VANAUṢADHIVARGA OF AMARAKOŚA: A COMPUTATIONAL STUDY

Dissertation submitted to Jawaharlal Nehru University

in partial fulfillment of the requirements

for the award of the degree of

MASTER OF PHILOSOPHY

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SPECIAL CENTER FOR SANSKRIT STUDIES

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INDIA

2011

विशिष्ट संस्कृत अध्ययन केन्द्र

जवाहरलालनेहरू विश्वविद्यालय

नई दिल्ली-११००६७

SPECIAL CENTER FOR SANSKRIT STUDIES

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NEW DELHI-110067

July 21st, 2011

DECLARATION

I declare that the dissertation entitle '***Vanauṣadhivarga of Amarakośa:* A Computational study**' submitted by me for the award of degree of Master of Philosophy is an original research work and has not been previously submitted for any other degree or diploma in any other institution/University

(BALDEV RAM KHANDOLIYAN)

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CERTIFICATE

The dissertation entitled '***Vanauṣadhivarga of Amarakośa:*** **A Computational study'** submitted by **Baldev Ram Khandoliyan** to **Special Centre for Sanskrit Studies, Jawaharlal Nehru University, New Delhi – 110067** for the award of degree of **Master of Philosophy** is an original research work and has not been submitted so far, in part or full, for any other degree or diploma in any University. This may be placed before the examiners for evaluation.

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To

My

Loving Mummy

Papaji

ACKNOWLEDGMENT

I wish to take this opportunity to express my deep sense of gratitude to my supervisor, Dr. Girish Nath Jha for his untiring supervision, invaluable suggestions and inspiring guidance, which enabled me to bring this work into the present shape. He trained me in Java programming and developing database, creating text files and other linguistic resources. He also helped me from time to time in programming and dissertation writing and solved several difficulties.

I sincerely thank to my co-supervisor Prof. Yamini Bhusan Tripathi, Head of the Department of Medicinal Chemistry,Institute of Medical Sciences, BHU, Varanasi for his encouragements throughout my dissertation.

I express sincere thanks and gratitude for Chairperson, Prof. Vaishna Narang and other faculty members – Prof. Shashiprabha Kumar, Dr. Ram Nath Jha, Dr. C. Upendra Rao, Dr.Hariram Mishra, Dr. Rajnish Kumar Mishra and Dr.Santosh Kumar Shukla of the Special Center for Sanskrit Studies (SCSS), Jawaharlal Nehru University, New Delhi, for encouraging and allowing this research to complete. I also acknowledge all the staff members for their cooperation and extending facilities to complete my work.

I also express my gratitude and great thanks to my seniors Sachin sir, Diwakar Mishra sir and Diwakar Mani sir for helping me systematize and structure the ideas for my research.

Thanks to Yashpal and Kapil who have inspired and influenced me in some or the other way and has always been with me like a shadow.

Thanks to my special friend Om Singh Lakhawat for guiding me positively and making my time joyful.

I am also thankful to Ramchandra, Sikramaram, Rahul Anand, Naval, Chitresh, Radhey Shyam, Anawar, Ramkishor Bhambu, Sunil Vaishnav, Nemaram. They have always been good friends and have inspired me for this work.

My special thanks to my seniors Subhash Chandra, Manji Bhadra, Surjit Kumar, Vijendraji, Mayankaji, Mukesh Mishra, Vishva Bandhu of the SCSS for helping me to systematize the ideas for my R & D.

My special thanks to all of my friends and classmates, particularly Rajneesh, Vishvesh, Babloo, Bind, Ashok, Nrependra, Pritosh, Priyanka, Jaya, Anita and Archana of the CSS.I express my thanks to my friends from my hostel Prem, Vishnu, Hawa Singh, Suresh, Vikash and Anil of JNU. I also extend my special appreciation to Sivlocha, Megraj and Devendra.

I extend my special appreciation to Partha, Prachetas, Hariom, Anushrita and some other juniors of MA for entering data of this research.

No words can adequately express my indebtedness to my Mummy-Papaji, Smt.Santosh,dear Mahendra,lovely Divya and my brother Ram Ratan, without whom support and motivation I would have not reached at this stage of academic distinction. I give special thanks to my uncle Ramniwasji and cousins Devakarnji Mahadevji, for their love, inspiration and co-operation. I shall remain indebted for the sacrifice they have done for building my carrier.

Thanks to UGC for providing me a Junior Research Fellowship which has been source of financial assistance as well as of academic motivation.

Baldev Ram Khandoliyan

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List of Abbreviations

AI	Artificial Intelligence
AK	Amarakośa
ASCII	American Standard Code for Information Interchange
BP	Bhāvaprakāśa
BPN	Bhāvaprakāśa Nighaṇṭu
CL	Computational Linguistics
DN	Dhanvantari Nighaṇṭu
GUI	Graphical User Interface
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
ICT	Information and Communication Technology
INRIA	Institut National de Recherche en Informatique et Automatique
ISCII	Indian Standard Code for Information Interchange
JDBC	Java Database Connectivity
JNU	Jawaharlal Nehru University
JSP	Java Server Pages
KDK	Kalpadrūkośa
Mbh	Mahābhārata
Mss	Manuscripts
MS-SQL	Microsoft Structure Query Language
MT	Machine Translation
NLP	Natural Language Processing

PDF	Portable Document Form
R&D	Research & Development
RDBMS	Relational Database Management System
SCSS	Special Centre for Sanskrit Studies
TDIL	Technology Development in Indian Languages
UTF	Unicode Transformation Format
VV	Vanauṣadhi Varga
WWW	World Wide Web

List of Tables, Figures and Screenshots

Transliteration key used in the dissertation

अ	=	a	ढ्	=	ḍh
आ	=	ā	ण्	=	ṇ
इ	=	i	त्	=	t
ई	=	ī	थ्	=	th
उ	=	u	द्	=	d
ऊ	=	ū	ध्	=	dh
ऋ	=	ṛ	न्	=	n
ॠ	=	ṝ	प्	=	p
ऌ	=	ḷ	फ्	=	ph
ए	=	e	ब्	=	b
ऐ	=	ai	भ्	=	bh
ओ	=	o	म्	=	m
औ	=	au	य्	=	y
क्	=	k	र्	=	r
ख्	=	kh	ल्	=	l
ग्	=	g	व्	=	v
घ्	=	gh	श्	=	ś
ङ्	=	ṅ	ष्	=	ṣ
च्	=	c	स्	=	s
छ्	=	ch	ह्	=	h
ज्	=	j	क्ष्	=	kṣ
झ्	=	jh	त्र्	=	tr
ञ्	=	ñ	ज्ञ्	=	jñ
ट्	=	ṭ	ऽ	=	’
ठ्	=	ṭh	ं (*Anusvāra*)	=	ṃ
ड्	=	ḍ	ः (*visarga*)	=	ḥ

Introduction

Introduction

Lexicography is one of the most important branches of Sanskrit literature. To know the information of words and their usages in the space and time context, Sanskrit lexicons were composed since the Vedic period. Lexicon is accounted as a part of *ṣaḍvedāṅga* in the form of *Nighaṇṭu* and *Nirukta.* After that, more than hundred lexica had been composed by Indian scholars down the centuries.

The *Amarakośa*(AK) is the most popular lexicon among Sanskrit lexical texts. It was memorized by Sanskrit Students from their childhood alongwith *Aṣṭādhyāyī.* It was easy to memorize this lexicon as it is composed in *anuṣṭubh* meter using simple language. The importance of these two texts has been expressedinthe following śloka - "***Aṣṭādhyāyī jaganmātā amarakośo jagatpitā***|" The AK is also referred to as *nāmaliṅgānuśāsana and trikāṇḍī,* because it has mentioned *liṅga* (gender) with *nāma* (word). This research is based on *vanauṣadhivarga*(VV), the fourth *varga* of the second *bhūmyādikāṇḍa* of AK.

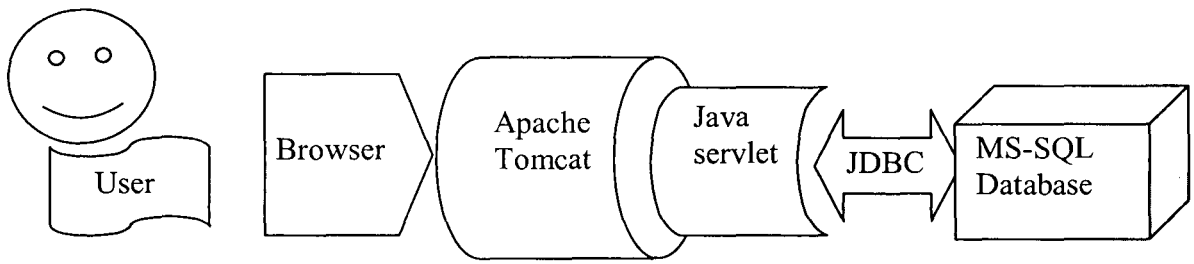
In VV forests, drugs and medicinal plants are described. The classification of herbs given in VV is helpful for the study of *āyurvedic nighaṇtus.* The word groups of VV shows the developed tradition of *āyurveda.*The *varga* provides the names of about 325 drugs, medicinal plants and fruits with their synonyms. But *dravyaguṇa*(morphological characters, *rasa pañcaka* and properties) of herbs is not given in this *varga.*

The scope of this work is to do a computational analysis of *vanauṣadhivarga*(VV) of Amarakośa(AK). For this Research and Development(R&D) a system uses exiting online as Online Multilingual Amarakośa which is available at http://www.sanskrit.jnu.ac.in/ created by Dr. Girish Nath Jha. The existing system provides only the *nāma*(word) and *liṅga*(gender) of herbs described in VV of AK. The present R&D extends the existing system and aims to develop a relational database system for the storage and interactive access of herbs described in the VV of AK with their morphological characters, their *rasa pañcaka*, properties. Besides this the *dravyaguṇa* of herbs which includes origin, synonyms, types, properties, therapeutics and the utility on the basis of Bhāvaprakāśa Nighaṇṭu (BPN) is also provided as an additional information.

Bhāvaprakāśa Nighaṇṭu of Bhāvamiśra(16th Century AD), is one of the most accepted texts for *dravyaguṇa*. The Information regarding to the place of drug's origin, synonyms, their types, properties, therapeutics and the utility of a particular plant part of drugs etc is described in BPN. With the help of BPN the more detailed about drugs of VV can obtained. So the present work is a model to online access a data of āyurvedic herbs. This work tries to link the herbs of VV of AK with the modern botanical names.

Development of the Amarakośa Vanauṣadhi Varga and Bhāvaprakāśa Nighaṇṭu indexer:
A dynamic web application/search engine cum-indexer has been developed under this research. This web application has been developed in the front-end of Apache Tomcat Web server using JSP and Java servlets. and its data is in Unicode datafiles alongwith RDBMS in MS SQL server.

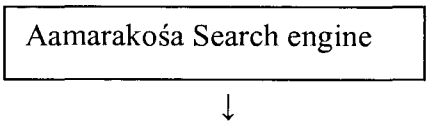
For connecting the front-end to the database server the MS-JDBC connectivity has been used. The system is available online on http://sanskrit.jnu.ac.in/amara/viewdata.jsp with input and output in Devanāgarī Unicode. The system works as an interactive and multi-dimensional knowledge based indexing system for *vanauṣadhivarga* of Amarakośa. The system can be used also as a generic system for all Sanskrit lexica and āyurvedic nighaṇṭus of similar structure. The architecture of the system is as follows:



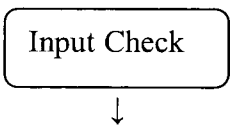
[Fig D.1: Architecture of the system]

Process flow of the system

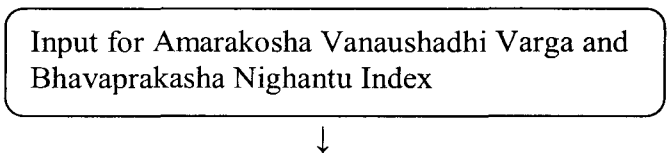
The process flow of the system can be explained in the following way:



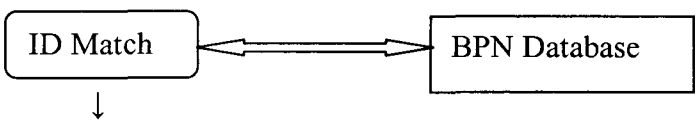
(already exists at http://sanskrit.jnu.ac.in/amara , It takes input in three ways i.e. typing the input word, selecting input word through alphabetical category or selecting the input word from drop down box)



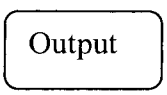
(If the input word is related to VV then the page has a link for additional search as "search this herb in Bhavaprakasha Nighantu " , clicking this link leads to the "Amarakosha Vanaushadhi Varga and Bhavaprakasha Nighantu Index" page)



(The input for this page is forwarded from the previous page. It also has the facility to accept a new input word through typing or in-built keyboard)



(The database of the main page(Aamarakośa Search engine) has an Id assigned to each word of VV, this id of the input word is matched with BPN database to get additional input)



[Fig.D.2.Process flow of the system]

The system gives output on the basis of AK database, and BPN database. The output includes AMARAKOSHA_ID, AUSHADHI NAME, BPN_ID, HINDI NAME, VARGA, SYNONYMS, SHLOKA, SHLOKA HINDI, SCINTIFIC NAME(LATIN).

The above process flow chart can be illustrated by the following example:

Step 1 selected the input word *vibītakaḥ* on AK search page.

Step 2 The input is related to VV, so a link for another page appears. By clicking it, a new window named "Amarakosha Vanaushadhi Varga and Bhavaprakasha Nighantu Index" opens.

Step 3 The same word *vibītakaḥ* appears as input on this new page.

Step 4 This word has an ID in Amarakosha database, this id is matched with BPN Database to get additional information.

Step 5 The final step shows the output. It describes AMARAKOSHA_ID, AUSHADHI NAME, BPN_ID, HINDI NAME, VARGA, SYNONYMS, SHLOKA, SHLOKA HINDI, SCINTIFIC NAME(LATIN). This detail comes out from both AK and BNP database.

Chapter description

The dissertation as a part of Research and Developedment(R&D) has been divided into five chapters. The first chapter '***Sanskrit Lexicography in India***' discusses the Sanskrit lexicographical literature in India. The structure and features of the lexica composed prior and posterior to AK are given as well as AK. A discussion is also made about modern Sanskrit dictionaries.

The second chapter '***A Survey of Āyurvedic Nighṇṭus***' discusses the tradition of āyurvedic nighaṇṭu. It describes 18 major and the few other nighaṇtus.

The third chapter '***Structure and Organization of the Amarakośa(AK) and its Vanauṣadhi Varga(VV)***' is a detailed study of the structure and contents of the AK and its VV.

The fourth chapter '***Comparative Study of the Vanauṣadhi Varga(VV) of Amarakośa (AK) with Bhāvaprakāśa Nighaṇṭu(BPN)***' describes the introduction of BPN, its structure and organization. This chapter presents a comparative study of VV of AK and BPN on the basis of similarity and dissimilarity.

The fifth chapter '***Computational analysis and System Design***' describes the implementation part of the research such as the front end, Java objects, lexical resources and how they work.

In the concluding part of the dissertation, the limitations of the system and its implications for future research have been summarized.

Research Methodology:

For the computational analysis and āyurvedic study of the VV of AK, the methodology used as follows:-

- to study of structure of VV of AK and create a database structure for it. Descriptions from BPN are included as extention.
- to make a brief survey of the herbs *(dravyaguṇa vijñāna)* in Indian tradition.
- to do a comparative study of the herbs described in the VV of AK with the BPN.
- to develop the necessary front end and search program

The methodology of comparative study and analysis used in Sanskrit based Natural Language Processing (NLP), and techniques of software engineering is also used for this work. An online system and the lexicon of the VV of AK with *dravyaguṇa* of the herbs have been developed.

Chapter 1

Sanskrit lexicography in India

Chapter 1

Sanskrit lexicography in India

1.1 Introduction

Lexicography is one of the most important branches of Sanskrit literature. To know the information of words and their usages in the space and time context, Sanskrit lexicons were composed since the Vedic period. Lexicon is accounted as a part of *ṣaḍvedāṅga* in the form of *Nighaṇṭu* and *Nirukta.* After that, more than hundred lexica had been composed by Indian scholars down the centuries. The *Amarakośa* is the most important and popular among Sanskrit lexica. So, accepting the *Amarakośa* as the center point, we can divide the history of Sanskrit lexicographical literature as follows: (1)Lexica prior to *Amarakośa,*(2)The *Amarakośa,*(3)Lexica posterior to *Amarakośa,*(4)Modern Sanskrit dictionaries.

This chapter discusses the history of Sanskrit lexicographical literature with the structure and features of the lexicon. A discussion is also made about modern Sanskrit dictionaries.

1.2. Lexica prior to Amarakośa

The *Amarakośa,* the most popular of all the Sanskrit lexicons, is not the first of its kind. Leaving aside the question of Vedic glossaries such as the *Nighaṇṭu* and a few others, it is found that there existed a number of lexica prior to the *Amarakośa.* The author of the text himself states that he compiled his lexicon after consulting other treatises.[1] In the opinion of Sarvānanda, Amara seems to have consulted the works of Vyāḍi, Vararuci, Trikāṇḍa and Utpalinī.[2]

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[1] *Samāhṛtyānyatantrāṇi saṁkṣiptaiḥ pratisaṁskṛtaiḥ |*
Sampūrṇamucyate vargaiḥ Nāmaliṅgānuśāsanam || Amarakośa, 1.1.2.||

[2] While commenting on *Amara,* 1.1.2, Sarvānanda remarks: "*Anyatrāṇi Vyāḍivararuciprabhṛtināṁ tantrāṇi, samāhṛtya ekīkṛtya ata eva saṁpūrṇamidam, yataḥ Trikāṇḍotpalinyādini nāmamātr tantrāṇi, Vyāḍivararucyādi praṇītāni tu liṅgamātṛni* " etc.

The *Nighaṇṭu* - a list of Vedic words - is the oldest Sanskrit lexicon known so far. According to the derivation of the word *'nighaṇṭu'*, as given by Aupamanyava[3] and accepted by Yāska[4], it comprises a list of Vedic words. The *Nighaṇṭu* consists of five chapters. The first three chapters of which form the main body of the text and are called the *Naighaṇṭuka-kāṇḍa,* the fourth is called the *Naigamakāṇḍa* and the fifth is *Daivatakāṇḍa.* The first *kāṇḍa* deals with synonyms, the second with homonyms and the third gives the names of the deities. The topics include: (i) physical things such as earth, air, and water; (ii) objects of nature such as clouds, dawn, day, and night; (iii) the human body and its limbs such as arms and fingers; (iv) objects and qualities associated with people such as wealth and prosperity or anger and fighting; and (v) physical abstract qualities such as heaviness or lightness.[5] The *Nighaṇṭu* is not the work of a single author. From the derivation of the work as given by Aupamanyava it seems probable that it is a compilation of different persons who might have been the sages of older days. Most probably it is a work of generations of ancient Vedic scholars. One tradition ascribed the authorship of the *Nighaṇṭu* to the sage Kāśyapa relying on the verses found in the *Mahābhārata.*[6] This, however, appears to be improbable.

One can, therefore, be justified in saying that the *Nighaṇṭu,* as it is presented to us marks the beginning of the lexicographical literature in Sanskrit. The *Nighaṇṭu* is a mere vocabulary of Vedic words. It does not give the meanings of words and in this sense it cannot be called a work of lexicography in the modern sense of the term. Even so, it must be admitted that the words in the *Nighaṇṭu* are arranged according to specific groups and this arrangement is generally found in later lexicons. It is mainly for this reason that the *Nighaṇṭu* can be regarded as the starting point in the compilation of later Sanskrit works on lexicography.

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[3] *Chandobhyaḥ samāhṛtya samāhṛtya samāmnātāḥ | te niganṭavaḥ eva santaḥ nigamanāt nighaṇṭavaḥ ucyante iti Aupamanyavaḥ*-Nirukta.

[4] *samāmnāyaḥ samāmnātaḥ |... tam imam samāmnāyam nighaṇṭavaḥ iti ācakṣate* |- Nirukta.

[5] L. Sarup, The Nighantu (1920), Introduction, p. 13.

[6] The verses occur in the Mokṣaparvan (ch. 342, vv. 86-7) and read as under:
"*vṛso hi bhagavān dharmaḥ khyāto lokeṣu Bhārata*
Nighaṇṭuka padākhyāne viddhi māṁ vṛṣamuttamam |
Kapir-varāṇāḥ śreṣṭhaśca dharmaśca vṛṣa ucyate
tasmāt vṛṣākapim prāha kaśyapo mām Prajāpatiḥ ॥"

Two commentaries on the *Nighaṇṭu* are known to us: the *Nirukta* by Yāska (800-700 B.C.) and the *Nighaṇṭu-nirvacana* by Devarāja Yajvan (twelfth century A.D.). [7]

The *Nirukta* of Yāska is one of six *vedāṅgas*. This is a thorough commentary on the *Nighaṇṭu*. Instead of merely explaining the words or passages occurring in the text, the *Nirukta* gives, besides the meanings of the words occurring in the *Nighaṇṭu*, the references to the terms as they are used in the Vedic literature. Yāska quotes Vedic passages and tries to give the derivation of the words found in the *Nighaṇṭu*. The *Nirukta*, as its subject-matter reveals, is not merely a commentary but contains an extensive original discourse in the form of etymological discussion of the words. Incidentally, the author remarks on the nature and utility of the study of the *Vedas*, the cosmological functions of the Vedic Gods and so forth. As Yāska's main object in writing a commentary on the *Nighaṇṭu* is to give the etymology of every word occurring in the text, he tries to derive every word from its original root.

The *Nirukta* is divided into twelve chapters, each chapter being again sub-divided into *pādas* which range from three to seven in different sections. There are two additional chapters, viz. chapters XIII and XIV, which are known as *pariśiṣṭas* or appendices. The twelve chapters of the *Nirukta* correspond to the three divisions of the *Nighaṇṭu* as-

Kāṇḍa and *Adhyāya* in *Nighaṇṭu*	*Adhyāya* in *Nirukta*
1.*Naighaṇṭuka-kāṇḍa*(1^{st} ,2^{nd}, 3^{rd})	1^{st} (Bhūmikā),2^{nd},3^{rd},
2.*Naigamakāṇḍa*(4^{th})	4^{th} , 5^{th} ,6^{th},

[7] Chatterji, Sunit Kumat, 2007, *The Cultural Heritage of India*, volume 5, p.327.

3.*Daivatakāṇḍa*(5^{th})	7^{th} (with special introduction related to *devatā*), 8^{th} ,9^{th} ,10^{th} ,11^{th} ,12^{th} .

Table1.1 : Chart Indicating relation of *Nighaṇṭu* and *Nirukta*[8].

Thus, chapters I-III correspond to the first three chapters of the *Nighaṇṭu* which are known as the *Naighaṇṭukakāṇḍa.* Chapters IV-VI deal with the fourth chapter of the *Nighaṇṭu* known as the *Naigamakāṇḍa* and chapters VII-XII deal with the last chapter of the *Nighaṇṭu* called the *Daivatakāṇḍa.*

For the *Nirukta,* we have two commentaries known to us. One is by *Durgācārya* who, according to Rajwade,[9] lived before the tenth century; the other is by Skandasvāmin and Maheśvara, who are believed to have lived between A.D. 1060 and 1350. The former is important from the textual point of view, for it repeats every word used by Yāska.

Apart from being a commentary on a Vedic glossary the *Nirukta* has an importance of its own. It is a work of great value not only to philologists but also to the students of Sanskrit language. Traces of later lexicography are to be found in the *Nirukta* as also in the *Nighaṇṭu,* for we find Yāska referring to many words from the Vedic literature.

Vyāḍi(before 500 AD) is very often quoted by well-known authors like Hemacandra, and was apparently a renowned lexicographer. Vyādi is also quoted in the commentaries on the *Amarakośa* written by Rāyamukuṭa and Maheśvara. From all these quotations it appears that Vyādi's lexicon was arranged in groups of synonyms and also contained a chapter on homonyms. Lengthy quotations from Vyāḍi, found in Hemacandra's commentary to his own work *Abhidhānacintāmaṇi,* show that Vyāḍi's lexicon must have been a voluminous one.

Kātya (before 500 AD) as a lexicographer is quoted by *Kṣīrasvāmin* in his commentary on the *Amarakośa,* by Hemacandra in his *Abhidhānacintāmaṇiṭīkā,* by Keśava in *Kalpadrukośa* (composed in 1660 AD), by *Rāyamukuṭa* and *Bhānujī* in their commentaries

[8] Upadhyay , Baldev, 2006, *Saṃskṛta Śāstroṃ kā Itihāsa,* p. 332.
[9] Nirukta (Marathi translation), p. 1278.

on the *Amarakośa*. Kātya is distinct personality with Vararuci.[10] Kātya's lexicon seems to have contained both synonyms and homonyms and its name appears to be *Nāmamālā*. Kātya does not, like Amara, put down the synonyms together but often strives to give accurate meanings by means of descriptive clauses.[11]

The name of **Bhāguri**'s lexicon was *Trikāṇḍa*. Bhāguri has not indicated the gender of words. He arranged words with synonyms. Sāyaṇa has explained Bhāguri's view about the word '*Varṣābhū*'.[12]

Ratnakośa – The author of *Ratnakośa* is not recognized. According to Sarvānanda classification of chapters in *Ratnakośa* was on the basis of gender.

The **Mālā** is authored by Amaradatta. Sarvānanda has given more than 30 quotations from *Amarmālā* in his *Amaratīkā*: Halāyudha has accepted *Mālā* as basis of his lexicon *Abhidhāratnamālā*.[13]

The name of **Vācaspati**'s lexicon was *Śabdārṇava* in which synonymic words were arranged. The feature of *Śabdārṇava* was giving various form to a word. Eg. '*himāṃśuścandramāścandraḥ śaśī candor himadyutiḥ.*'[14]

The Dhanvantari-Nighaṇṭu attributed to **Dhanvantari** is a glossary of materia medica and is believed to have existed in three different recessions. It gives a vocabulary of medicinal herbs and plants including their properties.

The *Anekārtha-dhvani-mañjarī* by **Mahākṣapaṇaka** was written before 925 A.D. It is a dictionary of homonyms and consists of three chapters (*ślokādhikāra-ardhaślokādhikāra- padādhikāra*) which repeatedly devote a quarter, one-half, or the whole of a stanza to the meanings of words.

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[10] Upadhyay , Baldev, 2006, *Saṃskṛta Śāstroṃ kā Itihāsa*, p. 338.
[11] *Kalpadrukośa*, Introduction, p. xiii.

[12] *Tathā bhāgurirapi hṛsvāntam manyate| yathā ca bhāryāmekasya varṣāmbī, ṛgī syād madagurasyatu śilīgaṇḍapadasyāmi kacchapasya ḍuliḥ smṛtā|| (Mādhavīya dhātu vṛttiḥ* pg. 42*)*
[13] *Abhidhāratnamālā* (1.1)
[14] *Padacandrikā pratham bhāga*, p.107

Pānini composed the lexicon named *'Dvirupa-Kośa.'* A manuscript of this lexicon is available at India Office Library, London which contains 7890 pages. At the end of lexicon it is written '*iti śrī Pānini muninākṛta dvirūpakoṣa sampūrṇam.*'[15]

1.3. The Amarakośa

The *Amarakośa* ascribed to Amarasiṃha (4th century AD), as far as the Sanskrit lexicography is concerned, is regarded as a work of paramount authority. The commentaries on numerous Sanskrit works frequently quote Amarasiṃha's lexicon. It has the widest circulation, and in all the schools and in every sect it is regarded as a work of unquestionable authority.[16] The popularity of this work can also be determined by the fact that Dr. Aufrecht records not less than forty commentaries on it in his '*Catalogus Catalogorum.*'

This lexicon is popularly known by the name *Nāmaliṅgānuśāsanam,* meaning thereby a work which deals with vocables and their genders. It is also known as *Trikāṇḍa* and is divided into three *kāṇḍas,* each *kāṇḍas* again being sub-divided into sections called the *vargas.* The table of contents is given below:

Svargādikāṇḍa	*Bhumyādikāṇḍa*	*Sāmānya kāṇḍas*
1. *Svargavarga*	*1. Bhūmivarga*	*1. Viśeṣyanighnavarga*
2. *Vyomādivarga*	*2. Pūravarga*	*2. Saṁkīrṇavarga*
3. *Digvarga*	*3. Śailavarga*	*3. Nānārthavarga*
4. *Kālavarga*	*4. Vanauṣadhivarga*	*4. Avyayavarga*
5. *Dhīvarga*	*5. Siṁhādivarga*	*5. Liṅgādisaṁgrahavarga*
6. *Śailādivarga*	*6. Nṛvarga*	
7. *Nāṭyavarga*	*7. Brahmavarga*	
8. *Pātālabhogīvarga*	*8. Kṣatriyavarga*	
9. *Narakavarga*	*9. Vaiśyavarga*	
10. *Vārivarga*	*10. Śūdravarga*	

Table1.2 : structure of *Amarakośa*

[15] Upadhyay , Baldev, 2006, *Saṃskṛta Śāstroṃ kā Itihāsa,* p. 165.
[16] Wilson, Collected Works, III, p. 166.

The whole work is written in metrical form in *anuṣṭubh* metre. A major part of it deals with synonyms and only one small section viz., the *nānārthavarga* is devoted to homonyms and is arranged after the final consonants. Indeclinable are treated in one chapter while the last section is devoted to the general rules for determining the genders. The arrangement of the work is faulty and one finds it extremely difficult to trace a particular word in the *kośa* without the help of an index. The genders of the words are expressed by the inflectional endings in some cases, while at times they are recorded with words such as *strī, puṃs* etc. indicative of genders.

1.4. Lexica Posterior to Amarkośa

The Anekārthasamuccaya is popularly known as the *Śāśvatakośa* after its author Śāśvata (about the 6th century AD). This is the first Sanskrit dictionary of homonyms. It is not a complete *kośa* and is not divided into different divisions. The words are arranged in full verses, half verses, and even in quarter verses. The work consists of 807 verses[17], in which about 2000 words are arranged and is divided into six sections, the last two of which deal with indeclinable.[18] The *Anekārthasamuccaya,* though a small work in extent, seems to have been the basis of later lexicographers. Śāśvata, has very often been quoted by Kṣīrasvāmin, by Vararuci in *Gaṇaratna-mahodadhī,* by Mallinātha, and others. This shows that Śāśvata's lexicon must have obtained a high degree of popularity in later years.

The Nāmamālā of Dhanañjaya (about 1123 AD) is a vocabulary of synonyms. According to India Office Manuscript[19] there is only one *pariccheda* viz., the synonyms and contains 205 verses. There are, however, other manuscripts[20] of the same work which consist of two or even three *paricchedas*. Some divide the work into two *paricchedas* - synonyms (containing 205 verses) and homonyms (containing 50 verses).

Puruṣottamadeva(between 1050 and 1200 AD) - is a well known commentator on Pāṇini's *Aṣṭādhyāyī* flourished in Bengal and wrote about five lexical works: i) *Trikāṇḍaśeṣa* or *Amaraviveka* ii) *Hārāvalī* iii) *Varṇadeśanā* iv) *Dvirūpakośa* and v) *Ekākṣarakośa.* The earliest reference to his work is found in *Sarvānanda*'s commentary on the *Amarakośa,*

[17] *Śāśvatakośa* edited by K.G.Oak, Poona, 1918.
[18] Ibid, p.59: '*athāvyayā nibadhyante Ślokārdhena savistaram*' |
[19] India Office Cat., no. 1014.
[20] *ibid*, no. 1015.

composed in AD 1159. *Trikāṇḍaśeṣa* or *Amaraśeṣa* is a supplement to the *Amarakośa* and contains words which are omitted in it. Corresponding to the three sections of the *Amarakośa,* this work is also divided into as 25 *vargas* as in the original. In the introductory portion, the author states that his aim in writing the lexicon was to give only such vocables as were omitted by Amara but were found in common use.[21] *Hārāvalī* is a small work consisting of about 270 stanzas. It consists almost exclusively of uncommon words and is divided into synonyms and homonyms. The former is again subdivided into three sections having full verses, half verses and quarter verses. In the end, the author states that the composition of *Hārāvalī* was the result of the consultation of several lexicons.[22] *Varṇadeśanā* is a treatise on the proper spelling of nouns with certain cognate consonants such as *kha* and *kṣa*, *ha* and *gha*, *ha* and *ḍa*, *ja* and *ya* etc. *Dvirūpakośa,* containing about 75 stanzas, is a vocabulary of words which are spelt in two different ways but which are similar in sound, e.g. the words *āṣāḍhā* and *āśāḍha, śasvara* and *sasvara*, *kuśala* and *kuṣala* etc. *Ekākṣarakośa* is a lexicon which contains words of one syllable having different meanings attached to such single letters. The meaning of 125 words in 38 *Śalokas* is composed in this lexicon. For instance, in this lexicon the meaning attached to the first four letters of *Devanāgarī* alphabet will be found as: '**ā**- *Vāsudeva*', '**ā**- *Pītāmbara*', '**i**- *Kāma*', '**i**- *Lakṣmī*'.

Abhidhānratnamālā is the lexicon of Halāyudha (950 AD) is a vocabulary of small extent containing about 900 stanzas and is divided into five *kāṇḍas*- *Svar, bhūmi, pātāla, sāmānya, anekārthakāṇḍa.* The first four of these deal with synonyms while the last is devoted to homonyms and the indeclinables. The genders are indicated by giving the declensional forms. Halāyudha is said to have flourished in the middle of the tenth century and is identified with the author of the *Kavi-rahasya*,[23] a grammatical work written in honour of King Kṛṣna III (c. 940-70) of the Rāstrakuta family.

Vaijayantīkośa of Yādavaprakāśa (before 1100 AD) is a voluminous lexicon consisting of two broad divisions, one containing synonyms and the other containing homonyms. The synonyms is divided into 5 *kāṇḍas* and the homonyms is divided into 3

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[21] *Alaukitatvādamaraḥ svakośe, Na yāni nāmāni samullilekha |*
Vilokya tairapyadhunā pracāram, ayaṁ prayatnaḥ Puruṣottamasya ||

[22] *Śabdārṇavautpalinī saṁsārāvarataityapi, kośā Vācaspativyāḍivikramādityanirmitāḥ /*
ādāya sārameteṣāṃ anyeṣām ca viśeṣataḥ, Hārāvalī nibaddheyaṁ mayā dvādaśa vatsaraiḥ ||

[23] R.G. Bhandarkar, Report in Search of Sanskrit Manuscripts for 1883-84, p. 9.

*kāṇḍa*s. Each of these sections is again subdivided into several chapters. The distinguishing feature of the *Vaijayantīkośa* is that it contains numerous words from the Vedic literature, and is considerably more voluminous. Except the *Nighaṇṭu,* there is *no* other lexicon dealing with Vedic words. On account of this feature the *Vaijayantīkośa* has been looked upon as a work of considerable merit and authority. Yādavaprakāśa, who lived in South India, is identified with the preceptor of Rāmānuja, the celebrated staunch adherent of the *Vaiṣṇava* school of Vedanta. Yādavaprakāśa is said to have been originally a devout follower of the *Advaita* philosophy of Śaṅkara, but then, as a result of his discussion with his pupil Rāmānuja, he is supposed to have given up *Advaitism* in favour of the philosophy of Rāmānuja.[24]

Viśvaprakāśa, made by Maheśvara (AD 1111)[25], is a dictionary of homonymous words arranged according to the final consonants. The words are further arranged in sub-groups according to syllables which range from one to seven, e.g. *kaikam, kadvikam, katrikam* and so on. Although the work is arranged after the final letters there is no alphabetical order.

Anekārthakośa (*Nānārthasaṁgraha*) of Ajayapāla (before AD 1140) is a lexicon small in extent but of considerable authority. It is a work which deals with various meanings attached to a single word. It contains about 1730 words. The words are arranged after the initial letters without regard to the number of syllables and are divided into chapters according to the extent of meanings, in full, half verses and so on.

The *Medinīkośa* is made by Medinīkara (before 1300 A.D.). This is a lexicon of homonymous words arranged according to the final letter and also followed the alphabetical order. It is also known as *Nānārthakośa.* In this lexicon there are 1807 Ślokaś.

Maṅkhakośa(*Anekārthakośa*), authored by Maṅkha (about 1140 AD), is a homonymous dictionary consisting of about 1007 verses. The words in the *Maṅkhakośa* are arranged in an alphabetical order according to the final consonants and the words are further arranged according to the number of syllables. The verses are written continuously without a

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[24] Vaijayantikasa (Ed. G. Oppert), Preface, p. vi.

[25] *Rāmānala vyomarūpaiḥ śakakālebhilakṣite|*
Koṣam viśvaprakāśākhyam niramācchīśrīmaheśvaraḥ|| (last stanza).

break. The author of this lexicon says that he composed his lexicon by consulting the works of *Bhāguri*, *Kātya*, *Halāyudha*, *Amarasiṁha* and some others.[26]

Hemacandra(AD 1088-1175)- This celebrated Jain monk of the 12th century is a remarkable figure in the history of Jain and Sanskrit literature. He was a versatile writer and wrote on several branches of Sanskrit and Prakrit literature. He authored four lexicographical works as 1) *Abhidhānacintāmaṇi* (with its commentary), 2) *Anekārthasaṁgraha*, 3) *Nighaṇṭuśeṣa*, and 4) *Deśīnāmamālā.*

The Abhidhānacintāmaṇi is a large lexicon containing about 1542 verses written in different meters. The work begins with a description of the *ruḍha*, *yaugika* and *miśra* terms and a note on the component parts of compound words as to which of them are commutable and which are not. For gender the reader is referred to the author's *Liṅgānuśāsana.*[27] Contents of this lexicon are given here in tabular form:

	Kāṇḍa	Contents
Synonyms	*Devādhideva*	the Jain gods and the religious terms
	Deva	Brahmanical and Buddhistic gods and terms connected with them
	Martya	human beings in their different relations
	Bhūmi	lower animals
	Naraka	the beings of the nether world
	Sāmānyakāṇḍa	the abstract notions, adjectives and the indeclinables.
Homonyms	It is arranged according to the number of syllables in each word.	

Table1.3 : Structure of *Abhidhānacintāmaṇi*

The Anekārthasaṁgraha is a dictionary of homonyms which consists of about 1829 stanzas. It is divided into six *kāṇḍas*- *Eka-dvi-trī-catuḥ-pañca-ṣaṭsvarakāṇḍa* with an additional supplementary *kāṇḍa* of the indeclinables. In each *kāṇḍa,* the words are arranged

[26] *bhāgurikātyahalāyudhadurgāmarasiṁhaśāśvatādikṛtān |*
kośānnirīkṣya nipuṇam dhanvantarinirmitam nighaṇṭum ca |
liṅgānuśāsanāni ca vicārya lakṣyaṁ mahākavīnām ca |
kurute'nekārthānām śabdānām maṅkhakaḥ kośam ||

[27] *Kalpadrukośa,* Introduction, xxxi.

in a two-fold alphabetical order, firstly according to the initial letters.[28] The words are mentioned without their genders which are to be learnt from *Liṅgānuśāsana*, another work by this author.[29]

The Deśīnāmamālā is a lexicon of *deśī* words. It is composed in *Prākṛta Āryās* and gives *Prākṛta* words along with their equivalents in *Prākṛta*. The whole work is divided into 8 divisions called the *vargas,* They are-

i) *svaravarga* ii) words beginning with gutturals iii) words beginning with palatals iv) words beginning with linguals v) words beginning with dentals vi) words beginning with labials vii) words beginning with liquids *ra* and *la* and viii) words beginning with *sa* and *ha.* Each division has a supplement dealing with words having more than one meaning. The words are arranged according to their meanings and the number of syllables.

According to Hemacandra, *deśī* words are those words which are in use since times immemorial (*tamhā aṇādi pāla payaṭṭabhāṣā visesao deśī*). Accordingly, this lexicon ought to include only such words as have been used in ancient *Prākṛta* literature, and which cannot be derived from their Sanskrit prototypes. But the rule laid down by the author himself does not seem to have been followed by him in his treatise and we frequently find that the author has included many words as *deśī* which could be traced to their Sanskrit originals.

The importance of this lexicon to the *Prākṛta* literature and language is invaluable. It has the same importance as the *Amarakośa* which is regarded as the basis of Sanskrit lexicography. It contains about 4000 *Prākṛta* words together with their *Prākṛta* equivalents and a systematic study of these words will be a valuable contribution to the *Prākṛta* language.

The Nānārthaṇva-Saṃkṣepa is the largest lexicon of homonymous words made by Keśavasvāmī(about 1200 A.D.), in which there are about 5800 Śalokās. This lexicon is divided into six *kāṇḍas* and each *kāṇḍa* is further divided into five *adhyāyas*(chapters). Division of *kāṇḍas* is based on counting of alphabets and the division of *adhyāyas* is based on gender as *Strīliṅga, Puliṅga, Napuṃsakaliṅga* etc.

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[28] *Akārādi krameṇādāvatra kādikramo'ntataḥ |*

[29] *Liṅgānuśāsane'smābhiḥ varṇito liṅganirṇayaḥ |*
Ato na grathitaḥ sūtre granthagauravabhīrūbhiḥ ||

The Kalpadrukośa ascribed by Keśava (AD 1660). This is one of the biggest lexicons, containing about 4000 verses. It is divided into three main divisions known as *skandhas (Bhūmiskandha, Bhuvaḥskandha, Svargaskandha)* which are further divided into 27 sub-divisions known as *prakāṇḍas*.[30] It can be seen from this exhaustive list of sub-divisions that the author has tried his best to make each group of synonyms as complete as possible. A large number of abbreviations are used for indicating genders and wherever any member of a compound can be replaced by its synonym the author does not give the compound in its original form but only the word of the compound.

The Kavikalpadruma-kośa- The author of this lexicon is Bopadeva,who was the son of Keśava. In this lexicon there are about 361 *ślokas*. Words, in this lexicon, are arranged according to the alphabetical order and also followed the final letter and word roots are mentioned.[31]

The Kośakalpataru was composed after 15th century, ascribed to Viśvanātha (17th century). This lexicon is one of the largest of its kind and contains more than 5000 verses. It combines both the synonymous and the homonymous characters. The first synonymous part is modeled after the *Amarakośa* and is accordingly divided and sub-divided into major and minor portions such as the *Kāṇḍas* and the *Vargas.* The second homonymous portion is arranged according to the number of letters under each head such as *kavarga, cavarga, ṭavarga, tavarga* and so on. Besides these two main divisions the lexicon contains two portions, one dealing with the genders of vocables and the other with the indeclinables. The work is composed in a variety of meters and occasionally contains prose passages also.

The Śabdaratnasamnvaya- Kośa is authored by Nareśa Śāhajī of Taṃjor. *Śabdaratna-Samanvaya-Kośa* is a lexicon of homonymous words in which a new method is used in the arrangement of words. Eg. *Janak, lalpāk, kūpak* etc. here is the collection of that words of which the third letter is 'K'.

The Nārtharatnamālā of Irugappa Daṇḍādhinātha(latter half of the 14th century) is a vocabulary of homonymous words and divided into the following six *kāṇḍas*:

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[30] Cf. *Asminkośe trayaḥ skandhāḥ prakāṇḍaḥ saptaviṁśatiḥ, ślokāścatuḥsahasrāṇi pañcāśatyā śatadvayam.* - Tanjore Des. Cat. Of Mss., no. 4739.

[31] *Dhātupāthsvadādyādya kramādantādikramaḥ*||[1.1.1.3 KDK]
Kavi kalpadrumo nāma padyairniṣpādyate traca|
Dhātavaḥ pathitāḥ pāthasūtralokāgamasthitāḥ||[1.1.1.4 KDK]

*Ekākṣarakāṇḍa, dvyakṣarakāṇḍa, tryakṣarakāṇḍa, caturakṣarakāṇḍa, saṃkīrṇakāṇḍa,*and *avyayakāṇḍa.* The vocabulary records words of various meaning arranged according to their syllable and final letters such as ending *ka, kha, ga* and so on. It is a diction of considerable importance especially in south India.

The Śārdīyamālā is a lexicon of synonymous words made by Harṣakīrti(half of 17th centuary). This lexicon is divided into three *kāṇḍas* and *kāṇḍas* are divided into *vargas.*

The Śabdabhedaprakāśa is another vocabulary ascribed to Maheśvara, the author of previous lexicon. It is a glossary of nouns which, though identical in meaning, differ more or less in their orthography, and is divided in four parts viz. i) *Nirdeśa*, with *śabdabheda*, ii) *bakārabheda*, iii) *ūṣmabheda*, and iv) *liṅgabheda*. This is a supplement of author's larger work *Viśvaprakāśa.*On the *Śabdabhedaprakāśa, Jñānavimalagaṇi*, a *Kharataragaccha* line of Jain priests wrote a commentary naming '*Śabdabhedaprakāśaṭīkā*' in 1598 AD. This commentary aims at giving the derivation of every word in the text and also tries to give the etymology of the words wherever possible.

The Ekākṣaranāmamālikā attributed to Sudhākalaśa (about 1350 AD) belongs to the category of the homonymous glossaries of monosyllables. It deals with the letters of the alphabet, giving at the same time the meanings attached to them. It is a very small lexicon consisting of only 50 verses approximately.

The Pārasīprakāśa- **U**nder the patronage of Akbar, Vihārī Kṛṣṇadāsa (between AD 1556 and 1605) composed a bilingual glossary dealing with Persian and Sanskrit words. Like the *Pārasīprakāśa* of Vedāṅgarāya the present work also deals with Persian equivalents for Sanskrit expressions but differs from the former in its nature. The *Pārasīprakāśa* of Vedāṅgarāya deals mainly with astronomical and astrological terms whereas the work of *Vihārī Kṛṣṇadāsa* gives the Sanskrit equivalents of Persian terms in general.

The Rājavyavahārakośa is a lexicon which was composed for Śivājī by his minister Raghunātha Nārāyaṇa Hanumante (about AD 1676-77). Unlike many other Sanskrit lexicons, it contains many Persian and Arabic terms along with their Sanskrit equivalents and is divided into tensections*Rāja, kāryasthāna, bhogya, śastra, caturaṅga, sāmanta, durga, lekhana, janapada, paṇyvarga.* The author states that at the time of Chhatrapti Shivaji, many of the Sanskrit words became obsolete and Persian and Arabic words came in vogue. For the

purpose to do away with the foreign words and to revive the usage of old Sanskrit terms, the present lexicon was composed.

Bhūriprayoga of Padmanābhadatta (last quarter of 14th century) is a lexicon of synonymous and homonymous words and is professed to be a supplement to the *Amarakośa*. *Abhidhānatantra* of Jaṭādhara (before 1431 AD) is a vocabulary of synonymous and homonymous words. *Anekārthadhvanimañjarī* of Gadasiṁha (before 1431 AD) is a vocabulary of words having different meanings. *Pañcavargasaṁgrahanāmamālā* of Śubhaśīla (between AD 1450 and 1500) is a small lexicon which imitates the *Abhidhānacintāmaṇi* of Hemacandra in style, division and general form. *Uṇādināmamālā* of Śubhaśīla consists of words having *unādi* suffixes. *Pañcatattvaprakāśa* of Veṇīdatta (1644) is a metrical glossary containing vocables of five elements (*pṛthvī-jala-tejas-vāyu-ākāśa*) in 335 verses. *Uṇādinighaṇṭu* of Veṅkaṭeśvara (1684-1712 AD) is a small work of about 720 verses in five chapters. It brings together all the words that have been dealt with in *Uṇādisūtras*. *Dharaṇīkośa* ascribed to Dharaṇīdhara (before AD 1159), is a vocabulary of homonymous words and arranged after the final letters and number of syllables like the *Medinīkośa*. It is also called *Anekārthasāra*. *Dvirūpakośa* is a small lexicon by Śrīharṣa (2nd half of the 12th century) which deals with words having two forms slightly different from one another. Such words may differ in the *mātrās* or syllables or in gender; e.g., *amarṣa* and *āmarṣa, agastyaḥ* and *agastiḥ* etc. *Nānārthārṇavasaṁkṣepa* of Keśava (12th or 13th century), deals with homonymous words consisting of 5800 verses and of 6 *kāṇḍa*s according to the number of syllables in a word. The words are arranged in an alphabetical order and Vedic words are included in this lexicons.[32] *Avyayasaṁgrahanighaṇṭu* of Śākalyamallabhaṭṭa (about 1330 AD) is a small lexicon of *avyaya*s which contains only 50 verses. *Ekākṣararatnamālā* is a lexicon of Mādhava (about 1350 AD) which deals with single letters of the alphabet and the meanings attached to each letter. *Anekārthatilaka* was written by Mahīpa (before AD 1434) is a dictionary dealing with homonyms which is divided into four sections- *Ekākṣara, Dyakṣara, Tryakṣara, Saṁkīrṇavarṇakāṇḍa*. It is also called *Nānārthatilaka*. *Śabdaratnākara* of Vāmanabhaṭṭa Bāṇa (about 1400 AD) is a dictionary of synonyms, homonyms and the indeclinables which contains 1050 verses in three sections.

[32] *Kalpadrukośa*, Introduction, xxxviii.

Rūpamañjarīmālā is a small thesaurus by Rūpacandra (AD 1588) consisting 120 verses only, giving synonyms for vocables and is divided into 09 *vargas*. The last *sāmānyavarga* deals with homonymous words and is styled as the *anekārthavarga.* The last but not least, *Śabdamuktāmahārṇava*, a modern vocabulary prepared for Colebrooke by a Pandit named Tārāmaṇi (about AD 1785) is a voluminous dictionary arranged alphabetically and further rearranged so that the words beginning with the same letter are again arranged according to the number of syllables and also according to the final letter of the words.

1.5. Modern Sanskrit Dictionaries

In the beginning of the 19th Century A.D., Sanskrit lexicography with modern scientific approach started in the form of building bilingual and multilingual Sanskrit dictionaries. Prof. Horace Hayman Wilson compiled 'A Sanskrit-English Dictionary.' This was published in 1819. In this dictionary the head-word is in Devanagari script with no accented transcription. An improvement over Wilson's dictionary was the Sanskrit-English Dictionary by Theodore Goldstucker, published in 1856 at Berlin. *Vācaspatyam*, A comprehensive monolingual Sanskrit dictionary, was compiled by Tārānāth Tarkavācaspati. It was published in 1873 at Calcutta in six volumes. The dictionary contains elaborate citations. *Śabdakalpadruma* was compiled by Rājā Rādhākānta Deva in 1886. This is a monolingual Sanskrit dictionary in five volumes. It has citations from various lexica and classical texts. It is arranged in modern alphabetical order. Sanskrit-Worterbuch, is one of the major Sanskrit dictionaries, compiled by Otto Bohtlingh and Rudolp Roth during 1852-75. It is popularly known as St. Petersburg Dictionary. It has seven volumes. The dictionary has cited a number of works on varieties of subject like art, astronomy, medicine, erotica and so on. The English version of the Perterburger Worterbuch as Sanskrit-English dictionary compiled by Carl Cappeller in 1891 at Strassburg. *Śabdaratnākara* is a Sanskrit-Marathi dictionary compiled by Madhava Candroba, published in 1870 at Bombay. The dictionary deals with words found in classical Sanskrit literature. The entries have no citations. The Monier-Williams Sanskrit-English Dictionary, published in 1899 at Oxford, is Etymogically and philologically arranged with special references to Indo-European cognate languages. A Practical Sanskrit-English Dictionary first by V.S. Āpte was published in 1890 at Poona, in

three parts. This dictionary includes Vedic terms. Dictionnaire Sanskrit-rancaise is a Sanskrit-French dictionary by Stchoupak, Nitti and Louis Renou, published in 1932 at Paris. *Śabdaratnamahodadhi* is a Sanskrit-Gujarati dictionary by Muktivijaya Gani published in 1937 at Ahmedabad. A Sanskrit-Hindi dictionary called Saṃskrita Śabdārthakauśtubha compiled by Dwarka Prasad Sharma and Tarinish Jha was published in 1957 at Allahabad. A Concise Etymological Sanskrit Dictionary called Kurzqetasstes Etymologisches Worterbuch des Altindischen was published during 1956-76 at Heidelberg. The dictionary gives German equivalents of Sanskrit terms with special emphasis on the etymology of Sanskrit terms. R.L. Turner's A Comparative Dictionary of Indo-Aryan Languages was published in 1966 at London. The Dictionary of Sanskrit on Historical Principles, a project of the Deccan College Post Graduate and Research Institute, Pune, is a hallmark in the history of Sanskrit Lexicography. The citations are arranged in chronological order under each meaning. Vedic Concordance of Bloomfield records mantras and formulate from vedic terms. There are some indexes and glossaries like Vedic Word Concordance(*Vaidicpadānukramakośa*) of Viśva Bandu, Word index to Patanjali's Mahabhāṣya by Siddeśavara Śāstrī Pāduka and S. Citrava. Glossary of Smṛti literature by S.C. Ranaji and Indian Epigraphical History published in 1966. There are specialized word lists which are not lexicographical point of view. Some of them *Vaidyaka Sabdasindhu* by U.C. Gupta, *Āyurvedic Mahākośa* by Vinodhrara Jośī and Nārāyaṇa Hari Jośī, The *Śrautkośa* of Vaidic Saṃśodhana Maṇḍala, Pune and A Dictionary of Hindi Architecture by P. K. Ācārya(1927).

Chapter 2

A Survey of Āyurvedic Nighaṇṭu

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A Survey of Āyurvedic Nighaṇṭus

2.1. Introduction

The term *Nighaṇṭu* is suffixed to the titles of the works on āyurvedic materia medica. This term was originally intended to give only synonyms of Vedic terms. Since texts on āyurvedic material medica also include synonyms of drugs in the beginning, the same term gained popularity so much so that in the context of āyurveda, *Nighaṇṭu* became synonymous with materia medica. For this purpose the term *Dravya Guṇa* came to use only at later stage. Thus *Nighaṇṭus* are basically the specific lexical texts dedicated for the study of all aspects of drugs (herbs and plants) from their place of origin, their pharmacological actions, useful parts up to preparations and dosage. The *Niaghaṇṭu* may be defined as a glossary containing synonymous groups, the names of drugs, plants, animals minerals and that is administered either as food or medicine to the human body. Such kind of lexicons are *Dhanvantarinighaṇṭu, Prayāya-ratnamālā,Prayāyamuktāvalī, Nighaṇṭu Śeṣa, MadanVinoda,KeyadevNighaṇṭu,Rāj Nighaṇṭu(Abhidhānacintāmaṇi* or *Nighaṇṭurāja), Śivakośa,śabda Candrikā, Dakṣināmūrti Nighaṇṭu, Dravyamuktāvalī, Prayāyārṇav.*

The importance of *Nighaṇṭu* has been explained for the first time by Narahari Pandit, son of Iśvarasuri in his work *Rāja Nighaṇṭu* during 14th Centuary A.D. He declares that people use to laugh at a medico who doesn't have the knowledge of *Nighaṇṭus*[1]

The *Nighantus* have detailed studies about drugs on following parameters-

Identification of the drug,

Place of origin,

Nomenclature,

Collection, preservation, detoxification and useful parts,

Pharmacological actions,

Preparations, and Dosage.

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[1] *nighantuna vina vaidho vidvan vyakaranam vina |*
ayudham ca vina yodha trayo hasyasya bhavanam ||(1.2 Rāja Nighaṇṭu)

2.2 Pramukha Vaidyaka-kośa-

2.2.1. Dhanvantari Nighaṇṭū

The *Dhanvantari Nighaṇṭu*(DN) is one of the important works on *Drayaguṇa*. And is attributed to Dhanvantari[2] (before AD 500). On going through the introductory verses, it becomes clear that the original work was known as *Dravyāvalī*.[3] Description of properties was added to it later on converting into a new text known as *Dhanvantari Nighaṇṭu*. Thus the exiting text of the DN is the *Dravyāvalī* added with description of properties, actions and uses of substances. The *Dravyāvalī* enumerates 373 items described in the text but as discussed earlier DN describes certain additional items also. The contents have been arranged systematically into seven groups as follows:

Varga	Contents
1. *Guḍūcyādi*	1. bitter and evacuative drugs.
2. *Śatapuṣpādi*	2. spices.
3. *Candanādi*	3. mostely fragrant substances.
4. *Karavīrādi*	4. small plants and herbs.
5. *Āmrādi*	5. big fruity trees.
6. *Suvarṇādi*	6. minerals and dietary substances.
7. *Miśrakādi*	7. groups of drugs and poisons.

Table2.1 : Structure of *Dhanvantari Nighaṇṭu*

The text deals with the vocabulary of medicinal herbs and plants. Synonyms for herbs and plants together with their properties are described by the author.

2.2.2. Aṣṭāṅga Nighaṇṭū

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[2] In *Dhanvantari Nighaṇṭu (ASS)*, Introduction p.2, the editor Vaidya Narayan Shastri Purandare seems to be of the opinion that the work must have been composed by one of the disciples of Dhanvantari, who is supposed to be the most ancient authority on Indian medicine, during his life-time (*Ayaṁ granthaḥ Dhanvantaryantevāsināmā kenacidapi chātreṇa grathita iti jīvasvāyurvedācāryeṣu Dhanvantarisvasya granthasya viracanā jātetyuditavacanāt suniścitameva*).

[3] *Gaṇadravyāvalī dyuktā sayogā saha mātrayā|*
Prayāyanāmānyucyante guḍūcyāderyathākramam||

The text deals with the vocabulary of medicinal herbs and plants. Synonyms for herbs and plants together with their properties are described by the author.

2.2.2. Aṣṭāṅga Nighaṇṭū

The *Aṣṭāṅga Nighaṇṭu* was written by Vāgbhaṭa or Vāhaṭa(8th Century A.D.). It was appended to *Āṣṭāṅga Hṛdaya*[4] but this *Nighaṇṭu* portion is not seen in the present texts of *Āṣṭāṅga Hṛdaya*. This work deals with synonyms only. The author had made attempts to describe the drugs clearly as such he has coined new synonyms which are very significant for giving clear picture of the *dravya*. Eg.

Phaṇijihvāparṇī (having leaves like snake's tongue) for *Śatāvarī*.

Vindhyajāta (growing in *Viṅdhya* region) for *Bibhītakī*.

2.2.3. Paryāyaratnamālā

It is known as one of the works of Indian Materia Medica by Mādhavakara(700 AD) son of Indukara or Indrakara. As its name implies, this work is a synonymous medical lexicon or *Nighaṇṭu* in its broadest sense. This work is a synonymous medical dictionary of botanical terms and contains the names of plants and herbs which were generally used by physicians for medical purposes in old days. Here, the arrangement of the words is neither systematic, nor is the work divided into sections. It incorporates numerous words of common parlance. It has appended to itself a section on homonyms and another on *māna*-measures including *paribhāṣā*. The synonyms are presented in *ślokas,*(11.13-1472), *ardhaślokas*(11.218-578), *pādās*(11.580.1424) and *pādārdhas*(11.1425-1472). The homonyms are presented according to the number of meanings attached to every word viz. i) words having a single additional meaning, ii) words having two meanings each and iii) words having many meanings. *Paryāyaratnamālā* have attained much popularity and is frequently quoted in the works and commentaries of Sarvānanda, Rāyamukuṭa, Medinī, Bhānujī and others. The lexicon contains the names of a large number of drugs and plants many of which are not traceable in other glossaries; e.g. *Akṣuka, Āṣīta, itakaṭa, uccaṭā, ṛkṣagandhā, kapāṭacakra, kumārajīva*, etc.

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[4] *Śrimadvāhaṭācāryaviracitāyāmaṣṭāṅgahṛidayasaṃhitāyāmaṣṭāṅganighaṇṭuḥ samāptaḥ* (Last verse of *Aṣṭāṅga Nighaṇṭu*).

It is a medical glossary written by Haricarana Sena. In the introductory stanzas the author acknowledges his debt to Mādhavakara.[5] The work appears to have been based on the *Paryāyaratnamālā* and in many cases the auther has freely borrowed from Mādhavakara'work. The whole work is written in a metrical form and is divided into 23 vargās-

Sugandhivarga madhyagandhavarga hīnagandhavarga sārajavarga ratnavarga dhātūpadhātuvarga madhuravarga amlavarga uttamaśākavarga tikkaśākavarga puṣpavarga līlāphalavarga kandavarga mahāvṛkṣavarga madhyamavṛkṣavarga hrasvavṛkṣavarga latāvarga śimbīśūkādhanyavarga tṛṇadhānyavarga kṛtānnavarga pānīyavarga āvaśyajkavarga bhautikādivarga.

2.2.5. Śabda Pradīpa

The *Śabda-pradīpa* by Sureśvara, is a dictionary of botanical terms. Naming the different plants, it mentions also their medical properties. The work is divided into two broad divisions: the *svara-kaṇda* (section on vowels); and the *vyañjana-kāṇḍa* (section on consonants). *Sureśvara* was a court physician to King Bhimapala who probably belonged to the Pala dynasty; the śabda-pradīpa was written for him in1075.[6]

2.2.6. Dravyaguṇa Saṃgraha

This is the work of Cakrapānidatta(11th Century A.D.). Cakrapān is considerd as a resident of Bīrbhūmi in the Province of Bengal. In *Dravyaguṇa Saṃgraha* the drugs have been collected along with their properties in 15 *vargas*.

2.2.7. Śabda Candrikā

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[5] *Pūrvaṁ lokahitāya Mādhavakarābhikhyo bhiṣak kevalam*
koṣānveṣaṅatatparaḥ pravitatāyurvedaratnākarāt |
mālāṁ ratnamayīm cakāra sa yathālabhaṁ samuddhṛtya yāṁ
sāsmābhiḥ kamanīyabhaktiracanādvāranyathā grathyate ||

[6] A.B. Keith, HSL, p. 123.

The *Śabda-Candrikā* by Cakrapāṇidatta(1060 Century A.D.), is a medicinal glossary dealing with vegetable and mineral substances. It also contains a chapter on compounds, both in medicine and in dietetics, and is divided into the following nine sections:

1. *vṛkṣādi-varga* (section on trees and the like);
2. *suvarṇādi-varga* (section on gold and the like);
3. *ghṛtādi-varga* (section on clarified butter and the like);
4. *bhūmyādi-varga* (section on land and the like);
5. *manuṣya-varga* (section on man);
6. *siṃhādi-varga* (section on the lion and the like);
7. *madyādi-varga* (section on wine and liquors);
8. *pañca-kaṣāyādi-varga* (section on five astringent juices and the like);
9. *iriphalādi-varga* (section on three fruits viz. *harītakī, bibhītakī*, and *āmalaki* and the like).

Cakrapānidatta is believed to have lived under the patronage of Sahajapala and Nayapala of the Pala dynasty. He was a well-known author and wrote several medical treatises in Sanskrit[7].

2.2.8. Nighaṇṭū Śeśa

It is a botanical supplement of *Abhidhānacintāmaṇi* of Hemachandra. Nighaṇṭu Śeṣa contains 398 ślokās which give the synonyms of the plants and description of herbs. This work has been divided into six kāndās.

[7] Lukas, D. Shanthkumar, 2006, *An Introduction to Nighaṇṭu of Ayurveda*, p.93.

Kānda	Ślokās	Contents
1. *Vṛkṣa*	183	1. all trees.
2. *Gulma*	104	2. shrubs.
3. *latā*	45	3. creepers.
4. *śāka*	34	4. vegetables.
5. *tṛṇa*	17	5. grasses.
6. *dhānyakāṇḍa*	15	6. cereals and legumes.

Table2.2 : Structure of *Nighaṇṭu Śeṣa*

2.2.9. Sodhla Nighaṇṭū

The *Soḍhala Nighaṇṭu* is made by Soḍhala(12th Century A.D.).In this *Nighaṇṭu,* Soḍhala emphasized that the Physician who does not know the properties of diet and drugs is not fit to be a Physician.[8] The *Soḍhala Nighaṇṭu* is divided into 26 *vargas*. In the first seven *vargas* 498 *dravyas* are mentioned. In *Soḍhala Nighaṇṭu* the basic concept of *dravyas* have been explained loke *dravya, rasa, vīrya, vipāka* and *prabhāva* on the basis of *Aṣṭāṅga Hṛdaya.*

2.2.10. Mādhava Dravyaguṇa

The *Mādhava Dravyaguṇa* is composed by Mādhava[9](1250 A.D.), son of Indukara. *Mādhava Dravyaguṇa* has been divided into the vargas, they are- *Vividhauṣadhivarga, Lavaṇavarga, Ikṣuvarga, Madhuvarga, Kśīravarga, Dadhivarga, Takravarga, Navanītavarga, Ghṛtavarga, Tailvarga, Snehavarga, Madyavarga, Kānjikavarga, Mūtravarga, Toyavarga, Śālivarga, Kudhānyavarga, Śimbidhānyavarga, Māṃsavarga, Matsyavarga, Phalavarga, Śakavarga, Śreṣṭavarga, Raṣavarga, Maṇḍavarga, Annavarga, Pānabhakṣyavarga, Anupānavidhi, Prakīrṇavarga.*

[8] *Bhiṣag bheṣajabhojuānām yon a veti guṇāguṇam|*
Na sa vaidyaḥ sabhāsabhyo karttavyo na ca bhṛmṛtām||
[9] *Mādhavakavinā racitaḥ sukhahetoḥ samastasatvānām|*(The last verse of Mādhava Dravyaguṇa).

2.2.11. Abhidhāratnamālā

The *Abhidhānratnamālā* is a *Nighaṇṭu* of synonymous style. There is no indication about the author of this *Nighaṇṭu*. The subject matter of *Abhidhānratnamālā* is arranged in six *Skandhas* according to six *rasa*, therefore it is also known as *Ṣaḍarasa Nighaṇṭu*. In the beginning of the chapters, all the drugs described therein are enumerated, there after the drugs are described one by one in the same order with the synonyms. The *Skandhas* and the number of drugs are as-

Skandha	Number of drugs
1. Madhura	102
2. Amla	32
3. Lavaṇa	11
4. Tikta	128
5. Kaṭu	70
6. Kaṣāya	115

Table2.3 : Structure of *Abhidhānratnamālā*

2.2.12. Hṛdaya Dīpaka

Hṛdayadīpaka of Bopadeva (about 1250 AD) is a medical work being a collection of approved recipes, for the treatment of several acute and chronic diseases. It also contains a glossary of medical technical terms and consists of 176 verses and is divided into 8 *vargas*- *Catuṣpādavarga, tripādavarga, dvipādavarga, ekapādavarga, dvināmavarga, ekanāmavarga, nānārthavarga, miśrakavaragavarga.* This *Nighaṇṭu* has been written on the basis of synonyms but not on the basis of *guṇakarma.* There is much similarity in the description of *Amarakośa* and *Hṛdyadīpaka*. Eg.

Amarakośa	*Hṛdyadīpaka*
1. *Cavyam tu cavikā* |	*Cavyam kolam ca cavikā* |
2. *Śatamūlo bahusutābhīruḥ* |	*Śatapatrā bahusutā śatamūlī* |

2.2.13. Madanapāla Nighaṇṭu

The *Madanapāla Nighaṇṭu* was the effort of the King Madanapāla (AD 1375).

This huge lexicon is commonly known by its shorter title *Madanavinoda* and also as *Madana Nighaṇṭu.* Madanpāla described over 500 ingredients,which are used in medicine, food and drink and which include vegetable products, animal products, metals, gems and jewels in this work. It is containing about 2250 verses and is divided into twelve sections:

Vargās	Contents
1. Bhayādi	1. 165 dravyās
2. Śugrādi	2. 39 dravyās
3. Karpurādi	3. 84 aromatic dravyās
4. Dhātvādi	4. 44 metals and minerals including gems.
5. Vanaspati	5. 50 dravyās.
6. Phala	6. 56 edible dravyās.
7. Śaka	7. 56 dravyās.
8. Pāniyādi	8. Description like water, milk, alcohol, and urine.
9. Ikṣukādi	9. Description of sugarcane, madhu etc.
10. Dhānyakṛtānnādi	10. Description of different food preparations.
11. Māṃsa	11. Description of various birds and animals meat.
12. Miśraka	12. Description of *anupāna* and seasonal regimens.

Table2.4 : Structure of *Madanapāla Nighaṇṭu*

Madanapāl introduced many new meterials and drugs such as *Ahiphena, Bhaṅgā, Jayaphāla, Kumari, Parasīkayavāni* etc. He has described the properties of human urine. He has

established the concept of *Balācatuṣṭaya*. For each drug, the synonyms, pharmacological action and therapeutic uses with basis āyurvedic concept is composed in a lucid style.

2.2.14. Rāja Nighaṇṭu

It is written by a Kaśmīrī Pandit, Śrī Naraharī Pandit (after AD 1375), son of Iśwarī Surī. The original name of *Rāja Nighaṇṭu* is *Abhidhānacintāmaṇi.* It si also known as *Nighaṇṭurāja* and *Dravyābhidhānagaṇasaṃgraha.* It is a medical glossary consisting of the names of various herbs and their medical properties. It is almost entirely limited to Materia Medica, or the synonyms and properties of various vegetable and mineral products considered to possess medicinal value. The nomentclature of dravyas and their synonyms are given on the basis of[10]:

1) *Rūḍhi*(Tradition or usage),
2) *Svabhāva*(By thei natural properties like uṣṇa, śīta, guru, laghu etc.),
3) *Deśokta(*Accoding to local names),
4) *Lāncchana(*On the basis of special Characters observed which are very distinct eg. Cakrikā, raktabīja etc),
5) *Upamā*(The synonyms are given which are simple to the beasts and animals. Eg gokarṇī, aśvagandhā, nākulī etc.),
6) *Vīrya*(According to the vīrya present in the dravya they are named or synonyms are given. Eg. Ūṣaṇa etc.),
7) 7) *Itarāhvaya*(Synonyms of dravya depending upon the deśa etc. Eg. Kābojī, māgadhā, sindhu etc).

The whole of *Rāja Nighaṇṭu* is written in 23 chapters with elaborate description in the concerned matter. The chapters are as follows- *Anūpādi, bhūmi, guḍūcyādi, Śatāvahādi, parpaṭādi, pippalyādi, mūlakādi, Śalmalyādi, prabhadrādi, karavīrādi, āmrādi, candanādi, suvarṇādi, pānīyādi, kṣīrādi, śalyādi, māṁsādi, manuṣyādi, siṁhādi, rogādi, satvādi, miśrakādi, ekārthādi, dvayarthādivarga.*

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[10] *Nāmāni kvacidiha ridiḥ svabhāvāt, deśoktasya kvacit ca lāñchanopamābhyām|*
Vīryeṇa kvaciditarāhvayādideśāt, dṛavyāṇam dhruvamiti sapta coditāni||

2.2.15. Kaideva Nighaṇṭu

This *Nighaṇtu* was written by Kaiyadeva, a resident of Gujarat and the son of Śaranga. Rāghava Bhaṭa has written a commentary on *Kaiyadeva Nighaṇṭu* named *Padthādarśa* in 1493 A.D. *Kaiyadeva Nighaṇṭu* is a pharmacopoeia concentrating on dietetics. Hence, it is also called by the name *Pathya-Apathya Viveka.* Kaiyadeva has classified the *dravyās* into nine *vargās* or groups. He has followed the grouping of *dravya* according to Vāgbhaṭa. He has given new grouping of drugs by adding *Vihāra varga* and *Nānārtha varga* for the study of synonyms. In *auṣadha varga* he has included more substances which are medicinally used. The *vargās* are- *Auṣadhavarga, Dhātuvarga, Dhānyavarga, Dravyavarga, Kṛtānnavarga, Māṃsavarga, Vihāravarga, Miṣrakavarga, Nānārthavarga.* All the parts are not available today. Meherchand Laxmandas publication of Lahore has edited and published only the *Auṣadhivarga.*

2.2.16. Bhāvaprakāśa- Nighaṇṭu

Bhāvaprakāśa Nighaṇṭu is an important work of āyurveda, which is enumerated among '*Laghutrayī*'. Though it is mentioned as the third book among *Laghutrayī*, it is a popular work among *Vaidyas* for Centuries. It is one of the classical works of *Bhāvamiśra.* The historians of *āyurveda* consider Bhāvamiśra as a bridge between medieval period and modern period. In his work two portions are there one of *Saṃhitā* portion which is divided into three parts like *Pūrvakhanḍa, Madhyamakhanḍa* and *Uttarakhanḍa.* Other one is the *Nighaṇṭu* portion, which is popularly known as *Bhāvaprakāśa Nighaṇṭu.* Bhāvamiśra has followed most of the *Madanapāla Nighaṇṭu* in this work. This *Nighaṇṭu* is considered as the latest among classical works in the field of *Dravyaguṇa Nighaṇṭu.* The *Nighaṇṭu* portion is commonly followed by physicians and students of *Dravyaguṇa.* This *Nighaṇṭu* consists a total of 23 chapters –

harītakyādi, karpūrādi, guḍūcyādi, puṣpavarga, vaṭādivarga, āmrādi, dhātwādi, dhānyavarga, śakavarga, māṃsavarga, kṛtānnavarga, vārivarga, dugdhavarga, dadhivarga, takravarga, navanītavarga, ghṛtavarga, mūtravarga, tailavarga, sandhānavarga, madhuvarga, ikṣuvarga and *anekārthānāmvarga.*

2.2.17. Śivakośa

This work has been prepared by Śivadaṭa Miśra, son of Caturbhuja. Writer belonged to the family of *Vaidyas* and was himself a learned physician.[11] The *Śivakośa* is a glossary of medicinal plants and gives homonyms for different herbs and plants. It arranged according to the final letter of the word and the number of syllables such as words having one syllable, two syllables, three syllables and so on. In *Śivakośa* there are 540 verses. The author himself has written a commentary by name *Śivakośa Vyākhyā* otherwise known as *Śiva-Prakāśa.* In this work names of plants, trees and herbs are given. In compiling the present lexicon the author seems to have utherities quoted by him at the beginning of his work. Among such authorities he includes *Śabdārṇava, Ajaya, Amara, Vopālitasiṃha, Medinī, Viśva, Harāvalī, Halāyudha,Śāsvata, Haima, and Trikāṇḍaśeṣa.*[12]

2.2.18. Dravyaguṇa Śataka

The *DravyaguṇaŚata Śloki*, which is also known as the *Pathyapathya-Nighaṇṭu* or *Dravyaguṇa-Śata-Śloki*, was written by Trimallabhaṭṭa between 1383 and 1499. It is a medicinal treatise giving the medical properties of usual articles of diet. Although it thus deals with the medical aspects of food substances, it also gives a classification of these substances. The work consists of 100 verses divided into fourteen sections: (i) *jala-varga* (section on water); (ii) *dugdha-varga* (section on milk); (iii) *dhānya-varga* (section on paddy); (iv) *maṃsa-varga* (section on meat); (v) *śāka-varga* (section on leaves and vegetables); (vi) *ikṣu-varga* (section on sugar-cane and the like); (vii) *taila-varga* (section on oil); (viii) *madhu-*

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[11] *Cakre Caturbhūjaḥ kośamśśivadattaḥ śivavidam |*
Iti karpūrīya śivadattakṛtaḥ śivakosaḥ pūrṅah ||

[12] *Śabdārṇavājayāmaravopālitasiṃhamedinivišvān*
Hārāvalihalāyudhaśāśvatahaimatrikāṇḍaśesāṃśca
Prītyai vivicya bhiṣajo vividhauṣadhanāṃasaṃdihānasya
Nānārthauṣadhakośa viracyate liṅgabhedena.

varga (section on sugar-cane and the like); (vii) *taila-varga* (section on oil); (viii) *madhu-varga* (section on honey); (ix) *draksādi-varga* (section on grapes and the like); (x) *suṇthyādi-varga* (section on ginger and the like); (xi) *siddhānna-varga* (section on boiled rice or cooked food); (xii) *madya-varga* (section on wine); (xiii) *abhyaṅgādi-varga* (section on cosmetics); and (xiv) *tāmbūlādi-varga* (section on betel leaves and the like[13]).

2.2.19. Rājvallaba Nighaṇṭu

Rājvallaba Nighaṇṭu is composed by Vaidyaśiromaṇi Śri Rājavallabha(18th Century A.D.). This text is followed and exemplified the *ślokas* of *Madanapāla Nighaṇṭu* and *Bhāvaprakāśa Nighaṇṭu.* This work has been divided into six *Pariccheda*(chapters).

2.2.20. Nighaṇṭu Ratnākara

The *Nighaṇṭu Ratnākara* is written by Vāsudeva Godbole. This *Nighaṇṭu* consists two parts-

1. *Prathamakhaḍa-* It consists the subject on *dravyaguṇa, śarīra, aṣṭasthānaparīkṣā, mānaparibhāṣa, rasaśāstra, ajīrṇamanjarī* etc.

2. *Dvitīyakhaṇḍa-* It consists the subject of *Nidāna* and *Cikitsā* have been dealt with.

Except the above mentioned *Nighaṇṭus*, there are some other important works which have a great role to play in the enrichment of Sanskrit lexical resources. *Laghu Nighaṇṭu* is a small lexicon composed by Vyāsa Keshava Rāma(18th Century A.D.). This is a synonymous type of work of which the style is very simple and the metre followed is *Anuṣṭubh*. *Nithaṇṭu* Saṅgtaha of Raghunāthaji Indraji(1893 A.D.) provides the names of the plants in ten different languages like Sanskrit, Gujarati, Marati, Hindi, Kannada, Telgu, Pharsi, Arabi, English and Latin. *Sāligrāma Nighaṇṭu* is composed portion of volume 7 and 8 of the *Brihan Nighaṇṭu Ratnākara,* published by Kheṃaraja Śrīkṛṣṇa Dās, Bombay. The author of this work is Lālā Sāligrāma Vaisya. This *Nighaṇṭu* is divided into two parts.

[13] Chatterji, Suniti Kumar, 2007, *The Cultural Heritage of India*, Vol.5.p.333.

Vanaspati Śāstra of Thākur Jayakṛṣṇa Indraji(19th Century A.D.), was written in Gujarati in the name of '*Barada Dungarani Jadibooto.*' *Vanauṣadhi Darpaṇa* of Birjācaran Gupta(19th Century A,D.), is written in Bengali language. It contains paribhṣā, describes rasa, guṇa, vīrya and vipāka and consists of rogānusāra sūcī, index of the plants in different languages like Sanskrit, Latin, Bengali and other local languages. *Haritakyādi Nighaṇṭu*(1926 A.D.) is written by Vaidyālankara Śiva Śarmā. This work is on BN and written in simpler words for easy understanding. It includes all the verses of BN along with same verses. The author has given the names of drugs in his work in Hindi, English, Parsi and in other vernacular names. *Nighaṇṭu Āḍarśa*(1928 A.D) of Vaidya Bapal, is one of the earlist works on Dravyaguṇa during modern period. This work deals with individual dravya, with their Nirukti and properties. The text is presented in two volums as Pūrvārḍha and Uttarārḍha. The morphology of 571 drugs, properties, formulations and some of the Unāni drugs have been mentioned in 126 vargas. *Mahauṣadha Nighaṇṭu*(1972 A.D.) was written by Āryadāsa Kumārasiṃha, a native of Śri Lankā. This work is the synonyms of the drug Śuṇṭī. *Priya Nighaṇṭu* of Prof. Priya Vrata Śarmā, is an important text, which give a clear idea of the plant.[14] The synonyms which denote different meaning of a drug has been explained. Prof. Priya Vrata Śarmā has also composed a lexicon named *Dravyaguṇakośa,* which contains terms relating to medicinal plants, their properties and actions with exact references of the sourse texts. *Bedi Vanaspati* is a unique lexicon on Medicinal plants, written by Prof. Ramesh Bedi. This huge Kośa is presented in six volumes and is arranged in Devanagari Alphabetical order. It is enriched with 2400 photoes(1100 colored and 1300 black and white). This lexicon comprise Medicinal, economical, industrial, agricultural, horticultural, silvicultural, ornamental, religious, cultural and ethonobotonical plants grown throughout India, Bhutan and Brazil. He has also furnished the names of plants in Hindi, Sanskrit, English, Latin and regional languages with their botanical character, habitat, chemical composition, uses etc. The author has used the whole Indian literature including Vedic, Jain, Buddist, Puranic and Epic works of Sanskrit literature along with *Āyurvedic Nighaṇṭus.*

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[14] *Pryāyān bahubhāvabodhajanakān bhrāntyāvahān śuddhaye|*
Buddhestān parihṛtya nām kathitam tvekārthaviadyaiḥ padaiḥ|
Rūpajñanamupekṣitam khalu purānāvaśyakam yanmatam|
Tannūnam punareva śodhanadhiyā kiñcit samutthāpyate||(Priya Nighaṇtu 4)

Chapter 3

Structure and Organization of the Amarakoś and its Vanauṣadhivarga

Chapter3

Structure and Organization of the Amarakośa and its VanauṣadhiVarga

3.1 Introduction

Amarakośa(AK) is the most popular lexicon among Sanskrit lexical texts. It was memorized by Sanskrit Students from their childhood alongwith *Aṣṭādhyāyī*. It was easy to memorize this lexicon as it is composed in *anuṣṭubh* meter using simple language. The importance of these two texts has been expressedinthe following śloka - "***Aṣṭādhyāyī jaganmātā amarakośo jagatpitā***|"

3.2 The authorship of Amarakośa

Amarakośa, the very title suggests, was the effort of the Amarasiṃha. Colophon at the end of each chapter (*kāṇḍa*) suggests that this work was composed by Amarasiṃha himself.[1] More than it, the lexicographer has not provided any other information about his birth place and time. Most of the scholars agree that he was a Buddhist -

Bhaṭṭa Kṣīrasvāmī, the very first commentator of AK, commenting on the first verse of AK[2] has used the phrase 'akṣaya' as '*akṣobhya Budha*' in his commentary at the start of the second verse of AK by saying "*ittham granthārambhe abhīpsitasidhihetu jinamanusṛtya śrotṛprotsāhantham.*" Bhaṭṭa Kṣīrasvāmī indicated that Amarasiṃha was the follower of Budha. Sarvānande, another commentator of AK, also wrote "*atra cānuktoapi śākyalakṣaṇoarthe jñānadayādibhiḥ spaṣṭam pratīyata iti.*" Commenting on the first verse of AK, Rāyamukuṭa also accept Amarasiṃha as budhist.[3] Amarasiṃha counted the synonyms of Budha before the synonyms of deity Brahmā, Viṣṇu etc. Paṇḍita Śivadatta Śarmā also explained in his AK edition as follows- "*ayamarasiṃhaḥ kadā kiṃjātīyaḥ kutratyam*

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[1] "*Ityamarasiṃhakṛtau nāmaliṃgānuśāsano*"(Colophon at the end of each *kāṇḍa* of AK.)

[2] *Yasya jñanadayāsindhoragādhasyānaghā guṇāḥ.*
Sevyatāmakṣayo dhīrāḥ sa śriye cāmṛtāya ca..

[3]"*Iha tu buddhādipadollekhe kṛte dakṣiṇā pathapathika sārthānāmanupādeyatā syāt, kṛṣṇādipadollekhe tu tatkālakavaliatamadoddharāṇam bauddhānāmityubhayasādhāraṇyenopādeyatārtham mukhyārthānuddeśo na doṣāya.*" (Padacanrikā by Rāyamukuṭa, p. 4, 1969, Saṃskṛta koleja, Calkattā).

mahīmaṇḍalam maṇḍyañckāreti na niścitam. parantu(amarā nirjarā devāstridaśā vibuddhāḥ surāḥ-ityādinā) devasāmānyanāmānyuktvā devaviśeṣanāmārambhe 'sarvajñaḥ sugato buddho dharmarāstathāgataḥ | samantabhadro bhagavān mārajillokajijjinaḥ' ityādinā buddhanāmnā lekhanena bauddhatvamavasīyate |"[4] *'dharmarājau **jina**yamau'*[5] Here, Amarasiṃha put the word *jina* before the word *yamau*. On this basis, Śrī, Krishnaji Govind Oka, in the introduction of his book *Amarasiṃha kā nāmaliṃgānuśāsana,* has accepted Amarasiṃha as Buddhist.

But by accepting Amarasiṃha as Budhist on the basis of above mentioned evidence, it is surprising that there is no technical word in AK related to *Bauddha Saṅgha.* Besides this, the importance of *varṇāśrama* and *yajña* are explained by the lexicographer in AK. After doing a complete analysis of AK it becomes clear that Amarasiṃha was a believer in the mainsream Vedantic system of thought. AK is the evidence that Amarasiṃha was a learned person. He was well versed with grammars and the lexicons which were composed prier to him. He was also well versed with the various domain of knowledge like *āyurveda*, astronomy etc. It is explained by Rājaśekhara, in his text *Kāvyamiṃmāsā*, that Amarasiṃha had participated in the examination of poets held at Ujjayinī-

śruyate cojjayinyām kāvyaparīkṣā-

*Iha kālidāsasameṇthāvatr**āmara**rūpasūrabhāravayaḥ.*

Haricandracandraguptau parīkṣitāviha viśālāyām..[6]

3.3. Date of Amarakośā

Clear evidence regarding the of Amarasiṃha is also not available This however can be determined indirectly after discussing some external and internal resources.

Guṇarāta, a resident of Ujjayinī, translated the AK into Chinese language in six Century A.D. So we can say that Amara would be prior to 6th Century A.D.[7] But how much prior? It seems

[4] Quated by Kailāśacandra Tripāthī, *Amarakośa kā koṣaśāstrīya tathā bhāṣāśātrīya adhyayana*, p. 18.
[5] (Amarkośa 3.3.31)
[6] . In the tenth chapter of first Adhikarṇa of Kāvyamiṃmāsā.
[7] Upādhyāya, Baldev, 2006, *Saṃskṛta śāstroṃ kā itihāsa*, , p. 342.

that Amarasiṃha was prior to Candragomī (a grammarian). In AK, the words '*prajñu*' for '*pragatajānu*', '*urdhvajñuḥ*' for 'urdhvajānu' and '*saṃjñu*' for 'saṃhatajānu' are indicated.[8] The formation of these three words can only be odne by using the Panini's rules '***prasaṃbhyāṃ jānunorjñu***(5.4.129) and '***urdhavād vibhāṣā'***(5.4.130). According to Cāndravyākaraṇa the form of these words are – *Prajña, urdhvajña, saṃjña.* Thus Amarasiṃha was the prior to *Candragomī* (5th Century A.D.). By tradition Amarasiṃha is supposed to be as one of the nine jewels at the court of king *Vikrmāditya* as –

Dhanvantarikṣapaṇakāmarasiṃhaśaṃkuvetālabhaṭṭaghaṭakharparakālidāsāḥ|

Kyāto varāhamihiro nṛoateḥ sabhāyām ratnāni vai vararucirnava vikramasya||

But who was the king Vikramāditya and when did he rule? Many questions on the identity of king Vikramāditya are still obscure to us.

Dr. Rājbalī Pāṇḍeya has fixed 1st Century B.C. as the period of Amarasiṃha on the basis of nine jewels at the court of king *Vikramāditya.*[9] The same period was also fixed by Wilson in the introduction of his book 'Sanskrit.'

Dr. Har Dutt Sharma in his introduction to the edition of the Amarakośa with Kṣīrasvāmin's comentry,[10] after discussing some internal evidence the age of Amarasiṃha, remarks: 'The theory of the existence of *antarābhavadeha* is rejected by *Vindhyavāsin* (*Īśvarakṛṣṇa*). This shows that Amarasiṃha was not acquainted with the revised notions of *Sāṅkhya* philosophy as proposed by Īśvarakṛṣṇa. This circumstance, again strengthens the probability that Amarasiṃha lived prior to Īśvarakṛṣṇa, that is, in the fourth Century A.D.[11]

According to Dr. Rāmjī Upadhyāya, Amarasiṃha would be in Gupta period (fourth Century A.D).[12] The industries and social context regarding to the Gupta period are reflected in the *manuṣyavarga* of AK.

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[8] *Khuraṇāḥ syāt khuraṇasaḥ **prajñuḥ** pragatajānukaḥ |*
***Urdhvjñu**rūrdhvajānuḥ syāt **saṃjñuḥ** saṃhatajānukaḥ ||*(AK 2.9.47)
[9] Quoted by Bālmukuda dvivedī, p.69, *Saṃkṛta koṣ-udbhava aur vikāsa*,1979.
[10] Publised in the Poona Oriental Series, Poona,1941.
[11] Ibid, introduction, p. x.
[12] *Bharat ki prachin Sanskriti*, p.732, kitab mahal, 2003.

On the basis of facts, mentioned above, it can be determined that Amarasiṃha was during the late of fourth Century AD and at the start of the fifth Century AD.

3.4. The text of Amarakośa

3.4.1.Names of Amarakośa

Besides the *Amarakośa,* the name used for AK is *Nāmaliṅgānuśāsanam* which is indicated by Amaraiṃha as-

Smāhtyānyatantrāṇī saṃkṣiptai pratisaṃskṛtaiḥ.

*Sampūrṇamucyate varganāma**liṅgāśāsanam..***[13]

Thus the lexicon is popularly known by the name *Nāmaliṅgānuśāsanam,* meaning thereby a work which deals with vocables (*nāma*) and their genders (*liṅga*). It is also known as *trikāṇḍakośa* and is divided into three *kāṇḍas* (*svargakāṇḍa, bhūmyādikāṇḍa, samākhyākāṇḍa*),each *kāṇḍa* again being sub-divided into 25sections called the *vargas.*

3.4.2. Arrangement of words in Amarakośa

The arrangement of words by any lexicographer in his lexicon has not only the importance to provide the meaning of words but also gives the introduction of cultural and intellectual development of lexicographer's period. Classification of words in AK, is according to synonymy and homonymy. A major part of it deals with synonyms and only one small section viz., the *nānārthavarga* is devoted to homonyms and is arranged after the final consonants. Words are recorded in the form of inflected forms. Indeclinables are treated in one chapter. The order of words selection is according to subject. Words are divided into *vargas* as their meanings. Amarasiṃha does not list all the animals in *siṃhādivarga,* one finds cattle like cow, sheep under the *vaiśyavarga,* because animal husbandry was their profession. Elephants, horses, etc are under the *kṣatriyavarga.* It was they who used it in warfare. It is clear that in a *varga,* related words are mentioned. Word groups in AK show how its structure was dictated by the world view of Amarasiṃha and the needs of his society.

[13] AK 1.1.2

3.4.3.Basis of Kāṇḍa-division and the Order of Kāṇḍas

Three *kāṇḍas* are the result of adopting the *kośa* tradition. *Vaidic nighaṇṭu* is the only available *nighaṇṭu* before AK which is divided into three part (*Kāṇḍas*). Use of the word ***'Kāṇḍa;*** for the large unit of text is older than *nighaṇṭu*. In *taittirīya saṃhitā*, *sāma saṃhitā* and *atharveda saṃhitā* the word *'Kāṇḍa'* is used for chapter. In *nānārtha varga* of AK, Amarasiṃha uses the word *Kāṇḍa* for collection of *vargas*.[14] Amarasiṃha divided the *kāṇḍas* as the order of important collected matters. In the first *kāṇḍa* called *svarga* (heaven), deities, and related matters are described. It is appropriate that Amarsinṃha starts his work with the *kāṇḍa* called *svargādikāṇḍa* and the first heading in this *kāṇḍa* too is *svargvarga* and Gods occupied the top place in that society and guided not only destiny but also all social activity. In the second *kāṇḍa*, the first five *vargas* deal with natural objects such as earth, seas, plants and animals etc. and the last five *vargas* deal with social structure. And in the third *kāṇḍa*, there are collected the adjectives of that nouns, which are mentioned in first two *kāṇḍas*. This is the Indian view where at first the importance is given to heaven (*parloka*) and then earth (*ihalika*). Thus the *kāṇḍa* division in AK, is on the basis of Indian view about the importance of subject matters.[15]

The order of three *kāṇḍas* into *25 vargas* are as follows-

kāṇḍas and *vargas* in AK

1.*svargakāṇḍa* (*svargavarga, vyomavarga, digvarga, kālavarga, dhīvarga, śabdādivarga, nātyavarga, pātālabhogīvarga, narakavarga, vārivarga*)

2.*bhūmyādikāṇḍa* (*bhūmivarga, puravarga, śailavarga, vanauṣadhivarga, siṃhādivarga, manuṣyavarga, brahmavarga, kṣatriyavarga, vaiśyavarga, śūdravarga*)

3.*Samākhyākāṇḍa* (*viśeṣyanighnavarga, saṃkīrṇavarga, nānārthavarga, avyayavarga, liṃgādivarga*)

The AK consists of 1538 verses (ślokas) composed in *anuṣṭubh*[16]meter.

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[14] *Kandostri dandabanrvavargavasaravarisu.* (AK 3.3.43)

[15] Tripathi, Dr. Kailasa Nath , *Amarkosa ka kosasastriya tatha bhasasastriya adhyayana,* p. 80.

[16] *Śloke ṣaṣṭaṃ guruṃ jñeyaṃ sarvatra laghu pañcamam.*
Dvicatuḥpādayorhrasvam saptamaṃ dīrghamanyayoḥ..

3.4.4.Basis of *Varga* division and Order of *Vargas*

As Amarasiṃha fixed the order of *kāṇdas* according to the importance of objects, He used the same logic in the division and composition of *vargas*. First and second *kāṇḍas* constist of ten *vargas* and third consists of five *vargas*. It can't be said that this is the only scientific order of *varga*-division because each lexicographer may have his own views about *varga* division. The words arranged in ten *vargas* in a *kāṇḍa* could be divided into 15 or 20 *vargas*. In AK, division of *kāṇḍas* in 10, 10 and 5 *vargas* shows the art of lexicographer and his view about the importance of objects. In the first *kāṇḍa*, Amarsiṃha starts his work with *svargavarga* (heaven) and goes to *narakavarga* (hell) and in the last the *vārivarga* (water) is mentioned. This *vārivarga* is presented in the form of introduction to the second *kāṇḍa*. This *varga* starts with the synonymy of sea. Earth is surrounded by sea. So this *varga* carries us to the second *kāṇḍa* which starts with *bhūmivarga*. Here the question can be raised that why the earth related word groups such as water, wave, boat and well etc. are putin the *vārivarga* instead of *bhūmivarga*. It is because Amarasiṃha listed all that words in a heading which are related to a particular subject i.e. water, its objects, which have direct connection with earth, are listed with sea. Thus the headings are arranged with reference to others. The same technique is applied in other *vargas*. Amarasiṃha indicated this style as-

uktaṃ svarvyomadikkāladhīśabdādi sanātyakam.

pātālabhogi narakaṃ vāri caiṣā ca saṅgatam..[17]

Here it is clear, that the view of Amarsiṃha in the words- "*eṣāṃ ca saṅgatam.*"

In the second *kāṇḍa*, first five *vargas* deal with natural objects namely earth, town, mountains, plants and animals. The last five *vargas* deal with man, *brāhmanas* (priests), *kṣatriya* (warrior), *vaiśyas* (traders and farmars) and *śudras* (menials). Here Amarasiṃha enters the realm of social organization. In the *vedic* age, Indian society was arranged on the basis of four well known *varṇas*. Thus the order of *vargas* in second *kāṇḍa* is on the basis of importance of natural objects and social organization.

[17] The colophon of 1st kāṇḍā in AK.

Third *kāṇḍa* is titled 'Words in General'. Here the subject matter and author's approach are very different from what we have seen so far. It is divided into five subheadings. The first of these contains adjectives. The word groups are put together either by association or juxtaposition. We see the same approach through to the fourth headings. The fifth and the last heading in this *kāṇḍa* is called 'words as per gender'. In this, the word groups are organized by the last letters, much like any other dictionary of its time. Lexicographer has mentioned indeclinables (non-changing words) in *avyayavarga*. Here Amarasiṃha has followed Pānini.

By the above discussion, we came to know that the words are grouped in *kāṇḍas* and *vargas* according to word's meaning instead of the alphabetical order of words.

3.4.5. Indication of Genders

In the starting portion of AK, Amarasiṃha has indicated the rules for deciding gender of words. Such as the genders of the words are expressed by the inflectional endings in some cases, while at times they are recorded with words such as *strī, puṁs* etc. indicative of genders.[18]

3.4.6. Content of AK as per *Kāṇḍa* and *Varga*

Svargādikāṇḍam

1) *Svargavarga*-In this varga *Āditya, Viśvedevāḥ, Vasu, Rudra, Anila, Viṣṇu, Śiva, Buddha* etc deities are mentioned.
2) *Vyomādivarga*- sky related synonyms.
3) *Digvarga*-directions are discussed.
4) *Kālavarga*-time, date, night and day are mentioned.
5) *Dhīvarga*- subjects related to cognition are described.
6) *Śailādivarga*- sound, teaching, literature, *Veda*, grammar, *Dharma* etc. are mentioned.
7) *Nāṭyavarga*-drama, song related words.

[18] *Prāyaśo rūpabhedena sāhacaryācca kutracit |Strī-puṃ-napuṃsakaṃ jñeyaṃ tadviśeṣavidheḥ kvacit || Bhedākhyānāya na dvandvo naikaśeṣo na saṅkaraḥ |Kṛtotra bhinnaliṅganāmanuktānām kramādate ||*(AK 1.1.3 and 1.1.4).

8) *Pātālabhogīvarga-* nether world and its lives are discussed.

9) *Narakavarga-*hell.

10) *Vārivarga-* water, ocean, waves etc. mentioned.

Bhūmyādikāṇḍam- In this *kāṇḍa,* Amarasiṃha *has* discussed the geographical, social, economical, religious and political arraignments of Indian culture

1. *Bhūmivarga-*earth, border of *Bhāratavarṣa,* mountains, rivers, oceans.
2. *Pūravarga-* towns or cities, villages, market, buildings etc.
3. *Śailavarga-* mountains.
4. *Vanauṣadhivarga-* forests plants, and medicines.
5. *Siṃhādivarga-* lions and other animals.
6. *Nṛvarga-* mankind.
7. *Brahmavarga- varṇa* division, characters and description of priests, their occupations etc.
8. *Kṣatriyavarga-* King, state, source of state income, political arrangement etc.
9. *Vaiśyavarga-* all the things and measurements related to business.
10. *Śūdravarga-* mixed classes.

Sāmānyakāṇḍam

1) *Viśeṣyanighnavarga-* adjectives are focused (Nouns are collected in previous two *kāṇḍas*).

2) *Saṃkīrṇavarga-* miscellaneous of which the gender is indicated by word root, suffix and meaning.(words with narrow meanings).

3) *Nānārthavarga-* homonymous words (words with many meanings).

4) *Avyayavarga-* collection of indeclinables (non-changing words).

5) *Liṅgādisaṁgrahavarga-* rules for deciding gender of words.(words as per gender).

3.5. Structure of Vanauṣadhi Varga

The *Vanuṣadhivarga*(VV) of AK is the fourth *varga* of second *kāṇḍa*. The *varga* is vast in size as there are 169 verses (*ślokas*) in it. The structure of this *varga* can be understood as follows-

- **Title of the varga**

  The title of this *varga* is given as '*Vanuṣadhi*' by Amarasiṃha in the starting colophon of AK.[19] Here are two words '*Vana*', '*auṣadhi*'. *Vana* deals with forest and *auṣadhi* deals with drugs. The word *Vana* is also the synonymy of *Vṛkṣa*. Thus *Vana* also deals with plants.

- **Content of VV**

  The content of VV which is divided into five sections is explained below:

  Section1. Forests, types of forests, groves, gardens and its types, avenues, definition of *auṣadhi*, trees, plants, parts of plant[20] like trunk, branch, root, top of a tree, bark, wood, leaf, fruit, flower and its nectar are mentioned in the VV from the verse 1 to 19.

  Section2. Trees of various kinds like *Pīpal* (piper), *Kapittha* (Feronia Elephantium) are discussed with their synonymous from the verse 21 to 81.

  Section3. Plants, mostly medicinal or with sensible qualities like *Guḍūca* (Menispermum glabrum), *Mūrvā* (Aletris Hyacinthoides) etc. are mentioned with their synonym from the verse 82 to 112

  Section4. Useful plants like *Kadalī* (banana), *Mudgaparṇī* are mentioned from the verse 113 to 134.

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[19] *Vargāḥ pṛthvī-pura-kṣmābhṛdvanauṣadhi-mṛgādibhiḥ .*
Nṛ-brahma-kṣatra-viṭ-śūdraiḥ sāṃṅgopāṃgairihoditāḥ . (First colophon in the 2nd kāṇḍa of AK).

[20] Plant parts are the different part of the plant, which are used for various purposes. It may be any part i.e. aerial or underground including herb plant seeds, plants bark, herbal flowers, herb roots etc. Each plant part possesses individual beneficial property, which is used as required. The aerial part of plant includes stem, leave, flowers, fruits and seeds and that of underground includes roots and rhizomes. These parts are used in as such or in several other forms like powder or oil or extracts or paste or decoction depending on the requirement.

Section5. Difference between *auṣadhiḥ* (A herb or deciduous plant) and *auṣdham* (a drug) is explained. Synonyms of grasses and palms are given from the verse 135 to 169.

- **Source of the content**

The word groups of VV shows the developed tradition of *āyurveda.* In this *varga* about 325 herbs are mentioned. Some disease and medicines are discussed in AK. It seems that the lexicographer has taken the help of *Caraka* and *Suśruta Saṃhitā* for his lexicon. According to Kṣīrasvāmī, a commentator of AK, *dhanvantrinighaṇṭu* is the base source of VV as the synonyms of some herbs are the same.

- **Importance of VV**

As we discussed earlier that in AK, names (*nāma*) and gender (*liṅga*) are mentioned. The *varga* provides the taxonomy of about 325 herbs which is done on the basis of place, quality (*guṇa*) and action (*karma*) etc. The classification of herbs given in VV is helpful for the study of *āyurvedic nighaṇṭus.*

- **Classification of Plants in VV**

In VV three types of plants are given as[21]

1. Vānaspatyaḥ- One fructifying from blosoms.
2. Vanaspatiḥ- One without apparent blossoms.
3. Auṣadhiḥ- An annual plant.

- **Morphology of plants in VV**

Morphology deals with the parts of plants. In VV various plant parts such as trunk, branch, root, bark, wood,leaf, fruit,flower etc. are described in VV. The information regarding to plant's part is useful as the part of plant is used as medicine.

[21] *Vānaspatyaḥ phalaiḥ puṣpāt, tairapuṣpād vanaspatiḥ. Auṣadhyaḥ phalapākāṃtāḥ*.....(AK 2.4.6)

- **Nomenclature of Dravyas in VV**

The synonyms of the plans are given on the basis of following paramiters Rūḍhi- Conventional usage of the namei.e. *aśoka*, *bodhidruma*(the tree under which Buddha knew the knowledge of truth).

Svabhāva

Deśokti- regional name of local language is *deśokti*.

Lāñchana- the morphological sign or special character observed is *Lāñchana* which are very distinct. e.g.*bahupāda*(which have many roots like *Vaṭa*).

Upamā- the synonyms are given which are simple to the beasts and animals. e.g. *gokarṇī*(of which the leaf's size is in the form of cow's ear).

Vīrya- according to the *vīrya*(pharmacological properties and actions) present in the *dravya* they are named or synonyms are given.

Itarāhvaya- the synonyms of *dravyas* depending upon their geographical source. e.g.

oṇḍapuṣpī(a flower found in *Oṇḍadeśa*. Eg. *Japā*).

Thus the characters of plants can be obtained through their synonyms.

3.6. Commentaries on Amarakośa

Being so popular, the *Amarakośa* naturally attracted the attention of commentators. Dr. Aufrecht mentions about forty commentaries on AK in the second part of his Catalogus Catalogorum. Some of these were printed but the rest are known to have existed only in manuscript form. The introduction of eighteen major and important commentaries composed between 11th Century to 18th Century is following-

1.Kāmadhenu

The *Kāmadhenu* by Subhūticandra, written between A.D. 1062 and 1172, is probably the earliest known commentary on the AK. The author famous by name Subhūti, was a Buddhist. The Tibetan Encyclopaedia Tanjor, contains the translation of a commentary on AK by one Subhūticandra. Professor Das Gupta is inclined to identify Subhūticandra with Subhūtipāla

who was perhaps a Bengali.[22] As Subhūticandra was a Buddhist, the manuscripts of his commentary on the AK are found preserved in Tibetan monasteries. He is often quoted by Bengali commentators such Rāyamukuṭa and others. The *Kāmadhenu* is an exhaustive and learned work and contains citations from numerous authorities. He quotes numerous authorities in his work. There are two factors that fix Subhūticandra's possible dates.[23] One is that the *Kāmadhenu* contains a reference to Bhoja and two of his works, the *Sarasvati-kāṇṭhābharaṇa* and the *Śṛigāra-prakāśa*, and the date of Bhoja's death is given as A.D. 1063. The other factor is a reference to Subhūticandra made by Saraṇadeva (twelfth century A.D.) in his *Durghaṭa-vṛtti*.

2.Amarakośodghāṭana

The *Amarakośodghāṭana* is an earliest extant known and most popular commentary on AK by Kṣirasvāmin in the latter half of the eleventh century A.D. Kṣirasvāmin is supposed to have lived in Kashmir; according to some, he was a native of South India, while others believe him to have belonged to Central India. His commentary is a work of considerable merit. The style is lucid and simple. A number of citations are given to support his interpretations. At times he gives his own interpretations which differ from those given by other commentators. His explanations are very brief and contain the etymology of every word occurring in the text.

3.Ṭīkā-sarvasva

The *Ṭikā-sarvasva* is a commentary on the AK composed by Sarvānanda in A.D. 1159. He was Bengali. Sarvānanda's commentary on AK is very valuable as it contains a good many *bhāṣā* words. It also contains many words which were probably current in Bengal during Sarvananda's time. It is an exhaustive work and quotes not less than two hundred authorities. The *Ṭikā-sarvasva* seems to have been the basis of all later Bengali commentaries on the AK

[22] Nalini Nath Das Gupta, '*The Bengali Commentators on the Amarakośa*', Indian Culture, Vol. II, No. 2 (October, 1935), pp. 261-70.
[23] Kuppusvami Shastri Commemoration Volume (1935), p. 4.

including the one by Rāyamukuṭa, the celebrated commentator who flourished in the fifteenth century A.D.[24]

4.Amarakośā-Ṭīkā

The *Amarakośā-Ṭīkā* is a commentary on AK composed by Trilocanadāsa. It is referred by Prof. Colebrook.[25] In AD 1935 Nalini Nāth Dās Gupta brought to light some information about this commentary in his article entitled "The Bengali Commentators on the Amarakośa," published in the Indian Culture. Trilocanadāsa, the author of the commentary on AK, is identified as the reputed author of the gloss on the *Kātantra-vṛtti* by Durgasimha.[26]

5. Amarakośamālā

The *Amarakośamālā*, is commentary on AK ascribed to Paramānandaśarmā who lived between 1350 and 1500A.D. Paramānanda Sarman is said to have been an inhabitant of the village of Sailakini in the Bhawal area of the Dacca district in the eastern part of Bengal. He is identified as Paramānanda who wrote a commentary on *Kāvyaprakāśa* of Mammaṭa. Aufrecht records only one manuscript of this commentary, but it is not available to scholars for study.[27]

6. Padacandrikā

The *Padacandrikā* is another commentary on the AK written in AD 1431 by a Bengali writer named Bṛhaspati who was known as Rāyamukuṭa. Bṛhaspati was a native of Radha in Bengal. He was a celebrated author and wrote commentaries on other works also. He has summarized sixteen earlier commentaries on the AK and presented an exhaustive work which is regarded as a great authority by later writers. His commentary is exhaustive and is regarded by subsequent

[24] *Kalpadrukośa*, Introduction, pg xviii.
[25] *Miscellaneous Essays*, 2.57n.
[26] Quoted by M.M.Patkar, *History of Sanskrit Lexicography*,p. 30,1981.
[27] T. Aufrecht, Catalogus Catalogorum, I, 325b.

writers as a work of great authority. From the Sultan of Gauda, that is, Bengal, he obtained the title *paṇḍita-sarvabhauma*. This commentary has recently been published from the Sanskrit College, Calcutta.

7. Amarakośaṭīkā

The *Amarakośaṭīkā*- written after 1275 AD by Durlabha Vallabha is a hitherto unknown commentary on the Amarakośa discovered by Das Gupta, although only a fragment of the manuscript was found. This is an in- complete manuscript and has been discontinued after the Brahmavarga. Available fragments of the manuscript show that the commentary is exhaustive with a number of quotations included. An account of the author is given in the book *Indian Culture*.[28]

8. Amarakośaṭīkā

According to S.K. De[29], Appaya Dikṣita, a famous writer on *alaṃkāra* and *vedānta* flourished, towards 'the third and fourth quarters of the sixteenth century. The extreme limits of Appaya Dikṣita's literally activity are AD 1549 and 1613. Appaya Dikṣita wrote a commentary on AK named *Amarakośaṭīkā*. Aufrecht[30] records only one manuscript of this commentary which is not available now.

9. Padārthakaumudī

The *Padārthakaumudī*, which is also known as the *Amarakośapañjikā*, is an exhaustive commentary on the AK. It was written in about 1618 by Nārāyaṇacakravartin, a Bengali commentator. The commentator belongs to Kalāpa School of Grammar as can be found from his derivation of words. This work is replete with quotations from previous works including the commentaries on the AK written by Subhūticandra, Sarvānanda, and Rāyamukuṭa.

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[28] Nalini Nath Das Gupta, loc.cit., pp. 263-64.
[29] Sanskrit Poetics, 1.265.
[30] Cat. Cat., I, 26b. Oppet, 7820.

10.Mugdhabodhini

Among the later commentaries of the Bengal school is *Mugdhabodhini* written by Bharatasena between 1650 and 1680. This commentary is the favourite authority of the Bengal school and, in fact, of all other schools in which the grammar of Bopadeva is accepted.[31] Its importance lies in the fact that it discusses different readings according to different authorities. The etymologies are given according to Bopadeva's system of grammar.

11.Vyākhyāsudhā

The *Vyākhyāsudhā* or *Subodhini* was written by Bhānuji Dikṣita in the latter part of the seventeenth century. Bhānuji Dikṣita calls himself the son of the celebrated grammarian Bhaṭṭoji Dikṣita. According to commentator, his work was written at the request of Kirtisimha of the Baghela dynasty and ruler of Mahidhara[32]. The *Vyākhyāsudhā* is among the important commentaries on the AK. The interpretations in the commentary are supported by illustrations. The etymological derivations are according to the Paṇini School of Grammar. At times the author improves upon the explanations given by his predecessors, especially Rāyamukuṭa; he also offers his own interpretations whenever he differs from them. The work contains a number of citations which testifies to the scholarship of the commentator.

12. Amarakośaviveka

[31] Wilson, *Collected Works*, 5.206.

[32] Cf. the colophon- *Iti śrībaghelavaṃśodbhava mahīdhara-viṣayādhīpa-śrīkīrtisiṃha-devājñayā śrī Bhaṭṭoji Dīkṣitātmaja-Bhānuji Dikṣitāyāmara-ṭīkāvyākhyāyām,* etc.

A very late commentary on the AK is the *Amarakośaviveka* written by Maheśvara, who appears to have been a resident of Maharāṣṭra, in the latter half of the seventeenth century. This commentary is of philological interest as Maheśvara quotes numerous Marathi words as the equivalents of Sanskrit expressions used in the text. Marathi forms with '*iti prasiddham*', '*iti khyātam*', '*iti laukikabhāṣāyām*', etc., have been recorded in the commentary. Thus it was an early attempt on bilingual dictionary. Maheśvara quotes several earlier commentators like Bhānujidikṣita and refers to several authorities.[33]

13. Amarakośapadavivṛti

The *Amarakośapadavivṛti* is a very exhaustive and copious commentary and is attributed to Liṅgabhaṭṭa(18th CenturyA.D.), about whose personal history nothing is known to us. Aufrecht, however, states that his father's name was Kamyabhattopadhyaya.[34] This work is also known as *Liṅgabhaṭṭiya* after the commentator's name. P.P.S. Sastry observes that Lingaya Suri was a Telugu Brāhmaṇa, and his commentary is the most popular one in South India. Although the author has been placed in the eighteenth century,[35] Dr. Raghavan is of the opinion that Liṅgabhaṭṭa must have flourished before Mallīnātha, that is, before 1430. Liṅgabhaṭṭa quotes several works in the commentary.

14. Sārasundarī

The *Sārasundarī*, is a commentary on AK composed by a Bengali commentator named Mathuresa Vidyalankara in 1666. According to Dr. Colebrook, it is a perspicuous piece of work. It is a rich source of information on interpolations and the various readings of the text as it abounds in quotations from other commentaries.

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[33] Kieth, A.B. p.517.
[34] Loc. cit., I, 344b.
[35] Tanjore Mss. Cat., IX, No. 4960.

15.Śadārthasaṃdīpikā

The *Śadārthasaṃdīpikā* is a commentary on AK, written in the eighteenth century by Nārāyaṇa Vidyāvinoda, who was a famous grammarian belonging to the Jaumara School. In this commentary Nārāyaṇa Vidyāvinoda generally presented Sanskrit grammar and specially praised the Jaumara School established by Kramadīśvara.[36]

16. Amarodyota

The *Amarodyota* of Puruṣottama Tarkālaṃkāra is a commentary on the AK. It is in Bengali script. The commentary appears to be exhaustive.

17. Śiśubodhinī

The *Śiśubodhinī* is one of the latest commentaries on the AK, written by Maheśvara Sukthaṇakara in the eighteenth century. The author hailed from Goa and belonged to a family of Gauḍa Sārasvata Brāhmaṇas; his family deity was the goddess *śāntādurgā*. Like the seventeenth century Maheśvara, this Maheśvara too gives Marāthi equivalents for Sanskrit expressions in several places. He also quotes often from previous authorities.

18. Rabhasapāla

This commentary on the AK was composed by Rabhasapāla. According to Ramavatar Sharma, Rabhasapāla may be said to have flourished later than Amara and before Kṣīrasvāmin i.e. between AD and 900.[37] The title of his commentary is not known. He has been quoted by Sarvānanda and Kṣirasvāmin. He has also been quoted in the works of Bharatasena in Bhaṭṭikāvya, in Trikāṇḍaviveka and in Sarvacandra's commentary on Vāsavadatta. This wide range of quotations from Rabhasapāla's lexicon by subsequent writers sufficiently indicates that his lexicon had attained high popularity among Sanskrit commentators.

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[36] *Santi yadyapi bhūyāṃsaḥ śabdalakṣaṇacakṣuṣaḥ .*
Tathāpi jaumarābhyāsaviśeṣādeva śiṣyate. (India Office Catalogus, n.964)
[37] Quoted by M.M.Patakar, *History of Sanskrit Lexicography*, p..51, 1981.

Chapter 4

Comparative Study of the Vanauṣadhivarga of Amarakośa with Bhāvaprakāśā Nighaṇṭu

Chapter4

Comparative Study of the Vanauṣadhi Varga of Amarakoṣa with Bhāvaprakāśa Nighaṇṭū

4.1.Introduction

The chapter deals with the introduction of BPN its structure and organization, classification of *dravyas,* and the nomenclature of *dravyas*. There are many similarities in the description of AK and BPN. This chapter therefore presents a comparative study of VV of AK and BPN on the basis of similarity and dissimilarity.

4.2. Bhāvaprakāśā Nithaṇtu

The *Bhāvaprakāśa-nighaṇṭu* (BPN) is one of the most recognized texts for *dravyaguṇa*, written by Bhāvamiśra -the son of Latkan Miśra. BPN is a part of the *Bhāvaprakāśa Saṃhita*. It is an important work of *āyurveda*, which is enumerated among *Laghutrayī*[1]. Though it is mentioned as the third book among *Laghutrayī*, it is a popular work among *Vaidyas* for centuries. *Bhāvaprakāśa* is divided into three parts[2]-

1.Pūrvakhaṇḍa- In this section, evolution of *āyurveda*, embryology, pediatric and *nighaṇṭu* are included.

2.Madhyamakhaṇḍa – This section includes diagnosis of disease and medicine.

3.Uttarakhaṇḍa- There is a description of rejuvenation and aphrodisiac treatment.

Thus the *Nighaṇṭu* portion is located in first section which is popularly known as *Bhāvaprakāśa Nighaṇṭu*. This *Nighaṇṭu* is considered as the latest among classical works in the field of *Dravyaguṇa Nighaṇṭu*. The *Nighaṇṭu* portion is commonly followed by physicians and students of *Dravyaguṇa*. Bhāvamiśra has followed most of the *Madanapāla Nighaṇṭu* in this work. The historians of *āyurveda* consider Bhāvamiśra as a bridge between medieval period

[1] Laghutrayī are- 1.Śārṅgadhara Saṃhitā. 2.Mādhava Nidāna, 3. Bhāva Prakāśa.
[2] Upadhyaya Baldev, *Saṃskṛta Śāstroṃ kā ītihāsa*, p. 37, 2006.

and modern period. He has followed the traditions of ancient *Saṃhitas* giving importance to the basic principles. Many new medicines are included in the BPN. Also the properties and use of medicines, described earlier by Madanapāla are stated in detail. For example- *Pārasīka Yavānī, Pudīnā* etc. Many varieties of the same drug are described, eg. Types of *Kastūrī* are Assami, Nepālī and Kaśmīrī.[3] Similarly if the original herb is not available, substitute herbs have been mentioned.

4.2.1. The Date of BPN

Bhāvamiśra has followed mostly form Madanapāla Nighaṇṭu and also from Kaideva Nighaṇṭu. While describing the *rasa, guṇa, vīrya, vipāka*, and *prabhāva* of *dravyas* and their characters it appears that Bhāvamiśara has followed Śārṅgadhara of 13th Century A.D. Bhāvamiśara has included drugs like *Ahiphen, Bhangā, Parasikayavānī* from Madanapāla Nighaṇṭu. This Nighaṇṭu was written by Madanaapāla in 1347 A.D. The 17th century texts like *Yogaratnākara, Yogataraṅgiṇī* and *Lolimbarāja* give reference about Bhāvaprakāśa. Bhāvaprakāśa has introduced the disease *phīraṅga* in his work for the first time. He has mentioned the *phiraṅga varṇa cikīrṣā* in this book. The *phiraṅgaroga* has been introduced in India by Portuguese and Europeans during 15th Century A.D. He has also mentioned the use of *easakarpura, copacīnī* etc. in the treatment of *phitaṅga roga.*

phiraṅgasaṃjñake deśe bāhulyenaiva yadbhavet .

tasmāt phiraṅga ityukto vyādhiḥ vyādhiviśāradaiḥ ..

gandharogaḥ phiraṅgo'yaṃ jāyate dehināṃ dhruvaṃ .

phiraṅgiṇoaṅsaṃsargātphiraṅgiṇyaṃ prasaṃgataḥ . vyādhirāgantujo hyeṣaḥ.....[4]

According to Julius Joly, there is a manuscript on *Bhāvaprakāśa* dated 1558 A.D. in Tubinan West Germany now Germany. According to Prof. Priya Vrata Śarma, the oldest manuscript on

[3]Ranade and Joshi , 2008, A Text Book of History of Ayurveda, p.155.
[4] Quated by D.S.Lucas, 2006, *An Introduction to Nighaṇṭu of Ayurveda*, p.158.

Bhāvaprakāśa dated, Saṃvatrsra 1722 corresponding to 1665 A.D. is available in the Oriental Library, Jammu.[5]

On the basis of these references, it is clear that the period of Bhāvamiśra was in 16th Century A.D.

4.2.2.The text of BPN

4.2.2.1.Classification of Dravyas in BPN

About 426 *dravyas,* which are used in medicine, food and drinks and which include vegetable products, animal products, metals, gems and jewels are described in BPN. For each drug, the synonyms, pharmacological action and therapeutic uses with basis āyurvedic concept is composed in a lucid style. In BPN the dravyas are grouped or classified into 23 chapters. They are as follows:

1.Harītakyādivarga - The *varga* starts with the description of *Harītakī*. On this basis the name of the *varga* is given *Harītakyādivarga*. In this *varga* 99 *dravyas* are described with their synonyms, types and properties. The *varga* include fruits and tubers which are used in medicine.

2.Karpūrādivarga- described 58 aromatic *dravyas*.

3.Guḍūcyādivarga- Describes the *dravya* whose *pañcaga* of the plant is used. The *varga* contains 116 bitter and evacuative drugs.

4.Puṣpavarga- describes 31 flowers with their various varieties.

5.Vaṭādivarga- In this *varga* grouped the big trees and uses of their *valkala*(barks). *Vaṭa, Pippalī, Udumber* etc. 42 trees are described.

6.Āmrādi- This may also be called as *Phalādivarga* which containing fruits. 55 *phalas* are described.

[5] Ibid. p.159.

7.Dhātvādi- Most of the Metals and minerals are grouped in this *varga*. 45 *dravyas* like gold, silver, lead, tin, bronze, iron, zinc, mercury etc. are described.

8.Dhānyavarga- variety of *dhānya*. 24 *dhānyas* are described. Some definitions about *dhānyas* are given at the end of *varga*.

9.Śākavarga- This group comprises the vegetables like *patra, puṣpa, phala, nāla, kaṇda, saṃsvedaja*.[6] 67 vegetable drugs are grouped in this *varga*.

10.Māṃsavarga- synonyms and types of flesh are given. There are two types of *māṃsa*(meat)- *jāṅgla* (māṃsa obtained from animal living in forests) and *Ānūpa*(māṃsa obtained from animal living in water) Description of various birds and animals meat with its properties is given.

11.Kṛtānnavarga- Description of different food preparations.

12.Vārivarga- In this *varga* the synonyms of water, its types, properties are explained. Time, need and method to consume water is described. In this *varga* the method of purify water is also given.

13.Dugdhavarga- contains milk and its products. Types of milk like cow milk, goat milk etc. explained.

14.Dadhivarga- synonyms of curb, properties of types of curb is given.

15.Takravarga- The *varga* describe the use of buttermilk to *Doṣa* and *Roga*.

16.Navanītavarga- described the properties of butter.

17.Ghṛtavarga- Names and properties of *ghī* are given.

18.Mūtravarga- properties of cow and human urine are explained.

19.Tailavarga- Definition of oil is given as *taila* is obtained from *snigdha* part of *tila* and other drugs, hence known as *taila*.[7]

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[6] Patraṃ puṣpaṃ phalaṃ nālaṃ kaṇdaṃ saṃsvedajaṃ tathā .
Śākaṃ ṣadvidhamuddiṣṭaṃ guru vidyādyatathottaram. (BPN 9.1).

20.Sandhānavarga- *kāñji, tuṣodaka, madya*(alcohol) etc. are explained.

21.Madhuvarga- contains the synonyms, types and properties of honey.

22.Īkṣuvarga- Description of sugarcane and its product and *madhu.*

23.Anekārthānāmavarga- The *varga* contains two drugs, three drugs, four drugs and many drugs having same synonym. Thus the *varga* have homonyms of some drugs.

4.2.2.2. Five padārthas in dravya

Explaining the basic principles of *dravyaguṇa* Bhāvamiśra has stated the *pañcapadārtha* as *rasa* (taste), *guṇa* (properties),*vīrya*(potency), *vipāka* (post digestion effect), *prabhava*(effect).[8] Basis description of these *pañcapadārthas* is given as below:

1.Rasa - It deals with the taste of *dravya.* There are six *rasas*[9] *Madhura*(sweet), *amla*(sour), *lavaṇa*(saline), *kaṭu*(pungent), *tikta*(bitter), *kaṣāya*(astringent). These are six rasas are loged in matter. The formation of these *ṣadrasas* in *Pañcamahābhūta dravyas*(five elements) is as follows –

madhura rasa = earth+water

amla rasa = earth+fire

lavaṇa rasa = water+fire

kaṭu rasa = air+fire

tikta rasa = air+space

kaṣāya rasa = earth+air

These six *rasas* are used in the form of *doṣa-śāmaka* in medicine.

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[7] *Tilādisnigdhavastūnāṃ snehastailamudāhṛtam.*(BPN 19.1).

[8] *Drvye raso guṇovīryaṃ vipākaḥ śaktirevaca.*
Padārthāḥ pañcatiṣthanti svaṃ svaṃ kurvanti karma ca.(BP1.1.10)

[9] *Madhuro'mlaḥ paṭuścaiva kaṭutiktakaṣāyakāḥ.*
Ityete ṣadrasāḥ khyātaḥ nānādravyasamāśritāḥ.(Dravyaguṇaratnāvalī 1.7)

madhura+amla+lavaṇa – pacifie *Vāta* and aggravate *Kapha.*

madhura+tikta+kaṣāya - pacifie *Pitta* and aggravate *Kapha.*

kaṭu+tikta+kaṣāya - pacifie *Śleṣma* and aggravate *Vāta.*

Thus *drvayas* are used as drug keeping in mind their *rasa* composition.

2.Guṇa -There are twenty *guṇas* like *guru* etc. ten and that's opposite ten.[10]

They are-

Grvādi ten guṇas	Opposite of gurvādi ten guṇas
1. guru(heavy)	1. laghu(light)
2. maṃda(dull, slow, inactive)	2. tīkṣṇ(pungent)
3. hima(cold)	3. uṣṇa(hot)
4. snigdha(oily, graesy)	4. rūkṣa(dry)
5. ślakṣṇa(gummy)	5. khara(rough)
6. sāndra(solid)	6. drva(liquid)
7. mṛdu(soft)	7. kathina(hard)
8. sthira(stable)	8. sara(tremulous)
9. sūkṣma(subtle)	9. sthūla(coarse, bulky)
10. Viśada(nonmucelaginous	10. Picchila(mucilaginous)

Table 4.1 Twenty *guṇas.*[11]

These *guṇas* are used in each *dravya.*

3.Vīrya- It deals with pharmacological properties and actions of *dravyas.*

Bhūtaprabhāvātiśayo dravyapāke rase sthitaḥ.

Cintyācintyakriyā hetu vīryaṃ dhanvantarermatam ..[12]

[10] *Gurumandahimasnigdhaślakṣṇasāndramṛdusthirāḥ.*
Guṇāḥ sasūkṣmaviśadāḥ viṃśatiḥ saviparyayaḥ. (Aṣṭāṅgasūtra. 1).
[11] Śāstrī, Viśvanāthadvivedī , 2007, BPN commentary. p.584.

Cintyācintyakriyā hetu vīryaṃ dhanvantarermatam ..[12]

Vīrya (potency) is of two categories viz., *uṣṇa* (hot) and *śīta* (cold). They are inherent in matter. They represent the *agni* and *soma* principles of the three worlds. Those having *uṣṇa* (hot) potency alleviate *vāta* and *kapha* and they aggravate *pitta*. Those having *śīta* (cooling) potency cause diseases of *vdyu* and *kapha*', but they alleviate *pitta*.[13]

4.Vīpāka-It deals with taste that emerges after digestion. The *vīpāka* of sweet and saline things is *madhura* (sweet) and sour things have *amla* (sour) *vīpāka*.[14] The *vīpāka* of pungent, bitter and astringent things is generally *kaṭu* (pungent).

Jathareṇāgninā yogād yadudeti rasāntaram .

Rasānām pariṇāmānte sa vipāka iti smṛtaḥ ..[15]

5.Prabhāva(specific action**)**

The examples of *prabhāva* are *dhātrī* and *lakuca*. They have similar *rasa* (taste) etc. But the former alleviates all the three *doṣas* whereas the latter does not.[16]

4.2.2.3.Nomenclature of Dravyas in BPN

BPN has exclusively dealt the pharmacological aspects of the herb; in separate second verses, preceded by first verse on their synonyms. For example-

haridrā kāñcanī pītā niśākhyā varavarṇinī.
kṛmighnī haladī yoṣitpriyāhaṭṭavilāsinī..
haridrā kaṭukā tiktā rūkṣoṣṇā kaphapittanut.
varṇyā tvagdoṣamehāsraśoṣapāṇḍuvraṇāpahā..(BPN 1.184-185)

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[12] Quated by Śāstrī, Viśvanāthadvivedī, Introduction p. xvii, BPN, 2007
[13] Uṣṇaṃ vātakaphau hanyātpittaṃ tu tanute tarām.
Śītaṃ vātakaphātaṅkānkurute pittahṛtparam. (BP, purvakhaṇḍa 6.238-239)
[14] Svāduḥ paṭuśca madhuramamlomla pacyate rasaḥ.(ibid 6.242)
[15] Quated by Śāstrī, Viśvanāthadvivedī, Introduction p. xvii BPN, 2007.
[16] Prabhāvastu yathā dhātrī lakucasya rasādibhiḥ.
Samo'pi kurute doṣatritayasya vināśanam.(BP, purvakhaṇḍa, 2.246-247).

Here first verse(1.184) deals with synonyms and second vesre(1.185) deals with the pharmacological aspects of the herb. The is the method followed in BPN. The nomentclature of *dravyas* and their synonyms are given on the basis of[17]:

1.**Rūḍhi**- Conventional usage of the name.

Aśoka- Goddess *Sītā* lived in *aśokavana.*

Bodhidruma- The tree under which Buddha knew the knowledge of truth.

Śivaśekhara- which is used in worship of Lord Śiva.

Yajñodumbara- which is used in yajña.

Śrīphala- The tree related to Goddess Lakṣmī.

2.**Svabhāva**- Natural behavior of the plant and plant material are considerd as *Svabhāva.*

Apāmārga- *Apā* means opposite and *mārga* means path. The plant forces the pedestrian to divert his path as it constist of prickly flowers.

Lajjālu- *Lajjā* means shy, The plant shies away and leaves fold inside on touching.

3.**Deśokti**-Regional name of local language is *deśokti.* The synonyms for which the Sanskrit derivation is difficult can be considerd as original from vernacular names. Bhāvaprakāśa has denoted certained popular vernacular names of Hindi lands of India, saying as '*iti loke*'. Eg.

Śṛṅgavera- *śṛṅgaveram* is Telugu word. *Vera* means root. A root looking like horn (*śṛṅga*) is called as śṛṅgavera. It is the synonyms is *śuṇṭhī.*

4. **Lāñchana**- The morphological sign or special character observed is *Lāñchana* which are very distinct. E.g.

Bahupāda- which have many roots like *Vaṭa*

Raktabīja- which have red seeds like *Sindūrī*

Carmin- of which leafs are like skin like *Bhūrjapatra.*

Maṇḍūkaparṇī- *maṇḍūka* means frog, *parṇī* is leaf. The leaf of *Maṇḍūkaparṇī* appears like the extended frog's web.

5.**Upamā**- The synonyms are given which are simple to the beasts and animals.

Nākulī- looks like *Nakula.*

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[17] *Nāmāni kvacidiha ridiḥ svabhāvāt, deśoktasya kvacit ca lāñchanopamābhyām.*
Vīryeṇa kvaciditarāhvayādideśāt, dravyāṇam dhruvamiti sapta coditāni..

Nākulī- looks like *Nakula*.

Gokarṇī – of which the leaf's size is in the form of cow's ear.

Mūsākarṇī- leafs are like ear of mouse.

Aśvagandhā- smell like horse.

6.Vīrya- According to the *vīrya*(pharmacological properties and actions) present in the *dravya* they are named or synonyms are given. Eg.[18]

Citrataṇḍula- *Citra*=Marks, *taṇḍula*=Seeds. The seeds of *Vidaṅga* are marked with bright yellow spots. This is a specific identification mark of *Vidaṅga*.

Kriṣṇa Bhedhā- *Kriṣṇa*=Black, *Bhedhā*=Break. The drug's officinale part looks black on breakage. Eg. *Kaṭukī*.

7.Itarāhvaya- The synonyms of *dravyas* depending upon their geographical source. This process has provided information on abundant availability to procure genuine drugs. Eg.

Oṇḍapuṣpī- A flower found in *Oṇḍadeśa*. Eg. *Japā*.

Saurāṣṭrī- which is found in *Sauvīra deśa*. Eg. *Phiṭakarī*.

Kāmbojī- Origins in *Kamboja deśa*. Eg.*Māṣaparṇī*.

Māgadhā- which origins in *Magadha*. Eg. *Pipalī*.

Sindhu- *Saindhavaḥ*.

Nadīsāraja- A drug which is found at river. Eg. *Arjuna*.

Bhūkadambikā- located at earth.

8. Synonyms on the basis of **trade, import and export** aspects. Medicinal plants have also been named after their trade and import. Eg.

Pārasīka Yavānī- The name is suggestive of import of the drug Pursia.

Turuskāh- It is imported from Arab countries.

[18] http://cloud.ap.nic.in/disha/tsc/gisttr_sc2.jsp?mcode1=01&mcode2=01&mcode3=14&acode=73030

4.2.3.Commentaries on Bhāvaprakāśa Nighaṇṭu

Sanskrit commentaries are not written on BPN. A number of commentaries was written in Hindi language. Pandita Śivaśarmā has written a Hindi commentary known as '*Śivaprakāśika*' which was printed and published by Sri Venkateshwara Press Bombay. Other Hindi commentaries are written by Dr. Krishna Chand Chunekar and by Dr. Vishwanath Dwivedi. The commentary by Dr. K.C. Chunekar is printed and published by Chowkhamba Vidyabhawan, Varanasi. This work is popularly followed by *Vaidyas* and Students of *āyurveda* all over Indian. The commentary by Dr. Vishwanath Dwivedi is printed and published by Motilal Banarasidas, Delhi.

4.3. Why Bhāvaprakāśa Nighaṇṭu is taken for comparative study

In detail, the names of various plants, fruits and herbs are given in the VV of AK. But *dravyaguṇa*(morphological characters, *rasa pañcaka* and properties) of drugs is not given in this *varga*. So an *āyurvedic* text related to *dravyaguṇa* is required. *Dravyaguṇa vijñāna* is *upāṅga*(associated branch) of *āyurveda*. *Dravyaguṇa vijñāna* involves the study of herbs described in the ancient classics of *āyurveda*. The precise description of *dravyas* with their morphological characters, their *rasa pañcaka* and properties, are all described throughout the *Nighaṇṭu* texts. BPN is one of the most accepted books for *dravyaguṇa*. The Information regarding to the place of drug's origin, synonyms, their types, properties, therapeutics and the utility of a particular plant part of drugs etc is described in BPN. With the help of BPN the more detailed about drugs of VV can obtained. Eg.

The synonyms of *Harītakī* are given in VV as

*Abhyā tvavyathā pathyā kāyasthā **pūtanā'mṛtā** .*

*Harītakī haimavatī **cetakī** śreyasī śivā ..* (AK 2.4.59)

In BPN these synonyms are defined in more detailed as

Alābuvṛtā vijayā vṛttā sā rohiṇī smṛtā .

***Pūtanā**'sthimatī sūkṣmā kathitā māṃsalā**'mṛtā** ..*

*Pañcarekhā**'bhayā** proktā jīvantī svarṇvarṇinī .*

*Trirekhā **cetakī** jñeyā saptanāmiyamākṛtiḥ* ..(BPN1.9-10)

Thus for the comparative study of VV with drugs related text, BPN is required.

4.4.VV of AK and BPN-Similarity

There are many similarities in the description of *Amarakośa* and *Bhāvaprakāśa Nighaṇṭu*. It is explained on the basis of following points-

4.4.1.Similarity in the synonyms of auṣadhi

1. **Some drugs of VV of AK and BPN have synonyms in same number.** Eg.

Śatāvarī in AK

Śatamūlī bahusutā'bhīrūrindīvarī varī .

Ṛṣyaproktā'bhīrūpatnī nārāyaṅyaḥ śatāvarī ..(AK 2.4.101).

Śatāvarī in BPN

Śatāvarī bahusutā bhīrūrindīvarī varī .

Nārāyaṅī śatapadī śatavīryā ca pīvarī .. (BPN 3.174).

Pṛśniparṅī in AK

Pṛśniparṅī pṛthakparṅīcitra prṅyaṇghriparṅikā .

Kroṣṭuvinnā siṃhapucchī kalaśirdhāvanirguhā .. (AK 2.4.92).

Pṛśniparṅī in BPN

Pṛśniparṅī pṛthakparṅīcitra prṅyaṇghriparṅikā .

Kroṣṭuvinnā siṃhapucchī kalaśī dhāvanī guhā .. (BPN 3.33).

Jīvantī inj AK

Jīvantī jīvanī jīvā jīvanīyā madhuḥsravā . (AK 2.4.142).

Jīvantī in BPN

Jīvantī jīvanī jīvā jīvanīyā madhuḥsravā .

Māṇgalyanadheyā ca śākaśreṣṭha payasvinī .. (BPN 3.48).

Jīvakaḥ in AK

Kūrcaśīrṣo madhurakaḥ śṛṇgahṛsvāṅgajīvakāḥ ..(AK 2.4.142).

Jīvakaḥ in BPN

Jīvako madhuraḥ śṛṇgī hṛsvāṅgī kūrcaśīrṣakaḥ ..(BPN 1.117).

2. **Some drugs of BPN have more synonyms than of VV of AK.** Eg.

Gokṣurakaḥ in AK

Palaṃkaṣā tvikṣugandhā śvadaṇṣṭrā svādukaṇṭakāḥ .

Gokaṇṭako gokṣurako vanaśṛṇgāra ityapi .. (AK 2.4,99).

Gokṣurakaḥ in BPN

Gokhuraḥ kṣurako'syāttrikaṇṭaḥ svādukaṇṭakaḥ .

Gokaṇṭako bhakṣakaṇṭo vanaśṛṇgāra ityapi ..

Palaṃkaṣā śvadaṃṣṭrā ca tathā svādikṣugandhikā .

Gokṣuraḥ śītalaḥ svādurbalakṛddhastiśodhnaḥ .. (BPN 3.42-43).

Māṣaparṇī in AK

Hayapucchī tu kāmbojī māṣaparṇī . (AK 2.4.138).

Māṣaparṇī in AK

Māśaparṇī sūryaparṇī kāmbojī hayapucchikā .

Pāṅḍulomaśaparṇī ca kṛṣṇavṛntā mahāsahā .. (BPN 3.52).

3. **Some drugs of BPN have less synonyms than of VV of AK.** Eg.

Kapāsa in AK

Tuṇḍīkerī samudrāntā kpāsī badareti ca . (AK 2.4.114) .

Kapāsa in AK

Kārpāsī tuṇḍīkeśī ca samudrāntā ca kathyate . (BPN 3.150).

Choṭānakhā in AK

Hanurhaṭṭavilāsanī . *śuktiḥ śaṇkhaḥ khuraḥ koladalaṃ nakham* .(AK2.4.130)

Nakhaṃ svalpaṃ nakhī proktā hanurhaṭṭavilāsanī . (BPN2.73).

Root of *Khasa* in AK

Mule'syośīramāstriyām .

Abhayaṃ naladaṃ sevyamamṛṇāla jalāśayam .

Lāmajjakaṃ laghulayamavadāheṣṭkāpathe . (AK 2.4.163-164).

Root of *Khasa* in BPN

Vīraṇasya tu mūlaṃ syāduśariṃ naladañca tat .

Amṛlāñca secyañca samagandhikamityapi .. (BPN2.86)

4.4.2.Similarity in the nomenclature of plants

In VV of AK the nomenclature of the plants was generally based on the plant's botanical characters(*paricaya prjñāpikāsaṃjñā*) and their therapeutic properties(guṇa prajñāpikāsaṃjñā). In BPN the same method also followed. In both text the names of plants are given on the basis of *Rudhi, Upamā, Vīrya, Deśa* etc.

4.4.3.Style

In VV and BN the synonyms of plants are described in *anuṣṭubh* meter.

4.5.VV of AK and BPN- Dissimilarity

4.5.1.Dissimilarity in the description of Dravyas

In *āyurveda, dravyas* are classification into three types-

(i) Plants,
(ii) Animals,
(iii) Minerals.

These three types of *dravyas* are described in BPN. Besides, In VV, among three types of dravyas, only plants are described. The synonyms of plants with their genders are given VV of AK. The properties and use of *auṣadhi* is not explained in VV. In BPN, the synonyms, properties and use of *auṣadhi* are explained but the genders are not mentioned.

4.5.2.Dissimilarity in the classification of Plants

VVof AK	BPN
Three types of plants are given as 1. Vānaspatyaḥ 2. Vanaspatiḥ 3. Auṣadhiḥ	Five types of plants are given 1. Vanaspati 2. Vānaspatya 3. Kṣipa 4. Valli 5. Auṣadhi

Table4.2. Plants classified in VV of AK and BPN.

4.5.3.Dissimilarity in the composition of text

AK is composed in three *kāṇdas* and *kāṇdas* are subdivided into 25*vargas*. VV is the fourth *varga* of second *kāṇda* in which the synonyms of plants are given. The BPN is divided into 23 *vargas*. Among these 22 *vargas* deals with the synonyms, pharmacological action of drugs. The last *varga* explain the homonyms of drugs. Thus VV is the only varga of AK which describe the plants, drugs. Besides, all the 23 *vargas* described drugs.

4.5.4.Dissimilarity in the synonyms of auṣadhi

Some drugs have synonyms in same number but some of them are different. Eg.

Bhojapatra in AK

*Bhūrje-carmi-**mṛgutvacau***(AK2.4.46)

Bhojapatra in BPN

*Bhūrhaścarmmī **bahuvalkalaḥ***(BPN 5.47)

Here ***bahuvalkalaḥ*** is new synonyms given in BPN by which more information about plant is cleared.

Ekāṅgī murā in AK

Tālaparṇī tu daityā gandhakuṭī murā ***gandhinī***(AK2.4.123)

Ekāṅgī murā in BPN

Murā gandhkuṭī daityā ***surabhī*** *śālaparṇikā* (BPN 2.97)

Here *surabhī*(of BPN) is the synonymy of *gandhinī*(of AK). Thus words are different as they given in the form of synonyms of synonyms.

Some synonyms of drugs are in different numbers and among them some are similar and some are not similar. Eg.

Gandhapalāśī have five synonyms in AK as

Atha śaṭī gandhmūlī ṣḍgranthiketyapi, ***karcūro****'pi palāśaḥ .(*AK2.4.154)

Gandhapalāśī have eight synonyms in BPN as

Śaṭhī palāśī ṣaḍranthā suvrtā gandhmūlikā .

Gandhārikā gandharvadhūrvadhūḥ pṛthupalāśikā ..(BPN2.88)

Here *karcūra* is not found in BPN and *gandhārikā, gandharvadhūrvadhūḥ, pṛthupalāśikā* these three new names are given in BPN which are not mentioned in VV of AK.

Chapter 5

Computational analysis and System Design

Chapter 5

Computational analysis and System Design

5.1 Introduction

This chapter describes the implementation part of the research. The topic of the research is to make computational analysis of VV of AK to explore the herbs with *dravyaguṇa* (morphological characters, *rasa pañcaka* and properties of herbs). To explore the *dravyaguṇa* of herbs, an interactive and multi-dimensional knowledge based web application of VV of AK with BN has been developed which will be illustrated here in this chapter. The developed computational model uses Java/JSP as the front end and RDBMS and text files in Unicode as the backend. The system accepts the word (*auṣadhi* name) in Devanāgari Unicode UTF-8 format as input in the text area and gives analyzed output in the same format.

5.2 Text digitization

The system consists of front end of Apache Tomcat server, programming is done in Java and back-end. The back end of server version contains lexical resources in the form of database tables and text files.

The data file is named lexicon.txt. It contains herbs of VV of AK and BPN in the following format

amarakosha_id	ID	AUSHADHINAME	HINDI NAME	VARGA	SYNONYMS	SHLOKA	SHLOKA HINDI	SCIN NAM

Table5.1. The formate of datafile.

Sample data of the lexicon file is following:

940 333 वार्षिकी बेला,बेल वार्षिको पुष्पवर्गः

श्रीपदी,षटपदानन्दा,वार्षिकी,मुक्तबन्धना। श्रीपदी षट्पदानन्दा वार्षिकी मुक्तबन्धना। वार्षिकी शीतला लघ्वी तिक्ता दोषत्रयापहा।कर्णाक्षिमुखरोगघ्नी तत्तैलं तदगुणं स्मृतम्॥२२॥ बेला-

शीतल, हलकी, कड़वी और तीनों दोषों को नाश करती है। कर्णरोग, नेत्र रोग तथा मुखरोगों को हितकारी है। इससे बने तेल में भी ये ही गुण होते हैं। Jasminum sambac

939 334 मालती स्वर्णजाती च चमेली,चम्बेली पुष्पवर्गः

जाति,जाती,सुमना,मालती,राजपुत्रिका,चेतिका,हृद्यगन्धा। जातिर्जाती च सुमना मालती राजपुत्रिका।चेतिका हृद्यगन्धा च सा पीतास्वर्णजातिका॥२३॥ जातीयुगं तिक्तमुष्णं तुवरं लघु दोषजित्। शितोऽक्षिमुखदन्तार्तिविषकुष्ठव्रणप्रजित्॥२४॥ चमेली और पीली चमेली दोनों- कड़वी, गरम, कसैली, हलकी दोषों को जीतनेवाली और मस्तकरोग, नेत्ररोग, मुखरोग, विष दाँत दर्द, कोढ़, वात तथा रक्तविकारों को नष्ट करनेवाली हैं। Jasminum gradiflorum

936/937/939 335 युथिका पीतयूथिका च जुही,पीली जूही पुष्पवर्गः

यूथिका,गणिका,अम्बष्ठा। यूथिका गणिकाम्बष्ठा सा पीता हेमपुष्पिका। यूथीयुगं हिमं तिक्तं कटुपाकरसं लघु॥२५॥ मधुरं तुवरं हृद्यं पित्तघ्नं कफवातलम्। व्रणप्रमुखदन्ताक्षिशिरोरोगविषायपहम्॥२६॥ दोनों प्रकार की जुही- शीतल, कड़वी, पाक में तथा रस में चरपरी, हलकी, मधुर, कसैली, हृदय को प्रिय, कफ तथा वातकारक और पित्त-व्रण, रक्तविकार, मुखरोग, दन्तरोग, नेत्ररोग, शिरोरोग तथा विषनाशक हैं। Jasminum auriculatum

918/919 336 चंपकः चम्पा पुष्पवर्गः चांपेय,चंपक,हेमपुष्प। चाम्पेयश्चम्पकः प्रोक्तो हेमपुष्पश्च स स्मृतः। एतस्य कलिका गन्धफलीति कथिताबुधैः॥२७॥ चम्पकः कटुकस्तिक्तः कषायो मधुरो हिमः। विषक्रिमिहरःकृच्छ्रकफवातास्रपित्तजित्॥२८॥ चम्पा- चरपरी, कड़वी, कसैली, मधुर, शीतल और विष, कृमि, मूत्रकृच्छ्र, वात, रक्तविकार तथा पित्त को नष्ट करती है। Michelia champaca

920 337 बकुलः मौलश्री,मौलसिरी पुष्पवर्गः बकुल,मधुगंध,सिंहकेसरक।

बकुलो मधुगन्धश्च सिंहकेसरकस्तथा। बकुलस्तुवरोनुष्णः कटुपाकरसोगुरुः॥२८॥ कफपित्तविषश्चित्रकृमिदन्तगदापहः॥२९॥ मौलश्री- कसैली, मातदिल, पाक में चरपरी, भारी और कफ, पित्त, विष, श्वेतकोढ़ कृमि तथा दंतरोग नाशक है। Mimusops elengi

964 338 बृहद्वकुलः बड़ी मौलश्री-पाशुपत पुष्पवर्गः

शिवमल्ली,पाशुपत,एकाष्ठील,बुक,वसु। शिवमल्ली पाशुपत एकाष्ठीलो बुको वसुः॥३०॥ बुकोऽनुष्णः कटुस्तिक्ताः कफपित्तविषापहः। योनिदोषतृषादाहकुष्ठशोथास्रनाशनः॥३१॥ बड़ी मोलसिरी- मातदिल (न गर्म न सर्द), चरपरी, कड़वी और कफ, पित्त, योनिदोष (शुल), तृषा, दाह, कुष्ठ, सूजन तथा रुधिरविकार को नष्ट करती है। ----------

877 339 कदम्बः कदम,कदम्ब पुष्पवर्गः कदम्ब,प्रियक,नीप,वृत्तपुष्प,हलिप्रिय।

कदम्बः प्रियको नीपो वृतपुष्पो हलिप्रियः। कदम्बो मधुरः शीतः कषायो लवणोगुरुः॥३२॥ सरो विष्टम्भकृद्रूक्षः कफस्तन्यानिलप्रदः॥ कदम्ब- मधुर, शीतल, कसैला, खट्टा, हल्का, दस्तावर, विष्टम्भ-कारक, रूक्ष और कफ, दुग्ध वा वातवर्द्धक है। Anthocephalus cadamba

The back-end of the indexing system also consists of RDBMS, which contains co-relative data tables. This Tomcat server based program connects to MS-SQL Server 2005 RDBMS through JDBC connectivity. The lexical resources are stored as Devanāgarī utf-8 and data files. There are two tables namely; 'Amarkosha', 'Bhavaprakasha'. The descriptions of the tables are following:

The basic database is "Amarkosha" which contains 'tbl_basic' as the fundamendatl table connecting to thetables like 'tbl_Category' and 'tbl_Synonyms' for obtaining related information. The 'tbl_basic' has the following data structure-

id int

shabda nvarchar(200)

reference nvarchar(50)

category smallint

number smallint

gender smallint

hindi nvarchar(300)

english nvarchar(300)

punjabinvarchar(300)

oriya nvarchar(300)

bangla nvarchar(300)

kannada nvarchar(300)

assamese nvarchar(300)

maithili nvarchar(300)

the column id is for the sequetcial id of the words, reference stores the textual reference from Amarakośa (AK), 'category' stores the id of the semantic (varga) category of the word (linked to he category table), number, gender store these information respectively. The remaining 8 columns store the multilingual glosses for the AK word. A sample of the data from this table is given below -

778 गृहारामः 2.4.1 40 1 1 घर के नजदीक का बगीचा ---- ଘର ଦେ ନଜଦୀକ ଦା ବଗୀଚା ଗୃହସମୀପବର୍ତ୍ତୀ ଉପବନ ગૃહસમીપસ્થ કૃત્રિમ વન ---- ગૃહસમીપસ્થ કૃત્રિમ વન ঘরऽক নজদীকক বগীচা

780 वृक्षवाटिका 2.4.2 40 1 2 राजमन्त्री व गणिका का बाग ---- ରାଜମଂତ୍ରୀ ମନ୍ତ୍ରୀ କିମ୍ବା ବେଶ୍ୟାଙ୍କ ଘରେ ଥିବା ଉଦ୍ୟାନ ଅମାତ୍ୟ ଓ ଗଣିକାର ଗୃହସମୀପସ୍ଥ ଉଦ୍ୟନ ---- ଅମାତ୍ୟ ଓ ଗଣିକାର ଗୃହସମୀପସ୍ଥ ଉଦ୍ୟନ राजमन्त्री व गणिकाक बाग

782 प्रमदवनम् 2.4.3 40 1 4 रनिवास के बाग---- ରନିବାସ ଦେ ବାଗ ରାଣୀମାନଙ୍କ ଖେଳନିମିତ୍ତ ଲଗାଯାଇଥିବା ଉଦ୍ୟାନ ରାଜାର ଅନ୍ତଃପୁରସ୍ଥ ବିହାରକାନନ ---- ରାଜାର ଅନ୍ତଃପୁରସ୍ଥ ବିହାରକାନନ रनिवासक बाग

786 अंकुरः 2.4.4 40 1 1 नया अँखुआ ---- ନବାଁ ଅଁଖୁଆଁ ଅଙ୍କୁର અંકૂર અંકૂર ---- অংকূর नया अँखुआ

The table 'Bhavaprakasha' has a description of the herbs in Amarakosha_id, AushadhiName, Hindi Name, Varga, Synonyms, Shloka, Shloka Hindi, Scientific Name(Latin), amarakosha_id

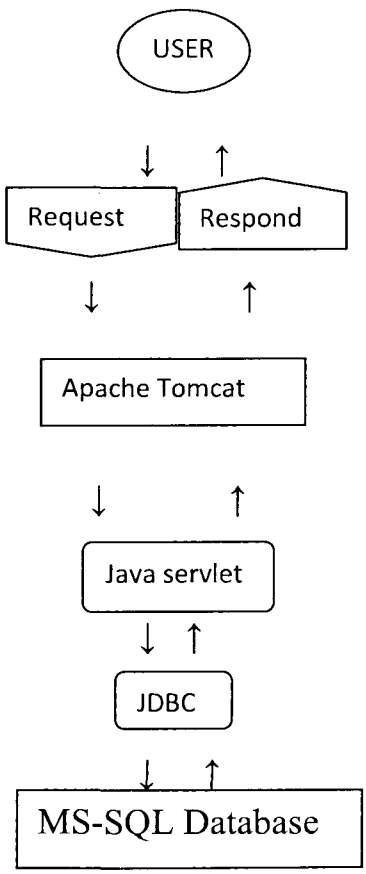
columns. The column 'Amarakosha_id' connects the 'tbl_basic' of the AK database with this table. The structure for database storage in the table is as follows:

Amarakosha_ID	Aushadhi Name	Hindi Name	Varga	Synonyms	Shloka	Shloka Hindi	ScientificName(Latin)
169	बिल्वः	बेल,शिवफल, सिरफल	गुडूच्यादिवर्गः	बिल्व, शांडिल्य, शैलूष, मालूर, श्रीफल, गन्धगर्भ, शलाटु, कण्टकी, सदाफल	बिल्वः शाण्डिल्यशैलूषौ मालूरश्रीफलाव् अपि। गन्धगर्भः शलाटुश्च कण्टकी च सदाफलः॥१२॥ श्रीफलस्तुवरस्तिक्तो ग्राही रूक्षोऽग्निपित्तकृत्। वातश्लेष्महरो बल्यो लघुरुष्णश्च पाचनः॥१३॥	बेल-कसैला, कड़वा, ग्राही, रूखा, अग्नि तथा पित्त को करने वाला, वात तथा कफ को हरने वाला, बलदायक, हल्का, गरम और पाचक है।	Aegle Marmeos

Table 5.2: Structure of database storage, it is second table among two called 'Bhavaprakasha'

5.3 Program architecture

The web application of VV of AK with BN is developed in front-end of JSP with Java servlet, Back-end of RDBMS and JDBC connectivity and data files. The webserver for Java/JSP is Apache Tomcat 4.0 and the RDBMS used is MS-SQL Server 2005 Database in Unicode scheme. The following model describes the interaction between multi-tier architecture of the indexing system of VV of AK and BPN



[Fig. 5.1. program architecture]

5.4 Development technology

5.4.1. Apache Tomcat 4.0 Web Server

The Apache Tomcat is the servlet container that is used for the Java Servlet and Java Server Pages technologies. The Java Servlet and Java Server Pages specifications are developed by Sun under the Java Community Process. Apache Tomcat is developed in an open and participatory environment and released under the Apache Software License. Apache Tomcat is intended to be a collaboration of the best-of-breed developers from around the world[1]. The Amarakosha and Bhavaprakasha Nighantu indexer runs on this Apache Tomcat 4.0 platform.

5.4.2. Java Servlet Technology

Java servlet technology provides web developer with a simple, consistent mechanism for extending the functionality of a web server and for accessing existing business systems. A servlet can almost be thought of as an applet that runes on the server side without a face. Java servlets make many web applications possible.[2]

5.4.3. Java Server Pages

Java Server Pages (JSP) technology provides a simplified, fast way to create dynamic web content. JSP technology enables rapid development of web based applications that are server and platform-independent[3] JSP pages are, however compiled into servlets. Still, it is better to use JSP pages instead of always using servlets because JSP technology separates the web presentation from the web content and thus simplifies the process of creating pages. Basically,

[1] http://tomcat.apache.org/
[2] http://java.sun.com/products/servlet/
[3] http://java.sun.com/products/jsp/

JSP pages use XML tags and script less written in the Java programming language. To encapsulate the logic that generates the content for the web page. On the other hand, it passes the formatting (html or xml) tags directly back to response page. In this way JSP pages separates the page logic from its design and its display. It is one of the most sophisticated tools availavable for high performance and secures web applications.

5.4.4. Relational database management system

A relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model as introduced by E. F. Codd. Most popular commercial and open source databases currently in use are based on the relational database model. A short definition of an RDBMS is: a DBMS in which data is stored in tables and the relationships among the data are also stored in tables. The data can be accessed or reassembled in many different ways without having to change the table forms.[4]

5.4.5. Database connectivity

The database connectivity has been done through the JDBC driver software. JDBC Application Programming Interface (API) is the industry standard for database independent connectivity for Java and a wide range of database-SQL databases. JDBC technology allows to use the Java programming language to develop 'Write once, run anywhere' capabilities for applications that require access to large scale data. JDBC works as bridge between Java program and Database. SQL server 2005 and JDBC support input and output in Unicode, so this system accepts Unicode Devanāgarī text as well as prints result in the same format.[5]

[4] http://en.wikipedia.org/wiki/Relational_database_management_system

[5] http://java.sun.com/javase/technologies/database/

5.5 Code description

Following are the sample JSP code snippet

Java Server Pages Class: search.jsp

The following code sets the language, encoding and content type of the page.

```
<%@page
      language="java"
      pageEncoding="utf-8"
      contentType="text/html; charset=utf-8"
%>
```

The following code imports java.util and user defined java package named sanskrit.

```
<%@ page import="sanskrit.*" %>
<%@ page import="java.util.*" %>
```

The following code sets the encoding of the page to UTF-8

```
<%    request.setCharacterEncoding("UTF-8");
```

The following code obtains values from checkbox and text area.

```
String sstr = request.getParameter("itext");
String wordid = request.getParameter("wordid");
```

This code calls the main class 'BPNSearch' with located lexicon file.

```
String LEX_FILE = ".....";

BPNSearch ls = new BPNSearch(LEX_FILE);
```

This is the display format of string.

```
String display_format = "AMARAKOSHA ID AUSHADHI
NAME ID HINDI VARGA SYNONYMS SHLOKA SHLOKAHINDI SCINTIFIC
NAME(LATIN)";
```

The following code calls the main class and displays the search result in JSP page

```
<%= ls.search(sstr) %>
```

The following code crates a form on web page to enter the search input

```
<FORM  METHOD=get ACTION=search.jsp   accept-Charset="UTF-8">

Enter the search string <INPUT TYPE=text SIZE=10 NAME="searchstr"
VALUE="<%=sstr %>" >
```

The following is the code of button to start the process of tagging.

```
<INPUT TYPE=submit VALUE="Click to Search">

<br>



</FORM>
```

Sample code of main Java class

The following code makes the class part of package sanskrit

```
package sanskrit;
```

The following code imports java packages to be used in the class.

```
import java.util.*;
```

The class starts

```
public class BPNSearch{
}
```

The following code intializes different variables.

```
String inputWord="";
LexiconReader lexdata = null;
String searchResultString="";
String searchResult="";
String searchResultToken="";
```

This is the class constructor, creates new instance of the class when called.

```
public BPNSearch(String lex_file){
lexdata = new LexiconReader(lex_file);
}
```

This is the main function search(searchString) of the class

```
public String search(String searchString){
}
```

The following code obtains each word as separate token.

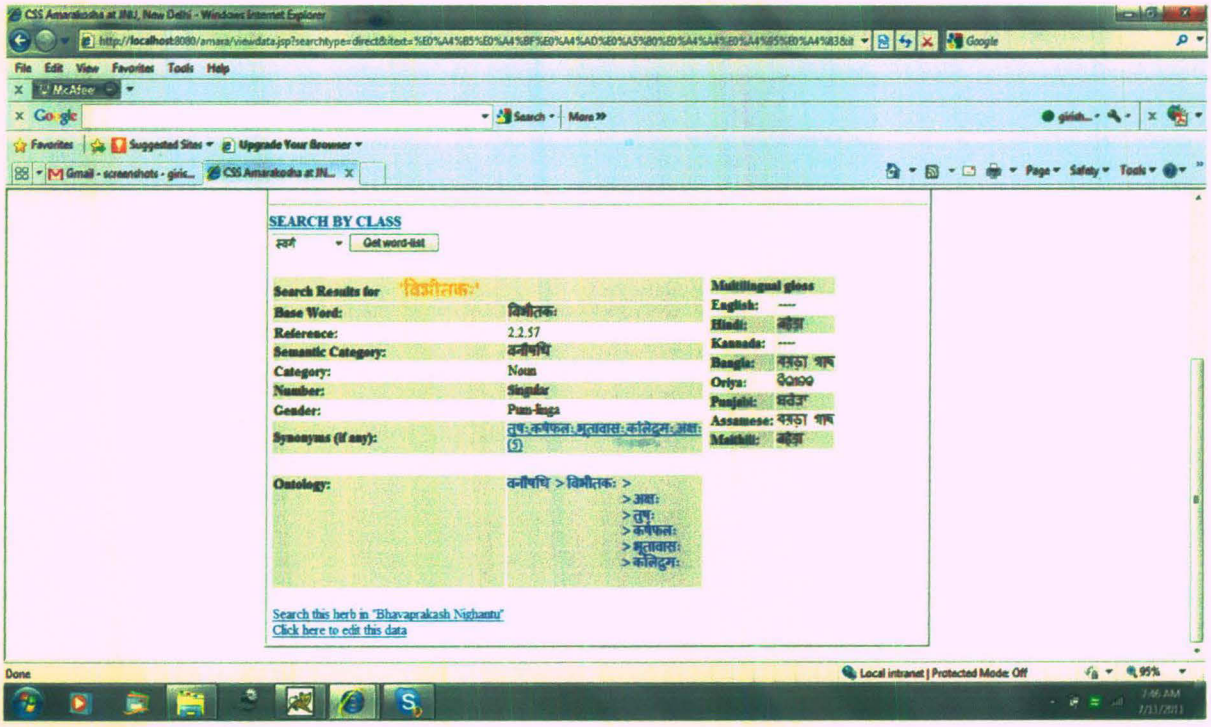
```
StringTokenizer listOfWords = new StringTokenizer(itext, " ");
```

The following code searches the queried word in each row of the table of BPN and displays the result.

```
Enumeration keys = lex.keys();
Object aKey=null;
String aVal="";
String ky= "";
while (keys.hasMoreElements()){
      try{
      aKey = keys.nextElement();
      aVal = lex.get(aKey).toString();
      }
.
if (searchResultString.length()==0)
      searchResultString = "No results were found for
'"+searchString+"'<br> Please try another search!";
return searchResultString;
```

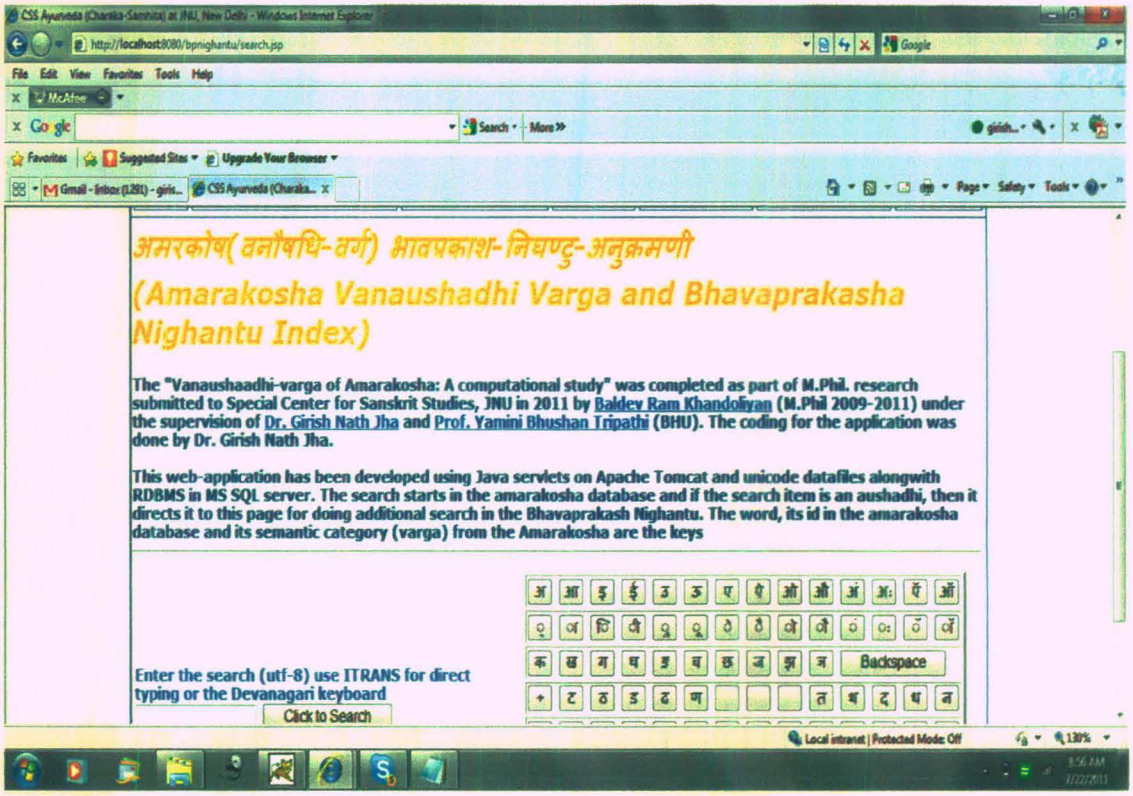
5.6 How To use the system

The Aamarakośa Search engine already exists at http://sanskrit.jnu.ac.in/amara , It takes input in three ways i.e. typing the input word, selecting input word through alphabetical category or selecting the input word from drop down box. The search starts in the amarakosha database and if the search is an aushadhi it will display as follows :



[Snapshot 5.1: First page as the result of auṣadhi searched in Amarakośa]

If the input word is related to VV then the page has a link for additional search as "search this herb in Bhavaprakasha Nighantu " , clicking this link the system directs it as the entered in the text area as illustrated below. The text has to be utf-8 Devanagari.

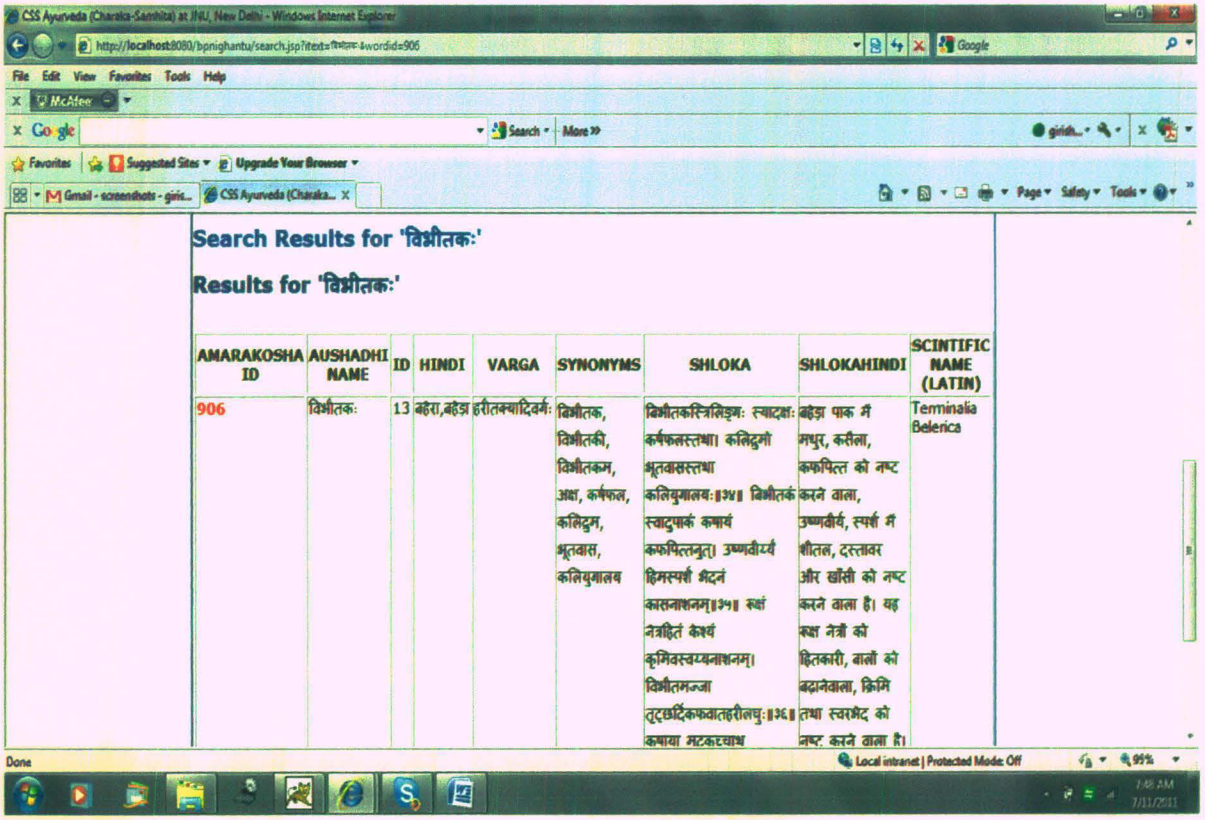


[Fig 5.2: Second page as AK VV and BPN Indexer]

The input for this page is forwarded from the previous page. It also has the facility to accept a new input word through typing or in-built keyboard.

The database of the main page(Aamarakośa Search engine) has an Id assigned to each word of VV, this id of the input word is matched with BPN database to get additional input.

The system gives output on the basis of AK database, and BPN database. The output includes AMARAKOSHA_ID, AUSHADHI NAME, BPN_ID, HINDI NAME, VARGA, SYNONYMS, SHLOKA, SHLOKA HINDI, SCINTIFIC NAME(LATIN).



Search Results for 'विभीतकः'

Results for 'विभीतकः'

AMARAKOSHA ID	AUSHADHI NAME	ID	HINDI	VARGA	SYNONYMS	SHLOKA	SHLOKAHINDI	SCINTIFIC NAME (LATIN)
906	विभीतकः	13	बहेरा,बहेड़ा	हरीतक्यादिवर्गः	विभीतक, विभीतकी, विभीतकम, अक्ष, कर्षफल, कलिद्रुम, भूतवास, कलियुगालय	विभीतकस्त्रिलिङ्गः स्याद्वातः कर्षफलस्तथा। कलिद्रुमो भूतवासस्तथा कलियुगालयः॥३४॥ विभीतकं स्वादुपाकं कषायं कफपित्तनुत्। उष्णवीर्यं हिमस्पर्शं भेदनं कासनाशनम्॥३५॥ रूक्षं नेत्रहितं केश्यं कृमिवस्त्व्यनाशनम्। विभीतमज्जा तृट्छर्दिकफवातहरीलघुः॥३६॥ कषाया मटकट्याश्च	बहेड़ा पाक में मधुर, कसैला, कफपित्त को नष्ट करने वाला, उष्णवीर्य, स्पर्श में शीतल, दस्तावर और खाँसी को नष्ट करने वाला है। यह रूक्ष नेत्रों को हितकारी, बालों को बढ़ानेवाला, क्रिमि तथा स्वरभेद को नष्ट करने वाला है।	Terminalia Belerica

[Screenshot 5.3: Final output of the system]

The above process flow chart can be illustrated by the following example:

Step 1 selected the input word *vibītakaḥ* on AK search page.

Step 2 The input is related to VV, so a link for another page appears. By clicking it, a new window named "Amarakosha Vanaushadhi Varga and Bhavaprakasha Nighantu Index" opens.

Step 3 The same word *vibītakaḥ* appears as input on this new page.

Step 4 This word has an ID in Amarakosha database, this id is matched with BPN Database to get additional information.

Step 5 The final step shows the output. It describes AMARAKOSHA_ID, AUSHADHI NAME, BPN_ID, HINDI NAME, VARGA, SYNONYMS, SHLOKA, SHLOKA HINDI, SCINTIFIC NAME(LATIN). This detail comes out from both AK and BNP database.

Conclusion

Conclusion

The present work is an attempt for computational analyze of *Vanauṣadhivarga* of *Amarakośa*. For this a study on the structure of *Amarakośa, Vanauṣadhivarga* and *Bhāvaprakāśa Nighaṇṭu* was done. The comparative study of herbs listed in *Vanauṣadhivarga* and *Bhāvaprakāśa Nighaṇṭu* was done. The modern botanical names of some of the herbs listed in VV are also given. Besides this, the evolution of tools and techniques – JSP for front end and Java for servlet objects and Apache Tomcat for web server was studied and an online interface was developed which is live at http://sanskrit.jnu.ac.in/amara/viewdata.jsp. The main characteristics of the system are as follows:

- This is one of the first interface online system to know about different aspects of the herbs listed in VV of AK.
- The modern botanical names are given to some of the herbs listed in VV.
- The system of *Amarakośa* is linked with *Bhāvaprakāśa Nighaṇṭu*.
- This system has dynamic input mechanism. One can search his query by direct typing the input word, selecting input word through alphabetical category or selecting the input word from drop down box.
- The system have an option to edit the data to add more information of herbs such as chemical composition, quantity etc.

Limitations

- The meaning of words clears through its etymology. At present, the system is unable to give the etymology of the synonyms of the herbs listed in VV of AK.
- The origin place of plants, used parts of plants in medicine is not provided.
- The system is not provide the names of *dravyas* in all other Indian languages.

Future research and development

The present Online Indexing system for *Amarakośa Vanauṣadhivarga* and *Bhāvaprakāśa Nighanṇṭu* has tremendous potentials in the field of Sanskrit Computational Lexicography and M(A)TS. Some of the immediate and future applications of the system are discussed below:

- An Online Indexer for Sanskrit Lexicons- the present work only deals with the *Vanauṣadhivarga* of *Amarakośa* and *Bhāvaprakāśa Nighaṇṭu* but the same methodology can be applied to build an interactive and multi-dimensional knowledge based web application with additional search for remaining *vargas* of Amarakośa and also for *Āyurvedic Nighaṇṭus* which have similar structure of *Bhāvaprakāśa Nighaṇṭu*.
- The system have a facility to edit the data. So an effort can be made to include available recent scientific information about the plants listed in VV of AK.
- The chemical composition and quantity of herbs can be added.

Appendix

Appendix

Words listed in Vanauṣadhi Varga of Amarakośa

अटवी, महारण्यम्, गृहारामः, आरामः, वृक्षवाटिका, आक्रीडः, प्रमदवनम्, वीथी, लेखा, वन्या, अंकुरः, वृक्षः, वानस्पत्यः, वनस्पतिः, ओषधिः, अबन्ध्यः, बन्ध्यः, फलवान्, प्रफुल्लः, स्थाणुः, क्षुपः, स्तम्बः, वल्ली, वीरुत्, उच्छायः, प्रकाण्डः, शाखा, स्कन्धशाखा, शिफा, अवरोहः, लता, शिरः, मूलम्, सारः, त्वक्, काष्ठम्, इन्धनम्, निष्कुहः, वल्लरिः, पत्त्रम्, पल्लवः, विस्तारः, फलम्, वृन्तम्, शलाटुः, वानम्, क्षारकः, कलिका, गुत्स्तकः, कुट्मलः, सुमनसः, मकरन्दः, परागः, फलम्, जम्बूः, बोधिद्रुमः, कपित्थः, उदुम्बरः, कोविदारः, सप्तपर्णः, आरग्वधः, जम्बीरः, वरणः, पुन्नागः ,पारिभद्रः, तिनिशः, पीतनः, मधूकः, मधूलक, पीलुः, अक्षोटः, अंकोटः, पलाशः, वेतसः, परिव्याधः, शोभाञ्जनः, मधुशिग्रुः, अरिष्टः, बिल्वः, प्लक्षः, न्यग्रोधः, गालवः, आम्रः, सहकारः, कुम्भम्, शेलुः, राजादनम्, गम्भारी, कर्कन्धूः, कोलम्, स्वादुकण्टकः, ऐरावतः, नादेयी, तिन्दुकः, काकेन्दुः, गोलीढः, तिलकः, पिचुलः, श्रीपर्णिका, क्रमुकः, नूदः, नीपः, वीरवृक्षः, गर्दभाण्डः, तिन्तिडी, पीतसालकः, सालः, नदीसर्जः, राजादनः, इङ्गुदी, भूर्जः, पिच्छिला, पिच्छा, रोचनः, चिरिविल्वः, प्रकीर्यः, करञ्जः, रोही, गायत्री, अरिमेदः, कदरः, व्याघ्रपुच्छः, शमीरः, शमी, पिण्डीतकः, शक्रपादपः, पाटलिः, श्यामा, मण्डूकपर्णः, तिष्यफला, विभीतकः, अभया, पीतद्रुः, द्रुमोत्पलः, लकुचः, पनसः, निचुलः, काकोदुम्बरिका, अरिष्टः, पिच्छिला, कपिला, शिरीषः, चाम्पेयः, गन्धफली, केसरः, वञ्जुलः, करकः, चाम्पेयः, जया, कुटजः, कलिङ्गम्, कृष्णपाकफलः, तमालः, सिन्दुकः, वेणी, श्रीहस्तिनी, तृणशून्यम्, आस्फोता, शेफालिका, श्वेतसुरसा, मागधी, हेमपुष्पिका, अतिमुक्तः, सुमनाः, सप्तला, माध्यम्, रक्तकः, सहा, अम्लानः, कुरबकः, कुरुण्टकः, वाणा, सैरेयकः, कुरबकः, कुरण्टकः, ओड्रपुष्पम्, वज्रपुष्पम्, प्रतिहासः, करीरः, उन्मत्तः, मातुलपुत्रकः, फलपूरः ,रुचकः, समीरणः, पर्णासः, पाठी, मन्दारः, अलर्कः, शिवमल्ली, वन्दा, वत्सादनी, मूर्वा, पाठा, कटुः, आत्मगुप्ता, चित्रा, अपामार्गः, हञ्जिका, मञ्जिष्ठा, यासः, पृश्निपर्णी, निदिग्धिका, नीली, अवल्गुजः, कृष्णा, करिपिप्पली, चव्यम्, काकचिञ्चा, पलङ्कषा, विश्वा, क्षीरावी, शतमूली, पीतद्रुः, वचा, वाशिका, वाशिका, आस्फोटा, इक्षुगन्धा, शालेयः, सीहुण्डः, वेल्लम्, बला, घण्टारवा, मृद्वीका, सर्वानुभूतिः, श्यामा, मधुकम्, विदारी, क्षीरविदारी, लाङ्गली, खराश्वा, गोपी,

योग्यम्, वृद्धिः, कदली, मुद्गपर्णी, हिङ्गुली, नाकुली, विदारिगन्धा, तुण्डिकेरी, भारद्वाजी, शृङ्गी, गाङ्गेरुकी, धामार्गवः, महाजाली, ज्यौत्स्नी, लाङ्गलिकी, काकाङ्गी, गोधापदी, मुसली, अजशृङ्गी, गोजिह्वा, ताम्बूलवल्ली, द्विजा, एलाबालुकम्, पालङ्की, बालम्, कालानुसार्यम्, तालपर्णी, गजभक्ष्या, अग्निज्वाला, पृथ्वीका, उपकुञ्चिका, व्याधिः, शङ्खिनी, वितुन्नकः, प्रपौण्डरीकम्, तुन्नः, राक्षसी, व्याडायुधम्, शुषिरा, धमनी, शुक्तिः, आढकी, कुटन्नटम्, गन्धिपर्णम्, मरुन्माला, तपस्विनी, त्वक्पत्रम्, कर्चूरकः, औषधिः, औषधम्, शाकम्, तण्डुलीयः, विशल्या, ऋक्षगन्धा, ब्राह्मी, पटुपर्णी, हयपुच्छी, तुण्डिकेरी, वर्वरा, एलापर्णी, चाङ्गेरी, सहस्रवेधी, नमस्कारी, जीवन्ती, कूर्चशीर्षः, किराततिक्तः, सप्तला, वायसोली, मकूलकः, अजमोदा, पौष्करंमूलम्, अव्यथा, काम्पिल्यः, प्रपुन्नाड, पलाण्डुः, लतार्कः, लशुनम्,, पुनर्नवा, वितुन्नम्, वातकः, पारावताङ्घ्रिः, वार्षिकम्, विष्वक्सेनप्रिया, मार्कवः, काकमाची, शतपुष्पा, सरणा, जनी, शटी, कारवेल्लः, कुलकम्, कूष्माण्डकः, ईर्वारुः, इक्ष्वाकुः, तुम्बी, चित्रा, विशाला, अर्शोघ्नः, गण्डीरः, शाकभेदाः, कलम्बी, उपोदका, मूलकम्, हिलमोचिका, वास्तुकम्, दूर्वा, गोलोमी, कुरुविन्दः, भद्रमुस्तकः, चूडाला, वंशः, कीचकः, ग्रन्थिः, गुन्द्रः, नडः, काशम्, वल्वजाः, रसालः, वीरणम्, उशीरम्, तृणम्, कुशम्, कत्तृणम्, छत्त्रा, मालातृणकम्, शष्पम्, घासः, तृणम्, तृण्या, नड्या, तालः, नारिकेलः, घोण्टा, उद्वेगम्, तृणद्रुमः|

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