

## ECONOMIC STAKES IN MEDICINAL PLANTS

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### ABSTRACT

*The current research works are based upon the scientific reports and research regarding medicinal plants for its ethical and economical aspects. Plant act as a main source of medicine from ancient human civilizations and thousands of plant materials are useful for mankind. This huge demand leads to start economical practices on medicinal plants which are going effects diversity of medicinal plants. The ethical aspects should be covered regarding medicinal plant research and collection which leads to sustainable achievements. Various national and international guidelines have been come from different countries regarding ethics in scientific research of medicinal plants. That's all should be considered with their suggestions as per national policy will helps to solve ethical problem in medicinal plant research.*

### Keywords

Research Ethics  
Medicinal Plant  
Countries  
Plant used

### INTRODUCTION

Research in the field of medicinal plants are emerging and fast growing trends due to its relation with human health. While discussing the use of medicinal plants in health care involves various overlapping aspects. Some of these often professional practices, conventional techniques and allopathic practices lead to directly and indirectly increase demands on useful plants for each said practices. As per World Health Organization 80% of the world's population depends on traditional medicine and in India 60% of the people in rural areas use herbal medicines (WHO, 2002). With increasing demands of medicinal plant there are also increases in research to find out new medicinal plants to get more benefits. Each day, our moral and philosophical preconceptions about the world in which we live are challenged by new discoveries and innovations. During the last few years, the use of herbal supplements increased from 2.5% to 12% (Stickel and Schuppan, 2007, Patil and Khan 2015a,b,c).

The Indian traditional medicine is based on various systems such as Ayurveda, Siddha, Unani, etc., which are still in use to provide primary healthcare, particularly to the rural folk. Ayurveda is a medical system primarily practiced in India that has been known for nearly 5000 years. It includes diet and herbal remedies, while emphasizing the body, mind and spirit in disease prevention and treatment (Morgan, 2002, Patil and Khan 2015c and Khan 2014).

Many developed countries have been expanded use of herbal medicines in the latter half of the twentieth century. Monographs on selected herbs are available from a number of sources, including the European Scientific Co-operative on Phytotherapy (ESCOP, 1999), German Commission E and different scientific technique to study medicinal plant (Blumenthal et al., 1998, P. A. Khan & M. B. Patil 2016 and Patil & Khan 2016) and the World Health Organization (WHO, 1999). Other resources that provide detailed information about medicinal plant products in current use include the Natural Medicines Comprehensive Database (Jellin, 2002) and NAPRALERT (NATURAL PRODUCTS ALERT) (2001). Information about other available databases has been published by Bhat (1995).

### ECONOMIC STAKES IN MEDICINAL PLANTS

Medicinal plant products is often cheaper to use as starting material for the synthesis of „Semi-synthetics“ drugs than pure chemical synthesis in drug industry's. Reserpine extracted from *Rauwolfia* species costs US \$ 1 per gram. Reserpine from *Rauwolfia* species has a market value that exceeds \$ 250 million a year (Ayensu 1986 and Shiva 1996). Diosgenin from the Mexican yam and its finished products are valued up to and 1 billion annually (Ayensu, 1986). The anti-leukemic drug „Vincristine“ extracted from *Catharanthus* leaves cost over \$ 220,000 per kg. And about half tone of leaves are required to extract one gram of the alkaloid. But the drug is very effective in even very small quantities. The plant produces about 1,000 times more „Vinblastine“ than „Vincristine“. *Catharanthus roseus* forms the basis of a multi-million dollar drug industry in the US today. Drugs derived from this plant bring in about US \$ 160 million worth of sales each year in US. The anti cancerous drug „taxol“ obtained from the pacific yew (*Taxus wallichiana*) and the Himalayan yew *Taxus buccata* is also being commercialized on large scale. In the US in 1973 over 40 percent of all over the counter prescriptions and sale of drugs contained an active biological compound obtained from wild or cultivated medicinal plants that originated in the poor developing countries of the south (Ayensu, 1986 and M. B. Patil & P. A. Khan 2017a). About 25 percent of all these prescriptions and drugs were derived from higher plants and were retailed at US \$ 1.6 billion. Figures for 1980 put the value of herbal drugs at US \$ 4 billion and those drugs dispensed from US Government agencies, hospitals and other legitimate channels at \$ 8.1 billion (Oldfield, 1984).

**Status of Medicinal Plant Research:** More than 3,00,000 plant species on the planet earth comprising flowering plants (87 per cent), non-flowering plants (0.32 per cent), ferns (4.4 per cent), mosses (5 per cent) and red and green algae (3.3 per cent) (IUCN online). As per a report, around 22 to 47 per cent of the world's plant species come under the endangered category (Graham, 2002).

Current estimates put 13 per cent of global flora on the verge of extinction (Hotspot Science online). Although the total number of plant species worldwide remains unknown

(estimates range from 3,10,000 to 4,22,000 species) (Table. 1 And Graph. i, ii), calculations show that between 94,000 and

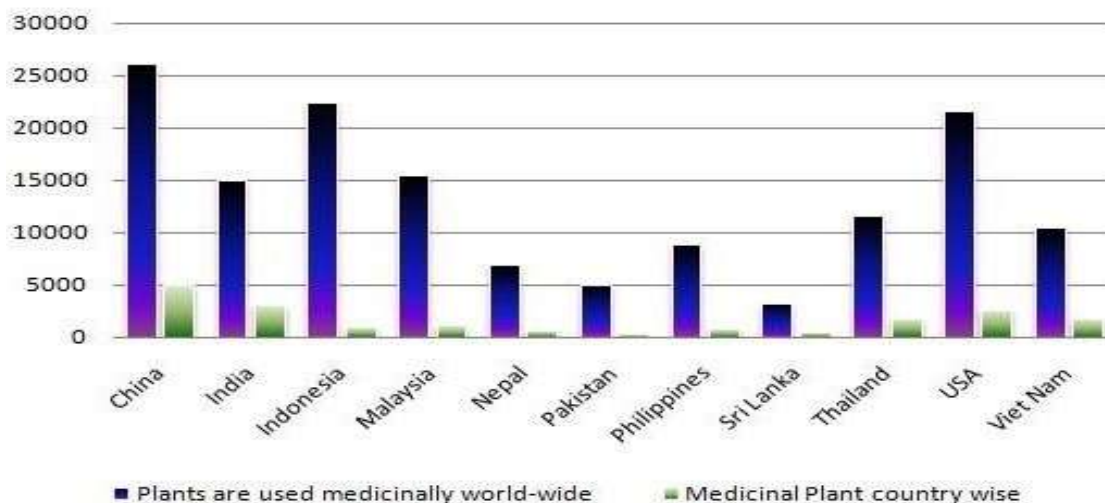
1,44,000 species are at the risk of dying out (Graham, 2002).

**Table-1 Medicinal Plant world wide**

Country	Plant species	Medicinal plant species	% (Country wise proportion)	% (Worldwide contribution)
China	26 092	4 941	18.9	14
India	15 000	3000	20.0	15
Indonesia	22 500	1 000	04.0	3
Malaysia	15500	1200	07.7	6
Nepal	6973	700	10.0	8
Pakistan	4950	300	06.1	5
Philippines	8931	850	09.5	7
Sri Lanka	3314	550	16.6	12
Thailand	11625	1800	15.5	12
USA	21641	2564	11.8	9
Viet Nam	10500	1800	12.5	9
Average	13366	1700	12.5	--
World	422000	52885	--	--

Sources: Duke and Ayensu (1985); Govaerts (2001); Groombridge and Jenkins (1994, 2002); Jain and DeFillips (1991); Moerman (1996); Padua *et al.* (1999)

**Graph. ii. All Plant Vs Medicinal Plant**

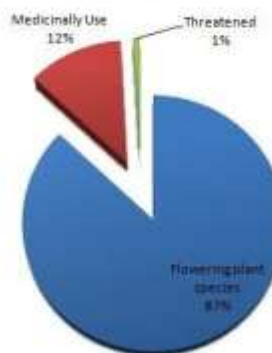


Several studies indicate mass extinction of valuable species, as we have roughly altered half of the habitable surface of the earth besides impairing and destroying several ecosystems (Raven, 1987, Myers, 1990; Daily, 1995; Singh, 2002). Walter

and Gillett in 1998 state that around 8% of medicinal plant are facing threatened categories which make risk in upcoming feature for medicinal plant bases industries and research for those plants (Table. 2. And Graph. iii).

<b>Table. 2. Medicinal plant species are threatened (FAO. 2002)</b>	
Number of flowering plant species worldwide (Govaert 2001)	422 000
12.5% of them are used medicinally	52 885
8% are threatened (Walter and Gillett 1998)	4 160

**Graph. iii. Threatened Medicinal Plants world wide**



**Enquiry:** On specific lines formulated on the spot, varying situation wise.

**Observation:** On cultigens, constructions, farm boundaries and fences, agricultural and food gathering, techniques, domestic and day to day chores.

**Interviews:** Based on three factors that is availability of plant during interview, not availability of plant and lastly with both condition.

**Participation:** Participation in various activities ceremonial and documentation of information taken for scientific lines.

**Audiovisual aids:** Participating in their feasts, festivals, other social events etc.

**Miscellaneous:** Forest personnel, school teachers, government physicians doctors, mines personnel, postal authorities and other personnel with experience in or posted in these regions were interviewed and exhaustive discussions were held with them for collecting fresh information or confirming the prior collected one.

**Questionnaire:** Based on the specific Performa designed by Jain & Goel (1995).

**Informants:** The local informants are four types, may selected by sampling and random sampling methods: (1) The medicine men, (2) Village headmen, Priests and other prominent leaders, their wives or other women. (3) Men and Women working in the field and (4) Men and Women in weekly market, temple and other common places.

## **SECONDARY METHODS FOR MEDICINAL PLANT RESEARCH**

Laboratory work mainly consisted of processing, study of morphology, dissection, identification, matching, mounting, labeling and preservation of the specimens. Main important and valuable research work will need to study anti-microbial activity, phyto-chemical activity, and therapeutic activity, anti inflammation activity and anti cancer activity for these medicinal plants. These all are the current emerging aspect which leads to research towards formation and inventions of new drugs in pharmaceutical industries for mankind. Plants and their secondary metabolite constituents have a long history of use in modern „western“ medicine and in certain systems of traditional medicine, and are the sources of important drugs such as atropine, codeine, digoxin, morphine, quinine and vincristine (M. B. Patil & P. A. Khan 2017b). These all research leads to evaluate medical research needs to more ethical backgrounds for replicable results.

Above all discussed aspects regarding medicinal plants and its research should be subject to following ethical aspects that will leads to more valuable, trustable, authentic and pure research with scientific inventions. Due to lack of ethical research in medicinal plants there is a lacuna and injustices with regards to time spending of researchers and hence lacking in the field of inventions among all scientific research even after huge number of publications.

### **Research ethics:**

Ethics can be defined as reflection on the nature and definition of “the good.” As a scholarly pursuit, philosophical and religious ethics examine the origins, priorities, emphases, and practical implications of various goods. People value different qualities and things, most obviously, but they also value their goods in different ways, in different relations to each other, for different reasons, and to different ends (Norton, Bryan. 2002). In an overarching set of values that can be identified and analyzed or achieved with careful attention are ethical dimensions (Midgley and Mary1991).

While ethics, in general, explores problems of good and evil, there exist countless ways to specify what this means, according to diverse interests and perspectives. For many philosophers, ethics is about individual conduct or character, and thus defined by questions such as “How shall I live?” or “What does it mean to be a good person?” For others, ethics refers to universal values and thus poses questions such as “What is the Good?” or “What rules can rightly apply to all moral actors or agents?” Still other ethicists focus on the process of moral decision-making, the characteristics of a good society, or the relationship between human goodness and the divine, among many other issues (Norton, Bryan. 2002).

Differences in ethical frameworks also emerge from divergent attitudes toward rationality, emotion, and science, among other matters. What unites different schools of ethics is a conviction that it is both possible and worthwhile to identify good, or at least better, ways of acting and being in the world (Leopold, Aldo. 1949, Beauchamp & Childress, 2001).

### **Types of Ethics:**

**Religious Ethical Traditions:** Probably the earliest, and still the most prevalent, way of thinking about values is religious. Religion involves ritual, symbol, community life, institutions, doctrines, and many other factors, but moral values are a central aspect of religious identity for both individuals and groups (Weston and Anthony 1997). Through religion, people think about what it means to be a good person and what a good society would entail; they find resources, support, and guidance in their efforts to live up to these values and to improve their communities.

**A stewardship ethic:** Begins with the premise that God has created the natural world for the benefit of all people. Humans are not the owners of this world, but rather are caretakers who have both special responsibilities and some special privileges with regard to created goods. Stewardship is intended as both a social ethic, to ensure that all people have their just share of created goods, and an environmental ethic that helps to preserve God’s creation(Midgley and Mary1991).

**Philosophical ethics/Social ethics:** Not all ethical traditions, of course, are religious in nature. Contemporary Western culture, including its efforts to become more sustainable, is strongly influenced by philosophical ethics. The secular tradition in Western ethics begins with the classical Greek thinkers, especially Plato and Aristotle. Social ethics, and more specifically the characteristics of a good society, is the central moral problem for these thinkers. Plato and Aristotle asked explicitly what the good life is for humans and provided

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answers that continue to influence both scholarly and popular thinking about ethics (Norton and Bryan. 2002). Their reflections began with the notion that humans are social beings whose good is only fulfilled in community. Their work does not display much interest in the issues that preoccupy many popular discussions of morality, but rather focuses on problems

of public virtue, right relationships, and good leadership (Midgley and Mary1991).

**Deontological ethics:** Most influential thinker in the Western ethical tradition which defines good practices as those that identify and follow the correct rules or uphold correct duties (deontology comes from the Greek deon, meaning duty). For deontological ethics, the likely consequences of actions do not matter in moral decision-making, and the actual consequences do not affect evaluations of the moral worth of an action. Rather, ethical judgments are based on the moral actor's intentions and adherence to duties or rules (Immanuel Kant).

**Teleological ethics:** In addition to deontological ethics, which includes rights theories, the other major model in Western philosophical ethics? This ethical systems covers decisions about what to do and subsequent evaluations of the morality of an action, based on the expected or actual consequences of a behavior (from the Greek telos, meaning end) (Weston and Anthony 1997).

**Social ethics:** Is a subfield in both philosophical and religious ethics that is primarily concerned with the ethical foundations, dimensions, and consequences of collective decisions, attitudes, and actions. It is social both because it looks primarily at decisions and actions that are collective rather than individual and personal and because it is concerned with goods that are collectively defined and achieved.

**Economic ethics:** Is a subfield of social ethics, involves collective decisions and processes. Even individual financial decisions are made only in relation to and subject to the influence of larger economic forces. Economic ethics is concerned with the moral foundations, characteristics, and consequences of economic activities and institutions (Leopold, Aldo. 1949).

**Environmental ethics:** defined as philosophical reflection on and arguments about the value of non-human nature. Environmental ethics may be concerned about entire ecosystems or regions or with smaller units such as species, individual non-human animals or plants, or landscape features such as mountains or forests. However, the usual starting point for environmental ethics is identified as the publication of Aldo Leopold's book *A Sand County Almanac*, including his essay "The Land Ethic," in 1949 (Minteer, Ben. 2006).

**Nichomachean Ethics:** In the Nichomachean Ethics, Aristotle famously defined justice as a virtue, which, like all the virtues of classical Greek philosophy, constituted a mean between two undesirable extremes. Justice is the mean between two different kinds of injustice: the injustice that takes too much and that which takes too little.

## PRINCIPLES OF ETHICS

**Polluter Pays Principle (PPP):** Is simple in concept and squarely addresses the problem of how to internalize externalities by requiring that the costs of pollution be borne by those who cause it. PPP was originally aimed at determining how the costs of pollution prevention and control should be allocated based on the concept that those causing the impacts should pay to compensate those impacted by their activities. Its immediate goal is internalizing the environmental externalities of economic activities and ensuring the prices of goods and services fully reflect the costs of production. Bugge (1996) identified four different interpretations of the PPP (The Ethics of Sustainability):

1. The PPP as an economic principle; a principle of efficiency;
2. The PPP as a legal principle; a principle of just distribution of costs;
3. The PPP as a principle of international harmonization of national environmental policy; and
4. The PPP as principle of allocation of costs between states

**Precautionary Principle:** It is often considered a foundation stone of an ethics. Precautionary Principle far predates the rise of sustainability as a global ethic in the 1980s. Words of wisdom handed down through the generations testify to the widespread endorsement of the ancient virtue of prudence. The actual term precautionary can be traced back to the German word *Vorsorge*, which mean care for the future.

**Reversibility principle:** Related to the precautionary principle according to which scientists or policymakers should not proceed on a potentially harmful course unless its consequences can be reversed. People should not make decisions, other words, that cannot be undone by future generations. A primary example of an irreversible action is the extinction of species (Midgley and Mary1991).

Sr. no.	Guidelines	Organizations	Year
1	From trials of war criminals before the Nuremberg military tribunals under control council law No. 10.	Nuremberg Code	1949
2	International guidelines for ethical review of epidemiological studies	Council for International Organizations of Medical Sciences (CIOMS)	1991
3	Guidelines and recommendations for European ethics committees	European Forum for Good Clinical Practice	1995, 1997
4	Guideline for good clinical practice	International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH)	1996
5	Convention for the Protection of Human Rights and Dignity of the Human Being with regard to the Application of Biology and Medicine: Convention On Human Rights and	Council of Europe	1997

**Table-3 Selected International guidelines and recommendations for ethical conduct in research**

	Biomedicine		
6	Operational guidelines for ethics committees that review biomedical research	WHO	2000
7	Declaration of Helsinki: ethical principles for medical research involving human subjects	World Medical Association	1994, 2000
8	International ethical guidelines for biomedical research involving human subjects	Council for International Organizations of Medical Sciences (CIOMS)	1993, 2002
9	The ethics of research related to healthcare in developing countries	Nuffield Council on Bioethics	2002

**Table-4 Selected national guidelines and recommendations for ethical conduct in research**

Sr, no.	Guidelines	Organizations	Year
1	The Belmont Report	National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (US)	1979
2	Code of federal regulations Title 45 Part 46: Protection of human subjects	Department of Health and Human Services (US)	1991
3	Guidelines on ethical matters in aboriginal and Torres Strait Islander health research	National Health and Medical Research Council of Australia (Australia)	1991
4	Guidelines on ethics for medical research, 3rd edition	Medical Research Council of South Africa	1993
5	Rule of the medical council on the observance of medical ethics	Ministry of Public Health (MOPH) Ethics Committee (Thailand)	1995
6	Resolution No. 196/96 on research involving human subjects	National Health Council (Brazil)	1996
7	HRC guidelines on ethics in health research	Health Research Council of New Zealand	1997
8	Guidelines for the conduct of health research involving human subject in Uganda	National Consensus Conference on Bioethics and Health Research (Uganda)	1997
9	Guidelines on ethical review of medical research	Committee on Research Involving Human Subjects (China)	1998
10	Guidelines for good clinical practice in clinical trials	Medical Research Council of the United Kingdom (MRC-UK)	1998

11	Tri-council policy statement: ethical conduct for research involving humans	Medical Research Council of Canada, Natural Sciences and Engineering Research Council of Canada and Social Sciences and Humanities Research Council of Canada (Canada)	1998
12	National statement on ethical conduct in research involving humans	National Health and Medical Research Council of Australia (Australia)	1999
13	Ethical guidelines for biomedical research on human subjects	Indian Council of Medical Research (India)	2000
14	Ethical and policy issues in international research: clinical trials in developing countries, Volumes I and II	National Bioethics Advisory Commission (US)	2001
15	Interim guidelines for research involving human participants in developing societies: ethical guidelines for MRC sponsored studies	Medical Research Council of the United Kingdom (MRC-UK)	2004

## IMPORTANT POINTS

- ✓ A greater awareness has emerged of the diversity of opinions on ethical issues in different socio-economic and cultural communities.
- ✓ The lack of dialogue between researchers and Policy makers
- ✓ The globalization of research requires the establishment of a body of ethical norms which are acceptable internationally but which are sensitive to cultural diversity.
- ✓ Countries will be enabled to actively participate in the international debate on research ethics as our equal partners.
- ✓ Ethical principles are universal but plurality and respect for cultural differences is also of value.
- ✓ The ethical priority must always be to ensure sustained access to appropriate, not minimum, health care for all.
  - ✓ Intellectual Property is an additional weapon in a technical world. There is a valuable role for lay members of ethics committees.
  - ✓ Community involvement should take place at all stages of research and facilitate the creation of opinion-leaders.

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