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Original Article

Preserving Indian Knowledge Systems (IKS): A Case Study of Traditional Knowledge Digital Library (TKDL)

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Abstract

This study looks at the Indian Knowledge System (IKS), which is regarded as one of the oldest and richest traditions in the world. The Vedas, Upanishads, Ayurveda, Siddha, Unani, Yoga, mathematics, astronomy, agriculture, and environmental knowledge are all included in its scope. Globalization, intellectual property rights violations, and "biopiracy"—the unlawful misappropriation of biological resources—have made it imperative to protect this knowledge. Examples of this include incorrect patent applications for yoga, ashwagandha, turmeric, neem, and basmati rice. In light of this, the Ministry of AYUSH and the CSIR collaborated to start the "Traditional Knowledge Digital Library" (TKDL) initiative. During this project, million formulas and procedures of the Ayurvedic, Siddha, Unani and Yoga systems were digitized and compiled to form a multilingual Ayurvedic and Yoga database. This information is provided to the international patent offices (such as WIPO, EPO, USPTO, etc.) so that they can prevent issuance of incorrect patents. This has enhanced the preeminence of the Indian Knowledge System in the global arena by providing digital access to such a huge quantity of data to researchers. Consequently, the TKDL has turned out to be a significant and innovative program for the preservation, conservation and propagation of Indian Knowledge System.

Keywords: *IKS, TKDL, Digital Library, Digital Preservation*

Introduction

The Indian Knowledge system (IKS) is one of the ancient and rich traditions. India has carved niches and made remarkable achievements in the Vedas, Unani, Siddha, mathematics, astronomy, environment, agriculture, cultivation and Upanishads. This knowledge heritage has been preserved through oral traditions, cultural usage and documentation. In this globalized world, issues such as "biopiracy", misuse of intellectual property rights and the appropriation of knowledge are making it hard to protect the knowledge of these benefits – as demonstrated in applications for intellectual property rights to yoga techniques, turmeric, neem, ashwagandha (garcin) and Basmati rice. Therefore, technical means have an aspect required for protection of this intellectual heritage of India. Both the Ministry of AYUSH and the Council of Scientific and Industrial Research (GoI), Government of India, have joined hands to develop Traditional Knowledge Digital Library (TKDL) to ensure this protection. The TKDL has digitalized millions of Ayurvedic, Siddha, Unani and Yoga formulas and created multilingual database. This database is open to international patent offices, such as WIPO, EPO and USPTO, in order to prevent incorrect patents from being granted. The TKDL has made made istizenship in the field of Indian knowledge traditions. There is a contribution of providing digital data on traditional medicinal compositions to the researchers and also a report for the tangible proof to avoid "biopiracy". The TKDL project, in conclusion, has proven to be an essential and good initiative to preserve, protect and disseminate knowledge systems of ancient India.

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Review of Literature:

In the WKPO Journal (2010) the Indian experience of such scenario was explored, and it was seen how the TKDL managed to block false patent applications for Therapeutic plants like Ashwagandha, Neem and Turmeric. The CSIR-TKDL study says that 350,000 Ayurvedic, Siddha, Unani and Yoga formulations have been digitized and made available in various languages such as Sanskrit, Hindi, Tamil, Urdu, English, Spanish, French, German and Japanese. This has now enabled the academics from around the world to avail the knowledge history in India. In the research paper entitled Manuscript Heritage of India", **Medhi (2025)** highlights the importance of digital archives for the preservation of Indian manuscripts. The TKDL is a fine example of a knowledge repository that can ensure the perpetuity of knowledge. **Das** 2026 explored the use of digital technologies in the TKDL such as text mining, machine learning and OCR. He illustrated with an example the use of TKDL in the application of traditional knowledge in modern study. Mall (2025) emphasized that the TKDL is an innovative initiative in library and information science, and the importance of library systems in safeguarding Indian intellectual heritage. There is an international appreciation of Indian medical heritage, and **Sureshkumar, Girishkumar, and Jayalakshmi (2026)** praised TKDL as a crucial tool to promote Indian knowledge heritage and practices internationally.

Objective:

1. To describe how TKDL contributes to the transmission and preservation of India's knowledge heritage.
2. To evaluate TKDL's efforts to stop "biopiracy."
3. To describe how TKDL operates, it's multilingual nature, and the function of international cooperation.

Scope and Limitation:

This investigation was based on the information provided on the official website of TKDL. The focus of the study is digitisation and comparison of the medicinal formulations-Ayurvedic, Siddha, Unani and Yoga and its extent and operation. Besides, it discusses collaboration with international patent offices to protect and popularize the knowledge culture of India internationally.

Research Methodology:

This study adopted multi-method approach to investigate the data available on the Traditional Knowledge Digital Library (TKDL) website. Before objectively comprehending TKDL and IKS (Indian Knowledge Systems) literature study was done first to explore the research papers, the report, and the official document in relation to them. Finally, a 'case study' methodology was applied to gain deeper insights into selected parts of the TKDL such as turmeric, neem, ashwagandha and yoga. In addition, a qualitative study was carried out to see the strategic impact of the TKDL; This showed that the approach has proved to be effective for "biopiracy" (unlawful utilization/misappropriation of biological resources). Finally, the comparative study of methods and interventions of the TKDL was conducted which proved the effectiveness of this system.

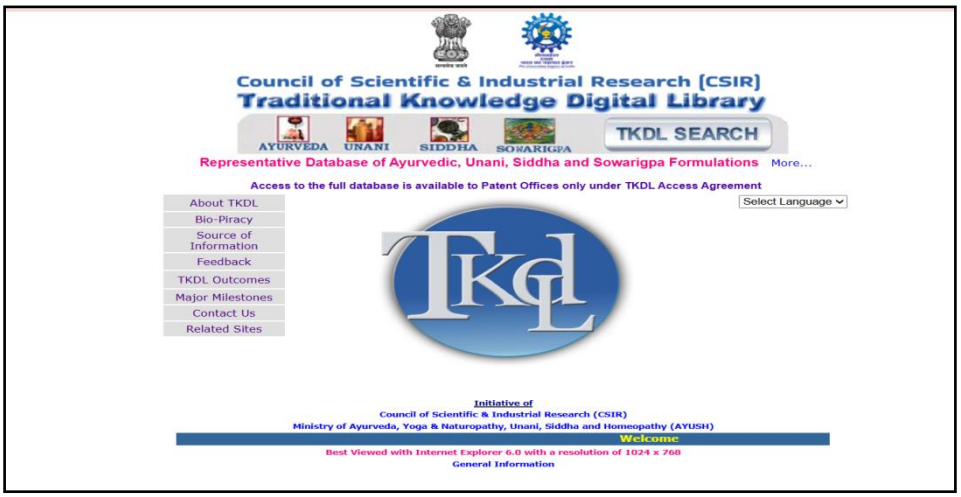
Elements of Case Study:

1. **Historical Background:**

In 2001, the Ministry of AYUSH and the CSIR jointly developed "Traditional Knowledge Digital Library" (TKDL). This initiative's main goal is to digitize traditional Indian medical knowledge and preserve it globally. The TKDL was largely motivated by the improper patent applications for medicinal plants like ashwagandha, neem and turmeric. The aim of TKDL is to use up to date technologies to preserve Indian knowledge practices. Consequently Indian medical traditions are now the famous in the world and practical steps have been taken to prevent "biopiracy".

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Figure No. 1: Home page of TKDL



2. **Database Structure:**

Already, TKDL has digitized almost 3.5 lakh formulas from Ayurveda, Siddha, Unani and Yoga. Information is available in multiple languages like Sanskrit, Hindi, Tamil, Urdu, English, Spanish, French, German and Japanese in this database. The world's largest database of traditional medical knowledge (TMK) has been built using OCR, XML and metadata technology, and is called the TKDL. The information on the inside is readily available to the researchers and can be offered as evidence to foreign patent offices to exclude granting of wrong patents.

3. **International Collaboration:**

The TKDL has signed partnerships with major patent offices across the globe such as WIPO, EPO, USPTO, JPO, etc. The cooperation is made to avoid the granting of wrong patents in reference to the TKLD. The TKDL has strengthened the efforts of the world in preserving the Indian knowledge traditions. This partnership has made Indian medical traditions more visible on the worldwide stage and enhanced India's opposition to 'biopiracy' (unlicensed practices involving the use of biological resources).

4. **Major Case Examples:**

The TKDL in several instances has successfully put a stop to biopiracy. This evidence provided by TKDL led to cancellation of a therapeutic application patent in USA for turmeric. In Europe, the TKDL was used to get a patent for neem oil's pesticide qualities revoked. With regards to Ashwagandha, the TKDL referred to an ayurvedic formulation, and as a result the patent application was withdrawn. Using TKDL data, attacks were levelled against a US patent on Basmati rice variants. Evidence of TKDL has also been used to reject Yoga 'asanas' patent applications. These all illustrate the successful role of TKDL.

Impact Analysis:

Preservation of the knowledge heritage of India on global platform has succeeded through the efforts of TKDL. It has significantly contributed to oppose biopiracy. Current research has resulted in the planting of traditional medical formulas that can be accessed online. The medicinal practices of the Indians are well known all over the world. The TKDL has helped India shift to a better place on IPR. This has led to a better treatment of Indian knowledge traditions in their conservation and diffusion.

Challenges:

The TKDL faces certain challenges, though. This database is not open to the public, therefore a researcher will not have a free hand in accessing this database. Translation of ancient documents is not an easy task. Funding is also an issue, and there is a lack of skilled personnel. Overcoming these issues would increase the TKDL's effectiveness.

Future Directions:

Through AI and machine learning, TKDL will soon be able to offer full text mining capabilities as well as automated interpretation services. The study which technical elites talked about the provision of 'open access' will further help the access to the study. In order to enhance its relationship with various research institutions abroad, TKDL will put a lot of effort into maintaining this partnership with a variety of organizations around the world. Continuing information to the general population with public awareness activities on TKDL will help.

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TKDL Case Study:

1. Turmeric Case:

There is an ongoing U.S. patent application on the therapeutic properties of turmeric. The TKDL, however, revealed many such instances in Ayurvedic literature where the usage of turmeric in medical requirement has been practiced for ages. The patent application was refused after the facts were analyzed based on the information provided by the TKDL. The TKDL thus not only helped in preventing the phenomenon of 'biopiracy' (unauthorized use of biological resources), but also in protecting traditional medicine in India.

2. Neem Case:

The beneficial characteristics of neem oil were the topic of a European patent application. In the case, the applicants stated that neem oil use in farming was a novel invention. The pesticide application of neem oil is not new however; this is backed by research carried out by the TKDL (Traditional Knowledge Digital Library) and suggestions in Ayurvedic scriptures. The patent was turned down by the EPO. It is quite important to mention here that this instance reflects the importance of TKDL in preserving the Indian agricultural/medicinal knowledge.

3. Ashwagandha Case:

One application was already filed in a European patent application based on the properties of neem oil. The petitioners stated that the use of neem oil in agriculture was an invention that was new. The application of neem oil in pesticide use however is not new; it is proved by research conducted at TKDL (Traditional Knowledge Digital Library) and as indicated in Ayurvedic texts. European Patent office Opposed the patent Application. This is a testament to the importance of TKDL in preserving India's traditional knowledge in agriculture and medicine.

4. Yoga Postures Case:

Multiple yoga poses are being patented. The candidates have claimed that their poses were innovative. But the TKDL backed up evidence from ancient yoga literature of these very postures. Therefore, the patent applications have been denied. The TKDL thereby helped to recognise Yoga as an international treasure and maintain Indian yoga.

Table No. 1: Comparative study of TKDL vs. Biopiracy Cases:

Case	Type of Biopiracy	Contribution of TKDL	Outcome
Turmeric	Patent application filed in the US for the medicinal properties of turmeric.	TKDL provided references from Sanskrit and Ayurvedic texts	Patent revoked; Indian knowledge protected
Neem	Patent on the pesticidal properties of neem oil in Europe	TKDL presented evidence and Ayurvedic formulations	Patent revoked; traditional knowledge of neem safeguarded
Ashwagandha	Patent applications for medicinal uses at the international level	TKDL provided formulations and treatment methods from Ayurveda	The patent application was withdrawn
Basmati Rice	Patent on Basmati rice variety in the US	TKDL provided evidence regarding agriculture and traditional knowledge	Patent revoked; India's agricultural heritage secured
Yoga Postures	International patent applications for certain yoga asanas	TKDL provided evidence from yoga texts	The patent application was rejected

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Table No. 2: Comparison Chart: Biopiracy vs TKDL

Aspect	Biopiracy	TKDL (Traditional Knowledge Digital Library)
Definition	Unauthorized commercial use of traditional knowledge and biological resources belonging to local communities.	An initiative to protect and disseminate Indian traditional knowledge globally through digitization. |
Process	Filing patent applications for medicinal plants, crops, yoga postures, etc., and claiming them as "novel inventions	Digitizing formulations and practices from Ayurveda, Siddha, Unani, and Yoga to create a multilingual database.
Impact	The knowledge and resources of local communities are jeopardized, and cultural heritage falls victim to exploitation.	Biopiracy is prevented, and Indian knowledge traditions gain global recognition.
Examples	Erroneous patent applications regarding turmeric, neem, Basmati rice, and yoga postures	Patent applications have been cancelled or rejected because of the evidence provided by the TKDL.
Role	Violation of intellectual property rights and commercial exploitation.	A protective tool that provides evidence to international patent offices.
Future Directions	There is a need for stringent laws and policies to curb biopiracy.	More effective preservation through AI, open access, international cooperation, and public awareness initiatives.

Conclusion:

The preservation of India's knowledge traditions on a global scale will have gained a tremendous impact from the TKDL. The TKDL's evidence led to withdrawal of the cancellation of bogus patents of turmeric, neem, ashwagandha, Basmati rice and yoga. This not only helped India to combat unauthorized misappropriation of biological resources (also known as 'biopiracy') but also helped in safeguarding the medical and cultural heritage that India owns. Through various initiatives of digitization, multilingualism and international cooperation, awareness about Indian knowledge system traditions has spread all over the world with the help of TKDL. The TKDL has put traditional medicinal compositions on the digital platform for researchers while India continues to build its position internationally with respect to IP Rights. The TKDL has its unwelcome features, however—namely, it is closed to 'open usage,' as the quality of the translation is sometimes compromised, it has limited resources in terms of funding and staff, and the public is not aware. In the future the efficiency of the TKDL could be enhanced with the integration of machine learning and artificial intelligence. Increased influence in the future could be achieved through the provision of Open Access portals and International Cooperation as well as through the increased public participation in Awareness activities.

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Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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