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CHAPTER 1

INTRODUCTION

1.1 Introduction

Throughout our civilization, the library has been treated as a house of knowledge. It provides shelter to the knowledge content of every human endeavour in written form, arranged together in systematic ways for retrieval and reuse, and thereby is recognized as stratified knowledge. Based upon these stratified knowledge created by past scholars, future scholars will create new ideas, new philosophy and new knowledge.

The traditional vehicle for communicating the past knowledge with the future is certainly the book, in its different forms, such as, papyrus, parchment, vellum, palm leaf, sanchipat, handmade paper and the machine made paper of the modern world. That is why book is ably termed as the bearer of human knowledge heritage. As far as physical entity is concerned, “a book is a beautifully designed package with text, diagrams, pictures, tables, etc., which is believed to be one of the best to transfer information from one person's mind to that of another” (Walker, 1985).

We all expect that such rich and varied mosaic of knowledge contained in books to be permanent, physically. It should be there for any scholar or reader to consult or study at any time or every moment at the present or in the future. The book is our knowledge heritage, and most people of the literary world expect the book to last forever. But, the actual support materials on and in which that knowledge resides - paper, cloth, leather, leaf, bark and so on - are all of biological origin and not permanent in nature. Either they die due to continuous natural degradation process of its own intrinsic properties or they are affected by some external factors that act upon materials of biological origin. It is a fact
about books and manuscripts that they deteriorate all the time, and what we can do is only slow the rate of deterioration.

### 1.2 Field of study

Though a librarian proudly announces the total strength of collections of his or her library, he or she already knows that a large numbers of deteriorated books of the collections are already beyond effective use. The cleaners of the LNB Library of Dibrugarh University collect approximately half a kilogram of litter from the stack floors which are nothing but pieces of books found every day littering the stack floors.

The result of a simple survey conducted shows that 35% (thirty five) of the books including back volumes in the LNB Library of Dibrugarh University and 40% (forty) of the books of B. C. Gupta Memorial Central Library of Gurucharan College including all rare manuscripts are brittle. It is practically understood from the fact that when folded for only a few times, the corners of the page of a book will sliver immediately. When the volumes of books in a library is very less than the above percent, it seems to be very less and signifies nothing, but if it is a large library like LNB Library containing more than 2.20 lakh of volumes, this 35% (thirty five) will corresponds to a huge mound of 70,000 (seventy thousand) volumes occupying a large chunk of space of the library and demanding huge maintenance efforts, as well as budget annually. What about the fate of rest of the volumes which will soon become more and more acidic in the passage of time and will turn into brittle very soon?

The physical state of the heritage ingredients of any library collection i.e. rare books and age old manuscripts, both wood-based and of animal derivation, such as papyrus, parchment or vellum, palm leaf, Sanchipat, handmade paper are in the critical stage of their existence and survival around the world, especially, from the point of view of their physical preservation aspect. India has the largest collection of hand written knowledge documents, approximately five million
While these ancient hand written compositions reconnect us with the knowledge and civilization of the past, there is a process going on all over the world to recontextualize the knowledge contained in the manuscripts for the present and the future generations. This is where the importance and value of preservation of manuscripts come into business with librarians, conservators or knowledge keepers who are responsible as well as fortunate for housing such excellent collections of rich cultural heritage in the form of manuscripts. But, due to lack of knowledge of preservation and neglect, these invaluable entities are getting damaged, infected, polluted, lost and thereby are on the verge of extinction today. Virtually, no scientific study and research been made so far so that a suitable integrated preservation system could be evolved specifically and exclusively for sanchipat. It is therefore felt that time has come for a methodical study and research to evolve such a technique or system which may lead to give a new lease of life to the few remaining sanchipat available today.

1.2.1 Defining preservation and conservation

The American Institute of Conservation (AIC) defines ‘preservation’ as: “The protection of cultural property through activities that minimize chemical and
physical deterioration and damage and that prevent loss of information content. The primary goal of preservation is to prolong the existence of cultural property”. The term preservation and conservation are sometimes confused. “Conservation is a more specific term, referring to the physical treatment of individual items, usually after some damage has occurred. Preservation is a broader term, concerned with reducing or preventing damage in order to extend the life expectancy of collections”.

On the other hand, according to the Statute of the International Institute of Conservation, London, ‘conservation’ is “any action taken to determine the nature or properties of materials used in any kind of cultural holdings or in their housing, handling or treatment; any action taken to understand and control the causes of deterioration; and any action taken to better the condition of such holding”. From this point of view, preservation and conservation are synonymous.

The term conservation includes two perceptions ‘preventive conservation’ and ‘curative conservation’. “Any direct or indirect action on a damaged or undamaged manuscript or collection of manuscripts aimed at enhancing the life of the manuscript(s) by reducing future risks of deterioration can be termed as preventive conservation.” (Basic Minimum Standards for Conservation of Manuscripts, NMM).

On the other hand, “any direct action on a damaged manuscript or collection of manuscripts aimed at stopping active deterioration in the manuscript(s) can be termed as curative conservation”(Basic Minimum Standards for Conservation of Manuscripts, NMM).

Restoration and reformatting are two different terms related to conservation and preservation. “Restoration means any order taken in order to try to return the object, as far as possible, to its original physical and aesthetic state. It attempts to rectify the result of the deterioration; it has a limited purpose and has a beginning and an end.” Any direct action on a damaged manuscript aimed at improving the visual aspect of the manuscript can be termed as restoration.” Reformatting on
the other hand is a process of alteration of the endangered material into another format aimed at preserving the information content of the material for better handling and access (Basic Minimum Standards for Conservation of Manuscripts, NMM).

In my further discussion, the term ‘preservation’ would be used at large which would represent all aspects of ‘preventive conservation’ of manuscripts.

1.2.2 Defining manuscript

According to Concise Oxford Dictionary (10th Ed.), manuscript has the following meanings:

i. a handwritten book, document, or piece of music.

ii. a handwritten or typed text submitted for or awaiting printing and publication. Origin: from medieval Latin. manuscripts, from manu ‘by hand’ + scriptus ‘written’.

Thus, in this context, we can describe manuscript as an art of inscription of human thoughts and ideas into script or characters, on various writing support, aimed at disseminating and preserving for posterity in physical form. Literally, “yadrsam pustake drstam tadrsam likhitam maya.” i.e. a manuscript denotes a handwritten composition or a book or a document prepared by the author himself or by a scribe who knows the trick to score. (A post-colophon found in various Sanskrit manuscripts).

Indian manuscripts represent in various terms. In Amarakosa, “pustam lepyadhikarman” means manuscript; terms like pustika, pustaka, pothaka, pothi, puthi, potha, adarsa, mulakosa, hastalekha, pandulipi are also being used in various parts of India. In Assam, puthi, hatelekha puthi and pandulipi are prominently used to denote manuscript (Bhuyan, 1930).

The studies on development of writing materials also indicate the history of development of knowledge, its storage, dissemination processes and information...
use behaviour of the human society at a particular point of time of history and its continuity to the modern world. By definition, history begins with written records; evidence of human culture without writing is the realm of prehistory. Throughout the human civilization, various kinds of writing materials have been in use throughout the world depending upon the availability of support materials, such as stone, wall, bone, terracotta, brick, pillar, papyrus, parchment (thin sheet of sheep or goat skin), metal plate, bamboo stretch, palm leaf, sanchipat (bark of aloes wood), birch bark, cloth, handmade paper, machine made paper, and so on.

"On the basis of the evidence available in Yoginitantra and Kavyamimamsa, Indian manuscript can be classified into the following categories: "prastarapatiya, sila-patiya, dhatu-patiya, mrt-patiya, pepirasia, carmapatiya, tadapatriya, bhurjapatriya, sancipatiya, kargadiya, tulapatiya, patiya, kasthapatiya and resamavastiya" (Biswal, 2006).

1.2.2.1 Sanchipat

The history of manuscript making and writing in Assam ("Kamrupa" or "Pragjyotishpura") is a practice from ancient time. In Assam, manuscripts are found primarily in stone, copper plates, sanchipat and tulapat. Other materials such as terracotta, bamboo stretch, and 'hue of the ripe pink cucumber' were also used, very rarely (Bhuyan, 1933).

The first written evidence of manuscripts relating to Assam has been found in Allahabad, known as Allahabad Pillar Inscription, which is made in the 4th Century A.D. by the King Samudragupta (c.335–375 A.D.) of Gupta dynasty of Magadha, about a great war with Pusyavarman, the King of Kamrupa. The first direct evidence of manuscript in Assam has been found as a rock inscription in three lines and a quarter at Dabaka, Nawzong, known as Badaganga Rock Inscription, dated 554 A.D, refers to Mahabhubitarvarman, king of Kamrupa of Pusyavarman family, who performed an asvamedha sacrifice. Next to Badaganga Rock Inscription are the three Clay Seals, discovered at Nalanda. The second seal, which gives a complete genealogy of the line of King Pusyavarman to the
King Stithavarman is believed to be of latter part of 6th Century A.D. The copper plate manuscripts of Assam, the most important of which is the “Doobi Grant Plates” made by Kumar Bhaskaravarman, (c. 600 A.D.- 650 A.D.) owing to the destruction of the original record of land grant made by Mahabhutivarman (c. 554 A.D.), the great-great-grandfather of Kumar Bhaskaravarman. These five of originally six copper plates were discovered in the village Dooni near Pathsala in Kamrup. Similarly, the Nidhipur Grant Plates, the five of originally seven copper plates, were found in the village Nidhipur in Sylhet, (now in Bangladesh) also made by Kumar Bhaskaravarman have immense historical importance for Assam (Baruah, 1969).

Exactly from when the bark of sanchi tree (aloes wood or Aquilaria agallocha) has been made use as writing material is not known. The first evidence of use of processed bark of sanchi tree, i.e. Sanchipat is found in the Bana’s Harsa-charita which was written in the 7th Century A.D. It also gives an account of manuscripts made of hue of ripe cucumber. It is written that the King Bhaskaravarman, the ruler of Kamrupa and friend and ally of Harshavardhana of Kanauj, presented to the Emperor “Volumes of five writings with leaves made from aloe bark and the hue of the ripe pink cucumber.” (Agarubalkalkalpita sanchayani ch subhachitabhanji pustakani parinatapatalapatolatibnghi). Here, sancipat was described as ‘agarubalkal’, i.e. aloe bark (Kane, 1918). The botanical name of the species aloe wood is Aquilaria agallocha Roxb., which in Assamese, popularly known as Agaru and Saei.(Bhuyan, 1930).

The evidence of presenting the gift of books in the form of ‘sanchi manuscript’, that too amongst the royal class, indicate that the techniques of writing on the sanchi manuscripts reached its peak form during the tenure of King Kumar Bhaskarvarman, and so, there is a possibility to guess that the sanchipat making technique is perhaps much older and probably dates back to the time of Pusyavarman, the first king of Varman dynasty of Kamrupa which ruled during the 4th Century A.D. or even earlier than that.
Perhaps, for the first time, the term, sanchi manuscripts was used in the Yaginitantram, as sancipatiya. But, even then, it is seen that most of the early writings of ancient and medieval Kamrupa commonly used the term Agarubalkal (or Agaruvalkal) to denote sancipat. The term sanchipat became most popular during Ahom era and henceforth, the term sanchipat used vehemently in the Assamese society.

The term sanchipat denotes two meanings in Assamese language, one, writing material or support made of bark of Saci tree (sanchi = Saci tree, pat = sheet or page (produced after processing the bark). Secondly, sanchipat also denotes the manuscript itself as a colloquial replacement of the original word ‘Puthi’ meaning manuscript. Many a times, much logical terms like sanchipatiya puthi meaning ‘manuscript made out of sheets or pages processed from Saci bark, are also used.

It has been observed that many authors used various spelling for sanchipat like, Sacipat, Saci-pat, Saci paat, Saci-paat, Sachipata or Sanchipata, Sanchipatra, hancipata, and so on. In the following sections of this research work, the term ‘sanchi manuscript’ has been used to denote ‘writing material or support or sheet made of bark of aloes wood’; the term ‘Saci tree’ to denote aloes wood or Aquilaria agallocha Roxb. The term ‘sanchipat’ was used profoundly by the noted Assamese litterateur Hemchandra Goswami and noted historian S.K. Bhuyan in their works. Another kind of handmade writing material used more commonly to make manuscript in Assam, other than sanchipat, is tulapat. Not much is found about tulapat preparation in Sanskrit or contemporary Assamese literature. “Tulapat leaves were made by pressing cotton. They were used for inferior manuscripts, for letters, for private documents, and for official orders, dispatches and records... All revenue grants, records of rights and judicial trials were written on tulapat, a name which still applied to all kinds of paper by the older section of the Assamese people” (Bhuyan, 1930)
1.3 Statement of the problem

The topic for this research work has been entitled as “A Critical Study of Preservation Techniques for Sanchi Manuscript of Assam”. Sanchipat (hereafter will be termed as sanchi manuscript in this thesis). i.e. sanchi manuscript is an integral part of our library collection today. Two major university libraries of Assam and many college libraries affiliated to these two universities have big collections of sanchi-manuscripts. The Krishna Kanta Handiqui Library of Gauhati University possesses almost four thousand of old and rare manuscripts of which a major chunk is sanchi manuscripts; likewise, Dibrugarh University has almost twelve hundred manuscripts most of which are sanchi manuscripts.

A pilot survey conducted by the National Mission For Manuscripts, Govt. of India, in Assam, during 28\(^{th}\) Nov. 2005 to 05 Dec. 2005 reveals that Assam still has almost 36,930 (Thirty six thousand nine hundred thirty) Manuscripts, most of which are sanchi manuscripts, scattered over 4,973 (four thousand nine hundred seventy-three) repositories in 27 (twenty seven) districts (except N.C. Hills) (Report: NMM, 2006). Most of the sanchi manuscripts found during survey were 200-400 years old.

It was also observed that this vast treasure, featuring hundreds of themes and sophisticated ideas, have been lying neglected and without any preservation policy and methods, except few sporadic use of unconfirmed indigenous knowledge (IK). As a result, this incredible and fabulous pool of knowledge is under threat and is disappearing at an annoying rate. It was strongly felt that although many scientifically developed conservation and preservation techniques were in application for other types of manuscripts such as papyrus, parchment, vellum, palm leaf, paper, bamboo leaf, etc., there has been neither any specific preservation technique available for sanchi manuscripts nor any scientific study made so far to develop such preservation techniques for this rare breed of writing support available in Assam. It is said that people’s spoken and written language is their most important cultural representation of human endeavour. Therefore,
the nation and the state, and all of us as responsible citizens of this civilized nation, has a role to play to protect and preserve this sanchi manuscripts in which most valuable cultural attributes are embedded in.

It is pitiable that thousands of manuscripts of sanchi origin have already been perished due to natural decaying processes; some are lost due to natural calamities like flood, earthquake and fire and some are lost due to mishandling, superstitions, social stigma and vandalism. Dearth of scientific trait and awareness even among the educated section of Assamese people has failed to bring the problem of preservation and conservation of sanchi manuscripts into the high-end research domain of the higher academic institutions of Assam so far.

This thesis has endeavoured to study all aspects of prevailing preservation techniques, both traditional and modern, and to find out the intricacies of physical, mechanical and chemical properties of sanchi material through in-depth experiments, with an aim to develop an integrated system of techniques or methods and thereby restore and enhance the life-expectancy of sanchi manuscript.

Works on the following lines have been carried out in this research work:

- Survey on physical status of sanchi manuscript in 20 selected repositories of Assam.

- Analysis of preservation status of surveyed manuscripts in 20 selected repositories of Assam and observation of preservation status of 2 archives and one library in Germany.

- Analysis of the environmental, biological and chemical factors of deterioration that affect manuscripts.

- A thorough analysis of the prevailing preservation techniques- both traditional and modern.
• Scientific analysis of the ancient methods of preparation of sanchi manuscripts in Assam.

• A thorough analysis of the physical, mechanical, and chemical properties of sanchi material using modern laboratory techniques and equipments to find out the cause of degradation and thereby evolve an integrated system of the most suitable and practicable preservation techniques for sanchi manuscript.

In the context of this research work on preservation techniques of sanchi manuscripts and the subsequent findings, it has been assumed that the findings would not only help to protect the physical form and knowledge content of the manuscript for long, but also would help scholars around the world to gain access into and understand the most intricate inherent physico-chemical and mechanical properties of sanchi manuscripts and their gradual degradation with the passage time against the ill effects of various environmental, biological and chemical factors on these manuscripts.

1.4 Objectives of the study

The specific objective of the present investigation is as the following:

1. To study and formulate an integrated preservation methodology for sanchi manuscripts, combining the modern state-of-the-art technology with traditional preservation techniques.

To achieve the above specific objective, the following objectives were also fulfilled:

2. To find out the prevailing Indigenous Knowledge (IK) and traditional practices of preservation of sanchi manuscripts in Assam.

3. To study some of the prevailing modern techniques of manuscript preservation and to explore possibilities of their use in the preservation of sanchi manuscripts.
4. To analyze scientifically the Indigenous Technical Knowledge (ITK) or the craftsmanship that has been employed during processing of the bark of Agaru tree (*Aquilaria agallocha* Roxb) to develop as a writing support in ancient and medieval Assam.

5. To analyze the cause and nature of gradual degradation of physical, mechanical and chemical properties of Sanchi manuscripts belonging to different time-periods through physical, mechanical and chemical tests using latest technologies and equipments such as Scanning Electron Microscopy (SEM), Powder X-Ray Diffraction (Powder-XRD), Fourier Transformed Infrared Spectroscopy (FTIR) and Stress-strain mechanical tests.

6. Restoration of infected Sanchi manuscripts using EDTA disodium solution; and alkaline hydrogen peroxide and silicon dioxide solution.

1.5 Research sites

It has been a difficult area of research, especially to restrict a concept like 'preservation of ancient manuscripts'. Fortunately, though Sanchi manuscripts have travelled to various parts of India and the world via various routes right from early historical period, Sanchi manuscripts are indigenous to Assam and its availability is still predominant in the geographical boundary of Assam. The selection of research sites were a purposeful act and based on necessity of the research work to be accomplished. In this research work, based on three different necessities, three different types of research sites were selected as given below.

a) A total of 20 repositories of 7 districts of Assam have been selected randomly for survey and examination of various parameters related to preservation of manuscripts on the spot. A total number of 1853 Sanchi manuscripts were examined physically as samples in these repositories to observe various extrinsic characteristics developed due to prolonged exposure to environmental, biological factors and chemical factors of deterioration of sanchi manuscript
### Table 1.1 Summary of the repositories taken for survey

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>District Covered</th>
<th>Total Repositories</th>
<th>Sanchi Manuscript</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jorhat</td>
<td>14</td>
<td>885</td>
</tr>
<tr>
<td>2</td>
<td>North Lakhimpur</td>
<td>1</td>
<td>68</td>
</tr>
<tr>
<td>3</td>
<td>Sibsagar</td>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>4</td>
<td>Dibrugarh</td>
<td>1</td>
<td>773</td>
</tr>
<tr>
<td>5</td>
<td>Cachar</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>6</td>
<td>Kamrup</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Bongaigaon</td>
<td>1</td>
<td>9</td>
</tr>
</tbody>
</table>

Districts: 07 Total Repositories 20 Sanchi Manuscript 1853

**b)** To conduct various physical, mechanical and chemical experimental investigations with the objective of analyzing the cause and nature of gradual degradation of sanchi manuscripts belonging to different time-periods. The various laboratory experiments and tests were being performed at departmental laboratories of IIT Guwahati and Dibrugarh University, Dibrugarh. These are:

i. Department of Mechanical Engineering Laboratory of Indian Institute of Technology Guwahati (IITG)

ii. Department of Chemistry Laboratory of Indian Institute of Technology Guwahati (IITG)

iii. Central Instrument Facility, Indian Institute of Technology Guwahati (IITG)

iv. Department of Chemistry Laboratory, Dibrugarh University, Dibrugarh.

c.) To study and observe state-of-the-art technology applied in Germany in preservation of manuscripts of various types such as, papyrus, vellum and paper of various ages and times, the following organisations were considered as research sites:

i. Conservation Laboratory of Thuringer Universitats and Landesbibliothek Jena (ThuLB), Germany

ii. Gothe-Schiller Archive at Waimer, Germany
Behind the selection of the above locations in Germany had three reasons:

- One, the opportunity to visit Germany arrived when the Centre for the Study of Manuscript Culture, University of Hamburg, requested for an 'Invited Lecture' on the experimental investigation on natural degradation of sanchi manuscripts of Assam.

- Secondly, the organisations mentioned above possess wide expertise on the state-of-the-art-technology on preservation of some of the most ancient manuscripts approximately 1500-2000 years old.

- Third, the organisations mentioned above are most enriched with Egyptian, Greek, Arabic and Coptic collections, which have various types of manuscripts including papyrus, parchment or vellum and paper all in one place, but, preserved with various methods specific to each of them.

1.6 Population of samples

A total of 1853 sanchi manuscripts: Fresh, 100 year, 200 year, 300 year and 400 year old were taken from 20 repositories situated in 7 districts of Assam for survey, and to study and examination of physical status of preservation of repositories; indigenous preservation practices and materials used; and, various physical conditions caused due to effect of various environmental, biological and chemical factors of deterioration on sanchi manuscripts.

To conduct some experimental investigations in the laboratories, five types of samples of sanchi manuscripts were taken according to their age viz., fresh bark removed, 100 years old, 200 years old, 300 years old and 400 years old to perform various tests in laboratories.
1.7 Research methodology

The preliminary observation and study on the topic suggested that the concerned research work was an exploratory or formulative research as well as experimental research. The research work was exploratory or formulative, because it intended to formulate a new scientific integrated system of preservation for sanchi manuscripts. This research work was also experimental one, because besides collecting and generating data from several readings of survey and observation methods, few experiments were also need to be conducted in the laboratory to ensure reliability of the result of the research work, and an inference has been drawn on the basis of causality.

At the beginning of the research work, 20 repositories and 1853 sanchi manuscripts were taken as sample for survey, and to observe and examination of their present physical condition and status of preservation. The observation and examination of physical conditions and statue of the manuscripts were done visiting physically to each and every repository. As sanchi manuscripts are scattered throughout Assam, the repositories were selected randomly to make above observations. The data collection for the above purpose has been done through questionnaire, personal interviews and physical observation of the manuscripts and repositories on the spot.

To know and to have a clear understanding of the traditional and modern aspects of preservation techniques and preservatives, a profound literature survey of micro and macro literature was conducted.

One of the objectives of the research work was to examine nature and gradual degradation of physical, mechanical and chemical properties of sanchi manuscript. To generate and supplement data to fulfil this objective, it was utmost necessary to examine and analyze the nature and gradual degradation of physical, mechanical and chemical properties of sanchi manuscripts with various physical, mechanical and chemical tests in the science laboratories of reputed academic institutions. These tests were conducted using Scanning Electron
One of the major causes of deterioration of sanchi manuscript was found to be biodegradation of cellulose caused by fungi and insects. The biodegradation caused by fungi and insects have direct influence and adverse effect on mechanical properties of the sanchi manuscripts. Therefore, to know the effect of biodegradation on mechanical properties of sanchi manuscripts, few tests such as toughness test, stress-strain test were necessary and thus conducted. Through Stress-Strain measurement, various parameters such as, Young’s Modulus Ratio (Ratio of stress-strain in linear portion), Tensile Strength (Stress needed to break a sample), Toughness (Area under stress-strain curve), Breaking Elongation (the Breaking elongation is a strain on a sample when it breaks, expressed in percentage) were studied and measured. These tests were conducted using a Universal Testing Machine (UTM).

Analyzing the images obtained from SEM technique and other physical observations, it was revealed that three types of fungus, viz., Aspergillus, Chaetomium and Penicillium were responsible for degradation of sanchi manuscripts. This finding necessitated to try for an experiment for restoration of the infected sanchi manuscripts. Use of EDTA disodium solution and alkaline hydrogen peroxide with silicon dioxide solution on infested sanchi manuscripts, respectively, provided tremendous success for restoration of the same.

For schematic presentation of research methodology adopted in this research work please refer to Fig. 4.1.

1.8 Scope of the study

The inference of the research work expected to have far reaching scopes. Some of them are as the following:
1. Manuscripts preservation is a growing field of research all over the world especially in library and archival study. The area is still nascent from research point of view and has huge scope for further research.

2. Research on physical preservation of sanchi manuscripts has not been done yet and has remained totally untouched. This work is the first attempt to study degradation of sanchi manuscripts in the molecular level using state of the art technology prevailing today. Being first attempt, obviously some inference will be developed which will create further scope for on the topic. This further substantiates the originality of the research problem and novelty of the research methodology employed in the present study.

3. The process of indigenous sanchi manuscript making technique is unique to the world. No such technique exists anywhere in the world for preparing writing support from aloes wood origin. Tremendous amount of Indigenous Knowledge (IK) was put into the thought process of making these writing medium. Each and every entity of application of these IK leaves scope for further research.

4. Sanchi manuscripts are regarded as knowledge and cultural heritage in Assam, therefore, research in this field has huge historical, social and cultural values and scope.

5. It may lead to further study and research on testing the ancient techniques of sanchi manuscript making and link them with modern marketing approaches (such as eco-friendly, acidic free paper, etc)) of ‘quality’ paper making.

6. The findings of the research work may help the decision makers at various level (local, national or international) whether there is a need for developing an integrated approach of preservation of sanchi manuscripts for its longevity as a physical entity, and (or) linked with prioritizing other modern approaches of preservation such as microfilming, digitization, reformatting, etc.
1.9 Limitation of the study

Doing research on preservation techniques of ancient manuscripts is a difficult task as lot of parameters such as environmental, biological, chemical and many other intrinsic and extrinsic factors are needed to taken into consideration. So the immensity of the topic restricts scholars to go beyond their periphery of work and explore new ideas, due to the restriction of time.

On the other hand, many experiments on manuscript preservation need specialized laboratories with simulated environment along with sophisticated equipments to perform complicated analytical tests. Lack of such facilities in the state of Assam is a stumbling block for high end research activities in the field of preservation and conservation of manuscripts.

Looking at the compendium of the study and variety of nature and problems, it is realized that the research on preservation and conservation of manuscripts is a matter of group research or team research having resource persons with specializations in various fields. It appears not to be a one man’s business or individual activity.

Moreover, dearth of experienced persons and reference sources on the field of sanchi manuscripts is in fact a crunch situation for researchers in this field. In true sense, absolutely no scientific research work has been done on preservation of sanchi manuscripts so far, not in Assam or in anywhere in the world, which is itself a huge void in the field and biggest limitation for the research scholars.

1.10 Organization of the study: brief of the chapter plan

The study is organized in six chapters. The first chapter provides the background against which the need for the present study is justified. Aims, objectives, population, research methodologies, scope, limitations and a brief outline of the study are delineated. The framework of the research work undertaken is explained through research methodology.
The second chapter is assigned for literature review which covers studies of literature published in the field previously in various forms such as books, journals, research paper, reports, etc. Also consulted and reviewed some of the online e-resources for old aspects of the field as well as latest development, especially for the state-of-the-art-technology related to the field of preservation of manuscripts. The chapter has been constituted in various sections to make it logical and simple. Some of the reviewed literatures categorized in sections are history, traditional process of manuscript making and preservation, environmental or physical factors of deterioration, chemical factors of deterioration, biological factors of deterioration, natural factors of deterioration, management of preservation activities and actions, etc.

The third chapter discusses the subject of the research work. This chapter basically gives the idea about concept of preservation of manuscripts, various factors like environmental, biological, chemical as well as man-made factors causing damage to manuscripts and respective preventive measures and state-of-the-art-technology; indigenous preservation practices prevalent in India; preservation of sanchi manuscripts in Assam and analysis of sanchi manuscript making technique of Assam.

The fourth chapter discusses about methods and methodologies. The chapter methods and methodologies has provided the framework of the research work undertaken. According to the needs and objectives, various methods were adopted and each method was explained lucidly. In this research work, besides survey and observation methods, some experimental methods such as physical, mechanical, and chemical methods, using various modern and sophisticated machines were also adopted to fulfill the need of the main objective.

The fifth chapter includes data analysis and interpretation. The data collected and generated through survey and observation methods, and also from various laboratory experiments and tests such as physical, mechanical and chemical tests were analyzed in this chapter and interpreted for a logical conclusion. The final result of the research work has been provided in this chapter.
Chapter six is the last chapter of this research work which is presented by summary, conclusions and suggestions.

At the end of the chapters, select bibliography and references, appendices has been provided.