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A Selective Review of Scholarly Communications on Palm Leaf Manuscripts

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Abstract - The very purpose of this paper is to provide a meticulous review of literature on various aspects of palm leaf manuscripts. Through the process of review, it aims to highlight the antiquity of palm leaf manuscripts, the process of seasoning and writing over the leaves, the physical, chemical and biological factors of deterioration, the classification and cataloguing process of manuscripts, different traditional / modern methods of preservation and conservation as well as the viability and prospects of digital preservation of manuscripts and the attempts taken by various manuscript libraries for digitization.

Keywords - Palm Leaf Manuscript, Antiquity, Indigenous Methods, Preservation, Factors of deterioration, Seasoning, Cataloguing, Metadata standards, Digitization.

Article Type - Literature review

Introduction:

India has sustained a glorious tradition of preserving knowledge through oral and written communication since time immemorial. A variety of writing materials were used for communicating knowledge ranging from walls of caves to copper plates and from bark of trees to leaves of various kinds. Of all the leafy writing materials, palm leaf was used as the predominant writing media due to the availability of palm trees throughout the length and breadth of the Indian sub-continent. These palm leaf manuscripts are considered as the written ambassadors of our past. Since our ancient cultural heritage is preserved in these manuscripts, these are regarded as valuable sources of information for the reconstruction of history and culture of a country. But the problems of preservation are acute as palm leaves being organic in nature are quite susceptible to deterioration in comparison to that of inorganic substances. Preservation and organization of manuscripts are the thrust areas of research since long, as such, quite a good number of publications are seen as regards to this area of study. With the advent of ICT, emphasis is being given on digitization of manuscripts and many manuscript repositories are opting for digital conversion of their cultural treasures. But digitization has brought several other problems such as standardization of bibliographic description, choice of appropriate subject headings and problems of technological obsolescence. In this context, the present paper provides a review of the literature on various aspects of palm leaf manuscripts.

Structure of the Paper:

This paper encompasses a selective range of research papers on palm leaf manuscripts published in national and international journals, proceedings of conferences of national and international repute, commemorated volumes, reports of different projects, case studies of different manuscripts repositories that have been appeared during a period coverage starting from1947 to 2013. The literature reviewed is organized into five related themes on the basis of the thought content directly drawn from the literature and presented thematically as well as chronologically within each theme.

The themes of the present study are as under:

- **Antiquities, types and nature of manuscripts;**
- **Process of seasoning and writing over manuscripts;**
- **Factors of deterioration, preservation and conservation ;**
- **Cataloguing, metadata standards and subject access to Manuscripts; and**
- **Digitization of manuscripts.**

Antiquities, Types and Nature of Manuscripts:

Suri (1947) in his study cited about the manuscript repositories of Jaisalmir among which the oldest collection is located in the fort near Shambhunath Jain Temple. He has given examples of some antique manuscripts of which, "Panchami-Kaha" was written in 1052 A.D. and "Kuvalayamala" was written in 1082 A.D.

Bhattacharya (1947) mentioned about some oldest palm leaf manuscripts, one of those is preserved in the Monastery at Horiuzi in Japan, written using Gupta script and it dates back to 6^{th} century AD where as another one is located in Nepal written in the later Gupta script and belong to 7^{th} Century A.D. The Pattan Manuscript Bhandaras of Gujarat contain the most ancient manuscripts of which the earliest dated manuscript is known as 'Nisitha Churni' which is of 1101 AD. His study further pointed out that, the two varieties of palm leaves used for writing are Tala and Sritala. While 'Tala' is grown almost all over India 'Sritala' is grown in South India especially in Malabar Coast.

Chakravarti (1947) studied the physical properties of palm leaves. He found that, the palm leaf is four times stronger than good quality handmade paper. From an experiment regarding loss of

strength of palm leaf on accelerated aging, it was found to be negligible but folding endurance of palm leaf was nil. It is a good material but its resistance to wear and tear and handling is poor.

Gupta (1974) mentioned about the availability of palm leaves in south India, Bihar, Bengal and in the countries of Nepal, Ceylon, Italy and even in the British Museum, London. His study pointed out that, palm leaves are of two varieties known as Tala and Sritala. Tala leaves are thick and course in nature while Sritala is thin and flexible like paper.

Padhi (1974) in his study pointed out the availability of palm-leaf manuscripts in abundance in Odisha and mentioned that palm leaves used for writing are primarily of two types, namely Sritala and Tala. In Odisha Sritala is scarce and only Tala leaves are used for writing.

Agrawal (1984) in his study described that palm leaf as a writing material is of great antiquity and the earliest available example of writing on palm leaves seem to belong to 2nd century A.D. It is a fragment of the text of an Indian drama written by Asvaghosa and discovered from Turfan in central Asia. According to him, manuscripts mostly dating from 10th century A.D. and onward have come down to us in large number but prior to that we have very few specimens. There are many varieties of palm trees but the palm leaves of few distinct varieties have been widely used by the scholars for writing through the ages. These are: Sritala – Corypha umbracaulifera linn, Tala – Borassus flabellifer linn and Corypha Taliera Roxb. Sritala which is known as Talipot palm or fan palm mostly grows in moist and humid coastal areas of south India, Sri Lanka, Burma, Malaysia, Andaman and Thailand and especially in Malabar coast. The Talipot palm is taller and grows up to a height of 20 to 25 meters and has a thinner trunk usually of 0.5 – 1 meter in diameter. Sritala leaves are beautiful, flexible, thin, long, smooth, crisp and light-coloured . Tala leaves are coarse, thick, hard and lack in precise absorption of ink.

Sinha and Agrawal (1994) mentioned that palm leaf is the typical writing medium in Indian influenced cultural regions. The said study analyzed samples of historic and modern palm leaves with regard to the physical and chemical properties, usability and the ageing behaviour of the material. The study recommends some treatment procedures to prolong the longevity of the manuscripts.

Joshi (1995) in her study has given some prominent examples of early palm leaf manuscripts available in India that include ‘Panchmi Kaha’ which was written in 1109 Vikrama Samvat corresponding to 1052 A.D. found in the Jnanabhandaras at Jaisalmir relating to Jainism. The Pattan Manuscript Bhandaras in Gujarat contain a certain number of ancient manuscripts. Also

mentioned about few letters those were written on palm leaves to the rulers of Princely States in Eastern India in the first half of the 19th century, are available at Victoria Memorial, Kolkata.

Process of Seasoning and Writing over Manuscripts:

Bhattacharya (1947) in his study described the process of seasoning used for Sritala leaves. When the Sritala leaves come out of their sheaths, begin to spread out and are delightfully soft, they are cut and separated from the tree and dried in the sun for seven days and then buried in the mud for three months. The leaves thus acquired brown colour, which are then kept in kitchen and exposed to smoke. They are then cleaned, cut to required size and written upon.

Padhi (1974) in his paper discussed elaborately the procedures of seasoning of palm leaves in Odisha. In *one* method the leaves are dried under sun and then kept under mud for about 10 to 15 days. Then they are cleaned and dried again in sun and finally turmeric powder is applied on the leaves. The *second* procedure is to keep the leaves in a smoky place generally in a kitchen for some days. Afterwards, they are cleaned and turmeric paste is applied. The *third* process is to boil the rough and matured leaves in water by which the leaves become thin and soft. The leaves are then cleaned and kept alternately in sun and in dew and finally turmeric paste is applied. Stylus is used for writing, which is made out of a solid piece of iron rod having a cone shape of about 6 to 9 inches length, its wider end is pointed like a pencil, used for piercing the palm leaf. The study depicts the procedure of writing over the leaves. The writer while scribing, sits on the ground and places the palm leaves on his right knee, he holds the leaves in his left hand and begins to scribe with the help of the stylus from left to right, line after line. As the fibers of the leaves are horizontal and the Odia script being round in shape has some advantages for easy writing without spoiling the fibers. Before reading the manuscripts, fresh greenish juice of leaves is applied in the engraved portions of manuscripts to give a distinct view of the script.

Agrawal (1984) mentioned the process of seasoning of palm leaves that are prevalent at South Asian countries namely India, Sri Lanka and Thailand. According to customs prevailing in South India, fresh palm leaves are dried in the shade and then gingili oil is applied over their surface to make them smooth. In some parts of South India, tender palm-leaves are hung for several days in kitchen and exposed to the smoke. Afterwards they are cleaned and used for writing. In Sri Lanka, the usual practice is first to boil fresh young palm leaves in water or sometime in limewater for a few hours, and then the leaves are dried in shade and the leaves are cut as to the

required size. In Thailand, the method of processing palm leaves (known as bai-larn in the Thai language, the palm-tree being called larn) is considerably different. After being cut from the tree, the leaves are dried in shade. Their stiff ribs are removed with sharp knife, and then cut to a uniform size. For processing a kiln is heated by burning wood or rice-husk. The leaves are fastened together in heavy wooden frames and kept inside the upper compartment of the kiln for nearly 24 hours, as a result of which, a kind of black oil exudes from the leaves and is deposited on the sides of the bundles which later rubbed off with a cloth and the bundles are opened. Each leaf is wiped free of the exudation with a cloth, followed by exposed to open fire for few minutes and finally the leaves are polished.

Joshi (1995) cited various methods of seasoning and how they differed from place to place. The study also described that, in some parts of South India the palm leaves are dried and boiled in water, any abnormal growth then paired off with a knife and gingili oil is rubbed to smoothen the surface. The author has also mentioned the writing procedures for Sritala and Tala variety of leaves. Since Sritala leaves are thin, soft and absorbent, the writing is done in carbonaceous ink. The characters are inscribed by moving the leaf beneath and keeping the stylus fixed. Tala leaves being coarse, thick and non-absorbent in nature, the writing is done by inscribing the characters using a pointed metal stylus.

Prajapati (1995) in his study described the system of writing over palm leaves. He is of the view that, there are two systems of writing viz. by using fluid inks and quill pens and by engraving letters and characters first, then colouring them are followed. While stylus is used for writing over Tala leaves, ink and quill pens are used for Srirala leaves because Sritala's smooth, flexible and good absorbency to fluid inks is considered suitable for this type of writing.

Bisoi (2000) in his study mentioned that, till 19th century palm-leaves were used as writing materials in Odisha and the writing was done with the help of iron stylus. For writing metal stylus was used and the ink was prepared by mixing oil with black pigment of coconut shell. Even in the first half of 19th century, writing on palm leaf was widely prevalent in Odisha, discussed on the various attempts taken on the study of Odia manuscripts.

Udayakumar et al. (2009) mentioned about various palm leaves which were used in India for writing like Borassus flabellifer Linn (the palmyra palm), Corypha Umbraculifera Linn (talipot, fan palm) and Corypha Taliera Roxb. They have described about the seasoning process of palm leaves. Various traditional writing skills and techniques have also mentioned for example Tamil

palm leaf manuscript was written by using incision with pointed metal stylus. Various types of metal stylus were used for writing on palm leaf manuscripts and then holes were punched for binding the leaves which were the only elements that breaks the text flow and a sufficient margin was given around it.

Factors of Deterioration:

Gupta (1974) categorized the causes of deterioration as physical and chemical damage; biological and microbiological damage; constant handling and improper storage. He discussed that, physical damage is due to the loss of natural oil present in the leaves because of time factor and atmospheric condition. Biological damage is caused due to the insects and the microorganisms. Constant handling of the leaves in an improper manner and storage of the manuscripts one over the other also often damage the leaves due to high pressure on the bundles of the manuscripts.

Harinarayan (1995) in his study has classified the causes of deterioration of palm leaf manuscripts into six categories such as atmospheric factors, physical wear and tear, dust, attack by living organism, mishandling, stains and discolouration. Mentioned that, high temperature accompanied by low humidity often causes dryness of the leaves as a result of which essential oil present in the leaves evaporates and the leaves become hard and brittle. High humidity also causes the leaves to stick together while damp condition is responsible for growth of living organisms that destroy the leaves. Handling of manuscripts for use also results in physical wear and tear.

Joshi (1995) in her study pointed out that palm leaf is a natural product and organic in nature. Like all organic products it is very susceptible to deterioration caused by changes in climatic conditions i.e. temperature, relative humidity, light and by bio-degradation.

Prajapati (1995) in his study mentioned the factors responsible for decay and damage of palm leaves and the agencies responsible for decay are climatic factors, polluting factors and biological damage. The elements of climate generally considered are light, heat and moisture for which palm leaves are deteriorated affected by the changes in these elements. Polluted atmosphere also poses a serious problem for the manuscripts. A thick accumulation of dust particles and many active gases such as sulphur-dioxide, oxides of nitrogen, ammonia, ozone and oxygen affect the leaves. Common enemies for biological damage are silverfish, cockroaches,

booklice, bookworms, moth and termites that bring about destruction of the manuscripts in many ways.

Preservation and Conservation:

Suri (1947) discussed about the traditional methods adopted in Jaisalmir for keeping manuscripts safe that includes, keeping small bags of a sort of grass known as 'Panadi' among the manuscripts bundles to save them from white ant. Another kind of herb ghorabach (Acorus Callomus) in powdered form is placed with the manuscripts as a deterrent against insects.

Sen (1947) pointed out that manuscript & printed books are not hard to preserve. Given normal conditions and proper care they will ordinarily survive for long but a casual mistake may often cause irreparable harm and it is important to know what to avoid. Discussed, a list of common errors such as faith in the healing properties of the sun, spraying of DDT, repairing with wrong materials reduces the life of such documents in some way or other. Suggested use of red and yellow Kharwas (heavy cloth) for keeping manuscripts for a longer period as it is a good indigenous practice most suitable for small libraries and owners of manuscripts.

Nordstrand (1958) described the procedures followed in the Royal Library of Copenhagen for the treatment of embrittled palm leaves with drying oil. The drying oil is absorbed in the honeycomb center of the leaf where it hardened. The repair of split and damaged leaves is done with silk gauze and bookbinders' paste in the library.

Kishore (1961) in his study has outlined his experiences for restoration of palm leaf manuscripts for which he applied a protective coating of metha-methycrylate varnish on the leaf to protect water-soluble writings from smudging. This chemical is available in the trade name of Bedacryl. The author further observed the harmful effect of unscientific methods of packing and storing and emphasized the need of storing of documents in congenial environmental conditions, i.e. temperature in the range 22-25 ^{0}C and relative humidity 50-60% and suggested for restoration of brittle leaves by different processes, viz., tissue repair, chiffon repair, inlaying etc.

Crowley (1969) described the methods followed in British Museum where incised texts were rubbed clean with distilled water and re-inked with lamp black and oil of camphor. Surface written texts were cleared with 1,1,1 – trichloroethane, followed by boiling with 5% camphor oil in alcohol. After softening he used a cold lamination method using acrylic emulsion and tissue coated with acrylic rubber.

Kathpalia (1973) in his study mentioned about the use of silk and flour paste for the repair of palm-leaves. He also suggested for the lamination of palm-leaves using cellulose acetate foil softened with acetone.

Padhi (1974) focused through his study the various indigenous methods of preservation with emphasis on rubbing of turmeric paste, keeping powered neem leaves, ghorabach, kumkum fruit and a paste mixing the juice of country bean, Eclipta Alba and Black Thorn Apple Stramonium as well as periodical drying under tender sun light.

Gupta (1974) highlighted the causes of deterioration and suggested elaborately about the treatment of the affected leaves that includes fumigation of palm-leaves in airtight chamber with Thymol and PDCB. Cleaning of incised manuscripts with a fine brush and then with mixture of alcohol and distilled water in the ratio of 3:2 with a swab of muslin. Separation of stuck up surface of palm-leaves by moistening the sticking portions of the leaves. Dry and brittle leaves can be made flexible by using camphor oil, citronella oil, clove oil or mustard oil with a mixture of alcohol in the ratio of 3:2. He also prescribed a very simple method of lamination, which has been used at the Central Conservation Laboratory that is to employ cellulose acetate foil under heat and pressure.

Agrawal (1977) in his study mentioned that palm leaves should not be stored in very dry conditions. To bring flexibility to palm leaves, various types of oil such as citronella oil, camphor oil and walnut oil can be used. For storing, it is recommended that the leaves always be stored between two stiff boards, slightly larger in size than the leaves and pressure must be avoided on the edges, while reading the manuscript. The author suggested for fumigation with various insecticides and other solutions to keep the manuscript free from insects and fungus. The above study further recommends for periodic cleaning to preserve and handle the palm leaf manuscripts.

Dutta (1978) mentioned about various conservation treatment of a palm leaf manuscript given at the Victoria Memorial by methods like fumigation, restoring flexibility, re- inking, joining the fragments, filling up the gaps and mending the tear. For regaining flexibility, a mixture of water with citronella oil (1:1) was agitated to obtain a milky while liquid, which was sprayed on the leaves and satisfactory results were obtained.

Agrawal (1984) in his study has given in detail the different types of deterioration generally occurred in the manuscripts. He has also suggested various restoration measures for each type of

defect. He found that, water is a best solvent for (water resistant) incised leaves to remove dust and hydrogen peroxide as a bleaching agent to treat dis-coloured manuscripts. Fumigation of palm leaves with 1:1 mixture of carbon tetrachloride and trichloroethane also found satisfactory. He also described the treating procedure of a manuscript having cleavage of the surface layer that was conducted at the laboratory of the National Museum, New Delhi with a solution of ethanol and water (1:1). To prevent flaking of the print and fix it on the leaf, a protective coating of 2% solution of soluble nylon in ethanol suggested for use. He mentioned about the treatment of tiny holes with fibers of mulberry tissue paper and the unused palm leaves which was used in the NRLC, where as the British Museum's department of Oriental Printed Books and Manuscripts uses wood veneer for the same purpose. For the lamination of palm leaves use of silk gauze or chiffon and starch paste as well as use of cellulose acetate foil, acetone and tissue paper found effective.

Das (1987) given an overview of the procedures adopted for preservation and restoration of palm leaf manuscripts at the National Library, Kolkata. The methods include cleaning of palm leaf with dry cotton, then with moistened cotton swab, followed by cleaning with rectified spirit, de-acidification with limewater using soft brush, drying in ordinary room temperature and treating the palm leaf with citronella oil and finally re-inking with graphite powder. If the leaves are found stuck together they are separated either by humidification or by hot liquid paraffin followed by clearing of wax with acetone.

Prasad (1986) studied the problem of restoration of flexibility of palm leaves that was investigated at National Archives of India. A mixture of Polyethylene glycol –200, lemongrass oil and water in the proportion 1:4:20 gave satisfactory results for regaining flexibility of the palm leaves.

Nair (1987) mentioned about the problems of preservation of manuscripts in the State of Kerala due to high humidity and temperature. The study emphasised that embrittlement of old palm-leaves is a major problem in conservation though they are having very good tensile strength compared to paper. Hot climate provides ideal conditions for the growth of insects and pests. Also in high humid condition, lignin present in palm-leaves is susceptible to oxidation and hydrolysis, yielding acidic derivatives. These acids combined with pollutants in the atmosphere affect the fibrous bond of the leaf and it becomes very brittle. He has given his observations that drying oils, which have a high context of fatty acids, have a damaging effect on palm leaves. It

was also noticed that if fresh leaves are boiled for some times in solvents like isopropanol or acetone their strength and flexibility is reduced considerably, it has also noticed that the organic solvent extractable material present in the leaf plays an important role in imparting flexibility to the leaves. Nair suggested that embrittled palm leaves should be fumigated using paradichloro-benzene to destroy insects and has mentioned the process of cleaning using distilled water, containing 0.2% sodium salts of ortho-phenylphenole, 5% isopropanol and 1% magnesium bicarbonate. Besides application of extracts of fresh palm leaves with some selected essential oils like clove oil, black pepper oil, sandalwood oil etc. on brittle and fragile palm leaf was found to be encouraging. Nair in his experiment of treating hardened palm-leaves of both the varieties with 1 to 5% solution of fresh palm leaf extract (colorless) in alcohol and isopropanol has found that flexibility of so treated leaves increases.

Suryanwanshi et al. (1992) experimented on the use of a number of oils for regaining flexibility of brittle palm leaves. Application of camphor, eucalyptus and clove oil in normal atmospheric conditions found to be helpful in improving flexibility of hardened palm leaves as these are more volatile, light, dry and are easily absorbed by the leaf, while in hot weather conditions Margosa (Neem oil), lemon grass and citronella oils are very effective in softening and improving flexibility of palm-leaves. Besides, Polyethylene glycol- 200 has been found effective for improving flexibility of hardened palm leaves.

Pandit Rao and Gandrish (1992) jointly conducted a study at Birla Institute of Scientific Research, Hyderabad which described the method of consolidation and preservation of ancient palm leaf by using mixture of fungicide and 10% polyvinyl acetate. The polyvinyl acetate in combination with fungicides like penta-chlorophenol and dehydroacetic acid had shown better results than polyvinyl acetate alone.

Samuel (1994) in his study aptly cited an issue devoted to preservation and conservation of library materials. The popular medium of writing and transmitting Tamil was through palm leaf manuscripts Described, the methods of processing palm leaves and results of a preliminary survey conducted by the Institute of Asian Studies, which revealed the existence of more than 50000 palm leaf manuscripts texts in Tamil throughout the world. Some of the problems of preserving this material are outlined including the adoption of microfilming technique.

Harinarayan (1995) mentioned vividly the traditional methods of preserving palm-leaf manuscripts that are prevalent in different parts of India. In some places palm leaves are taken

out at least on Vijayadasami day, cleaned and kept back. In some places the annual ritual is to apply paste of coconut juice, wood charcoal or turmeric then the leaves are wiped away with a clean cloth. Exposure of the palm leaf to the tender rays of the rising sun helps in destroying the traces of insects. Wrapping the manuscripts in yellow and red coloured cloth helps in repelling the insects. In some places along with the bundles pieces of Vasambu and dried ginger are kept to save the manuscripts from bio-deterioration. For water-soluble writing use of non-aqueous solvents like ethanol and 1,1,1 trichloroethane, for fumigation of the manuscripts use of PDCB as an insect repellent and thymol as a fungicide has also recommended. Narayanan also suggested the use of Japanese tissue paper for filling the holes and integration of bigger holes with unused palm leaf and polyvinyl acetate adhesive; for repair of brittle and fragile palm leaves use of chiffon and starch paste, tissue paper, cellulose acetate and acetone has been stated.

Joshi (1995) while stating her observations about the indigenous methods of preservation as well as the modern preservation techniques found that, separation of stuck-up palm leaf is effected by exposing to moisture, placing them in a bath of hot water at 60 degree centigrade containing 5-10% glycerin. For regaining flexibility of the dried and brittle leaves a number of chemicals like citronella oil, camphor oil, and clove oil in combination with water and alcohol in different proportions have been tried and found effective. For inking the engraved characters, use of powdered graphite, lamp black, citronella oil or alcohol and carbon black has been recommended.

Prajapati (1995) in his study suggested that manuscripts must be kept in dustless, pollution free environment with optimum temperature of 23^0C and humidity range of 50-60 %. He has recommended the restorative conservation of the manuscript which includes, physical cleaning, de-acidification, fumigation, and separation of blocked leaves with hot paraffin. According to him, brittle manuscripts can be fastened using acetate foil, silk gauz and acetone or gauz and maida paste. A newer method of preserving palm leaf manuscript in book form has also developed by him.

Dean (1999) in his study observed that, palm leaf manuscripts are prone to damage through becoming brittle over time. Damage and deterioration tends to be the result of insects staining, splitting and cleavage (separation of upper and lower surfaces) and mechanical damage. Briefly reviewed the methods used for treating manuscript prior to storage; notably killing insects and cleaning the surfaces of the leaves; and remedial treatment of damaged manuscripts. Concludes

with notes on conservation techniques used for repaired manuscripts like oiling, securing the leaves and housing the palm leaf manuscripts.

Brown and Seals (2001) present their research work focused on developing new techniques and algorithms for digital acquisition, restoration and study of damaged manuscripts. The authors present result from an acquisition effort in partnership with British Library which was designed to capture 3-D models of old and damaged manuscripts. The results show how these 3-D facsimiles can be analyzed and manipulated in ways that are tedious or even impossible if confined to the physical manuscript. The study presents results from a restoration framework that has developed for "flattening" the 3-D representation of badly warped manuscripts.

Cornell Department of Preservation and Collection Maintenance (2003) examined that, the traditional housing of palm leaf manuscripts in wooden shelves or wrapping with heavy cloth is conducive for easy access for insects and rodents. So, a suitable casing for individual manuscripts should be prepared. Prior to casing of the leaves, the ties and cover boards should be examined, and the leaves checked for dust and surface oil. The original ties should be loosened and examined whenever possible; if they are broken they should be replaced with a soft-fibered cord of roughly the same thickness as the original. This paper has also given the method of designing manuscript case.

Nichols (2004) discusses about an alternative approach for loss of compensation in palm leaf manuscripts, which are prone to chemical, physical and biological degradation. The inner white bark of the mulberry plant is advantageous as it has high cellulose content and ideal for its use as infill material and therefore, has improved material permanence. The studies have shown that the use of white bark has offered improved results over conventional materials, creating a visually and structurally sympathetic infill.

Takagi et al. (2006) elaborately mentioned the conservation procedure of rolled palm leaf manuscripts that are locally called Tamsuk in Nepal with reference to Asa Archives situated at Kathmandu. The Archives houses more than 6,700 manuscripts on various subjects mostly in Nepali, Newari, Sanskrit languages and these MSS. are preserved in a metal case with shallow drawers with cardboard dividers. Each rolled manuscript generally kept in a small plastic bag with a string to close the top which is beneficial in preventing damage caused by mice which is common in Nepal. Conservation of these manuscripts done by humidifying these in a shallow tray putting several layers of lokta paper dampened with filtered water, then surfaces of the

leaves are cleaned with cotton swabs moistened with a mixture of ethanol and filtered water. Repairs removed mostly with acetone. Tears are repaired using100% Kozo fibre Japanese papers toned with Cartasol K dyes in various shades. The vertical folds and creases are supported with repair paper from verso. The authors concluded that Asa Archives is one of the very few institutions in Nepal to have digitized its entire collection of manuscripts.

Devanathan (2012) points out that the earliest scripts have been written on materials such as Taalapatra and Bhurjapatra, which could not be readily preserved. In the treasure of Ayurvedic literature, many texts are missing or partially available. Only references or few verses from many such texts are mentioned in later texts. Unfortunately, a large number of Ayurvedic texts are unexplored till today are likely to exist in palm-leaf manuscripts, which are decaying or undergoing permanent annihilation. As such many unique and valuable information contained in these texts are being lost. Through the present work the author also tells about conservation and preservation of manuscripts in the natural way.

Cataloguing, Metadata standards and Subject Access to Manuscripts:

RSLP Paleography Project Progress Report (2000) comes out with the findings that in most cases of manuscripts, a coherent subject access approach is lacking. Many libraries seem to have chosen to skip the subject indexing altogether, while others have confirmed to a set of minimum requirements based largely on local practices. Subject librarians and researchers strongly feel that of the many possible fields available for manuscripts scholars in an electronic environment, the one used with greatest frequency is that of subject matter. For manuscript books and their reference sources to be made accessible and useful to researchers, bibliographic descriptions must be accompanied by an array of fairly specialized subject headings. Subject indexers and manuscript cataloguers believe that the existing tools for subject indexing and classification are lacking the level of specificity required to adequately covering such specialised manuscript collections and user enquiries. So often cataloguers resort to improvising local schemes – subject headings lists and classifications in order to cope with the limitations of these tools.

Pass (2003) gives rules for descriptive cataloguing of Ancient, Medieval, Renaissance and Early Modern Manuscripts known as AMREMM. This AMREMM rules account for two levels of detail in the description of manuscripts: summary and detail description. Both levels share basic sets of elements that differ in-depth of treatment in the notes with emphasis on the content note

and in the amount of the required added entry access. Summary description is intended primarily for ready access to the works contended in a manuscript. For the purposes of the illuminated manuscripts, the cataloguer must rely on the level of detailed descriptions, which permits fuller notice to textual, paleographical, codicological, artistic and other physical features inherent in the manuscript.

Ghosh (2003) through her paper to the Seminar on **"The Medieval Manuscript Book and its Study: Enhancing Subject Access"** explores the development of a ***Thesaurus for Manuscript Studies*** as a work in progress and emphasized the need for a new vocabulary and the experiences emerging from its development. The thesaurus identifies and organizes subject terms that are best suited for printed materials, manuscript catalogues, manuscript facsimiles, monographs and general reference works used in the study of manuscripts. The thesaurus is envisaged as a flexible yet structured tool that will continue to grow and incorporate new terms commonly used for describing original manuscripts.

Harinarayana and Gangdharesha (2005) present that cataloguing of manuscripts has received a scant attention by the Indian cataloguers. Though IT has provided better opportunity to preserve the content of the manuscripts, it is necessary to adopt a standard metadata for retrieval of the digitized content. They pointed out the inconsistency and non-uniformity exists in cataloguing practices for manuscripts. Hence, through this paper they have identified appropriate standards for the description of manuscripts, comprehensively and efficiently. The standards available for description of manuscripts such as 'Digital Scriptorium' and 'Text Encoding Initiative' (TEI-MSS) have critically been examined and compared in their paper.

The Medieval Manuscript Book and its Study: Enhancing Subject Access http://www.paleography.ac.uk/rbmsprop.htm seminar has brought together findings of current projects and investigations focusing on ways of approaching subject analysis and enhancing subject access to bibliographic records of manuscripts. It presents that in recent years, more and more institutions with manuscripts and manuscript related collections have started to take advantage of the enormous opportunity offered by the electronic environment to provide wider access to their holdings. Many have engaged in retrospective conversion of the resources, others have undertaken to digitize their entire manuscript catalogues. But what most of these efforts seem to have in common is their main objective to get things online, thus generally providing a more or less adequate bibliographic description, but rarely a coherent subject access approach

has made to the many facets of a manuscript book or to the study of manuscripts. This is partly due to the lack of appropriate tools for subject indexing and classification in the field of manuscript studies. Cataloguing of manuscripts required a depth and complexity of subject analysis and intellectual requirements of the task if it is undertaken and a controlled subject vocabulary is only one of the prerequisites for such work.

Torre (2007) presents that illuminated manuscripts are beautiful works of art but the cataloguing and classification of these pre-modern wonders are difficult and complicated. The author has examined literature topics pertaining to cataloguing and classification of illuminated manuscripts and given comparison of the modern manuscript and the pre modern manuscript and considers the application of codes and standards, especially AMREMM (Ancient, Medieval, Renaissance and Early Modern Manuscripts), a supplement of AACR-2 that provides some guidance. The author suggested that as the manuscripts of the pre-modern era bear much more in common in their bibliographic and physical structures with printed books, standards that have been premised for modern manuscripts, need revaluation. The author is of the view that levels of details and variety of access points, problems in transcription, physical description and setting of cataloguing policy within an institutional context are all issues that deserve closer consideration.

Chamnongsri et al. (2009) the authors aim to examine whether the PLMM (Palm Leaf Manuscripts Metadata Schema) satisfactorily meets the user requirements in searching for the PLMs and managing the PLMs collection describing the particular characteristics of Northeastern Thai Palm Leaf Manuscripts. The evaluation process began with the development of the prototype of PLMs management system to implement the PLMM. Then, more than 200 metadata records describing all types of sample PLMs (with variations in sizes, scripts, languages, titles, and number of content subjects contained in a fascicle) were provided in Extensible Markup Language (XML) format, while system interfaces and queries were developed with Hypertext Preprocessor (PHP). This was followed by the trials with end users and staff in their workplace in order to evaluate the usefulness of PLMM in user tasks according to the FRBR tasks such as find, identify, select, obtain, and collection development tasks. The finding also suggests that perceived efficiency of the PLMM was significantly higher with more years of users' experience with the PLMs and status of users is another factor that affected the perceived.

Makhfi et al. (2011) points out that ancient manuscripts constitute a heritage to preserve for future generations and make it accessible to a wider audience. Restriction of access to national heritage manuscript is related to the concern to preserve the manuscripts physically manipulated which contribute to their accelerated degradation. Taking into consideration these limitations on access while ensuring preservation of original manuscripts, the solution widely adopted by developed countries is based partly on the digitization of these heritage manuscripts. Easy access to such manuscripts presented on images format requires an index which can be created manually or automatically by using Optical Recognition of Characters (OCR). The automatic approach is difficult to realize by considering the cursive nature of Arabic writing and by the exaggerated overlapping between words and lines in handwritten Arabic manuscripts. So, the segmentation leading to extract respectively and separately lines, words and characters constitutes the critical operation, affecting the performance of all Arabic (OCR) systems. Recent research works adopt the word spotting approach. The words in a manuscript are matched as images and grouped into clusters which contain all instances of the same word. This new and original approach solves the problem related to the cursive nature of the Arabic writing by not considering the character segmentation, but considers the line and word segmentation. To tackle these problems mainly connected to segmentation operation, the authors propose a new indexing system of Arabic manuscripts, which facilitates transcription and the establishment of Arabic handwritten text by annotating images of manuscripts according to metadata.

Azimi and Nazi (2011) mention that complying with accepted standards in any field leads to harmonization with the world which is also applicable to manuscript cataloguing. Keeping up to date standards leads to consistency of catalogues and facilitates the exchange of information and preparation of joint databases at national and international levels. The present research work studies the extent to which the manuscript catalogues in Iran comply with the elements of the checklist derived from the common elements existing in the international rules and standards of some important libraries of Iran and the world. The research findings showed that the National Library had the highest percentage of compliance with cataloguing standards and the Central Library of Teheran had the lowest.

Digitization:

Smith (2003) pointed out the issues and challenges dealt with long-term digital preservation of manuscripts particularly that associated with "born digital materials". He is of the view that digital information is easily created, quickly accessed, cheaply disseminated and provides significant benefits to users, but this versatility brings with it a new level of volatility and fragility. The rapid changes in hardware and software make digital media short-lived and inherently fragile. Therefore the task of preserving the digital records is formidable and raises social and technical challenges of a fundamentally new form. It is vitally important to understand that digital format is extremely fragile media for preserving the cultural heritage of the world. Traditionally preserving things meant keeping them unchanged, however if digital information is held without modification, accessing the information over time becomes increasingly more difficult and eventually impossible. Digital information is highly susceptible to technical obsolescence and physical deterioration and requires continuous conversion, refreshing and migration to new formats.

It has stated at **Acharya** < www.acharya.iitm.ac.in/palm_leaf.html > that modern image processing techniques may be very effectively used in preserving the information contained palm leaf manuscripts. These methods are superior to methods that use direct photographic techniques to capture the image of the leaf on film through high-resolution cameras. Even very fragile leaves may be kept between two sheets of transparent foils and scanned using a good resolution scanner, typically in 600dpi. Leaves shorter than 8 inches may be scanned by arranging them one below the other to fill the scan area. Longer leaves will have to be paste lengthwise and rotated subsequently using the image processing programme. Use of an image enhancement program such as "Adobe Photo Shop" or "Corel Photo Paint" can give good images after a bit of brightness and contrast enhancement is effected.

Sasikala (2004) in her paper mentioned about the availability of Talapatra manuscripts which written and typed in Telugu and Sanskrit languages, along with the other variety of collections in the Andhra University Library (known as Dr. V.S.K. Library) Visakhapatnam. Over the years because of the rich collection of the library, it has attracted the students and researchers from different parts of the country and has proved to be the vital source of research information. Referred that, although the library rightly responding to the changing needs of environment and time by initiating automation and modernization of its activities and services, but the rare manuscripts collections are available to only those people who personally visit the library.

Besides the problem of restricted access, preservation and maintenance of rare books and manuscripts is a critical issue bothering the library management. Therefore, suggested digitisation of the library's rare collection, which provides solutions to the problems of preservation and access to such valuable collections of the library. The steps to be adopted for the process of digitization are mentioned and suggested that once the collections are digitised, they can also be made available on Internet for global access. The paper focuses light on problems and issues involved in digitising the historic and valuable collections of the library. Detailed accounts on costs along with manpower infrastructure required are also given.

Shafi (2004) stated that medieval manuscripts are rich sources of Indian tradition, history and culture. Therefore these ought to be preserved, organised and disseminated to make them available to the world at large. The author is of the view that western countries have taken a lead in starting digitisation to preserve the manuscripts but such initiatives in India are either poorly organised or in primitive stage of development when on the other hand the rich collection of these treasures is distributed in private and public institutions in variety of media, languages, scripts and in different conditions. But the information technology has come with a promise to develop digital initiatives for manuscript for preservation, accessibility and delivery. Therefore suggested to initiate digital libraries for manuscript to preserve and disseminate the information content of the manuscripts.

Comment (2004) in his article examined the history of two digitisation projects, one in Russia (Comintern Archives Project) and one in Albania (Albanian National Archives Project) and gave some comments of his own as an IT expert. Stated the history of each of the projects and summarized the similarities and the differences between the two projects. Pointed out the difficulties that are coming from the organisation of the project are (multilateral versus bilateral) the too long time scale with the consequence on the technology used, the failure in estimation of the work to be done and not enough decision about how to access this cultural heritage by the public. The writer mentions the positive results like the existence of the pilot stage, the great professionalism of archivists to manage the data input are the fact that the two projects have succeeded.

Rath and Shinde (2004) expressed that digitisation has changed the entire concept of the ways scholars, students and general population find and use scholarly information and its dissemination. For the preservation of cultural heritage lying in the contents of old and rare

materials, which are either in a decaying stage or are of restricted use, digitisation has shown a new ray of hope. They are of the view that with the method of digitisation of contents, the knowledge lying underneath old and rare books can be made accessible to the outside world. However it is mentioned that digitisation of materials is not as easy and simple as it seems from the outset. Discussed issues like managerial issues, technical issues, financial issues, human resources and digitisation as a sustainable solution towards preservation that needs to be addressed properly. Provided some insight on the issues to be taken care of after the digitisation project gets over.

Brown (2004) pointed out that preservation reformatting that is copying of information from one from to another is a key international preservation strategy. It saves the original from further damage. It also provides a copy that can be used long after the original has crumbled to dust. He discussed on the advantages of two technologies i.e. microfilming and digitisation. The author suggested that, by combining two reformatting tools – microfilming and digitising – it is possible to gain the "best of both worlds". Microfilm technology offers the long-term preservation base, while digitising provides all the advantages of flexibility and access.

Razdan and Rowe (2004) discussed the various 3D techniques for analysing handwritten manuscripts for digital libraries. Concluded that, these tools provide powerful and new analytic capabilities for better understanding and analysis of complex and highly variable handwritten documents. In addition to assisting in deciphering characters and letterforms, these tools can be used to improve comparison and analysis of multiple documents and assists in recognising writers among documents.

Kaur (2004) surveyed the university libraries of India to find out the type of collections of the university libraries have. Stated that, besides other university libraries, University of Kerala has a rich collection of 56,000 manuscripts on palm leaf and paper and Sampurnananda Sanskrit Vishwavidalaya has probably the richest collection of 1, 09,254 manuscripts. Besides this, a number of other types of collections such as rare books, microfilm, audiovisual cassette and CDROM are also available in the library. Therefore it is felt that a transition is taking place in the collection of university libraries of India. Discussed, the challenges that are going to be faced by the library and information professionals in near future due to the transition from manuscript to digital format.

Kumar and Shah (2004) describe about the large wealth of literature that India has produced during its history extending over 5000 years and how these are ravaged with passage of time due to several factors. They have listed the names of libraries in the world where rare manuscripts of Indian origin are presented and 33 premier institutions of India with their respective manuscript collections. This paper also discusses in detail about Scindia Oriental Research Institute (SORI) a Pioneer Manuscript library of India which has secured11th rank among manuscript repositories as per the survey conducted by INTACH. Some 4190 manuscripts of importance have been microfilmed by IGNCA at SORI and it has been recognized as one of the MRCs for accessioning, cataloguing and launching of awareness program in Madhya Pradesh. The authors have also shared the digitization of UNESCO project entitled "The Memory of the World "that started in 1993 and manuscript digitization pilot project entitled as Down the Memory Lane at National Library of India.

Uhlir (2004) informs about the history of manuscript digitization project of Czech National Library that started as cooperative effort with UNESCO Memory of the World in 1992.In 1999 the National Library of Czech Republic became one of the partners of European MASTER (Manuscript Access through Standard for Electronic Access) project and created records of manuscripts using MASTER and MASTER+ standards. The MASTER records enable the choice among various kinds of manuscript description according to the various purposes that the records are procured for. The important characteristic of MASTER^{+} record is that it enables connecting the descriptive record with the appropriate interrelated digital documents and in this way making complex documents that are compound as well as transient, that is to build the digital library as a basis for the global virtual research environment. The author opines that the use of MASTER and MASTER + records is the necessary condition for interoperability.

Majumdar (2005) provides the history of artistic heritage, history of literary heritage and recorded knowledge of India. He is of the view that the cultural depiction in the Indian literature has its own importance with uniform terminology used by different Indian languages. The past literary heritage is in the form of manuscripts available in palm leaves, cotton, silk, wood, bamboo and copper plates. The initiatives taken by the Indian Government in introducing the National Mission for Manuscripts is the right step towards preserving these culturally significant works. The author pointed out that the ultimate aim of the Mission is to identify such rich

heritage, register them wherever available, preserve them and provide the surrogates for worldwide dissemination.

Ramana (2005) has given a brief overview of India's largest and ancient manuscript collections, the forms and places of availability of these manuscripts. Described, some indigenous methods of preserving palm leaf manuscripts like wrapping and applying extracts of some natural products. The author has elaborately given the important benefits of digital preservation in dissemination of information, collection management as well as the manuscript collections of National Library of India, the process of digitization of manuscripts at NLI and the responses of National Mission for Manuscripts established by the Department of culture, Ministry of Tourism, Government of India with IGNCA as the nodal centre as regards to manuscript preservation.

RamanNair (2006) depicts about the valuable recorded knowledge housed in different museums, archives, art galleries and manuscript libraries that are affiliated to Kerala University. Mentioned that, development of a campus wide information system and opting for digitization of the valuable content would help for their wider accessibility. The various digitization initiatives taken at international, national, regional level for digitization of indigenous knowledge and the digitization softwares like Basis Plus, Green Stone digital library software, Nitya Archive and D space are mentioned at length through this paper.

Maltesh et al. (2007) discuss about digitization of cultural heritage particularly manuscripts of India and other parts of the world including UNESCO project "Memory of the World", Czech National Library, National Library of Australia etc. This paper also highlights organizational role of metadata for information retrieval and access as regards to manuscripts. It enumerates key projects undertaken in western countries and in India highlighting key issues regarding manuscript digitization and archiving.

Kumar and Sharma (2007) point out that digitization of manuscripts in Indian set up is a bigger challenge than it appears. However in the area of manuscripts, Department of Culture, GOI made an ambitious plan in 2003 by constituting National Mission for Manuscripts to preserve, conserve and digitize manuscripts for posterity. In this paper, effort has been made to capture the NMM guidelines and how Punjab University, Chandigarh is utilizing the same to digitize its multilingual holdings.

Satyabati Devi (2008) describes that manuscripts are one of the precious materials of our cultural heritage and a valuable source of history and knowledge, offering perspective on contemporary society. Current progress in the field of information and communication technology offers a potential solution to the problem of decay and damage of manuscripts by improper handling. Through large scale digitization projects, manuscripts can not only be stored and preserved, but also made available to the public. This paper highlights the importance of the Manipur Manuscripts collection and the necessity to preserve the collection for future generations.

Mazumdar (2009) describes about the manuscript collection in Assam as well as initiatives for digital preservation in Assam with reference to Krishna Kanta Handique Central library of Gauhati University which has about 4,500 valuable manuscripts written in Sanchipat, tulapat and paper. KKH Library has been working as both Manuscript Resource Center and Manuscript Conservation Center under the National Mission for Manuscripts and has digitized around 2000 manuscripts. KKH Library has developed a bibliographic database of 25,480 manuscripts available in Assam till December 2008.

Fazluddin (2009) considers digitization as a powerful means of preservation of manuscripts. At the outset the author mentioned various factors that facilitates for the digitization such as PCs are more core effective, scanning technologies have become cheaper, storage technology have impressed, widely accepted standard protocols, use of standards like SGML and HTML. Mentioned the tools required for digitization like hardware such as computers, scanners, digital camera and software like editor, HTML editor, XML editor, OCR software, image editor, page layout and Pdf software. The author also described the detailed workflow of digitization work starting from selection process of manuscripts to storage and access of manuscript on the web.

G**aur and Chakraborty (2009)** present that the glorious past of Indian culture lies in the ancient manuscripts. These are the basic historical evidence and have great research value and it is estimated that India possesses more than five million manuscripts making her the largest repository of manuscript wealth in the world. Though our ancestors have tried to preserve these manuscripts, thousands of such valued unpublished manuscripts on varied subjects are lying scattered in India and foreign collections. Recognizing the need to encompass and preserve this knowledge resource and to make these accessible to scholars IGNCA had initiated the most important manuscript microfilming programme in 1989. Through this paper the authors also

discussed topics like the tradition of preservation and access in India, institutional efforts in the fields of preservation and access, initiatives taken by IGNCA and NMM and Prospects and challenges of manuscript preservation in the 2[1st] century.

Obien & Monseau (2010) mentions that digital surrogates provide a non-invasive means to study old manuscript documents those are often too fragile and valuable for wide public access. These surrogates are generated from web-accessible derivatives made from high-resolution archival masters; these masters serve as long-term digital preservation copies. This paper considers the notion of the archival file format PDF/A (ISO: 19005-1) as digital archival surrogate or DAS that combines the functions of surrogate, derivative, and master. The paper discusses, furthermore, the versatility of PDF/A in dealing with the complex nature of old manuscripts, and the possible implications of adapting PDF/A as a DAS standard.

Seifi (2011) discusses about the library of Astan Quds which was founded in 973 A.D. and regarded as the largest library in the Islamic world in Iran and serves as the main resource center for historians, writers and students. It houses 32485 rare manuscripts and 36,000 microfilms. Through this paper the author highlights about the purpose of digitization, technical requirements for digital preservation and also the initiatives taken round the globe for digital preservation of manuscripts including UNESCO's Memory of the World, PADI Gateway of National Library of Australia, National Digital Memory of Iran and Khuda Baksha Oriental Public Library of Patna.

Saikia and Kalita (2011) present how to preserve the manuscript collections in digital environment. Considering the importance of manuscripts as a source of historical and cultural information the authors are of the view that it is important to initiate projects aimed to preserving them and making them accessible in ICT environment to information seekers. The study also highlights the digitization process of manuscript collections in Krishna Kanta Handiqui library, Guahati, Assam which is having 4,500 copies of manuscripts on important branches of knowledge and are in Assamese, Sanskrit ,Bengali, Nepali and Tibetan Scripts. The study also describes digitizing tools like scanner, digital camera, image processing software, file compression and OCR software along with digital library software like GSDL, DSpace and Eprints as well as the workflow of digitizing manuscripts.

Psohlavec (2011) explains about the growing interest in old manuscripts and their scientific value as well as possibilities of digitization. Since the original manuscripts are irreplaceable, it is digitization that enables complete prevention of the basic image and data. The author is of the

view that in order to make use of digital facsimile it is necessary to comply with the basic conditions like quality of digitization, availability of data in due time and preparedness of users to accept the digital facsimile. Preferably in the domain of manuscripts, the technical recommendations of Unesco mention two quality levels known as Q95 and Q99.Q95 is the quality in which the fine details of characters have signs of digitization and are easily readable, where as Q99 is the quality that enables the printing of a facsimile.

Abdulkareem et al. (2012) mention that, technological advancement has led to innovations in the field of manuscript conservation and preservation. The present article focuses on the digital preservation of manuscripts and the challenges posed to the Nigerian educational and information systems, highlighting the concepts of digital preservation and digital conservation strategies necessary for preserving language manuscripts. The plausibility of strategies such as technology emulation, migration, encapsulation, and restoration was identified. Furthermore, the challenges facing the use of these and other strategies were explored. Finally, the article proposes ways of overcoming the challenges for effective conservation of knowledge and information. **Singh (2012)** depicted that cultural heritage is the symbolic presence that integrates the history, traditions and culture of a country and it is an irreplaceable source of pride for country's people. It possesses a universal value that can touch all people around the world. There are numerous properties of precious tangible and intangible cultural heritage currently placed at risk. This paper examines the viability for preserving India's cultural heritage resources in a digital world for making it globally accessible and discusses the initiatives taken by Indian government for digital preservation of cultural heritage resources and manuscripts.

Jain et al (2013) defined manuscripts in India, stated their importance, narrated in brief various types of manuscripts available and provided an account of the National Mission for Manuscripts (NMM) in India, its MRC, MCC, MPC, Kritisampada, Vijnananidhi and its output. In the end the authors concluded with need of international cooperation and suggested for signing MOUs between countries for cooperation on conservation and digitization of manuscripts and prepare an international database and suggested that National Mission for Manuscripts (India) like programs should be introduced in other countries.

Conclusion:

The articles reviewed through this paper are focused on various aspects of palm leaf manuscripts starting from its antiquity to digitization of these valuable cultural heritage. The findings of the paper depict that the earliest known palm leaf manuscript of Indian origin dates back to 2nd century A.D., the evidences of which are found in sculptures and monuments. Out of many varieties of palm leaves, **Tala** and **Sritala** are the popular kind of leaves that were widely used for writing purposes. The process of seasoning of these leaves varies from place to place so also the writing techniques. Palm leaves being organic in nature are subject to deterioration aggravated by climatic conditions. Through some studies an effort has been made to classify the different causes of deterioration of palm leaf manuscripts. Majority of the studies have concentrated on preservation the palm leaves for posterity, while some other studies tried to compare the palm leaves with that of good quality hand-made paper in terms of their preservation. There are several indigenous methods of preservation which are still in practice in many manuscript libraries due to its multifarious advantages over modern methods of preservation. There is lack of uniformity as regards to the cataloguing practices of manuscripts. Some studies also point out the need for achieving uniformity as regards to cataloguing practices and metadata standards of manuscripts. With the development in ICT, digitization has emerged as a viable means of preserving, documenting and accessing the textual heritage of palm leaves. Thus, the whole gamut of the studies reviewed in this paper primarily outlined new approaches to conservation and preservation of the palm leaf manuscripts with emphasis on need, procedures and initiatives made for digitization of palm leaves that carries most valuables thought contents, providing new experience to the Archivists, Record keepers, Curators who are the real custodians of these valuable documents of antiquity.

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