



## Kerala commentaries on *Lilavati*

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**Abstract:** *Lilavati* of Bhaskara II, the famous Indian mathematical text, is very popular all over the world. It has many commentaries and translations in India and abroad. It became a basic mathematical text since 12<sup>th</sup> century. Apart from Sanskrit, there are a number of commentaries in all vernaculars including Malayalam. The eminent scholar K.V.Sarma listed out five Sanskrit and six Malayalam commentaries in his book “*A history of the Kerala school of Hindu Astronomy*”.

**Keywords:** *Lilavati* of Bhaskara II, *Kriyakramakari*, Vatasserri Paramesvara, Sankara Variyar and K.V.Sarma.

The continuous mathematical tradition of Kerala is said to have been developed from 13<sup>th</sup> century A.D. Even though social circumstances and the foreign assaults caused inversely the growth and development of intellectual activities all over India, Kerala mathematicians were interested in various scientific disciplines especially in astronomy and mathematics. Thus a number of excellent original texts and commentaries had been produced during that period. Madhava of Sangamagrama (1340-1425 A.D), who is known as *Golavid*, enunciated a formula for finding the circumference of a circle to an advanced degree of accuracy. The *Kriyakramakari*, a Sanskrit commentary of *Lilavati* from Kerala discusses this result in detail. *Yuktibhasha*, the very famous old Malayalam work has given a geometrical proof for this infinite series. Apart from this, Kerala School had also produced great savants like Vatasserri Paramesvara, Putumana Somayaji, Sankara Variyar and Sankara Varman.

The rich mathematical tradition of Kerala had produced many commentaries to the text *Lilavati* both in Sanskrit and in Malayalam. *Lilavati* of Bhaskara II, the famous Indian mathematical text, is very popular all over the world. It has many commentaries and translations in India and abroad. It became a basic mathematical text since 12<sup>th</sup> century. K.V.Sarma, the doyen in this field, had taken painstaking efforts to unearth these commentaries of *Lilavati*. He identified five Sanskrit commentaries and six Malayalam commentaries on *Lilavati* from Kerala<sup>1</sup>. They are:

1. *Kriyakramakari* commentary of Sankara Variyar and Narayanan Namputiri
2. *Karmapradipika* of Narayanan Namputiri
3. Commentary by Vatasserri Paramesvara
4. *Bhaskariyaganitavyakhya* of Kotungallur Godavarma Ilaya

<sup>1</sup> *A History of the Kerala School of Hindu Astronomy*, K.V.Sarma, Vishveshvaranand Institute, Hoshiarpur, 1972, pp.162-163.

Tampuran<sup>2</sup>

5. A commentary by Damodaran Namputiri of Mangalasreni<sup>3</sup>.

As the Malayalam vernacular was well-acquainted with the text *Lilavati* for the traditional Kerala scholarship, we are fortunate to have several Malayalam commentaries. Most of them are now in manuscript form and are unpublished<sup>4</sup>.

**Kriyakramakari commentary:** *Kriyakramakari* is an extensive commentary on *Lilavati* which has construed the text into a gargantuan one. It is a well-known commentary of *Lilavati* written by Sankara Variyar of Trikkutaveli (A.D.1500-1560) and Narayanan Namputiri(A.D.1540-1610) of Mahishamangalam. Sankara Variyar of Trikkutaveli (Today this place name is known by the name Trikkatiri near Ottappalam) has commented upon the first 199 verses of *Lilavati* and the remaining portion is commented by Narayanan Namputiri of Mahishamangalam. K.V.Sarma, the veteran scholar in the field of Indian mathematics, has confirmed the joint authorship of the commentary<sup>5</sup>.

In *Kriyakramakari*, the rationales are expressed mainly in the form of *Sangrahaslokas*. Here the word ‘*Sangraha*’ may confuse us because usually it means concise. But in *Kriyakramakari*, the *Sangrahaslokas* contain entirely new geometrical explanations in addition to the brief reproduction of the rationales discussed in the commentary<sup>6</sup>. And also these verses thus form a rich source of medieval Kerala mathematician’s line of thought.

**Commentary of Vatasseri Paramesvara :** The Sanskrit commentary of Vatasseri Paramesvara is a brief commentary of *Lilavati* as compared to *Kriyakramakari*. It is an unpublished commentary of *Lilavati*<sup>7</sup>. It begins with the verse-

लक्ष्मीभूविलसत्पार्श्वसहस्रादित्यसन्निभः

<sup>2</sup> Ulloor mentions that he has not seen the *Bhaskariyaganitavyakhya* of Vidvan Ilaya Tampuran. *Keralasahityacaritram* - Vol.4, Publication Division, University of Kerala, Fifth Edition, 1990, p.37. Vatakkumkur does not give any description on the text *Bhaskariyaganitavyakhya*. *Keraliyasamskratasahityacaritram*, Vol.4, Vatakkumkur Raja Raja Varma Raja, Publication Division, Sree Sankaracharya Samskrita Sarvakalasala, Kalady, Second Edition, 1997, p.312

Later E.Easwaran Nampoothiry and Poovattur Ramakrishna Pillai state that the *Bhaskariyaganitavyakhya* of Vidvan Ilaya Tampuran is written on the *Bhaskariya* of Bhaskara I.

*Sanskrit Literature of Kerala*, E.Easwaran Nampoothiry, College Book House, Trivandrum, Second reprint, 1977, pp.21-22. *Keralasamskrta vijnanakosam*, Dr. Poovattur Ramakrishna Pillai, Current Books, Thrissur, 2000, pp. 217-218 and p.409.

Dr.R.Kamalakumari, Associate Professor, Dept. of Sanskrit Sahitya, Regional Centre, Trivandrum, Sree Sankaracharya University of Sanskrit, Kalady has recorded in her unpublished Ph.D thesis ‘*Sanskrit works of Godavarma Yuvaraja of Kotungallur*’ that Kunjunni Raja and K.V.Sarma could not procure the manuscript of the *Bhaskariyaganitavyakhya*.

<sup>3</sup> Vatakkumkur records that Mangalasreni Namputiri has written a commentary on *Lilavati* and *Prasnariti*. He opines that these two books were much popular in those days. But he does not furnish any details regarding the respective commentary on *Lilavati*.

*Keraliyasamskratasahityacaritram*, Vol. 3, Vatakkumkur Raja Raja Varma Raja, Publication Division, Sree Sankaracharya Samskrita Sarvakalasala, Kalady, Second Edition, 1997, p.316

<sup>4</sup> Among the six unpublished Malayalam commentaries on *Lilavati*, the manuscripts of the two commentaries have been collected from the three major public repositories of Kerala viz. Thunchan Manuscripts Repository, Department of Malayalam and Kerala studies, University of Calicut, Sree Ramavarma Government Sanskrit College Manuscript Repository, Trippunithura and Oriental Research Institute and Manuscripts Library, Trivandrum. These manuscripts are collected by the author as part of presenting the paper ‘*Two commentaries on Lilavati*’ in an International Conference on Bhaskara 900 jointly with Dr.N.K.Sundareswaran ( Professor, Department of Sanskrit, University of Calicut, Kerala) at Thane, Mumbai in 2014.

Apart from the above six Malayalam commentaries, another Malayalam commentary named *Sarabodhini* by Panditarajan Areekkulangara Narayana Panicker is published from Mathrubhumi Books, Calicut in 2008. It is edited by Areekkulangara Soman Panicker. But it was originally completed in the year 1944. The editor Areekkulangara Soman Panicker claims it to be the first commentary on *Lilavati*.

<sup>5</sup> *Lilavati of Bhaskaracarya with Kriyakramakari commentary by Sankara and Narayana*, (Ed.) K.V Sarma, Vishvesvaranand Vedic Research Institute, Hoshiarpur, 1975. p.xvi.

<sup>6</sup> In many cases, the discussion of mathematical results continues upto three or more pages. For instance the sections *vargakarma* and *ghanakarma*.

<sup>7</sup> A Ph.D Thesis has been submitted by Anil Narayanan under the guidance of Prof.N.K.Sundareswaran, HOD, Department of Sanskrit, University of Calicut. It is the critical edition of the commentary of Vatasseri Paramesvara.

ज्ञानमूर्तिरनाद्वष्टेन्ददातुना प्रणमामि गणेशानाम् ।<sup>8</sup>

Some scholars suggest the name *Vivarana* to this commentary<sup>9</sup>.

**Karmapradipika of Narayanan Namputiri:** Narayanan Namputiri is found to be the author of *Karmapradipika*. Sarma assumes that Narayanan Namputiri might have written a brief commentary on *Lilavati* just after completing *Kriyakramakari* commentary<sup>10</sup>. This commentary is only for the textual verses of *Lilavati*, not for the *vasana* of the author himself.<sup>11</sup> According to T. A.Saraswathi Amma, *Karmapradipika* of Narayanan Namputiri seems to be indebted to the commentary of Vatasseri Paramesvara.<sup>12</sup>

The manuscripts of the remaining two Sanskrit commentaries of *Lilavati* i.e, *Bhaskariyaganitavyakhya* of Vidvan Ilaya Tampuran and the commentary of Damodaran Namputiri of Mangalasreni are not found yet.

**Malayalam commentaries on *Lilavati* :** There are six unpublished Malayalam commentaries on *Lilavati*. All of them are of unknown authorship. The following are the list of these manuscripts in the major manuscript repositories in Kerala.

**A. Sree Rama Varma Government Sanskrit College Grantha Library, Trippunithura**

Sl.No.	Name of the manuscript as recorded in the library	Manuscript No.
1	<i>Lilavativyakhya</i>	619B
2	<i>Lilavatibhasha vyakhyanam</i>	620B

**B. Thunchan Manuscripts Library, Department of Malayalam and Kerala Studies, University of Calicut**

Sl.No.	Name of the manuscript as recorded in the library	Manuscript No.
1.	<i>Lilavatibhasha Vyakhyanam</i>	3585

**C. Oriental Research Institute And Manuscripts Library, University Of Kerala, Trivandrum**

Sl.No.	Name of the Manuscript as recorded in the library	Manuscript No.
1	<i>Lilavati bhashavyakhyanam</i>	12559
2	<i>Lilavatibhasha (Transcript)</i>	T 890
3	<i>Lilavati bhashavyakhyanam</i>	5813

<sup>8</sup> Ms. No. 498-B, Thunchan Manuscript repository, Department of Malayalam and Kerala Studies, University of Calicut.

<sup>9</sup> *Astronomy and Mathematics in Kerala*, K. Kunjunni Raja, The Adyar Library and Research Centre, Madras, 1995, p.25.

<sup>10</sup> K.V.Sarma , op.cit.,p.xxii.

<sup>11</sup> Bhaskara II has written a gloss for each and every verses of *Lilavati*.

<sup>12</sup> *Geometry in ancient and Medieval India*, T.A.Saraswathi Amma, Motilal Banarsidass, New Delhi, 1979,pp.12-13.

4	<i>Lilavati bhashavyakhyanam</i>	5786
5	<i>Lilavati bhashavyakhyanam</i>	3636E
6	<i>Lilavativyakhya</i>	22440 A
7	<i>Lilavatibhashavyakhyanam</i>	17683
8	<i>Lilavativyakhyanam</i>	10648
9	<i>Lilavatibhashavyakhya</i>	18438
10	<i>Lilavativyakhya</i>	L 839
11	<i>Lilavativyakhya</i>	14633 B
12	<i>Lilavati with Malayalam commentary</i>	22199
13	<i>Lilavatibhashavyakhanam</i>	L 878B
14	<i>Lilavativyakhya</i>	L 839

The above listed manuscripts are of very significant from the point of view of the textual tradition of *Lilavati*. Most of the manuscripts have the entire text apart from the commentary. Thus it will help us to revive the correct reading of the text as such.

**Conclusion:** The medieval Kerala mathematical tradition has a vital role in the successful legacy of Indian mathematics. The social and the cultural milieu in Kerala had produced a number of original works and commentaries both in Sanskrit and in Malayalam. But only a few of them were edited and studied. Serious research has to be done in this field for finding out the contribution of Kerala mathematicians. Thus it is very essential to make editions and studies of these texts to revive the mathematical culture of Kerala.

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