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The recording of traditional knowledge: Will it prevent ‘bio-piracy’?

Sangeeta Udgaonkar

Traditional knowledge is not protected within the patent system as it stands today. The turmeric case highlights the problems faced by India in preventing bio-piracy. The recording of traditional knowledge seeks to reduce the possibility of bio-piracy, but looks to future legislation to effectively protect the rights of the people. Some important structural changes based on a sound legal footing are proposed, which can be easily incorporated within the present databases, and would go a long way in preventing bio-piracy and protecting the interests of the knowledge-holders.

THE turmeric case, in which India succeeded in overturning a patent granted by the United States Patent and Trademark Office on turmeric powder, was a landmark in the battle against ‘bio-piracy’. It was the first case in which a Third World country succeeded in its objection to a foreign patent on the grounds that it was based on traditional knowledge known to the country for generations. By this, the attempt to secure a monopoly on turmeric powder for use in wound healing was defeated. This case threw into prominence some of the main issues concerning the position of traditional knowledge of scientific importance under the patents regime, and also highlighted the difficulty in protecting knowledge that

was known for centuries, but which was not articulated in a form found within Western cultural paradigms.

A number of consequences have followed from this case, one of which has been the effort to record the traditional knowledge of India, in an attempt to ensure that similar patents are not granted again anywhere in the world. This article seeks to analyse the effect within the patent system of such recording of traditional knowledge, and whether it will in fact, achieve the aims of its proponents. Certain problems are pointed out, and possible solutions suggested. In particular, the use of contractual provisions to overcome the flaws in the patent system might point a way to prevent cases of ‘bio-piracy’ in the future.

This article is restricted to the recording of traditional knowledge relating to plants, animals, microorganisms and other forms of life. The actual biological material,

Sangeeta Udgaonkar is at the National Law School of India University, Nagarabhavi, Post Bag No. 7201, Bangalore 560 072, India
e-mail: sudgaonkar@hotmail.com

and also traditional knowledge relating to arts, crafts, and the like are not dealt with here, as they require independent legal analyses.

The turmeric case

On 28 December 1993, an application for a patent on the 'use of turmeric in wound healing' was filed before the United States Patent and Trademark Office. Suman K. Das and Hari Har P. Cohly were shown as the inventors, and the University of Mississippi Medical Center was shown as the assignee¹. The patent was granted by the United States Patent and Trademark Office on 28 March 1995 under Patent No. 5,401,504.

The main claim in the patent was: 'A method of promoting healing of a wound in a patient, which consists essentially of administering a wound-healing agent consisting of an effective amount of turmeric powder to said patient².'

This patent was challenged by the Council of Scientific and Industrial Research, India, which applied to the United States Patent and Trademark Office for re-examination of the patent. The basic thrust of the Indian challenge was that turmeric is known to be beneficial for wound healing, it has been used for such purposes in India over centuries, and that the inventors have added nothing new to this knowledge. India claimed that the patent did not fulfil the legal requirement of novelty. India was able to show, by means of 32 documents, that the claimed new use for turmeric had in fact been well-known in India long before the filing of the patent application³. This challenge succeeded and the patent was revoked. It was thus overturned, as there had been nothing new done by the inventors, i.e. they had not in fact invented anything, and so could not be granted a patent.

The experience gained in the turmeric case has highlighted the advantages inherent in the recording of traditional knowledge. In order to understand the effect that this will have on future patents, it is necessary to analyse it in the context of the legal framework.

The legal framework

Patents are a form of intellectual property rights. These are rights to intangible property. This means that a patent seeks to reward the inventor for the *information* embodied in his/her invention, not for the physical product itself. The patent laws aim at ensuring a fair return to the inventor, while at the same time encouraging innovation and making new inventions available to the public. After the patent period is over, the invention passes into the public domain, and is then available to all. Thus, the patent system seeks to strike a balance between private and public interests⁴.

Legally, three fundamental conditions need to be fulfilled before a patent can be granted. These are: novelty, an inventive step, and industrial application. These conditions are the basic requirements for a patent in most jurisdictions around the world. These same requirements are now mandatory under the Agreement on Trade-Related Aspects of Intellectual Property Rights⁵. All these three conditions must be satisfied before the grant of a patent can be considered – if even one of them is not fulfilled, the patent application must fail.

Novelty

A patent cannot be granted if the claimed invention lacks novelty. In other words, the claimed invention must be new⁶. It is necessary for the inventor to satisfy the patent office that what he/she has invented has not been used or known before. This is done by the inventor, by disclosing previous work done in the same field (known as 'prior art') in his/her patent application, and showing how the particular invention sought to be patented is different from such prior art. A very important aspect of the requirement of novelty, and one that has a major role to play in cases where the patent is derived from traditional knowledge, is that the novelty requirement need not involve a major departure from prior art. A very small change made in prior art could also bring the invention within the novelty requirement⁴. In addition, a new use for an existing product is also independently patentable⁴.

Non-obviousness

This is also referred to as the requirement for an inventive step. The invention sought to be patented must be non-obvious. The question, of course is, non-obvious to whom? It has been held that the test to be applied is whether a person ordinarily skilled in the art would have felt that the claimed invention was obvious⁷. Patents are meant to be a reward for human ingenuity. It is therefore necessary to show that what is invented is something which another person in the field would not ordinarily have done; that the inventor has done something special.

Utility

The invention must have some industrial use. To grant a patent it is necessary that the invention must be commercially useful in some way, otherwise the question of protecting it by granting a monopoly does not arise.

The wider issue of 'bio-piracy'

There is an almost infinite number of plant, animal, and microorganism varieties in the world today. We do not

even know all the species that are living on this planet. Estimates vary, but between 4 and 40 million species are unknown⁸. New species are being discovered even today. In all this diversity, a company that wishes to develop a new product often makes use of the knowledge of local people in the form of traditions, folklore, etc. in deciding upon a plant, animal or other biological source to study. If the study fructifies into a commercially useful product, the company applies for a patent in its own name on this product. The inventor generally does not even acknowledge in his patent application that his product was derived from information provided by a particular community. In such a situation, the economically rewarding product very likely would not have been found at all had it not been for the knowledge resource of the local population. Yet the commercial gain is entirely that of the company. This use of traditional knowledge as a basis for products of commercial value, which are then patented without sharing any benefit with the source of the traditional knowledge, is what is generally termed 'bio-piracy'.

The question is, how best to ensure that the rights of the local people are protected from 'bio-piracy', given the present patent system. The Law Commission of India in its Report has said that there is a need to recognize indigenous rights and to develop appropriate and effective legal mechanisms to provide intellectual property rights and economic benefits to the informal innovators⁹.

Legal obstacles

Traditional knowledge of biological material, however, cannot be patented *per se*. There are several reasons for this. Firstly, the principles of patent law were established when rapid strides were being made in manufacture, and new inventions were aiding industrial development. It was the consistent legal view that patents could not be granted on living things or on products of nature. It has only been with the advent of biotechnology in the past two decades that this view has changed¹⁰. Traditional knowledge based on the properties of plants, animals, etc. being based on life forms, was thus historically not patentable. As a consequence, even if a person had wished to patent his traditional knowledge he could not have done so. This 'product of nature' doctrine would apply under the Indian Patents Act 1970 as well, although there is no express inclusion or exclusion of life forms in general from patentability¹¹. Secondly, in order to patent the knowledge now, it must be novel today, in the sense that it must not be known to the public. Traditional knowledge by its very nature is knowledge that has been known over a long period of time and therefore it lacks novelty. For both these reasons, it cannot be brought within the ambit of patent protection, as it exists today.

It is difficult to reward traditional knowledge within the patent system. When the knowledge was discovered, no one could reap the commercial benefits that the patent system gives. Today it is too late – the knowledge is now in the public domain. The patent system gives the entire economic benefit to those who have only slightly altered the traditional knowledge and gives nothing at all to those who developed it over generations to its present form. That is why the term 'bio-piracy' has met with such widespread acceptance.

The technicalities of proving the three fundamental patent requirements may also vary from country to country. For example, in the United States documentary proof is necessary to show novelty outside the country. Oral knowledge is not considered novel if it is found abroad, but it is considered novel if found in the United States¹². India has no such requirement, and now the proposed amendment to the Patents Act, 1970 seeks to state explicitly that oral evidence is acceptable¹³. As the turmeric patent had been filed in the United States, the patent law as found in the United States applied. This meant that it was necessary to produce *documentary* proof that spoke both of 'turmeric powder' and 'wound-healing' (the words used in the claim), other terminology being inadequate to satisfy the patent law.

Recording of traditional knowledge

The turmeric case has highlighted the difficulties faced by the holders of traditional knowledge in getting due recognition and reward/benefit for their knowledge within the present legal system. One major difficulty faced by India was in proving the traditional knowledge relating to turmeric itself. Since traditional knowledge is often not easily accessible, and is also not necessarily in a written form, it is very difficult to locate and prove. There was also the necessity of translating the documents once found.

India may consider the use of turmeric in wound-healing to be well known. In fact the case has been in the news here precisely because the use of turmeric for wound healing is so widely known that to an Indian, granting a patent for such use is clearly wrong. As the *Matsya Purana* said, as early as in the 8th Century AD, 'All poisons can be removed from the human body if treated with a paste of turmeric'¹⁴. However, a patent office abroad may consider the same use to be novel – when unknown to that office. When the particular use of turmeric for wound-healing was brought to the attention of the United States Patent and Trademark Office with a request for re-examination accompanied by proof, they did revoke the patent they had granted. Thus, had the documents been easily accessible by the Patents Office earlier, the patent would very likely never have been granted and no problem would have arisen.

One solution to the difficulty of proving traditional knowledge, and one that has gained widespread acceptance, is that of making a written record of the traditional knowledge available in India today. This, it is hoped, would prevent the recurrence of such patents. A major effort in this regard is under way, given an added impetus by the experience in the turmeric case. There are a number of such endeavours under way, one of them being the Traditional Knowledge Digital Library, which aims at recording traditional knowledge in digital form and linking it to an internationally accepted patent classification system for ease of searching and information retrieval³. Another example is the People's Biodiversity Register¹⁵.

Utility of recording traditional knowledge

By recording the traditional knowledge, legally, it becomes public domain knowledge. Under the patent law, this means that it is considered to be prior art and hence is not patentable. Such a written record, in a form easily accessible to patent offices around the world, would provide all such offices with a record of India's prior art. Patent examiners could easily check this database and reject any patent application that might be a mere copy of traditional knowledge. Being in document form, it would be acceptable to patent offices that insist on a written record of prior art, as in the United States. To this extent it would prevent cases of 'bio-piracy'.

Such a database would also serve the purpose of integrating the various documents related to traditional knowledge in a common language and in an easily retrievable form. It would be of enormous benefit in developing the traditional knowledge further. Such a rich database of information would be extremely useful to research and industry, both in India as well as abroad, providing an impetus to invention³, and the development of products such as medicines, which would be of immense value to all of mankind – not just to the country that produces them, but also to the rest of the world, including India and other developing countries. It would also serve the very important function of ensuring credit to India for its centuries-old traditional knowledge.

Limitations of a traditional knowledge database

Any database, of course, would not be perfect. One difficulty with the recording of traditional knowledge is the sheer amount of it that India possesses. It is important to remember that everything cannot possibly be recorded. There are many serious obstacles. Traditional knowledge is widespread, India is vast, old texts are difficult to translate, the same plant is named differently in different regions, to name only a few. Another requirement of a comprehensive database would be that

for every possible species, every possible use known under the sun be documented. For example, topical application of turmeric for the treatment of scabies was referred to in the patent claim², but knowledge of this use of turmeric powder was not adequate to preclude a patent for its uses in wound-healing. If the specific uses claimed were not included in the database, it would not be adequate. Thus, while recording traditional knowledge is the aim, it is virtually impossible to record everything. But a very comprehensive database can be built up by selectively recording the knowledge relating to some specifically chosen species or area. Any database, however, cannot be complete. This is a factor necessary to take into account, if it is to be used as the sole source of prior art.

The terminology used in traditional knowledge is another problem. Apart from the difficulties inherent in translation, traditional words used are often general in nature and cannot be equated always with the present medical terminology – one word or phrase may cover several different types of a particular disease. For example, Indian old texts use various general words for a liver complaint, while the Western world today uses the terminology 'Hepatitis A', 'Hepatitis B', 'Hepatitis C', etc. Thus, while a particular plant may be genuinely effective and prescribed over centuries in India for liver problems, the Western world may refuse to accept this as prior use and may say that since words, like say 'Hepatitis B' were not used in the traditional knowledge system, such a use is novel today¹⁶. Thus cases of patents being assessed solely within the Western cultural paradigm cannot be ruled out. A traditional knowledge database would not be useful in such cases. It would serve the purpose of the innovator or entrepreneur much better than that of the traditional knowledge holder. In such a situation, the database would serve only to encourage 'bio-piracy'.

Impact of biotechnology on traditional knowledge

The patent law permits small improvements on previously existing knowledge, provided that any such improvement shows an inventive step. The new developments in biotechnology are ideally poised to provide that inventive step. For example, isolating the active principle of a plant could be sufficient to make it patentable as something new, above and beyond the existing knowledge. In such a situation, where biotechnology is forcing us to re-think the concept of life itself, a traditional knowledge database would serve to channel the flow of traditional knowledge to foreign lands for patenting after minor changes. It would not serve the purpose of preventing further misappropriation of Indian traditional knowledge, but would instead be used

as source material for such misappropriation. As long as the person drafting the claims was careful of the language used, the database would encourage 'bio-piracy', not prevent it. It would thus become a major conduit for 'bio-piracy', completely contrary to the intentions behind it.

Had the turmeric patent, for example, been drafted after the traditional knowledge database was completed, it could have been ingeniously worded in such a way that it did not use any of the specific terms found in that database. Human ingenuity, in particular, lawyers' ingenuity should not be underestimated. It was because the claimants in the turmeric case did not have the documents referred to by India before them in an easily accessible form while drafting the patent application that the patent could be re-examined and revoked on the basis of those documents.

It would be fallacious to generalize from the turmeric case to all cases of 'bio-piracy'. Legally, the turmeric case is in fact a very simple, straightforward example of a patent being wrongly granted by a patent office, which is then revoked on proof of prior use. But this does not mean that no patent exists on turmeric today. A number of different patents have been granted on turmeric, the above case being only one of them. Others still stand, even today¹⁷.

Thus, the recording of traditional knowledge as it is currently envisaged will not necessarily have the desired effect of stemming 'bio-piracy'. In fact, there is a grave danger of it having the opposite effect. At the same time the advantages inherent in having easy access to the information contained in traditional knowledge cannot be denied. In order to be able to obtain all the advantages of a traditional knowledge database without fear of it being used as a source of 'bio-piracy', it is necessary to incorporate certain conditions regarding access and benefit-sharing within the structure of the database itself.

Free distribution of traditional knowledge

A common objective of most attempts to record traditional knowledge is that the community's knowledge would be made freely available to all, and in exchange the community concerned should get the credit for its information¹⁸. The expectation is that, with a written record of its information, the community will then be able to pursue a claim for benefit-sharing in any product that may be developed from the information, as and when the laws in this regard are in place. For example, the People's Biodiversity Registers ideally aim at co-ownership of the local people in the database, giving them rights to accession fees and a share of the commercial benefits resulting from their use. The legal framework for this would, however, have to be provided

by such legislation as the Biological Diversity Bill 2000, which is still pending before the Parliament. Supportive international policies and legislative frameworks would be needed¹⁸. Another view is that undisclosed information or trade secret provisions may be used to protect any traditional knowledge that is not in the public domain. However, public domain traditional knowledge is seen to require *sui generis* intellectual property rights³.

The underlying assumption would be that the public domain traditional knowledge *per se* has no economic value today – that only further research on the knowledge culminating in commercial products would have value. The published knowledge becomes merely a stepping-stone to developing the products that might then be patented.

But it is not necessary that knowledge be patented for it to have a value. The knowledge to be included in the database is the intellectual heritage of Indians. It is the result of Indian innovation, intelligence and effort, which has remained unacknowledged until now. Had the people holding the knowledge been a large company having, say, information vital to the cure for AIDS, could such a situation arise? To get the formula of a substance, modify it slightly so that it has a longer shelf life¹⁹, and sell it in the market at a profit without giving more than a token acknowledgement (if any) to the company which is the source of the information would be unheard of; indeed it would be considered unethical. In practice, the company would refuse to part with the knowledge without first laying down stringent conditions as to its use and the method of payment.

A similar approach may be adopted with respect to traditional knowledge. It is the right of all those who hold knowledge, traditional or otherwise, to part with it only on condition of adequate compensation. This right must be asserted at the outset itself, at the time of permitting access to the information. To fight for compensation at the end, after distributing the knowledge broadcast or after the product is developed, is to fight a losing battle. Furthermore, where the recording of traditional knowledge is already under way, it would be unwise to wait for legislation to assert the rights of the people.

Necessity of access conditions

Recording traditional knowledge in the manner in which it is being done at present would result in making a free gift of India's traditional knowledge to the rest of the world, no doubt for the greater good of mankind. This is a very laudable objective. But when we seek to distribute traditional knowledge to the world, we must remember that we are not on a level playing field. India is far behind the Western world in the development of biotechnology products for commercial use. True, it is

fast developing in this area, especially given the support of the government. But Indians have one great advantage – traditional knowledge. This is India's heritage. In a few short years it can be used fruitfully in Indian laboratories and by companies owned by Indians in India, perhaps with collaboration from the outside. Such research has already started. We would be throwing away a great advantage if we simply give it away now, when Indians are just starting out in the field.

Biotechnology requires large inputs of money. It is expensive research. Traditional knowledge was protected for a large number of years primarily because it was in Indian languages not readily accessible to the rest of India, let alone to foreigners. To give away our heritage at a time when India is poised to use it to its fullest, would be a great shame – people abroad would be able to use it faster because they have more laboratories which are better equipped. The patent law generally gives the economic benefit to the person who files a patent application first²⁰. Thus handing over information free and without any conditions attached at this stage would simply put Indians out of the running in the competitive global market place.

What is needed is a system that combines easy access to traditional knowledge with payment for the use of that knowledge and this in turn opens the door to future benefit-sharing. Contract law is best suited for this. At the stage of access it may not be known how to distribute any eventual benefit or on what basis to charge it or what form it should take. This does not mean that the right to benefit-sharing cannot be asserted at all. An undertaking to share any future benefits can be obtained in general terms at the time of access itself, and the details may be left to be worked out later, after the knowledge has led to a commercially viable product. The recording of knowledge and the conditions for its dispensation must go hand in hand.

The legal mechanism

It is not necessary to make access to a traditional knowledge database available unconditionally or free of cost. What is necessary is that getting access to it should be easy, say over the Internet. People will be inclined to use such a database, as it would save them a lot of trouble, expense and time. Moreover, it would be perhaps the only major Indian resource easily available in a single international language.

The access conditions and terms of compensation must be integrated into the very structure of the database itself. Any person who wishes to access the database must be required to first agree to certain conditions – one of them being eventual compensation to the source of the knowledge. The point of access to the information is the one point at which we can justifiably

impose conditions – conditions which will be legally binding on others and can be enforced without the need for special international treaties, legislation, international cooperation, etc. A traditional knowledge database would provide a very good place to lay down conditions as to possible future benefit-sharing, non-disclosure, etc. These access conditions could be independent of any Material Transfer Agreements or proposed legislative measures.

One major advantage of such a system would be its flexibility. It would be possible to have different terms and conditions for different categories of users such as academics, companies, patent officers, etc. Another area of flexibility would be in relation to knowledge that might be held by various communities who want different conditions imposed for access. An electronic database could integrate all this knowledge into one system, while imposing variable conditions for access to various sections of knowledge. It could therefore integrate all the disparate efforts to record traditional knowledge that are being pursued today.

Such a system of access would give a strong contractual basis for future claims and their enforcement. The law of contract is well established and well understood in most jurisdictions as well as in relation to international transactions. It is better to rely on a clear and detailed contract than on the tenuous interpretations of the patent law. This would give a stronger legal underpinning to future claims for benefit-sharing.

It would also obviate the necessity of waiting for adequate legislation to be enacted before any claims are made to benefit-sharing. Enacting legislation is a long drawn-out process, and at the rapid pace at which biotechnology is developing today, biotechnology will very soon outstrip any law that may be framed with today's developments in view. Furthermore, to prevent access to traditional knowledge while awaiting legislation would hinder the progress of research into vital areas such as medicine.

Requirement of confidentiality

An essential condition for imposing such access conditions is that what has been or is being recorded should not be published without first putting the access conditions in place. It should be kept strictly confidential until then, and control of the database should be in India. A search of the database may be conducted after agreeing to the relevant terms and conditions and after paying the requisite search fee. This can be done even if the database is made available over the Internet. In this manner we can make the database available to patent offices around the world as well as to researchers and scholars, but at the same time retain control of the knowledge for the purpose of benefit-sharing.

Such a system would not hinder the recording of knowledge. It would make this knowledge available to all. The problem of showing lack of novelty would be solved, as in any patent application arising out of traditional knowledge, Indian documents could be referred to as prior art, and the benefit-sharing obligation would also be imposed. If, for example, the database had been in place before the turmeric patent was granted, the United States Patent and Trademark Office could have searched the database and rejected the patent application itself. There would have been no need for anyone in India to file an application for re-examination. On the other hand, let us assume that the inventors had conducted a search of the database before drafting their patent application and had carefully worded it, so that it did not appear to be covered by prior art. In such a situation, the access conditions imposed would make it incumbent on them to share any benefit they might gain from the patent with the knowledge holders. Once again, the need to challenge the patent would not arise.

Finally, making a database is not cheap. The amount of money, time and effort involved in this massive exercise makes it very important to make a serious attempt to ensure adequate returns to India from the knowledge. The information recorded has at least the value of the money spent in gathering it. When public money is spent, a thought must be given, at minimum, to the possibility of recovering the costs.

Conclusion

The recording of traditional knowledge is taking place today. It is imperative that the method of recompense be in place before the information being recorded is made public. Failure to do this would be doing a grave injustice to those who developed this knowledge through generations.

Traditional knowledge is in demand as a source of information of the possible properties of biological material. It is valuable knowledge. We should place its value high, not devalue it completely by giving it away free. Unless we do so, no one else will acknowledge that it has any value at all. Intellectual property rights, including patent rights, are rights over knowledge. We have that knowledge. Let us not give up our rights. In dealing with patents we are dealing with a law designed for businessmen. Let us also have a business-like approach to the problem. By designing the structure of the traditional knowledge database appropriately, it is possible to make the knowledge available to all and at the same time retain the control necessary for benefit shar-

ing to be operationalized. This would go far in ensuring that cases of 'bio-piracy' are prevented in the future.

1. United States Patent Application No. 174363.
2. United States Patent No. 5,401,504.
3. Mashelkar, R. A., *Curr. Sci.*, 2001, **81**, 955–965.
4. See in general Roy Chowdhury, Salil, K. and Saharay, H. K., *Law Relating to Trade Marks Copyrights Patents and Designs*, Kamal Law House, 1996.
5. Article 27 in Section 5 of the TRIPS Agreement states: '*Patentable Subject Matter* – 1. Subject to the provisions of paragraphs 2 and 3, patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. Subject to paragraph 4 of Article 65, paragraph 8 of Article 70 and paragraph 3 of this Article, patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.'
6. See Section 2(j) of the Indian Patents Act, 1970.
7. *Press Metal Corporation Ltd v. Nashir Sorabji*, AIR 1983 Bom. 144
8. Sharma, Manju, *New Biosciences: Opportunities and Challenges As We Move Into The Next Millennium*, Indian Science Congress Association, 1999.
9. Law Commission of India, Report on Patents (Amendment) Bill, 1998, 25 February 1999.
10. The product of nature doctrine was questioned only in 1985 in the leading case of *Sidney Diamond vs. Ananda Chakrabarty*, 447 US 303. The United States Supreme Court said, while granting a patent in respect of a genetically engineered bacterium, that anything under the sun made by man could be patented, irrespective of whether it is living or not.
11. But see clause 4 (e) of The Patents (Second Amendment) Bill 1999, which is still pending before the Parliament.
12. See 35 USC 102.
13. See The Patents (Second Amendment) Bill, 1999, Clauses 17(a) and 28(a).
14. Sairam, T. V., *Home Remedies*, vol. I.
15. See Ghate, Utkarsh, Gadgil, Madhav and Sheshagiri Rao, P. R., *Curr. Sci.*, 1999, **77**, 1418–1425.
16. This argument has been used in the case of the patents granted in respect of *Phyllanthus niruri*.
17. For example, United States Patent No. 6,277,881 (turmeric as an anti-irritant in compositions containing hydroxy acids or retinoids), United States Patent No. 6,048,533 (turmeric for treating health ailments), or United States Patent No. 5,897,865 (turmeric for treating skin disorders).
18. There are some exceptions – see for example the register of the Pattuvam village in Kerala (see Alvares, Claude, *An Indian Village Bucks GATT over Control of Genetic Resources*, Third World Resurgence No. 84, p. 11).
19. As in United States Patent No. 5,124,349 (storage-stable azadirachtin formulation).
20. The main exception to this practice is the United States where a patent is granted to the person who is the first to invent, not the first to file.

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