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Vṛṣṭi-Vijñāna in the Indian Knowledge System: Study of Rainfall from Classical Sanskrit Texts

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Abstract

Vṛṣṭi (rainfall) occupies a central place in the Indian Knowledge System (IKS), where it is regarded as a fundamental determinant of agriculture, ecological balance, and human well-being. This study examines the traditional concept of *Vṛṣṭi-Vijñāna* through a critical analysis of selected Sanskrit sources, including the *Ṛgveda, Atharva Veda, Bṛhat Saṃhitā, Bhadrabāhu Saṃhitā, Meghamālā, Varṣaprabodha, Kṛṣi Parāśara* and *Gaṇitasārasaṅgraha*. The objective is to explore the principles of cloud formation, rainfall forecasting, and measurement preserved in these texts and to evaluate their scientific and historical significance. The study adopts a qualitative textual and comparative approach, examining descriptions of cloud formation, cloud morphology, wind direction, solar phenomena, *Nakṣatra* based observations, and seasonal indicators associated with rainfall prediction. It also investigates the ancient indian system of rainfall quantification using standardized units such as *Prastha, Āḍhaka, Droṇa*, and *Khārī*, together with observational techniques including the *Rohiṇī Kumbha* method. The analysis demonstrates that these texts present a systematic framework in which rainfall is understood through the interaction of astronomical, atmospheric, hydrological, and environmental factors. Furthermore, the consistency of metrological units across mathematical and scientific literature reflects the existence of a well-developed system for the quantitative assessment of rainfall in ancient India. Although these traditional methods were developed within a historical context, they preserve valuable empirical observations of weather and climate that contribute to the understanding of indigenous meteorological knowledge. The study concludes that *Vṛṣṭi-Vijñāna* constitutes a significant component of the Indian Knowledge System and provides an important foundation for future interdisciplinary research integrating Sanskrit textual studies with meteorology, hydrology, environmental history, and climate science.

Keywords

Vṛṣṭi Vṛṣṭi-Vijñāna; Indian Knowledge System (IKS); *Bṛhat Saṃhitā*; Traditional Meteorology; Rainfall Forecasting; Indigenous Environmental Knowledge.

Introduction

Rainfall is one of the most fundamental components of the Earth's hydrological cycle and plays a crucial role in sustaining agriculture, ecosystems, and human civilization. Since ancient times, societies have developed various methods to observe, predict, and measure rainfall based on environmental and astronomical phenomena. In the Indian Knowledge System (IKS), the science of rainfall, referred to as *Vṛṣṭi-Vijñāna*, constitutes an important branch of traditional meteorological knowledge. Classical Sanskrit literature preserves detailed observations on the

origin, prediction, measurement, and seasonal behaviour of rainfall, reflecting centuries of empirical environmental understanding.

Among the earliest references, the *Ṛgveda* presents a conceptual description of the hydrological cycle by explaining the movement of water between the atmosphere, clouds, and the Earth. Subsequent works, including the *Bṛhat Saṃhitā*, *Bhadrabāhu Saṃhitā*, *Meghamālā*, and *Varṣaprabodha*, provide systematic methods for rainfall forecasting based on cloud morphology (*Megha Lakṣaṇa*), cloud embryo (*Garbha Lakṣaṇa*), *Rohiṇī Yoga*, wind direction, solar phenomena, and *Nakṣatra* based observations. These texts also describe traditional methods for estimating the quantity and spatial distribution of rainfall, together with standardized units of measurement such as *Prastha*, *Āḍhaka*, *Droṇa*, and *Khārī*.

Although these traditional concepts have been discussed in historical and cultural contexts, a comprehensive synthesis of their meteorological principles remains limited in contemporary academic literature. In particular, the observational framework underlying *Vṛṣṭi-Vijñāna* has received comparatively little attention from an interdisciplinary perspective integrating Sanskrit textual studies with environmental and meteorological sciences.

The present study aims to examine the traditional principles of rainfall prediction and measurement described in Sanskrit texts through a qualitative textual and comparative analysis. It explores the major indicators of rainfall, traditional forecasting methods, and metrological concepts while highlighting their relevance to the history of meteorological knowledge within the Indian Knowledge System. By systematically organizing these concepts, the study contributes to a better understanding of India's indigenous scientific heritage and provides a foundation for future interdisciplinary research on traditional environmental knowledge.

Vṛṣṭi

Vṛṣṭi (V) refers to the process of rainfall, i.e., the precipitation of water from the atmosphere onto the earth. The Vedic seers (c. 3000 BCE), described the complete process of rainfall from its origin to its eventual precipitation in the *Ṛgveda* (RV). The RV one of the oldest extant Sanskrit texts of the Vedic period represents the earliest literary source of the Indian knowledge System (IKS) and contains valuable observations on natural phenomena, including rainfall and atmospheric processes. According to (RV, 5.55.5):

"उदीरयथा मरुतः समुद्रतो यूयं वृष्टिं वर्षयथा पुरीषिणः ।"

udīrayathā marutaḥ samudrato yūyaṃ vṛṣṭiṃ varṣayathā purīṣiṇaḥ

Means, "You send the rain, Maruts, from the firmament; charged with the waters you shower down the rain; destroyers of foes, your kine are never dry; may the cars of the quick-moving Maruts arrive for our good." (Wilson, 1866).

The process of V begins in the *Antarikṣa* (the celestial region comprising the *Nakṣatras*, *Sūrya*, *Candra*, and other heavenly bodies). Thereafter, water rises from the ocean and ultimately returns to the earth in the form of clouds that release rainfall. This entire sequence of atmospheric and hydrological processes is collectively referred to as V.

The (Anonymous, 1866) 5.54.9[lii] identifies *Bhūmi* (Earth), *Marut* (winds), *Dyuloka* (the celestial realm), *Antarikṣa* (the atmospheric region) and *Parvata* (mountains) as the fundamental natural

elements involved in the process of V. *Bhūmi* (Earth) serves as the primary source from which water is available for evaporation. *Marut* (winds) facilitate the transport of water vapour and clouds across the atmosphere. *Dyuloka* (the celestial realm) represents the region associated with solar energy, which drives the process of evaporation and other atmospheric phenomena. *Antarikṣa* (the atmospheric region) functions as the medium where cloud formation, condensation, and cloud movement take place. *Parvata* (mountains) play a significant role in influencing the spatial distribution of rainfall, comparable to the phenomenon of orographic precipitation recognized in modern meteorology.

Thus, the *Mantra* (hymn) 5.54.9 presents V not as an isolated event but as the outcome of the continuous interaction among the Earth's surface, solar energy, atmospheric circulation, clouds, and topographical features. This description closely corresponds to the fundamental principles of the modern hydrological (water) cycle, in which evaporation, atmospheric transport, condensation, cloud formation, and precipitation occur as interconnected and cyclic processes.

The Importance of *Vṛṣṭi*

The significance of V extends beyond rainfall itself, as it constitutes the primary source of freshwater essential for ecological balance, agriculture, and the sustenance of all living beings.

Ācārya Varāhamihira (AV) (c. 505 CE - 587 CE), the renowned Indian astronomer and polymath, authored the *Bṛhat Saṃhitā* (BS), which contains extensive observations on rainfall, meteorology, and environmental phenomena. (Varahmihir, 2014), 21.1[liii] states that rainfall is the fundamental basis for the production of *Anna* (food) (Sastri, 1946).

Ācārya Parāśara (AP) (4th CE), regarded as one of the earliest authorities on agricultural science, authored the *Kṛṣi-Parāśara* (KP). (Parashar, 2004), 2.1[liv] mentions that Without rainfall, agricultural production cannot be sustained, making timely precipitation essential for the survival and well-being of both humans and all other living beings (Pandey, 2002).

In this context, the term *Anna* (food) should not be understood merely as cereal grains or food crops. Rather, it encompasses all the essential resources required to sustain life. The necessities upon which every living organism depends are, directly or indirectly, made possible through V, thereby highlighting the central role of rainfall in maintaining ecological balance and supporting the continuity of life.

***Vṛṣṭi Garbha* and *Prasav* Period**

(Raman, 1960) The formation of clouds is metaphorically described as *Garbha* (G) (Ethereal Embryo), while the occurrence of rainfall is termed *Prasav* (P) (delivery or birth). Although the terms G and P are conventionally associated with pregnancy and childbirth, ancient Indian scholars employed them to explain the natural process of rainfall through an organic and life-oriented analogy. Just as a mother gives birth to a child after a period of gestation, the sky, through the formation of clouds, metaphorically gives birth to rain.

(Varahmihir, 2014), 21.7[lv] states that the interval between the formation of rain-bearing clouds and the commencement of rainfall is considered to be approximately 195 days. This period represents the G of rainfall in the traditional Indian meteorological system, culminating in the P of rain.

(Iyer, 1884) In English translation of BS, 21.7 explains the exact counting of days of G,

"*i.e., fully 7 months after, as the siderial period of the moon is exactly 27 days, 7 hours, 43 minutes, 11.4 seconds*".

This stanza enables us to determine the very day of the occurrence of rain.

Ācārya Bhāskara II (AB), renowned Indian mathematician and astronomer (1150 CE) in his book *Siddhānta Śiromaṇi* (SS), the comprehensive treatise composed of 1,450 verses. (II, 1926) explains in SS, *Gaṇitādhyāya*, 20[lvi] the traditional Indian system of calendrical and astronomical reckoning, the computation of time is primarily based on two distinct methods: *Cāndramāna* (C) (lunar reckoning) and *Sāvanamāna* (S) (solar or civil-day reckoning). C measures time according to the motion of the Moon, whereas S is based on civil days reckoned from one sunrise to the next and is associated with the apparent motion of the Sun.

According to the traditional astronomical framework, (Anonymous, Atharva Veda, 2001) the celestial sphere is divided into 27 *Nakṣatras* (N) (lunar mansions)[lvii] through which both the Sun and the Moon successively traverse during their respective motions (Ram, 2013). The text states that when the Moon occupies a particular N at the time of G (rain-bearing clouds), P (precipitation) is expected to occur after an interval of 195 days. However, this interval does not correspond accurately when calculated solely according to the C, as the Moon does not return to the same N exactly 195 days later. In contrast, when the interval is computed according to the S, the 195-day period coincides with the recurrence of the same N in which the cloud gestation was originally observed. At this stage, the Moon again occupies the same N, and this alignment is regarded as the appropriate time for the occurrence of rainfall.

(Varahmihir, 2014), 21.7[lviii] described the interval between the G and P of rainfall is reckoned according to S, rather than C.

Relationship of G and P with *Pakṣa* and *Māsa*

The traditional Hindu calendar, like the Gregorian calendar, comprises twelve *Māsa* (months), *"Caitra, Vaiśākha, Jyeṣṭha, Āṣāḍha, Śrāvaṇa, Bhādrapada, Āśvina, Kārttika, Mārgaśīrṣa, Pauṣa, Māgha, Phālguna"* from March to February respectively. Each *Māsa* is divided into two *Pakṣa* (lunar fortnights), the *Kṛṣṇa Pakṣa* (waning fortnight) and the *Śukla Pakṣa* (waxing fortnight) (B. Mahadevan, 2022).

(Iyer N. S., 1991), *Kṛṣṇa Pakṣa* is the fortnight during which the visible portion of the Moon gradually diminishes until it becomes invisible on the *Amāvasyā* (day of the new moon). This phase consists of fifteen *tithis* (lunar days).

(Rinehart, 2004), *Śukla Pakṣa* is the fortnight during which the illuminated portion of the Moon gradually increases, culminating in the *Pūrṇimā* (full moon). This phase likewise comprises fifteen *Tithis* (lunar days).

(Varahmihir, 2014) in BS, 21.8[lix] and (Varahmihir, 2014) in BS, 21.9-12[lx], explains the relationship between G and P of V in terms of *Pakṣa* and *Māsa*. He specifies the correspondence between the fortnight in which the rain-bearing clouds are formed and the fortnight in which rainfall is expected to occur. Likewise, he describes the relationship between the month of cloud gestation and the corresponding month of precipitation. The complete correlations are presented in Table 1 and Table 2 (given below), respectively.

Table 1: *"*Relationship of G and P with *Pakṣa"*

G Period	**P Period**
Śukla Pakṣa	*Kṛṣṇa Pakṣa*
Kṛṣṇa Pakṣa	*Śukla Pakṣa*
Day	Night
Night	Day
Evening	Evening

Table 2: *"*Relationship of G and P with *Māsa"*

G *Māsa*	**P *Māsa***
Pauṣa Kṛṣṇa	*Śrāvaṇa Śukla*
Māgha Śukla	*Śrāvaṇa Kṛṣṇa*
Māgha Kṛṣṇa	*Bhādrapada Śukla*
Phālguna Śukla	*Bhādrapada Kṛṣṇa*
Phālguna Kṛṣṇa	*Āśvina Śukla*
Caitra Śukla	*Āśvina Kṛṣṇa*
Caitra Kṛṣṇa	*Kārttika Śukla*

Indicators of *Vṛṣṭi*

Most classical Indian authorities describe a broadly consistent set of indicators for predicting the nature, intensity, and distribution of V. These indicators are primarily based on systematic observations of natural phenomena and celestial conditions rather than on isolated events. Among them, *Megha* (clouds), *Sūrya* (Sun), *Vāyu* (winds), *Nakṣatra* (constellations), and other environmental signs are regarded as the principal indicators of V. Their characteristics, behaviour, movement, colour, direction, and seasonal variations are collectively interpreted to assess the timing, quantity, duration, and quality of precipitation. The following sections examine these indicators in detail as described in the major Sanskrit texts.

Megha Lakṣaṇa

Ācārya Bhadrabāhu (ABh) (c. 4th century BCE), one of the earliest and most revered Jain scholars, is traditionally credited with the authorship of the *Bhadrabāhu Saṃhitā* (BhS), text presents systematic observations on natural phenomena, including V indicators, seasonal variations, and environmental conditions, and serves as an important source for understanding traditional Indian knowledge related to meteorology and prognostication.

One of the earliest and most consistent indicators of abundant rainfall described in classical Indian meteorological literature is the direction of cloud movement.

(Bhadrabahu, 1959) in BhS, 8.2[lxi] states that, (Shastri, 1959) "*When a rain-bearing cloud appears dark like Añjana (collyrium) in the "śānta Diśā"*[lxii] *(western direction) and is characterized by a moist, soft appearance and slow movement, it is regarded as an indicator of beneficial and abundant rainfall*".

Since the text is traditionally associated with the region of *Śravaṇabeḷagoḷa*, in present-day Karnataka, south part of India. This observation closely corresponds to the climatological

significance of the south-west monsoon, which continues to be the principal source of rainfall over the Indian subcontinent. The continuity between this traditional observation and the modern understanding of the south-west monsoon highlights the empirical basis of classical Indian meteorological knowledge.

(Bhadrabahu, 1959) further classifies rain-bearing clouds on the basis of their colour while maintaining the same set of favourable characteristics, namely their appearance in the *śānta diśā*, moist and soft texture, and gentle movement. According to 8.3[lxiii], a *Pīta varṇa megha* (yellow-coloured cloud, resembling a flower) is regarded as an auspicious indicator of rainfall. 8.4[lxiv] identifies a *Rakta varṇa megha* (red-coloured cloud) as a sign of abundant and beneficial rainfall. Likewise, 8.5[lxv] describes a *śukla varṇa megha* (white-coloured cloud) as a rain-bearing cloud that releases the entire quantity of moisture contained within it, thereby producing complete precipitation.

Bhaḍalī Meghrāja (BM) (c. 15-17 CE) is traditionally regarded as the author of the *Meghamālā* (MM), a medieval Indian treatise on rainfall prediction. (Megharaj, 2016) describes *Tītara varṇī bādarī* (clouds resembling the colour of a partridge) appearing in the western direction are regarded as indicators of prolonged rainfall lasting for sixteen *Praharas* (approximately eight days), resulting in widespread inundation.

(Bhadrabahu, 1959), chapter 8 describes several traditional indicators for V based on the physical characteristics and behaviour of clouds. These prognostic features and their corresponding interpretations are summarized in Table 3.

Table 3: "*Megha Lakṣaṇa* and V indications"

Megha Lakṣaṇa	**V Indications**
Bird or water body shaped clouds	Abundant and beneficial rainfall
Smooth, moist, slow-moving clouds	Widespread rainfall
Pleasant fragrance and soft thunder	Adequate rainfall
Lion or jackal shaped clouds with harsh thunder	Inauspicious atmospheric conditions
Vulture or carrion bird shaped clouds	Blood like rainfall (traditional omen)

Sūrya Lakṣaṇa

(Varahmihir, 2014), 21.27[lxvi] explains that when the Sun exhibits auspicious characteristics, conditions become favourable for the development of clouds, resulting in rainfall. Conversely, when the Sun displays contrary or inauspicious characteristics, cloud formation is inhibited, leading to the absence of rainfall.

(Jha, 2014) in his commentary on the BS, 21.27, elaborates the *śubha* (auspicious) and *Aśubha* (inauspicious) characteristics of the Sun. *śubha* solar characteristics include a clear and unobstructed sky, moderate solar heat, regular sunrise and sunset, and the absence of abnormal atmospheric conditions in the cardinal directions. Conversely, *Aśubha* characteristics are marked by excessive heat or unusually low temperatures, the Sun appearing hazy, reddish, or dull in colour, irregularities in sunrise or sunset, and unusual illumination or darkness in the cardinal directions.

These characteristics are regarded as important indicators for assessing the likelihood of cloud development and subsequent rainfall.

Vāyu Lakṣaṇa

(Bhadrabahu, 1959) in 9.4 – 9.6[lxvii], writes that the *Dakṣiṇa vāyu* (south wind), when blowing from the southern direction, is referred to as *Samudrānuśaya Vāyu*. It is regarded as the primary force responsible for the formation of cloud embryos, thereby initiating the process of rainfall. The text further explains that this wind not only gives rise to cloud embryos but also facilitates their maturation, enabling the clouds to become capable of producing rainfall. Once these clouds have fully matured, the north wind assumes the role of dispersing them across the sky and releasing the water they contain as precipitation. Owing to this function of bringing about rainfall, the north wind is identified as *Marut*. This description presents a sequential model in which the southern wind initiates and nurtures cloud formation, whereas the northern wind facilitates the final stage of precipitation.

Nakṣatra Lakṣaṇa

In the classical Indian knowledge tradition, the movements of *Nakṣatras* were systematically employed to understand and interpret natural cycles. Among these, rainfall, which was fundamental to agriculture and human livelihood, was closely associated with the positions and movements of the *Nakṣatras*. The integration of *Nakṣatra* based astronomical knowledge with rainfall prediction represents a distinctive feature of traditional Indian meteorology and continues to influence indigenous weather-forecasting practices in several rural communities.

(Griffith, 1895), the sky is divided into 27 *Nakṣatras* (*Aśvinī, Bharaṇī, Kṛttikā, Rohiṇī, Mṛgaśīrṣa, Ārdrā, Punarvasu, Puṣya, Āśleṣā, Maghā, Pūrvaphālgunī, Uttaraphālgunī, Hastā, Citrā, Svātī, Viśākhā, Anurādhā, Jyeṣṭhā, Mūlā, Pūrvāṣāḍhā, Uttarāṣāḍhā, Śravaṇā, Dhaniṣṭhā, Śatabhiṣā, Pūrvabhādrapadā, Uttarabhādrapadā, Revatī*) through which the Moon completes its monthly course. Observations of these *nakṣatras* were traditionally used to predict cloud formation, the onset, quantity, and distribution of rainfall, as well as its expected favourable or unfavourable outcomes.

Among the twenty-seven *Nakṣatras*, (Sastri, 1946), 21.29 identifies five as particularly auspicious for the formation of the *Garbha*, namely *Śatabhiṣā*, *Āśleṣā*, *Ārdrā*, *Svātī*, and *Maghā*. According to the text, the conception of the *Garbha* under these *Nakṣatras* is regarded as highly favourable and is traditionally associated with abundant, sustained, and agriculturally beneficial rainfall that nourishes the earth over an extended period.

(Sastri, 1946), 21.30 states that if any of the five auspicious *Nakṣatras* coincides with the day of cloud conception during the months commencing with *Mārgaśīrṣa*, the duration of the rainfall expected approximately 195 days after the formation of the *Garbha* is determined according to the prescribed combinations of *Tithi* and *Nakṣatra*. Table 4, summarizes the duration of rainfall during the *Prasava kāla* (rainfall period) associated with the occurrence of these five auspicious *Nakṣatras* in their respective *Garbha* months.

Table 4. "*Garbha* Months and Rainfall Duration during *Prasava Kāla"*

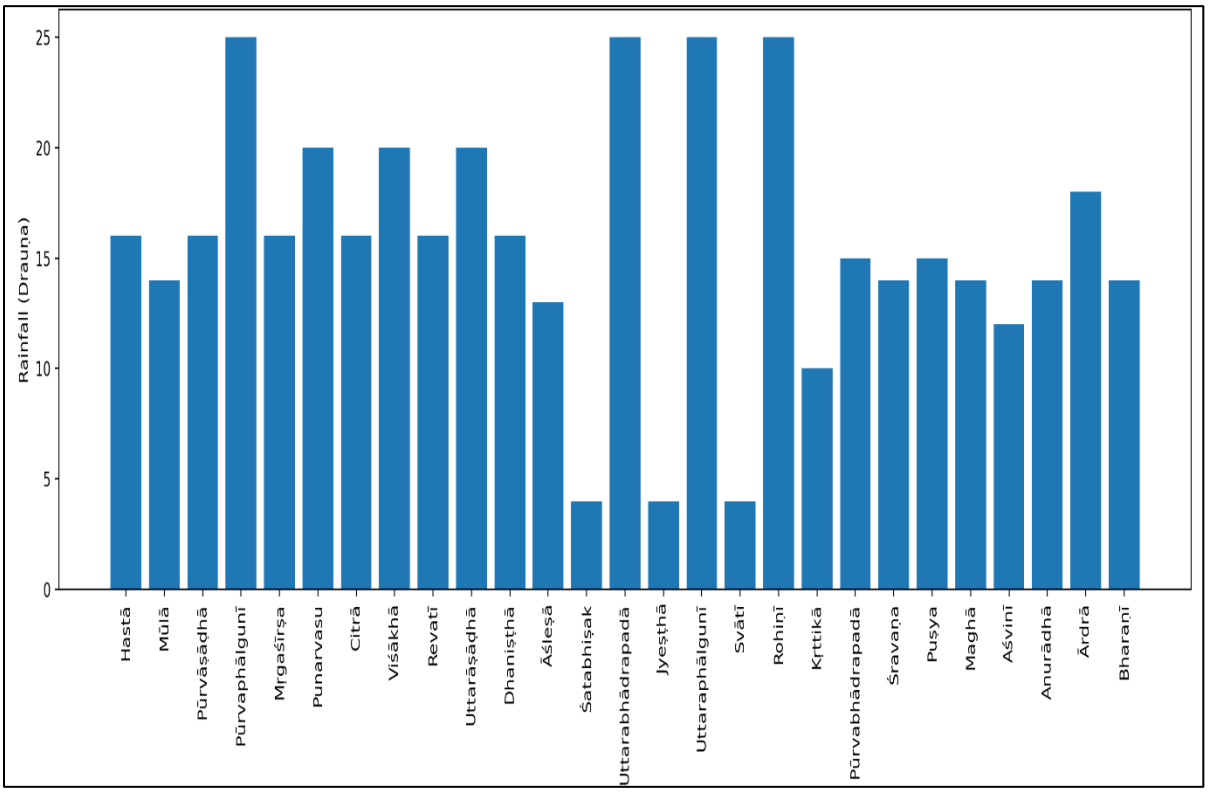
Garbha Māsa	**Duration of Rainfall during *Prasava Kāla***

Mārgaśīrṣa	8 days
Pauṣa	6 days
Māgha	16 days
Phālguna	24 days
Caitra	20 days
Vaiśākha	3 days

(Sastri, 1946), 23.6 - 23.9 describe the quantity of rainfall expected during the *Prasava* when the rain *Garbha* is formed under the rising of different *Nakṣatras*. The text assigns specific rainfall measurements, expressed in *Droṇa* (Ancient unit of measurement) (detail given in *"Measurement of Vṛṣṭi"* topic of this article), to individual *Nakṣatras*, indicating the expected amount of precipitation under normal conditions. For example, *Hastā*, *Pūrvāṣāḍhā*, *Mṛgaśīrṣa*, *Citrā*, *Revatī*, and *Dhaniṣṭhā* are each associated with 16 *Droṇas* of rainfall, whereas *Śatabhiṣā*, *Jyeṣṭhā*, and *Svātī* correspond to only 4 *Droṇas*. The highest rainfall, 25 *Droṇas* is assigned to *Pūrvaphālgunī*, *Uttaraphālgunī*, *Rohiṇī*, and *Uttarabhādrapadā*, while other *Nakṣatras* are associated with intermediate quantities.

A graphical representation of these traditional rainfall measurements is presented in **Figure 1.**

Figure 1: "*Rainfall Measurement by Nakṣatras*



5 Nimittas (Auspicious Indicators) of High-Water Content during Cloud Formation

(Varahmihir, 2014), BS, 21.37 describes the presence of five *Nimittas*, *Vāyu* (wind), *Jala* (water), *Vidyut* (lightning), *Garjana* (thunder), and *Megha* (clouds) during the formation of the cloud embryo indicates a high rainfall potential.

BS, 21.31 and BS, 21.32 describe two complementary aspects of rainfall prediction based on the occurrence of the five *Nimittas* during cloud formation.

21.31 explains how the number of *Nimittas* determines the spatial extent of rainfall, specifying the geographical area over which precipitation is expected to occur. A cloud that produces rainfall in association with all five prescribed *Nimittas* is said to cause precipitation over an area extending up to one hundred *Yojanas* (Traditional Indian unit of measurement of distance) (detail given in "*Measurement of Vṛṣṭi*" topic of this article). If fewer than five *Nimittas* are present, the extent of rainfall decreases proportionally, first by half and then by successive reductions of half. Even when rainfall is associated with only a single *Nimitta*, its spatial extent is traditionally determined in accordance with the number of indicators present.

21.32 further explains that the same five *Nimittas* are used to estimate the quantity (volume) of rainfall expected within that area. A cloud associated with all five *Nimittas* during the *Prasava* produces one *Droṇa* of rainfall. When accompanied only by *Vāyu*, the rainfall is measured as three *Prasthas*; when associated with *Vidyut*, it amounts to six *āḍhakas*; and when accompanied by *Garjana*, it produces twelve *āḍhakas* of rainfall.

The relationships between the number of *Nimittas* and (i) the spatial extent of rainfall and (ii) the volume of rainfall are illustrated in **Figures 2** and **3**, respectively.

Figure 2: *"Relationship between Number of Nimittas and Rainfall Extent"*

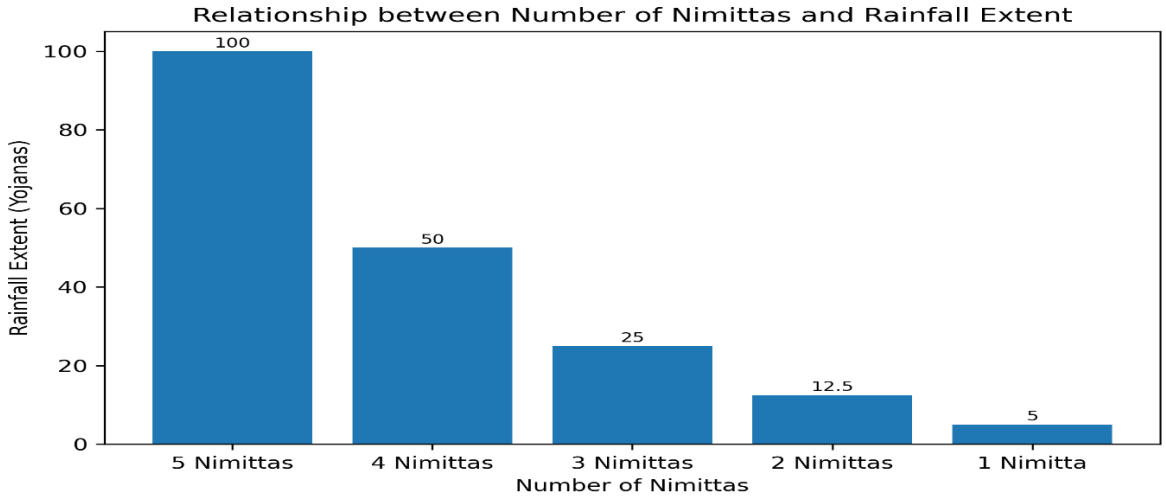
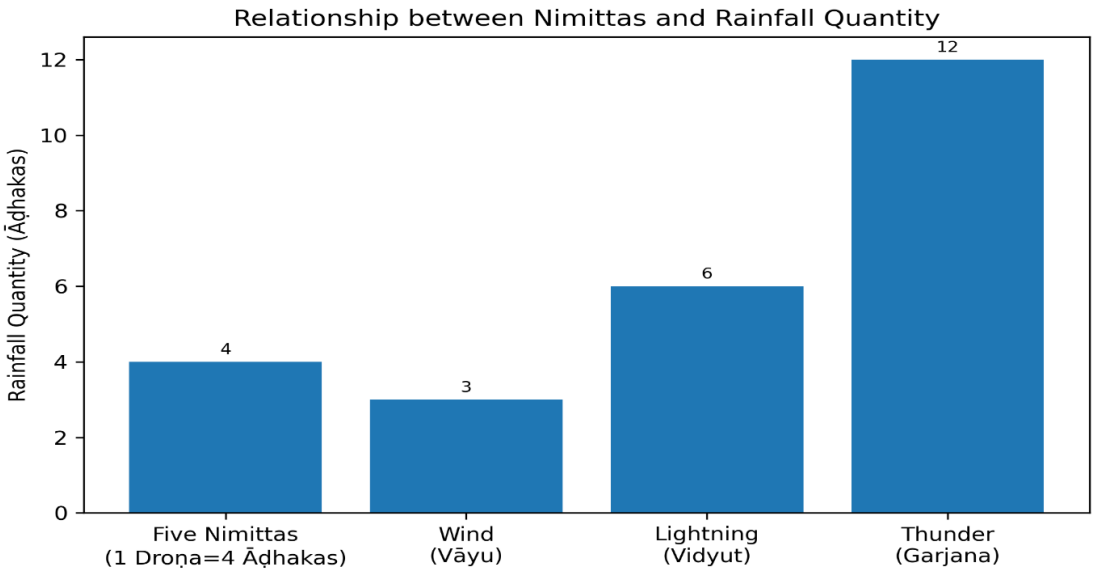


Figure 3: *"Relationship between Nimittas and Rainfall Quantity"*



Measurement of *Vṛṣṭi*

Ancient Indian scholarly literature exhibits a standardized system for measuring the quantities of grain and water across diverse disciplines, including astronomy, mathematics, agriculture, and statecraft. This uniform system is documented in several Sanskrit treatises, such as the *Bhadrabāhu Saṃhitā, Gaṇitasārasaṅgraha, Arthaśāstra, Pāṭīgaṇita*, *Varṣaprabodha, Meghamālā, Aṣṭādhyāyī*, and *Līlāvatī*. The consistent use of common units of measurement across these works indicates the existence of a well-established and systematic metrological tradition in ancient India, facilitating uniformity in agricultural assessment, commercial transactions, and rainfall quantification.

Traditional Units of Measurement

Ācārya Mahāvīra (AM) (c. 9th century CE), one of the foremost Indian mathematicians of the Jain tradition, authored the *Gaṇitasārasaṅgraha* (GSS), a comprehensive Sanskrit treatise on mathematics. The text presents systematic discussions on arithmetic, geometry, algebra, mensuration, and units of measurement, including standardized measures for grain and liquids. (Aacharya, 1922), 1.36 - 1.38 describe a hierarchical system of traditional units used for measuring grain and liquids, which is represented in Table 5.**Table 5:** *"Traditional Units of Measurement in the GSS and their approximated Modern Litre Measurement"*

Unit	**Equivalent**	**Approximated Modern litre (L) measurement**
1 *Kuḍava*	4 *Ṣoḍaśikā*	0.25 L
1 *Prastha*	4 *Kuḍava*	1 L
1 *Āḍhaka*	4 *Prastha*	4 L
1 *Droṇa*	4 *Āḍhaka*	16 L
1 *Mānī*	4 *Droṇa*	64 L
1 *Khārī*	4 *Mānī*	256 L
1 *Pravartikā*	5 *Khārī*	1280 L
1 *Vāha*	4 *Pravartikā*	5120 L
1 *Kumbha*	5 *Pravartikā*	6400 L

The values of these traditional units are approximate and may vary slightly across different Sanskrit texts and regional traditions. In modern studies, the *Prastha* is commonly taken as a reference unit of approximately one litre, from which the values of the larger units are estimated. These metrological units were widely employed in ancient Indian literature relating to statecraft, medicine, ritual practices, and agriculture. In the *Bhadrabāhu Saṃhitā*, the units ranging from *Prastha* to *Khārī* are specifically used for the quantification of rainfall.

Method for Measuring Rainfall Quantity

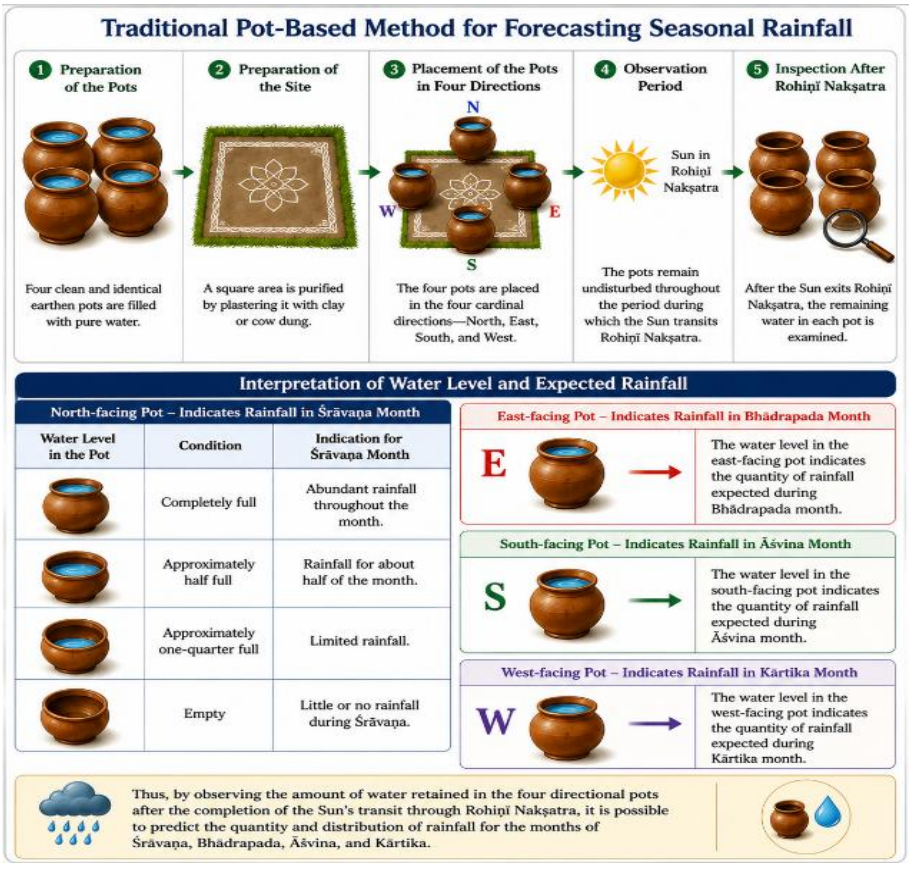
BS, 23.2 describes a traditional method for measuring rainfall based on the collection and weighing of rainwater. Rainfall was collected in a specially designed circular vessel, *Kuṇḍaka* having a diameter approximately equal to the breadth of a hand. The quantity of rainwater was determined by weight, with 50 *Palas* equivalent to one *āḍhaka*. This method enabled the quantitative assessment of both rainfall intensity and the total volume of precipitation, providing a practical basis for agricultural planning and meteorological forecasting in ancient India.

Traditional Pot-Based Method for Forecasting Seasonal Rainfall

(Shastri, 1959), pg. 106 describes an experimental procedure for forecasting the quantity and distribution of rainfall during the forthcoming monsoon season. The observation is initiated when the Sun enters the *Rohiṇī Nakṣatra* and is based on changes in the water level of four *Kumbha* (water-filled pots) as shown in Figure 4.

Figure 4: "*Traditional Pot-Based Method for Forecasting Seasonal Rainfall"*

Image Courtesy: Chatgpt



The procedure is as follows:

1. Preparation of the Pots: Four clean and identical earthen pots are filled with pure water.
2. Preparation of the Observation Site: A square area is purified by plastering it with clay or cow dung, following the traditional ritual practice.
3. Placement of the Pots: The four pots are placed in the four cardinal directions north, east, south, and west, within the prepared square.
4. Observation Period: The pots remain undisturbed throughout the period during which the Sun transits *Rohiṇī nakṣatra.*
5. Inspection: After the Sun exits *Rohiṇī*, the remaining water in each pot is examined. The quantity of water retained in each pot is interpreted as an indicator of the rainfall expected during the corresponding monsoon month.

The traditional interpretation is summarized as follows:

- North-facing pot: Indicates the expected rainfall during *Śrāvaṇa*.
    - Completely full: abundant rainfall throughout *Śrāvaṇa*.
    - Approximately half full: rainfall for about half of the month.
    - Approximately one-quarter full: limited rainfall.
    - Empty: little or no rainfall during *Śrāvaṇa*.
- East-facing pot: Indicates the expected rainfall during *Bhādrapada.*
- South-facing pot: Indicates the expected rainfall during *Āśvina.*
- West-facing pot: Indicates the expected rainfall during *Kārtika*.

Thus, the method predicts both the quantity and seasonal distribution of rainfall from *Śrāvaṇa* to *Kārtika* by observing the amount of water retained in the four directional pots after the completion of the Sun's transit through *Rohiṇī*. This procedure represents a systematic indigenous rainfall forecasting technique that combines astronomical timing with empirical environmental observation.

Rohiṇī nakṣatra* impact on *Vṛṣṭi

The present analysis follows the Hindi commentary of the *Varṣaprabodha* (VP) prepared by Shri Hanuman Sharma. Since the original authorship of the text is uncertain, references in this study are made to the edited and annotated edition.

(Sharma, 1999), ch.9 describes a traditional method for forecasting rainfall based on the position of *Rohiṇī Nakṣatra* in the *Samudra Cakra* during the Sun's transit into Aries, *Meṣa Saṅkrānti*.

The *Samudra Cakra* is constructed by assigning the 28 *Nakṣatras* (including *Abhijit*) sequentially to four symbolic regions *Samudra* (ocean), *Taṭa* (shore), *Parvata* (mountain), and *Sandhi* (junction). The position occupied by *Rohiṇī* is then interpreted to predict the nature of the forthcoming rainfall. If *Rohiṇī* falls in the *Samudra* region, abundant rainfall and high agricultural productivity are expected. Its occurrence in the *Taṭa* region indicates favourable rainfall and prosperity in crops and grain production. If it is located in the *Parvata* region, little or no rainfall is anticipated, leading to drought-like conditions and crop failure. When *Rohiṇī* occupies the *Sandhi* region, *Khaṇḍa Vṛṣṭi* (intermittent or localized rainfall) is expected, although the crops are generally not adversely affected.

Conclusion

The present study demonstrates that the concept of *Vṛṣṭi-Vijñāna* preserved in the Indian Knowledge System (IKS) represents a systematic and multidisciplinary framework for understanding rainfall and its prediction. Rather than treating rainfall as an isolated atmospheric event, the classical Sanskrit texts interpret it as the outcome of the dynamic interaction among astronomical, meteorological, hydrological, and environmental factors. Beginning with the *Ṛgveda*, the study reveals an early conceptual understanding of the hydrological cycle, while later treatises such as the *Bṛhat Saṃhitā*, *Bhadrabāhu Saṃhitā*, *Meghamālā*, and *Varṣaprabodha* provide increasingly detailed methodologies for rainfall forecasting based on cloud characteristics, winds, the Sun, *nakṣatras*, seasonal indicators, and other natural phenomena.

The analysis further shows that these texts employ well-defined observational criteria for predicting both the quantity and spatial distribution of rainfall. Indicators such as cloud colour, shape, movement, moisture content, thunder, lightning, wind direction, solar phenomena, and *nakṣatra*-based observations are presented within a coherent predictive framework. The use of standardized units of measurement, including *prastha*, *āḍhaka*, *droṇa*, and *khārī*, together with experimental procedures such as the *Rohiṇī kumbha* method, demonstrates that ancient Indian scholars sought not only qualitative interpretations but also quantitative approaches to rainfall assessment.

Another significant finding of this study is the remarkable consistency in metrological concepts across mathematical, astronomical, and meteorological literature, as evidenced by works such as the *Gaṇitasārasaṅgraha*. This reflects the existence of a standardized system of measurement that supported agricultural planning, water management, and environmental observation. Such uniformity indicates that rainfall prediction was integrated with broader scientific and practical traditions rather than being confined solely to astrology or ritual practices.

Although the predictive principles described in these classical texts were formulated within their historical and cultural context, many of the observational parameters such as cloud morphology, wind behaviour, seasonal cycles, and atmospheric changes remain relevant to environmental observation. These traditional frameworks provide valuable historical evidence of long-term empirical engagement with weather and climate. Future interdisciplinary research integrating Sanskrit textual studies with meteorology, hydrology, climatology, remote sensing, and data analytics may further evaluate the scientific significance, practical applicability, and contemporary relevance of these indigenous rainfall forecasting traditions.

In conclusion, *Vṛṣṭi-Vijñāna* represents a sophisticated body of traditional environmental knowledge that combines careful observation, standardized measurement, and systematic reasoning. Its preservation and critical scientific examination can contribute not only to a deeper understanding of India's intellectual heritage but also to ongoing discussions on sustainable environmental knowledge and traditional approaches to weather forecasting within the broader framework of the Indian Knowledge System.

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[lii] ***"प्रवत्वतीयं पृथिवी मरुद्भ्यः प्रवत्वती द्यौर्भवति प्रयद्भ्यः / प्रवत्वतीः पथ्या अन्तरिक्ष्याः प्रवत्वन्तः पर्वता जीरदानवः //"***

pravatvatīyaṃ pṛthivī marudbhyaḥ pravatvatī dyaurbhavati prayadbhyaḥ / pravatvatīḥ pathyā antarikṣyāḥ pravatvantaḥ parvatā jīradānavaḥ //

- (*Ṛgveda* 5.54.9)

[liii] ***"अन्नं जगतः प्राणाः प्रावृट्कालस्य चान्नमायत्तम् । यस्मादतः परीक्ष्यः प्रावृट्कालः प्रयत्नेन" ।***

annaṃ jagataḥ prāṇāḥ prāvṛṭkālasya cānnam āyattam / yasmād ataḥ parīkṣyaḥ prāvṛṭkālaḥ prayatnena //

- (*Bṛhat Saṃhitā* 21.1)

[liv] **वृष्टिमूला कृषिः सर्वा वृष्टिमूलं च जीवनम्। तस्मादादौ प्रयत्नेन वृष्टिज्ञानं समाचरेत्।**

vṛṣṭimūlā kṛṣiḥ sarvā vṛṣṭimūlaṃ ca jīvanam | tasmād ādau prayatnena vṛṣṭijñānaṃ samācaret

- (Krishi Parashar 2.1)

[lv] "***पञ्चनवते दिनशते तत्रैव प्रसवमायाति"***

pañcanavate dinaśate tatraiva prasavam āyāti

- (*Bṛhat Saṃhitā* 21.7)

[lvi] ***रवेश्चक्रभोगो….***

- (Siddhant Shiromani, 20)

[lvii] **चित्राणि साकं दिवि रोचनानि सरीसृपाणि भुवने जवानि । तुर्मिशं सुमतिम् इछमानो अहानि गीर्भिः सपर्यामि नाकम् ॥**

citrāṇi sākaṃ divi rocanāni sarīsṛpāṇi bhuvane javāni / turmiśaṃ sumatim ichamāno ahāni gīrbhiḥ saparyāmi nākam //

- (Atharv Veda, 19.7.1)

[lviii] ***"यन्नक्षत्रमुपगते गर्भश्चन्द्रे भवेत् स चन्द्रवशात्" ।***

yannakṣatram upagate garbhaś candre bhavet sa candravaśāt

- (*Bṛhat Saṃhitā* 21.7)

[lix] ***"सितपक्षभवाः कृष्णे शुक्ले कृष्णा द्युसम्भवा रात्रौ । नक्तंप्रभवाश्चाहनि सन्ध्याजाताश्च सन्ध्यायाम्" ।***

sitapakṣabhavāḥ kṛṣṇe śukle kṛṣṇā dyusambhavā rātrau / naktaṃprabhavāś cāhani sandhyājātāś ca sandhyāyām //

- (*Bṛhat Saṃhitā* 21.8)

[lx] ***"मृगशीर्षाद्या गर्भा मन्दफलाः पौषशुक्लजाताश्च ।….***

mṛgaśīrṣādyā garbhā mandaphalāḥ pauṣaśuklajātāś ca |…..

- (*Bṛhat Saṃhitā* 21.9-12)

[lxi] **"यदाञ्जननिमो मेंघः शान्तायां दिशि दृश्यते । स्निग्धो मन्दगतिश्चापि तदा विन्द्याज्जलं शुभम्" ॥**

yadāñjana-nibho meghaḥ śāntāyāṃ diśi dṛśyate /
snigdho mandagatiś cāpi tadā vindyāj jalaṃ śubham //

- *(Bhadrabahu Samhita, 8.2)*

[lxii] Translation of shant disha is pashchim disha in hindi translated bhadra bahu samhita edited by nemichandra shastri, bharatiya gyan peeth, Varanasi, February 1959.

[lxiii] **"पीतपुष्पनिभो यस्तु यदा मेंघः समुत्थितः ।**
शान्तायां यदि दृश्येत स्निग्धो वर्षं तदुच्यते" ॥
pītapuṣpanibho yas tu yadā meghaḥ samutthitaḥ /
śāntāyāṃ yadi dṛśyeta snigdho varṣaṃ tad ucyate //

- *(Bhadrabahu Samhita, 8.3)*

[lxiv] **"रक्तवर्णो यदा मेंघः शान्तायां दिशि दृश्यते ।**
स्निग्धो मन्दगतिश्चापि तदा विन्द्याज्जलं शुभम्" ॥
raktavaṃo yadā meghaḥ śāntāyāṃ diśi dṛśyate /
snigdho mandagatiś cāpi tadā vindyāj jalaṃ śubham //

- *(Bhadrabahu Samhita, 8.4)*

[lxv] **"शुक्लवर्णो यदा मेंघः शान्तायां दिशि दृश्यते ।**
स्निग्धो मन्दगतिश्चापि निवृत्तः स जलावहः" ॥
śuklavaṃo yadā meghaḥ śāntāyāṃ diśi dṛśyate /
snigdho mandagatiś cāpi nivṛttaḥ sa jalāvahaḥ //

- *(Bhadrabahu Samhita, 8.5)*

[lxvi] **स्वतुस्वभावजनितैः सामान्यैश्च लक्षणैर्वृद्धिः ।**
गर्भाणां विपरीतैः सौरेव विपर्ययो भवति" ॥
svatu-svabhāva-janitaiḥ sāmānyaiś ca lakṣaṇair vṛddhiḥ /
garbhāṇāṃ viparītaiḥ saureva viparyayo bhavati //

- *(Brihat Samhita, 21.27),*

[lxvii] **दक्षिणस्यां दिशि यदा वायूर्दक्षिणकाष्ठिकः । समुद्रानुशयो नाम स गर्भाणां तु सम्भवः ।।**
तेन सञ्जनितं गर्भ वायूर्दक्षिणकाष्ठिकः । धारयेत् धारणे मासे पाचयेत पाचने तथा ।।
धारितं पाचितं गर्भ वायुरुत्तरकाष्ठिकः । प्रमुन्चती यतस्तोयं वर्षमं तं मरुतोच्यते ।।
dakṣiṇasyāṃ diśi yadā vāyūrdakṣiṇakāṣṭhikaḥ । samudrānuśayo nāma sa garbhāṇāṃ tu sambhavaḥ. tena sañjanitaṃ garbha vāyūrdakṣiṇakāṣṭhikaḥ । dhārayet dhāraṇe māse pācayet pācane tathā. dhāritaṃ pācitaṃ garbha vāyuruttarakāṣṭhikaḥ । pramuñcatī yatastoyaṃ varṣamaṃ taṃ marutocyate.

- (*Bhadrabahu Samhita*, 9.4 - 9.6)

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