy Issues in the Americas: Article: Toward a Vibrant Peruvian Middle Class: Effects of the Peru-United States Free Trade Agreement on Labor Rights, Biodiversity, and Indigenous Populations. 20 Fla. J. Int'l L., 93
- Shankar, D. 1997. Traditional Medicine and Biopiracy. *Ancient Science of Life*. **17**(1): 67-71.
- Shamama, A. 2008. Biopiracy and Protection of Traditional Knowledge: Intellectual Property Rights and Beyond. Indian Institute of Management Calcutta Working Paper Series, Wps No. 629/ September 2008.
- Sudha, P.S. 2014. Combating Biopiracy of Indian Traditional Knowledge (TK) – A Legal Perspective. *Bharati Law Review*, 42.
- Verma, M., Chauhan, I., Kumari, R. and Sharma, M. 2014. India–victim of bio-piracy. *Indo American Journal of Pharma Research*, **4**(01): 1-14.
- Yusuf, M. 2010. Ethical issues in the use of the terminator seed technology. *African Journal of Agricultural Research* **9**(52): 8901-8904.

