

CHAPTER VI

*The ecological ideas in the
Mahabharata*

The Mahabharata is the longest Sanskrit epic which composed by Vyasa. Its longest version consists of over 100,000 shloka or over 200,000 individual verse lines (each shloka is a couplet), and long prose passages. The setting of the epic has a historical precedent in Iron Age (Vedic) India, where the Kuru kingdom was the center of political power during roughly 1200 to 800 BCE¹. The historicity of the Kurukshetra War is unclear. Many historians estimate the date of the Kurukshetra war to Iron Age India of the 10th century BCE. Mahabharata corpus was built, with a climactic battle eventually coming to be viewed as an epochal event. Puranic literature presents genealogical lists associated with the Mahabharata narrative. The fifth century mathematician, Aryabhata, calculated the date of the Mahabharat War to be approximately 3100 B.C. from the planetary positions recorded in the Mahabharat. Prof. C.V. Vaidya and Prof. Apte had derived the date to be 3101 B.C. and Shri. Kota Venkatachalam reckoned it to be 3139 B.C.². Many scholars give different opinions about the period of the compilation of the different edition of the great epic. Some say it is between 460 B.C.E to 400 B.C.E , other say it between 4th century B.C.E to 4th century C.E.. Dr. Moti Chandra mentions the period after considering the political upheavals taken place in the 2nd century B.C.E on North Western India border, that the *Sabhaparva* is composed in period of 184 to 148 B.C.E³.

Mahabharata is the most important epic in India in respect of its magnitude of verses and its import of representation. It represents the complete view of the life of ancient Indians. So this epic not only represents *itihasa* (history) but it equally represents the *rajnitisastra* (politics), *nitisastra* (ethics), *Katha* (legends), geographical data, ecological diversity and righteous practice of ancient India. The actual text of the Mahabharata which is composed by Krishnadvaipayana Vyasa has only 8800 *slokas*. In *Adiparva* records that *Vyasa* utters these *slokas* to his five disciples. All five disciples afterwards develop different editions.

Originally in the main theme of the Mahabharata there is little scope of the presence of the environmental idea and discussion of the biodiversity, but later the environmental concept of the land, geographical specification are added in the *Upayanaparva*, *digvijaya* campaign of the *panadava* and *Bhishaparva* of *Mahabharata*. The compilation of all these data continues for a long period. For compilation purpose authors takes data from the existing literatures between 6th

century and 3rd century B.C.E. So all environmental concepts which are already have in the *Vedas*, *Brahamanas*, *Aranyakas* and other existing works, are present in Mahabharata in a different way of expression perfectly blended with the prevalent knowledge of the said topic of the authors. In the Vedic traditions it is mentioned that the river *Sadanira* (Rapti) makes a boundary of the *Janapadas* of *Videha* and *Kosala*. It is mentioned in the *Satapatha Brahmana* that the *Brahmins* never cross the river because the *Vaiswanara agni* could not reach there⁴. This indicates that during the time of the composition of the *Satapatha Brahmana* the Aryans could not cross the river *Rapti*. After that they cross the same river and perform their sacrifice or *Yajna* in the other bank of the river and the land becomes sacred. With expansion of the population of the ancient India their environmental knowledge gradually increases and more geographical and environmental data are incorporated into the text of the then works. In the course of time the limit of the *Aryavarta* gradually changes and more divisions are added into it. In the *Aitareya Brahmana* three broad divisions of India are mentioned i.e. *Brahmavarta*, *Madhyadesa* and *Dakshinapath*⁵. Later on two more divisions are added in the main list i.e. *Prachya*, *Dakshina*, *Pratichya*, *Udichya* and *Madhyadesa*⁶.

Following is a comparative account of different islands, seas, rivers and mountains are given for establishing the facts that the Mahabharata is gradual development of thoughts and knowledge of human beings.

Item	Vedas and Upanishads	Ramayana	Mahabharata
Continents	No description of continents	2 names	14 different names of continents or islands.
Ocean	No data	4 names of important oceans	7 names of important oceans
Mountains	Himalaya and other peaks	14 names of important mountains	31 names of important mountains
Rivers	17 different names of rivers	20 different names of important rivers	36 different names of important rivers

According to E. H. Carr - 'What distinguishes the historian from the collector of historical facts is generalization'⁷. So in history the process of generalization is very important. All facts are gradually accumulated during the course of time and historians analyze these data or facts for getting a conclusion or generalization of these facts or data. Here the above table gives the idea of gradual development of knowledge in fields of different environmental entities like continents, oceans, mountains and rivers from the Vedas to Mahabharata. This fact is depicted in the following bar diagram depending on the data presented on the above table.

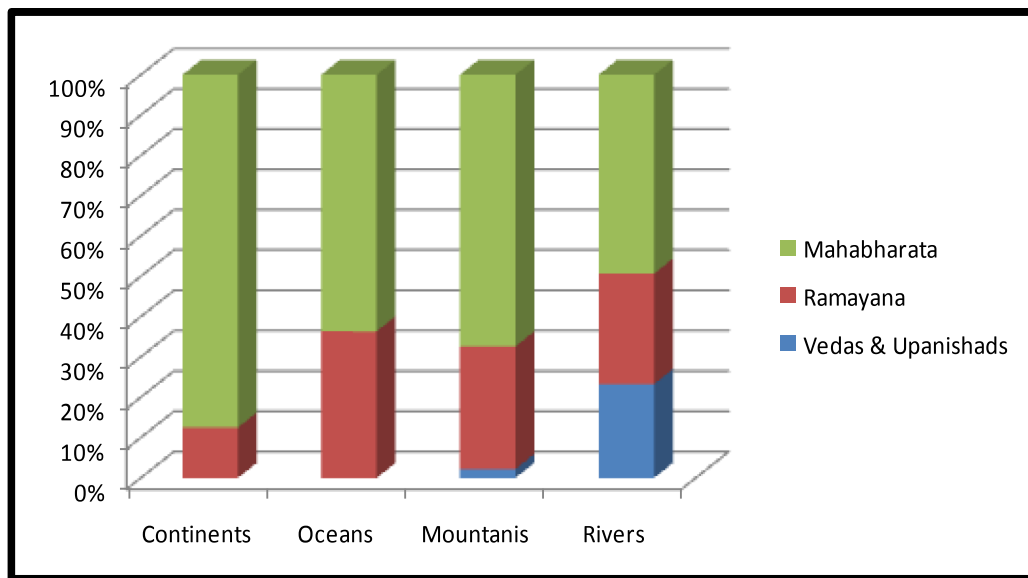


Diagram-16: Gradual development of knowledge in different parts of environment

From the diagram it is found that regarding the knowledge of the river in three texts gives some reasonable data with gradual increasing trend which is revealed in the length of three bars. But in other cases like continents, oceans and mountains the graph indicates that only major portion of the graph is marked for the Mahabharata texts. So the development of knowledge in the field of continents, oceans and mountains are recent. In course of civilization people understand the environment and its many other components. But from the very beginning people have reasonable knowledge in field of the different rivers. This indicates that people in all ages understand the usefulness of the different rivers for their civilization. Rivers have

been used as a source of water, for obtaining food, for transport, as a defensive measure, as a source of hydropower to drive machinery, for bathing, and as a means of disposing of waste⁸. The earliest evidence of river navigation is found in the Indus Valley Civilization, in Northwestern India around 3300 BC and riverine navigation is still used extensively in major rivers of the world like the Ganges, Nile, Mississippi, and Indus⁹. Rivers are called the arteries of the earth. Like arteries it infuses every moment the life vitality i.e. water for the earth. The existence of the life is due to the presence of water. This important fact is known to the people in ancient times. So people in all ages are very conscious about the rivers and its diversifications. Recently one photograph was taken from the International Space Station as astronauts flew over the Himalaya range, near the China–India border on April 8, 2015, with a Nikon D4 digital camera using a 500 millimeter lens, and is provided by the ISS Crew Earth Observations Facility and the Earth Science and Remote Sensing Unit, Johnson Space Center. This picture reveals the same artery like concept of the rivers on the earth¹⁰.



Diagram-17: photograph of the Himalaya range, near the China–India border on April 8, 2015

The gradual development of knowledge in all the texts indicates that people gradually gather knowledge in all varied fields of environmental and ecological factors. This gradual development is depicted through the diagram where circles are touching internally at a point on the circumference.

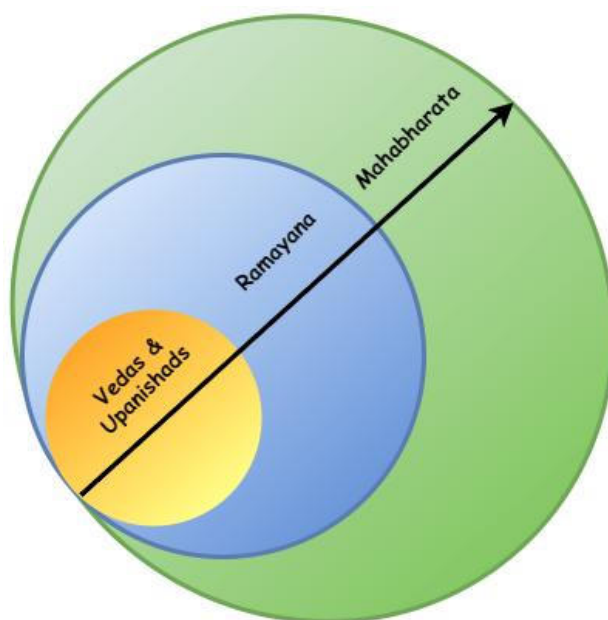


Diagram-18: The diagram is the gradual development of ecological factors through the circles are touching internally at a point on the circumference.

The geometry of internal touching circles according to the words of Euclid is : If two circles touch one another internally, and their centres, the straight line joining their centres, if it be also produced, will fall upon the point of contact of the circles. So all centres of the internally touching circles fall upon the common straight line which again falls upon the point of contact of the circles. In the above case the centre of each circle depicts the ecological awareness of human beings in different ages and the touching point on the circumference is the consciousness about the importance of river. With course of time human knowledge develops in varied fields with the centrifugal expansion spirit. But in each case common importance is laid upon the importance of the river and river related ecosystem.

The texts of the *Mahabharata* reveal that the Vedic people have no idea about the other continent beyond India which is known as Aryavarta. The Aryavarta extends according to the Vedic people to the *Vindyarange*. Ramayana contains reference of *Yavadvipa*, *Kshirasagara*, Sea of *Ikshurasa*, *Salmalidvipa* and *Kshiroda*. This gives the idea that People in Ramayana have the idea about the different island, seas and other continental regions. So people in Ramayana are more advance regarding the

environmental awareness of the earth. In the *Mahabharata* people are more advance regarding the different geographical items and environmental system on the earth. They have an exhaustive knowledge of the different rivers, mountains, seas, etc. and other biotic and abiotic diversity in the land India. Moreover in the text of *Mahabharata* it is found sincere knowledge about different *dvipas*, *samudras*, and lands outside the India main land specially in northern direction. The whole text takes its shape in different ages. It has many facts and data incorporated in later time. So the Mahabharata gives us the knowledge about the many ecological aspects.

Extension of the idea of the main land beyond *Vindya-parvata*. In earlier Vedic literature gives only the idea of the land upto the *Vindya-parvata*. Collection of the data of different geographical knowledge like mountains, rivers, seas, etc. and the biodiversity data from the earlier literature and successfully incorporation of the present knowledge of the above fields make the epic *Mahabharata* as the true encyclopedia of the environmental and geographical idea of people of the *Aryavarta*. Continental knowhow of the neighbouring lands indicates that the people in the time of *Mahabharata* are extensively involving themselves in linkage with the near and far off countries through trade and commerce.

About the Mahabharata Prof. S.M. Ali maintains that, “the geographical matter contains in the Mahabharata is immense. It is perhaps the only great work which deals directly with geographical details and not incidentally as other works. An inference can be drawn from the observation of Prof. S.M. Ali also that the geography of Ramayana is earlier than the Mahabharata. He further argues that the Ramayana laid the foundation of geography and the Mahabharata re-oriented it¹¹.

All geographical and environmental knowledge come through the travels and subsequent noting down the description of the travelling parts of the land. It is a common practice. In ancient times people also follow the same way for developing the knowledge of the earth and its different varieties. In Mahabharata the author incorporates all these environmental and geographical data with the mythical and poetic style. The observation and travels which start in India sometimes not later than 7th century B.C.E and continued even to the time of emperor Asoka when he sent the Buddhist monks *Sona* and *Uttara* to propagate Buddhism in *Suvarnabhumi*¹². There are many existing theory regarding the continents and many are rejected and ultimately the Plate Tectonics Theory is valid upto date. The first valid theory

regarding the formation of continent is established by Alfred Wegener which is known as Continental Drift. Alfred Wegener first presented his hypothesis that the continents had once formed a single landmass, called *Pangea*, before breaking apart and drifting to their present locations, to the German Geological Society on 6 January 1912 C.E. Wegener was the first to use the phrase "continental drift" (in German "die Verschiebung der Kontinente" – translated into English in 1922 C.E.) and formally publish the hypothesis that the continents had somehow "drifted" apart. Although he presented much evidence for continental drift, he was unable to provide a convincing explanation for the physical processes which might have caused this drift. His suggestion that the continents had been pulled apart by the centrifugal pseudoforce (Polflucht) of the Earth's rotation or by a small component of astronomical precession was rejected as calculations showed that the force was not sufficient. The Polflucht hypothesis was also studied by Paul Sophus Epstein in 1920 C.E. and found to be implausible¹³.

Plate tectonics is a scientific theory that describes the large-scale motion of Earth's lithosphere. The geoscientific community accepted plate-tectonic theory after seafloor spreading was validated in the late 1950s C.E. and early 1960s C.E. Plate movement is thought to be driven by a combination of the motion of the seafloor away from the spreading ridge and drag, with downward suction, at the subduction zones. Another explanation lies in the different forces generated by the rotation of the globe and the tidal forces of the Sun and Moon. The relative importance of each of these factors and their relationship to each other is unclear, and still the subject of much debate¹⁴.

The Mahabharata gives the idea that the earth has a vital force; life is evolved and dissolved into it. It is the origin, shelter and dissolution of all living beings. The all energy of the earth comes from the river, mountains and forests. Then *sanjaya* describes the earth as *prakriti*. The earth has some qualities like *sabda*, *sparsa*, *rupa*, *rasa* and *gandha*. Similarly the water has four qualities, but Vayu has only two *sabda* and *sparsa*¹⁵.

शब्दः स्पर्शश्च रूपं च रसो गन्धश्च पञ्चमः ।

भूमेरेते गुणाः प्रोक्ता ऋषिभिस्तत्त्ववेदिभिः ॥

चत्वारोऽप्सु गुणा राजन्गन्धस्तन्न विद्यते ।

शब्दः स्पर्शश्च रूपं च तेजसोऽथ गुणास्त्रयः ॥

शब्दः स्पर्शश्च वायोस्तु आकाशे शब्द एव च ॥ Mahabharata, Bhishmaparva, 6.5,6

When the elements of the nature comes contact with the same nature elements they do not procreate but when they get into contact with opposite class elements they start procreate and give life. The different climate and topographical position gives the different outlook and expression of life. So man relates intricately with the nature and its diversities. The narrator describes the geographical details of the land *sudarsanadvipa*. The description is so vivid that the narrator is describing the land just after his visit. The author gives information about the *Jambu* tree named *sudarsan* and the *dvipa* is called *jambudvipa*. There is description of the delicious fruit of the *Jambu*. When it gets ripe it falls down in the river of the same name due to which the water of the river becomes very healthy¹⁶.

तस्या जम्बवाः फलरसो नदी भूत्वा जनाधिप ।

मेरु प्रदक्षिणं कृत्वा संप्रयात्युत्तरान्कुरुन् ॥

पिबन्ति तद्रसं हृष्टा जना नित्यं जनाधिप ।

तस्मिन्फलरसे पीते न जरा बाधते च तान् ॥ Mahabharata, Bhishmaparva, 8.23,24.

The narration also describes the people living in the *dvipa* and all people are in healthy bodies and sound minds¹⁷. Though good narration of the all environmental description of the *dvipas* is present, some western scholars believe that the description of the *dvipas* is nothing but the fanciful fables¹⁸. Some observed that these *dvipas* are nothing but seven stellar planes¹⁹. Not only the Mahabharata but the *Puranas* also have recorded this geographical data. According to them, the world comprises of seven *dvipas*²⁰. W.F. Warren opines that Seven homocentric globes each solid, yet so transpicuous that though we dwell inside them all, we may gaze right though the whirling seven, every cloudless night and behold the vastly more distant stars unchangeably fixed in or on the outer most of all the celestial spares the seven concentric *dvipas* are simply concentric invincible spheres of ancient Babylonian and Greek astronomers and seven concentric seas that separate them, simply the intervening concentric spaces²¹. F.E. Pargiter observes that there are many fabulous tales in geography mentioned in brahmanical literatures, but it is confined as a rule to out-side India but the allusions to purely Indian topography are generally sober. The main features of the country were adequately known in very early times. The Aryans

were well acquainted with all North India as far as the limits of Bengal proper and the chief mountains and rivers of South India were known²². According to observation of W.E. Clark – the geographical passage in the *Mahabharata* possibly reflects a traveler's tale²³. The pilgrimage to different countries cannot be necessarily taken to be one sided affair, rather it should be taken to be a mutual affairs when some foreigners visited India and also some Indians visited the foreign countries known to them²⁴. Pythagoras in his work mentions the communication between India and other countries. So considering the above discussion we can safely say that the geographical data of the *Mahabharata* which is earlier than Puranas has been collected by one who has deep knowledge of the countries. The description of *Nilagiri* hills, *Bhadrasala* forest, the description of flora and fauna and the picture of *Jambudvipa* indicate that the person who bears a great trouble during his journey to acquire the knowledge. The work of Herodotus has been considered by the western world as the first geographical record. But the nature of the work and methodology for recording the data find great similarity in the *Mahabharata*. Like *Mahabharata* the work of Herodotus is full of exaggeration. Reviewing the work of Herodotus, Mr. George Rawlinson comments that – the quantum of travel has indeed been generally exaggerated but after every deduction is made that judicious criticism suggests as proper, there still remains, in the distance between the extreme limits reached, and in the fullness of information gained, unmistakable evidence of a vast amount of time spent in the occupation²⁵.

Sanjaya in his discussion of *Sudarsanadvipa* mentions that it is circular in shape, full of rivers, ponds, mountains, cities, *Janapadas*, full of natural resources and encircled by the salt sea (*Kshara Samudra*). In the main text all description and identification of continent or island is done in respect of any mountain. So the description of any continent or island is incomplete without the help of mountain what Sanjaya has followed in the description. He mentions that ancient time people know only six mountains existing from east to west bound by sea²⁶. The name of the mountains are *Himavan*, *Himakuta*, *Nishadha*, *Nila*, *Sveta* and *Srinagavan*. *Sanjaya* says that the south of *Nilagiri* and north of *Nishadha* is the mountain called *Malyavan*. After that comes *Gandhamadan* mountain and between *Gandhamadan* and *Malyavan* is the mountain called *Meru* which looks like the young rising sun *tarunasurya*. Around this *Meru* or *Sumeru* mountain the four *dvipa* are present - *Bhadrasva*, *Ketumala*, *Jambudvipa* and *Uttara Kuru*.

तस्य पार्श्वे त्विमे द्वीपाश्चत्वारः षंथिताः प्रभो ।

भद्राश्वः केतुमानश्च जम्बूद्वीपश्च भारत ॥

उत्तराश्वैव कुरवः कृतपुण्यप्रतिश्रयाः ॥ Mahabharata, Bhishmaparva, 7.11.

Beyond *Nila parvat* is *Svetavarsha* and after that is *Hiranyavarsha* and *Ilavritavarsha*. In this way *Sanjaya* gives us the data about four *dvipas* and seven *varshas*. He describes the rivers and mountains of these *varshas*. After giving the different geographical and environmental data of India, *Sanjaya* again begins the discussion about *Sakadvipa*, *Kusadvipa*, *Salmalidvipa*, *Kraunchadvipa* and *Mahapumanadvipa* etc. which are seven in number. In all discussion it is mentioned the term *dvipa* which means an island, peninsula or sand bank, evidently between the forks of rivers etc. The term *Mahadvipa* meaning continent, has not used in the description. At that time only one term named *dvipa* is known. It may be island formed between rivers or seas and continent. To the north of the *Bharatavarsha* is *Haimavatvarsha*, to the north of *Hemakuta* is *Harivarsha*, all these four *varsha* have been located around the golden mountain *Meru*. *Ketumala* has been described to the west of *Meru*. The *Hairanyakavarsha* and *Airavatavarsha* are situated beyond *Nilaparvat* and *Svetaparvat*²⁷. It is mentioned in the text that *Airavatavarsha* is situated in the north and *Bharatavarsha* is situated in the south as two ends of a bow and rest five *varshas* are present in between them with *Ilavritavarsha* in the centre²⁸.

नीलित्परतरं श्वेतं श्वेताद्वैरण्यकं परम् ।

वर्षमैरावतं नाम ततः शृङ्गवतः परम् ॥

धनुःसंस्थे महाराज द्वे वर्षे दक्षिणोत्तरे ।

इलावृतं मध्यमं तु पञ्चवर्षाणि चैव ह ॥ Mahabharata, Bhishmaparva, 7.35,36

Through the discussion it is clear that the *varshas* are seven. In the description author draws comparison the *Bharata* and *Eravatavarsha* with two sides of a hare whereas *Nagadvipa* and *Kasyapadvipa* with its two ears²⁹.

यां तु पृच्छसि मा राजन्दिव्यामेतां शशाकृतिम् ।

पार्श्वे शशस्य द्वे वर्षे उभये दक्षिणोत्तरे॥

कर्णौ तु नागद्वीपं च कश्यपद्वीपमेव च ॥ Mahabharata, Bhishmaparva, 7.52

This gives the idea that people at that time have a good sense of the animal and its diversity. We can easily guess that in the period of *Mahabharata* the main land is full of grass which is very congenial for the growth of the hare like long ear type mammals. In the description author mentions some *dvipas* which are surrounded by the ocean of salt and some are surrounded by the ocean of pure water. At that time people have no clear idea about continent and region inside the main continent. But their description clearly indicates that those lands are surrounded by the ocean are called continents and those are surrounded by the fresh water are the regions inside the main land.

A comparison between the two sets of the *dvipas* shows that Sakadvipa, Salmaladvipa etc. are surrounded by oceans while Bhadraksa Uttarakura etc. are not surrounded by oceans. This indicates that the former are continents and the latter are regions, it gives an idea of the two stages of geographical knowledge, first when their knowledge was limited to the regions around Jambudvipa and the second stage when they knew about other continents also which were either to unknown³⁰.

Next Dvipa is Ketumala which is identified by N.L. Dey with Turkistan, land watered by river Oxus³¹. The next *dvipa* Uttarakuru is situated to the north of Meru and the south of Nilagiri. In Mahabharata a tree is mentioned called kshiri (Euphorbia), the fruit which is used as ornament³². The Mahabharata mentions that no human habitation is found in this *dvipa* and beyond this *dvipa* is dark and sun could not enter. The valley of Yarkand – Khotan rivers may be identified with Uttarakuru. To the north of Yarkand – Khotan river valleys is Siberia where darkness prevails for six months. Next *dvipa* is Sakadvipa where huge saka (teak) tree are present. In this *dvipa* the rivers – Sukumari, Kumari, Sita Kavera, Mahanadi Manijala and Ikshuvardhanika³³.

शको नाम महाराज तस्य द्वीपस्य मध्यगः ।

तत्र पुण्या जनपदाः पूज्यते तत्र शङ्करः ॥

सुकुमारी कुमारी च सीता कावेरका तथा ।

महानदी च कौरव्य तथा मणिजला नदी ॥

इक्षुवर्धनिका चैव तथा भरतसत्तम ॥ Mahabharata, Bhishmaparva, 12.26, 30.

According to the Prof. S.M. Ali the characteristic of the Sakadvipa are the following :

a) Besides the traditional rivers of Sakadvipa, there are hundreds and thousands minor streams. b) Saka or teak has been a distinctive tree of this dvipa therefore it must be within the monsoon belt. c) Here Vishnu is worshiped as Sun.

In Mahabharata Santiparva it is mentioned that this Sakadvipa is situated to the east of Jambudvipa. On this basis he identifies it as Burma, Malay, Siam and Indo-China i.e. the South-east Asia and Southern China. Here some people mentioned are black colour would have been the Autroloids while some of them are fair complexion would have been the Chinese and some of them would have been mixed colour³⁴.

Mahabharata gives description of the Kusadvipa. One of the characteristics of the dvipa is the presence of grass Kusa. Considering the flower, fruits, vegetations, herbs, volcanic mountain, Prof. Ali suggested it as Iran, Iraq and Ethiopia³⁵. Captain wilford indicates that it would be Armenia, Syria and Arabia³⁶. According to the description and the natural resources available in the Kraunchdvipa, which is another dvipa mentioned in Mahabharata, according to Prof. S.M. Ali it may be the Black Sea and the basin of the Black Sea with Siberia. As in Mahabharata, Andhakaradesa i.e. black region is mentioned³⁷.

अन्धकारात्परो राजन्मैनाकः पर्वतोत्तमः ।

मैनाकात्परतो राजन्गोविन्दो गिरिरुत्तमः ॥ Mahabharata, Bhishmaparva, 13.18

The above description indicates the following important characteristics :

The people in the Mahabharata have the knowledge of different lands situated north or north-west direction surrounding the mainland India. Moreover they have given the name of the lands according to main flora and fauna available in the land or some geographical characteristics present in the place. Their descriptions of the different continents are mixed with the description of the different islands present in the mainland India and its vicinity area. The all descriptions are full of anecdotes, story and poetic touch rather than the precise data recorded from the firsthand evidence. So every chance there is the scope of speculation. But in their descriptions they consider mountain, river, vegetations, herbs, animals, major climatic condition, etc. These are nothing but the reflection of their ecological awareness and concern for the nature.

Thus ancient Indians have tried to record their geographical knowledge in the Mahabharata about the world which they knew. Evidently being travelers' tales mainly the data is based on directions and many times it gets lost in mythological or confused accounts. This gives us an idea that the authors of the Mahabharata knew

about Asia, some part of Northern or North-Eastern Africa, Eastern Europe, possibly USSR and Scandinavian countries³⁸.

The people in Vedas have the knowledge of the four oceans. The Rigveda indicates the seafaring affairs of the ancient people during the Vedic period³⁹.

नू रोदसी अहिना बुध्न्येन स्तुवीत देवी अप्येइरिष्टैः ।

समुद्रं न संचरणे सनिष्य वो धर्मस्वरसो नद्यो अपव्रन् ॥ Rig Veda IV.55

The Yajurveda mentions that teacher instructs a disciple to go to sea by boarding the boat⁴⁰. Atharvaveda mentions about Purva Samudra and Uttarasamudra⁴¹. The Adiparva of Mahabharata gives a description of the ocean. In Adiparva *seventy three* (73) times the word 'Ocean' is mentioned in the text. In this section a story of Kadru and Vinata, two daughter of the king Daksha is mentioned. In their description ocean is the repository of all different aquatic animals, fishes, full of gems, and confluence of all rivers. But the sea of ghrita, sea of curds, sea of wine and sea of sweet water have been mentioned in the text. Prof. S.M. Ali observes that the oceans of milk, curd, clarified butter, sugarcane juice or wine should not be taken too literally. Oceanic waters differs in colour, salinity, density, turbulence, percentage and colour of silt, bottom deposit or organic growth (e.g. corals). They give some superficial character to the water bodies which are often named after them. The white sea, the black sea, the red sea, the yellow sea, the Green sea, the Blue Nile and White Nile do not signify the actual colour of the water but indicate the characteristics caused by the presence of impurities or other features on their surface or bottom or of their contents⁴².

The above notion about the different colour of the ocean can be found in present day also. The following are some photographs of the different water bodies which looks different colours due to some specified reasons. All the examples indicate that the people in the age of Mahabharata describe the ocean in the angle of apparent hue observed.

Laguna Colorada, Bolivia



Courtesy of Flickr user Valdiney Pimenta

Diagram-19: Red sediments and algae pigmentation produce the unique red color of this salt lake

Red sediments and algae pigmentation produce the unique red color of this salt lake in Bolivia, which is further contrasted by the white borax islands that are spotted throughout it. Located at more than 13,000 feet above sea level, the lagoon is part of the Andean Fauna National Reserve and is a common roosting spot for a variety of flamingo species⁴³.

Kelimutu Volcano, Indonesia



Courtesy of Flickr user Neils Photography

Diagram-20: Volcano harbors three crater lakes of blue, green and black or red colour

This volcano harbors three crater lakes at its summit that are strikingly different from one another in terms of color. Typically, Tiwu Ata Mbupu (Lake of Old People) appears blue, Tiwu Nuwa Muri Koo Fai (Lake of Young Men and Maidens) green, and Tiwu Ata Polo (Bewitched or Enchanted Lake) either black or red, although they all are known to change shades quite frequently and unpredictably. The latter two are separated by a crater wall, creating a stunning distinction when viewed side-by-side, especially when they are green and black, as seen in the photo. Thus far, research has revealed no official explanation for the differences and changing colors, but the general consensus is that chemical reactions are being triggered by volcanic gas activity that drives nutrient-rich water to the surface⁴⁴.

Red tide off the California coast



Diagram-21: Red tide off the California coast

Other color names assigned to bodies of water are sea green and ultramarine blue. Unusual oceanic colorings have given rise to the terms red tide and black tide.

The Ancient Greek poet Homer uses the epithet "wine-dark sea"; in addition, he also describes the sea as "grey". Some have suggested that this is due to the Ancient Greeks classifying colors primarily by luminosity rather than hue⁴⁵.

In this way we find that the ancient Indians collected geographical material and compiled it in the Mahabharata. They knew the continents of Europe, Asia and Africa and incorporated this knowledge in the great epic. The fact is that during the period from 6th century B.C.E to 3rd century B.C.E., Indians did not lag behind in the knowledge about the countries and continents around them. Archeological and literary evidence can be cited to suggest the contacts of Indians with the outside world⁴⁶.

The people of the Mahabharata understand the importance of the mountains. The whole earth is fertilized by the mountains is known in Mahabharata.

एवमेषा महाराज पर्वतैः पृथिवी चिता। Mahabharata, Bhishmaparva. 7.38

In Mahabharata mountains have been classified as two groups i.e. Varshaparvata and Kulparvata. Varshaparvata indicates the mountain which divides the earth into different Varshas or countries. The Kulparvatas are spread far and wide in the countries land and divides the land into small valleys. So we see near the Varshaparvata the land or country is the same name. Near Sveta mountain the land

Svetavarsha, near sringavan mountain Sringavanvarsha. The first list of the mountains which spreads from east to west where both sides are bound by the seas. These mountains are Himavan, Himakuta, Nishadha, Nila, svetagiri and Sringavan. In India seven Kulparvatas are mentioned in text i.e. Mahendra, Malaya, Sahya, Suktimana, Rikshavana, Vindhya and Pariyatra. These are surrounded by many other mountains. The important Kulparvata in India is Himalyan group of mounatains.

The study of Mahabharata gives the knowledge about six mountains i.e. Himavana, Hemakuta, Nishadha, Nila, Sveta and Srinagavan.

हिमवान्हेमकूटश्च निषधश्च नगोत्तमः ।

नीलश्च वैदूर्यमयः ;स्वेतश्च रजतप्रभः ॥

सर्वधातुविनद्धश्च शृङ्गवान्नाम पर्वतः ॥ Mahabharata, Bhishmaparva, 7.3

According to Prof. S.M. Ali – Himavana is matched with Himalayan range, Hemakuta is with Ladakah – Kailash – Trans Himalayan chain, Nishadha is with Hindukush – Kun – Lun chain, Nila is with Zarafshan Trans – Alai – Tien – Shan chain, Sveta with Nura Tau – Turkistan Atbashi chain and Srinagaran with Kara – Tau – kirghis keuman chain⁴⁷. But this theory could not solve the discrepancy like - a)

In the Mahabharata it is recorded that the distances between these mountains are more than thousand yoganas. If we consider one yogana as 2.5 miles according our convention then this distance is more than 2500 miles. But really these are present closely. b) In Mahabharata it is mentioned that these ranges are not only surrounded by sea on both the sides but have gone deep into the sea on the both sides⁴⁸. But the above description does not fulfill the criteria.

अवगाढा ह्युभयतः समुद्रौ पूर्वपश्चिमौ ॥ Mahabharata, Bhishmaparva, 7.2

Many authors have tried their own way to identify the six mountain ranges. During identification Prof. Ali has given importance upon the shape of the mountains as the basis described in the Puranas. But he has given less importance upon the toponymy. It is observed that in Mahabharata the shape or formation of the mountains are not mentioned. But all the details are mentioned in puranas. But all the writers of the Puranas and Mahapuranas at all have done the field study before writing the Puranas and Mahapuranas is the main doubt in this regard. Many Mahapuranas are edited in the Gupta Period. The aim of the presenters are to preserve the old Brahmanical tradition which is lost due to the influence of the Buddhism. In such circumstances

they have little opportunity to consider the geographical and historical data of the Mahabahrata which is existed at that time in the present form. So it the high chance that the editors have taken the data from Mahabharata literally. In this context the topographic details regarding the location and direction of the mountains are important⁴⁹.

All the scholars have identified three mountains Himavan, Haimakuta and Nishadha with the unified opinion. But opinion differs on Nila, Sveta and Sringavan mountains. From the map of the Asia, it is observed that the mountains Himavan (Himalaya), Haimakuata (Kailasa – Ladakh mountain chain) and Nishadha (Hindukush complex) forming the one mountain belt covering the large belt of the border of India, Afghanistan and Iran, bound by Caspian sea and south China sea on the east west direction. The other three mountains are formed in another belt. The following picture gives the idea of the different mountains range.

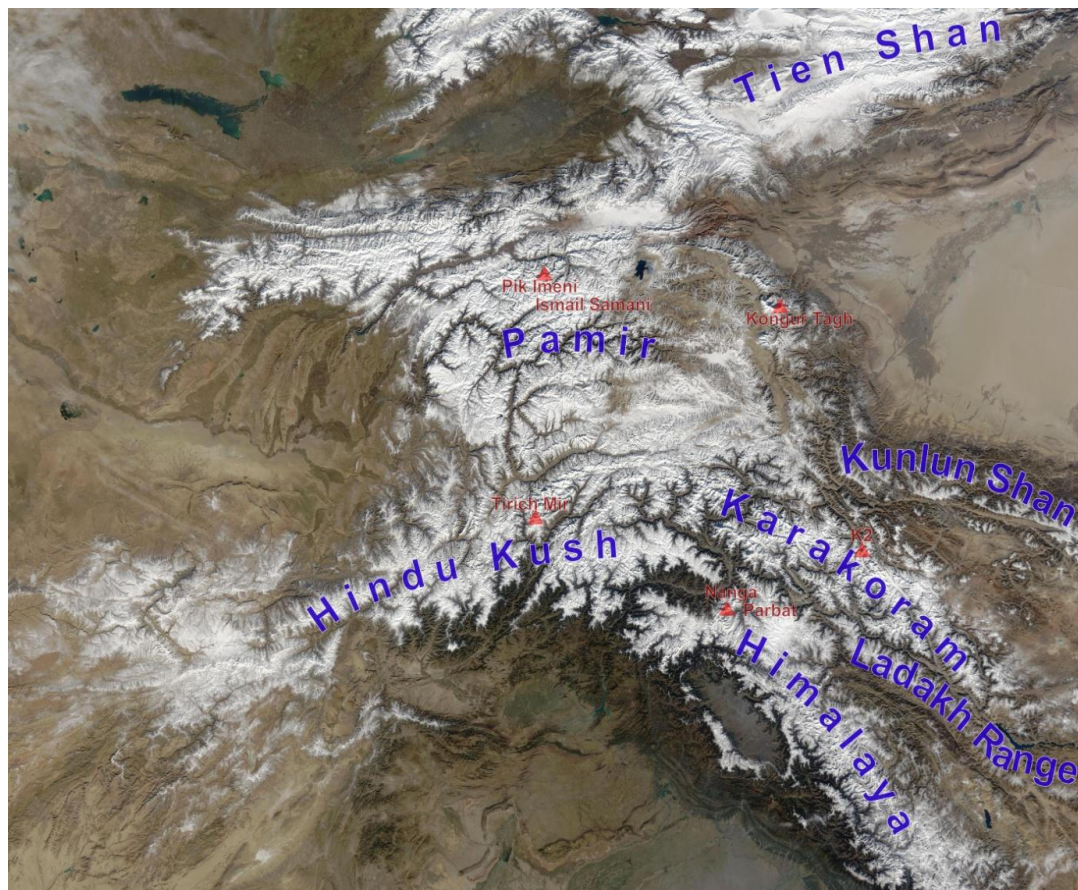


Diagram-22: Satalite photographs of Hindu Kush and other on 27 November 2012.

We study the Sabhaparva and Bhishmaparva for getting the ideas in this regard. Sabhaparva records that after defeating the Kulutas in Kulu valley, Arjuna reaches near *Devaprayag* from there he reaches Kashmir Valley and defeated the hilly robbers like Trigarttas, Daradas and Paramakambojas settled in *Daradistan*. From *Daradistan* he marches against the *Lohas* and *Rishikas*, the hilly tribes of Chinese Turkistan and Sinkiang. After defeating them he reaches to the outskirts of *Svetagiri*. From all these data it appears that *Svetagiri* would be somewhere near Chinese Turkistan. In this region Pamir is very important mountain. So *Svetagiri* may be Pamir. From *Svetagiri* he approaches towards *Hatakas* and comes to the place north of *Manasarovara*. In this context some more slokas are found in south Indian edition of *Sabhaparva*. According to this edition Arjuna defeats the Tanganas and paratanganas settled in Yarkand - Khotan river valleys and occupies the whole country upto Nilagiri. From critical analysis it is clear that Nilagiri may be Tien – Shan – Kun – Iun chain. According to the south Indian edition Arjuna occupies *Sringavan* mountain also. In *Bhishmaparva* it is mentioned that it is present in the west. The data of the *Bhishmaparva* clearly mentions it in the west whereas other six mountains are extended from east to west bound by sea in both sides. The Kun – Iun – Tien Shan chain which directly touches the Kurdistan – Elburz mountain chain in the west. The second mountain chain reaches upto Black sea. The mountain Sringavan may be Kurdistan Elburz mountain complex. Some of the part of the mountain have gone directly into the sea which is evident from the data of the Mahabharata. In the *Bhishmaparva* it is mentioned that the region to the north of the Sringavan is called Airavatavarsha which is cold country. Actually to the north of Kurdistan – Elburz mountain chain is the USSR which is cold country⁵⁰.

A growth of an indigenous plant Karnikara (*Cassia Fistula*) in the north of Meru is mentioned in Mahabharata⁵¹. This plant grows on central and eastern Himalaya on the altitude of 3000 ft. As per the opinion of Botanical Science it is a middle sized straight glabrous tree⁵². It is mentioned that Bhadrasva is situated to the east of Meru and Bhadrasala forest is present there. People of the Bhadrasva are strong and fair complexion, women are versed with music. So the land is identified with China which matches all the above descriptions. According to Santiparva it is once ruled by Yudhishtira. The Mahabharata gives the information that the forest Bhadrasalavana begins from the foot of Meru which is also mentioned in Jain literature and it is water by the rivers Sita and Sitoda⁵³.

नीलात्परतरं श्वेतं श्वेताद्वैरण्यकं परम् ।

वर्षभैरावतं नाम ततः शृङ्गवतः परम् ॥ Mahabharata, Bhishmaparva, 7.35

In *Aranyaparva* the peaks of the mountain is covered with rivers, bushes, forests which is full of lions and tigers, other wild animals like Chatakas, Jala-kukkuta, Peacocks, Satapatra, Jivaka, Chakor, Asitapanga Putrapriya and Sarsa⁵⁴. In *Sabhaparva* Haimakuta is mentioned as Kailasa⁵⁵. In the course of the exile Arjuna goes to Kailas. From there he reaches Badarivisala. After passing the Janapadas of Chinas, Tusharas, Daradas, Kunindas he reaches up to Yamuna parvat. From there he reaches Visakha-Yupa-parvat which is covered with thick forest and full of wild beasts and snakes. In *Sabhaparva*, the peaks like Antargiri, Bahirgiri and Dhavalagiri are mentioned covered with snow⁵⁶. In course of their exile the pandavas stay in *Svetagiri* which is in Himalaya. Many peaks of Himalaya are mentioned in the text. First of all is the mount Meru or Sumeru. In Jain literature also same name of the mountain is mentioned. This is the mountain which is used for churning purpose of the ocean which is mentioned in *Adiparva* of the Mahabahrata. The another mountain is mentioned as Gandhamadana. Near this mountain Chaitraratha forest, Satasringa and Kalakuta mountains are present. The mountain is full of forests, ponds, rivers and trees blossomed with beautiful flowers, ponds are full of lotus, peacocks and elephants roaming in the forests. The pandavas observes beautiful textures of the stones⁵⁷. All these vivid description surely indicates a mountain. But it is difficult to locate the actual mountain. According to prof. S.M. Ali – That by Gandhamadana the Puranas meant the northern ridge of the great Hindukush with its northern extension, the Khwaja Mohammad range⁵⁸. According to Sri N. L. Day Gandhamadana is part of Rudra Himalaya and according to Hindu geographer it is a part of a Kailasa range⁵⁹. According to Mahabharata Gandhamadana is near to Kailasa. So the view of Sri N. L. Day is most fit with the text. According to the description of the Mahabharata some observations are - a) The pandavas could not go further beyond 3000 metres where the wild beasts like animals are present. b) The place of their visit is near the valley of the river Ganga and the stone described in the text is Nilasilatalam. c) The valley of the Ganga has green field which is confirmed the description of Mahabharata⁶⁰.

After that the pandavas pass the river Alakananda and proceeding further they see the mountain Mandarachala. So this mountain is close to the river Alakananda. As the

Bhagirathi, Alakananda and Ganga are the stream of one river. So the north-east of Bhagirathi is Dunagiri which may be Mandarachala. The description of the mountain is mentioned in Mahabharata as :

ततो दुरात् प्रकाशन्तं पाण्डुरं मेरु संनिभम्।

ददृशुस्ते नरश्रेष्ठा निकीर्णं सर्वतो दिशम् ॥ (Mahabharata, Vanaparva, 142, 13)

In Bhishmaparva it has been mentioned that mount Mainaka is situated to the north of the mount Kailasa⁶¹. Sri N.L. Dey has identified this mountain as Sevalik range where Ganga appears first time and it is divided into seven channels⁶². In Dronaparva various other peaks of Mandarachals has been identified due to which it is called Maha Mandarachala. These peaks are called as Satasringa, Vrishadamsa, Kalaparvata and its forest has been called as Saryativana⁶³. Moreover one more Malayavan mountain is mentioned in Ramayana. Which is situated near sea beach in the south. Sri N.L. Dey has identified this range as Anagudi hill on the bank of Tungabhadra river. In Vanaparva both the mountains i.e. Malayavana in south and north have been mentioned. During their pilgrimage Pandavas has witnessed two mountains⁶⁴. Sri N.L. Dey has identified the Malayavana mountain of north as Karakoram which is situated between Nila and Nishad. If the Nila vanta is Tien Shan Kun Lun range and Nishad is Hondu Kush then the Malayavana is present between the two i.e. Karakoram and the Samvarttaka fire referred in the Mahabharata is Jvalamukhi as the fire comes out of the mountain continuously⁶⁵. In Sabhaparva five hills of Magadha are mentioned these are Vipula, Varaha, Vrishabha, Rishigiri and Chaityaka⁶⁶.

वैहारो विपुलः शैलोवराहो वृषभस्तला । Mahabharata, Sabhaparva, 21. 2-3

According to the Sri N.L. Dey these are around Girivraja, the ancient capital of Magadha. These hills are Baibharagiri, Bipulagiri, Ratnakuta, Girivrijagiri and Ratnachala⁶⁷.

The people in the age of Mahabharata are more familiar about the different mountains of the Himalaya. But little is mentioned about south region of India main land. In Mahabharata there is no mentioning of mountains in Ceylon. The classification of Varsa and Kula parvata indicates the geographical boundaries of the different main lands and the fertility of any land. This process of classification gives the idea of their topographic knowledge of different land and the characteristics. In Mahabharata we

see that Pandavas have visited many mountains where the natural beauty with different flora and fauna is clearly mentioned. This description indicates that the people in Mahabharata are aware of the ecological aspect of the earth specially the importance of the mountain for maintaining the biodiversity of the earth. In Mahabharata it is mentioned that Pandavas could not proceed further the high peaks where the existence of ecosystem is not possible.

The description of the journey of Pandavas in Mahabharata reveals the triad model of the mountain, ecosystem and human being. Here ecosystem includes all plants, animals and natural resource. Human being is directly related with the mountain and ecological parameter, whereas mountain and ecosystem are dependent upon each other for their existence.

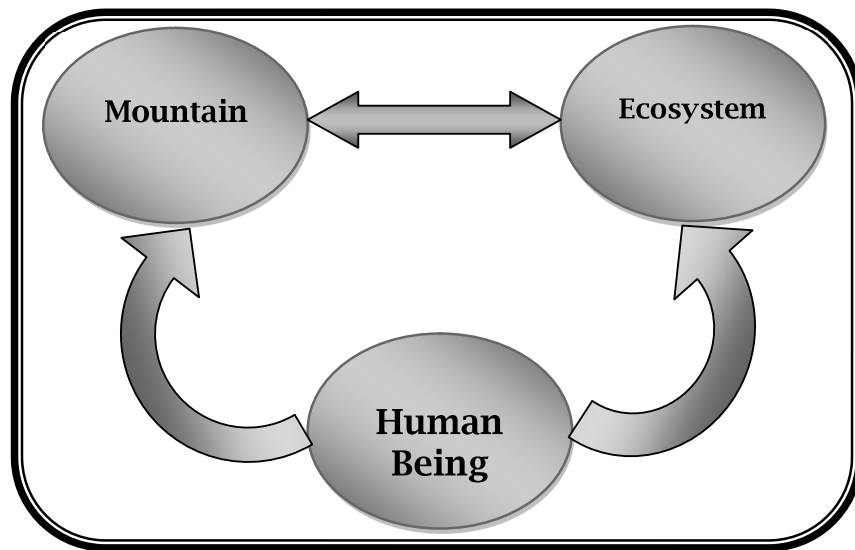


Diagram-23 : Triad model of the mountain, ecosystem and human being

In Mahabharata it is mentioned that *Rivers are the mothers of the universe*. Like mother it nourishes all the creatures and living beings on the earth.

एता नद्यस्तु धिष्ण्यानां मातरो याः प्रकीर्तिताः।⁶⁸

विश्वस्यमातरः सर्वाः सर्वाश्चैव महाफलाः।⁶⁹

The of land of India is fertile due the existence of different rivers passing through the lands. These rivers are emerging from the different mountains which are *Kula* and *Varsha* categories mentioned earlier. Due to their origin they carry soft clay along with their course of journey. These are deposited in the plain land and increase the fertility of the land. Different types of vegetables, grass, fruits, grains and all sorts of plant based products are produced from the land throughout the year. All habitations are settled down on the bank of different rivers. It is found in all ancient literatures. These groups form village and ultimate the small community. So the river is directly involved in the social and cultural development of the community. Sometimes the community migrates from the land to other lands situated on different types of rivers always keep the memory of the river where they have settled in earlier time. Example is – the river Me-Kong is a corrupt form of river Ma-Ganga⁷⁰.

In Bhishmaparva Sanjaya enumerates a list of rivers which are useful for people.

नदीः पिवन्ति वहला गङ्गां सिन्धुं सरस्वतीम्।

गोदावरीं नर्मदा च बाहुदां च महानदीं॥

शतद्रुं चन्द्रभागां च यमुनां च महानदीम्।

दृषद्वतीं विपाशां च विपापां स्थूलवालुकाम्॥

नदीं वेत्रवतीं चैव कृष्णवेणां च निम्नगाम्।

इरावतीं वितस्तां च पयोष्णीं देविकामपि॥

वेदस्मृतिं वेतसिनीं त्रिदिवानिष्कुमालिनीम्।

करीषिणीं चित्रवहां चित्रसेनां च निम्नगाम्॥

गोमतीं धूतपापां च वन्दनां च महानदीम्।

कौशिकीं त्रिदिवां कृत्यां विचित्रां लोहतारिणीम्॥

रथस्थां शतकुम्भां च सरयूं च नरेश्वर।

चर्मण्वतीं वेत्रवतीं हस्तिसोमां दिशं तथा॥

शतावरीं पयोष्णीं च परां भैमरथीं तथा।

कावेरीं चुलुकां चापि वार्षीं शतबलामपि॥

निचीरां महीतां चापि सुप्रयोगां नराधिप।
पवित्रां कुण्डलां सिन्धुं वाजिनीं पुरमालिनीम्॥
पूर्वाभिरामां वीरां च भीमामोघवतीं तथा।
पलाशिनीं पापहरां महेन्द्रां पिप्पलावतींम्॥
पारिषेणामसिक्नीं च सरलां भारमर्दिनीम्।
पुरूहीं प्रवरां मेनां मोघां घृतवतीं तथा॥
धीमत्यामतिकृष्णां च कुशधारां महानदीम्॥
शशीकान्तां शिवां चैव तथा वीरवतीमपि।
वास्तु सुवास्तुं गौरीं च कम्पनां सहिरण्वतीम्॥
हिरण्वतीं चित्रवतीं चित्रसेनां च निम्नगाम्।
रथचित्रां ज्योतिरथां विश्वामित्रां कपिञ्जलाम्॥
उपेन्द्रां बहुलां चैव कुचरामम्बुवाहिनीम्।
वैनन्दीं पिञ्जलां वेष्णां तुङ्गवेष्णां महानदीम्॥
विदिशां कृष्णवेष्णां च ताम्रां च कपिलामपि।
शलुं सुवामां वेदाश्वां हरिस्रावां महापगाम्॥
शीघ्रां च पिच्छिलां चैव भारद्वाजीं च निम्नगाम्।
कौशिकीं निम्नगां शोणां बाहुदामथ चन्दनाम्॥
दुर्गामन्तः शिलां चैव ब्रह्ममेध्यां बृहद्वतीम्।
चरक्षां महीरोहीं च तथा जम्बुनदीमपि॥
सुनसां तमसां दासीं त्रसामन्यां वराणसीम्।
लोलोद्धृतकरां चैव मगानद्यो हनाधिप।
सदानिरामयां वृत्यां मन्दगां मन्दवाहिनीम्॥
ब्रह्मार्णीं च महागौरीं दुर्गामपि च भारत।

चित्रोपलां चित्रबर्हां मञ्जुं मकरवाहिनीम्॥
 मन्दाकिनीं वैतरणीं कोकां चैव महानदीम्।
 शुक्तिमतीमरण्यां च पुष्पवेण्युत्पलावतीम्॥
 लोहित्यां करतोयां च तथैव वृषभङ्गिणीम्।
 कुमारीमृषिकुल्यां च ब्रह्मकुल्यां च भारत॥
 सरस्वतीः सुपुण्याश्च सर्वा गङ्गाश्च मारिष।
 विश्वस्य भारतः सर्वाः सर्वाश्चैव महानबलाः॥ ⁷¹

In the above list of Mahabharata we have seen the *fifty one (51)* names of different rivers present in India. In the above list majority are flowing from west to east and they all directly or indirectly merges with the sea⁷².

The *Mahabharata* mentions *Gangadvara* which has been identified with *Hardwar*. From *Gangadvara* there was a direct route upto *Kailas* but it is difficult to go beyond it⁷³. In *Dronaparva* the story records as *Bhagirathi* is a river, considered as the daughter of king *Bhagiratha*. In *Anusasanaparva* it is mentioned as *Janhavi* after the king *Janhu*, the son of *Ajamidha*. The *Ganga* passes through the many important cities of India and falls into the Bay of Bengal. The four streams like *Alakananda*, *Bhagirathi*, *Madakini* and *Jahnvi* get united and form the main stream and it is named as *Ganga*. Different streams mentioned in the Mahabharata indicate that the people in that age are aware of these streams and its importance. So people describe the rivers meticulously and consider them as the part and parcel of their social and spiritual life.

Sindhu is an important river and in *Rigveda* it is described as the mother of all the rivers. Sven Hedin surveys the source of *Sindhu* river. He observes that the main stream of *Sindhu* is divided into many streams. The valley of the river is vast and predominant. He mentions that Mount *Kailas* is situated a day's journey from it. Local men call it as *Singi-Tsangpo* or *Singi-Kamba*⁷⁴. It emerges from the height 16946 ft. above the sea level, passes through western Tibet and *Ladakh*. It also passes through *Dardistan*, *Kohistan*, *Peshawar* and the plain of western *Punjab* and falls into Arabian Sea⁷⁵. In Urdu, the official language of Pakistan, the Indus is known as (Daryā-e Sindh). In other languages of the region, the river is known as सिन्धु नदी

(Sindhu Nadī) in Hindi, (Sindhu) in Sindhi, (Sindh) in Shahmukhi Punjabi, (Sindh Nadī) in Gurmukhī Punjabi, (Abāsīn, lit. "Father of Rivers") in Pashto, (Nahar al-Sind) in Arabic, (Sênggê Zangbo, lit. "Lion River") in Tibetan, (Yìndù) in Chinese, and Nilab in Turki. It is also called *Indus* River. The total length of the river is 3,180 km (1,980 mi) which makes it one of longest rivers in Asia. Very old civilization are present on the bank of Indus valley. This called Indus Valley civilization. The major cities of the Indus Valley Civilization, such as Harappa and Mohenjo-daro, are very old and their age are around 3300 B.C.E., and represent some of the largest human habitations of the ancient world. The Indus Valley Civilization extended from across Pakistan and northwest India, with an upward reach from east of Jhelum River to Ropar on the upper Sutlej.



Diagram-24 : The path of Indus River

The another river is *Yamuna*, which is according to *Adiparva* emerges from *Yamunotri* and meets with *Ganga* at *Prayag*. It may be one of the seven channels of *Ganga*⁷⁶. *Yamunotri* is present in the *Bandara- Puchchha* mountain in the *Himalayas*. Source of the *Yamuna* river has several hot springs. In the bank of the river several important cities like Delhi, Agra, and Mathura are situated.

Another river *Sarayu* is mentioned in *Ramayana* and *Mahabharata*. According to the *Anusasanaparva*, it emerges from *Manasarovara* lake⁷⁷. In *Adiparva* it is considered as one of the seven channels of the river *Ganga*⁷⁸. In *Anusasanaparva* it is mentioned that sage *Vasishtha* brings the water from river *Ganga* in *Manasarovara* Lake and the stream *Sarayu* is originated from it.

In *Rigveda* it is mentioned that the river *Vipasa* is sacred due to its pure water and flows with swift current. One incident is mentioned in *Adiparva* that *rishi Vaishtha* has tied his hands and feet with a rope and jumped into the flooded river for committing suicide but the river has thrown him back on the bank of the river after un-tying and the *rishi* has given the name *Vipasa* – ‘one free from noose’⁷⁹.

In the *Mahabharata* *Saraswati* is considered as the sacred river. It is mentioned from the *vedic* period. Moreover in *vedic* period it has an important place. In *Purana* it is mentioned that the river is started from *Plakshaprasavana*. It appears and disappears in many places during its journey towards sea. The Swedish archaeological team has made many interesting study during their expedition in 1952 and 1954. The team is headed by Hanna Rydh. According to their study it reveals that the rivers *Vah*, *Ghaggar*, *Saraswati*, *Chautang* and other small rivers emerge from the region of Siwalik Range. Most of the rivers have no connection with larger glaciers. The *Chautang* passes through *Kurukshetra* and joins *Saraswati*. The upper course of *Saraswati* carries water throughout the year⁸⁰. C.F. Oldham has studied the *Saraswati* river according to the old Sanskrit literature. According to his opinion the river *Saraswati* was once the greatest river of the region⁸¹. In *Rigveda* it is mentioned that the river *Saraswati* is the main river out of seven rivers⁸². In *Mahabharata* it is mentioned that the river joins with the sea near *Prabhas*⁸³.

ततो गत्वा सरस्वत्याः सागरस्य च संगमे ।

The *Mahabharata* gives two contradictory statements regarding the river *Saraswati*. In *Vanaparva* the river has been described as a swift current but in another *sloka* it is mentioned that the disappearance of the river due to the menace of *Nishadhas*⁸⁴.

Oldham opines that it is actually due to the shrinking of water. Due to the climatic changes, there have been the scarcity of rain; the rain water shortage coupled with the lack of water in the original source is the cause of disappearance of the *Saraswati*. The main stream received various names in different regions. Further, the changing process of the streams of Sutlej and other rivers has also affected the water of the stream of *Saraswati*. The period of the disappearance of *Saraswati* could be fixed sometimes between 100 B.C.E. and 600 B.C.E.⁸⁵.

Saraswati in vedic time⁸⁶.

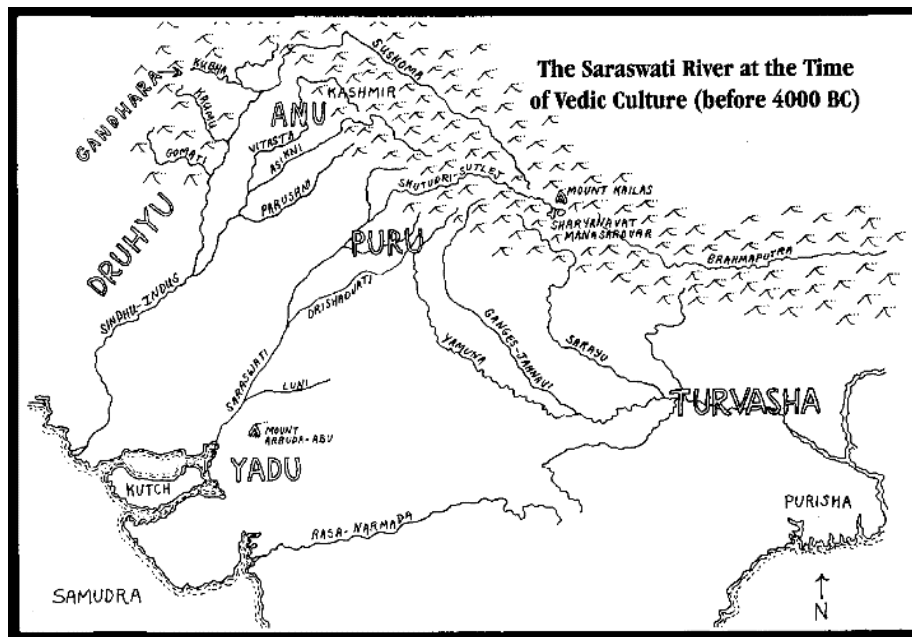


Diagram-25 : Saraswati in vedic time

The origin of *Saraswati* and its path is described which is mentioned in all Sanskrit literatures from the Vedic period to *Mahabharata*⁸⁷.

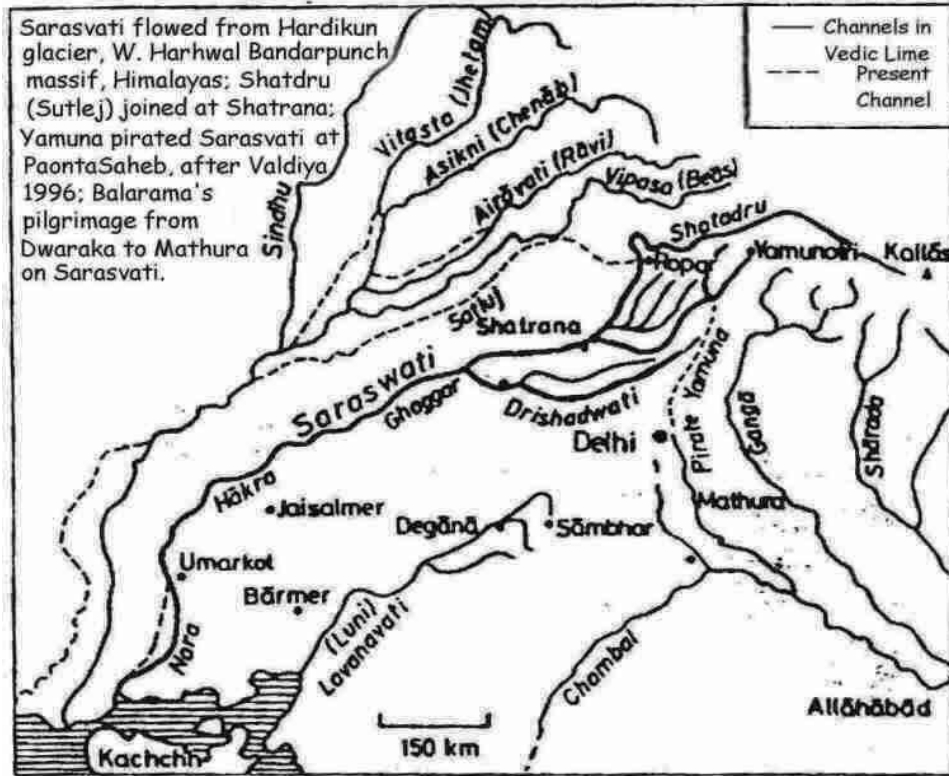


Diagram-26: Origin and path Saraswati according to Sanskrit literatures

In the *Jaisalmer* district, even with very little rainfall (less than 150 mm) and extreme weather conditions, groundwater is available at a depth of 50-60 m (!!!) and wells in the vicinity do not dry up throughout the year. Groundwater samples exhibit negligible Tritium content indicating ABSENCE of modern recharge.

Independent Isotope analyses have also corroborated this fresh water stored UNDER the sand dunes and Radiocarbon data suggests the groundwater is at least a few thousand years old! Not surprisingly, these stores of fresh water are located on the DRY river-bed of Saraswati.

According to the course discovered, it seems river *Saraswati* originated from the *Harki-Dun* glacier in West *Garhwal*, *Bandarpunch* massif in the Himalayas, along with the river *Yamuna*. The two rivers flowed parallel for some distance and later joined, proceeding south as the Vedic *Saraswati*.

The seasonal rivers and rivulets, including *Ghaggar*, joined *Saraswati* as it followed the course of the present river through Punjab and Haryana. River *Sutlej* (*Shatadru* in Sanskrit), joined *Saraswati* as a tributary at *Shatrana*, approximately 25 km south of the modern city of Patiala.

Saraswati then followed the course of *Ghaggar* through *Rajasthan* and *Hakra* in *Bhawalpur* before emptying into the *Rann of Kutch* via *Nara* in *Sindh* province, running parallel to the *Indus* River⁸⁸.

The following picture indicates that the river *Saraswati* is passing through the town *Jaisalmer* of *Rajasthan* and this town is situated in a desert⁸⁹.

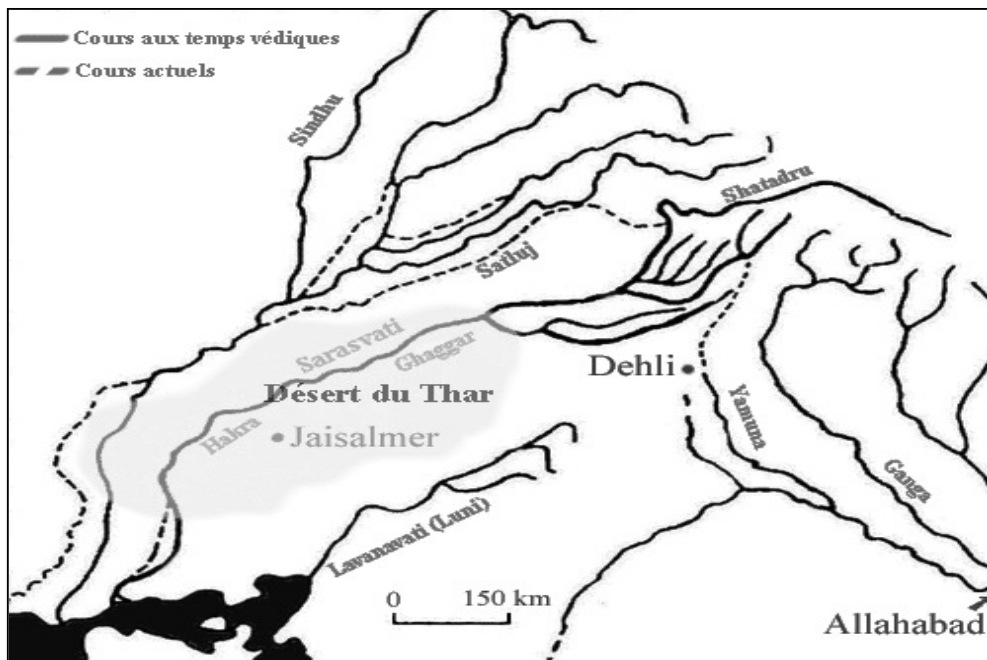


Diagram-27: Saraswati is passing through the town Jaisalmer of Rajasthan

All the rivers mentioned in Mahabharata are not possible to identify. But some major rivers are being identified. According to the study of the Mahabharata the some ideas regarding the rivers mentioned in text are important for consideration.

The author of the Mahabharata only mentions the name of the rivers in northern India and its vicinity region. But it has hardly mentioned the rivers in south India and the south-east Asia like Burma, Thailand, Cambodia, etc. The book gives idea that the people in the epic are aware of the knowledge of the *Jambudvipa* and the related continents but they have little knowledge about the geography and ecology of the southern part of the land. The description of the rivers is fully emotional rather than scientific approach. Except few cases it is treated as informative basis. All rivers

originate in the northern part of India either from the glaciers or lake and throughout the year all have water. The main and historic cities and places are located on the bank of these rivers. This indicates that people develop their culture and civilization in the river centric manner so that they can safely identify themselves with vast ecosystem through this dynamic component of the ecosystem. The river-centric civilization always loves and prefers the river for further development. The great war of Mahabharata is mainly due to get possession of the land on the bank of a great river. So the author in Mahabharata meticulously mentions all types of rivers in northern part. This may be the cause of the author of Mahabharata not to mention elaborately the rivers of southern India. As we see the rivers in southern regions could not carry ample water throughout the year. All these are not originated from the glaciers or lakes which supply ample water throughout the year.

In Mahabharata the plant is used as Udbhija. The *sthavaras* are called *Udbhijas* and have five classes i.e. *vriksha*, *gulma*, *lata*, *valli* and *tyaksara*. These *sthavaras* have nineteen classes and when these are added with *mahabhutas* it becomes twenty four which is compared to *Gayatri*, and is called *lokagayatri*.

एषा विशतिरेकोना महाभूतेषु पञ्चसु ।

चतुर्विंशतिरुद्दिष्टा गायत्री लोकसंमता ॥ Mahabharata, Bhishmaparva, 5. 18

The Bhishmaparva states that there are five classes of the plants i.e. *vriksha*, *gulma*, *lata*, *valli* and *tvaksara*. But all of them are called *trina* in general sense⁹⁰. In *Anusasanaparva* it has been mentioned that six classes of the *Sthavarabhutas* i.e. *Vriksha*, *Gulma*, *Lata*, *Valli*, *Tvaksara* and *Trina*⁹¹. In *Mahabharata* the identification of different plants have been done and they are classed accordingly. Plantation of any kind of plant is highly meritorious deed in *Mahabharata*. Moreover those have no progeny they consider the trees as their sons. As trees are all along beneficial to all living creatures, it is obvious that people should adore trees as their own sons and protect them after plantation⁹²

पुत्रवत् परिरक्ष्याश्च पुत्रास्ते धर्मतः स्मृताः ।

In *Santiparva* *Bharadvaja* asks question that the trees have no heat and no activity, Neither the trees can hear, nor can see or smell, they have neither any feeling of touch. They cannot perspire and cannot breath. In this condition how are

they related with the *panchamahabhutas* ? Bhrigu replies that though the trees are solid, they have the sky due to which the trees and plants produce fruits or flowers⁹³.

भरद्वाज उवाच ॥

पञ्चभिर्यदि भूतैस्तु युक्ताः स्थावरजङ्गमाः।

स्थावराणां न दृश्यन्ते शरीरे पञ्च धातवः॥

न शृण्वन्ति न पश्यन्ति न गन्धरसवेदिनः।

न च स्पर्श विजानान्ति ते कथं पाञ्चभौतिपाः॥

अद्रवत्वादग्नित्वादभौमत्वादवायुतः।

आकाशस्याप्रमेयत्वाद्वृक्षाणं नास्ति भौतिकम्॥ (Mahabharata, Santiparva 6,8,9,)

भृगुरुवाच ॥

धनानामपि वृक्षानामापाशोऽस्ति न संशयः।

तेषां पुष्पफले व्यक्तिर्नित्यं समुपलभ्यते॥

ऊषमतो ग्लानपर्णानां त्वक्फलं पुष्पमेव च ।

म्लायते चैव शीते न स्पर्शस्तेनात्र विद्यते॥

वाय्वग्न्यशनिनिष्पेषैः फलपुष्पं विशीर्यते।

श्रोत्रेण गृह्यते शब्दस्तस्माच्छृण्वन्ति पादपाः॥

वल्ली वेष्टयते वृक्षं सर्वतश्चैव गच्छति।

न ह्यदृष्टेश्च मार्गोऽस्ति तस्मात्पश्यन्ति पादपाः॥

पुण्यापुण्यैस्तथा गन्धैर्धूपैश्च विविधैरपि।

अरोगाः पुष्पिताः सन्ति तस्माज्जिघ्रन्ति पादपाः॥

पादैः सलिलपानं च व्याधीनामपि दर्शनम्।

व्याधिप्रतिक्रियत्वाच्च विद्यते रसनं द्रुमे॥ Mahabharata, Santiparva 10-15.

From the whole reply of Bhrigu the following points regarding the life of the plant are established :

Plants have *ushma* (heat) , due to the heat, the leaves, skin, fruits and flowers of the trees get dry. Here the term ‘heat’ indicates the life energy which is responsible for giving up the old leaves, skins, fruits, etc. and formation of the new one.

Sometime due to lightening or terrific noise, the fruits and leaves of the trees fall down. This indicates that the plants can hear and have a response to sound.

Two scientists have done experiment exposing the different sound on beans and impatiens. Their result is – One chamber was used as a control for the plants, and the plants in the other chambers were subjected to sounds of different frequencies at roughly the same sound intensity. Sounds of pure tones and random [wide band] noise were used. The changes in the growth of the plants were monitored every two days for twenty-eight days. Upon completion of the tests, it was observed that optimum plant growth occurred when the plant was exposed to pure tones in which the wavelength coincided with the average of major leaf dimensions. It is suggested that this was due to the “scrubbing” action of the traversing wave, causing air particle motion on the surface of the leaf; this movement removed the stagnant air layer adjacent to the leaf, thus increasing the transpiration of the plant. It was also noted that the plant growth was less when exposed to random noise.

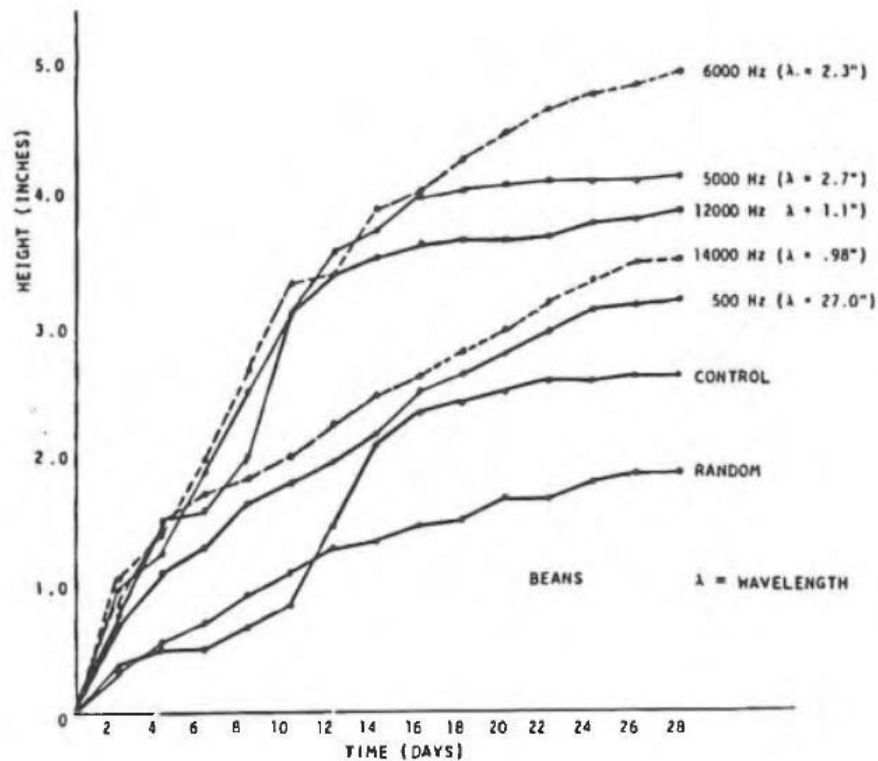


Figure 3. Plant Growth Characteristics Curves for Bean Plants

Diagram-28: Plant growth curve in presence of the different sound

The average dimension for the bean leaf [measured from the control group] gave values of 2.4 inches by 2.4 inches. A wavelength of 2.4 inches corresponds to a frequency of 5,600 Hz for the given conditions. The best results for the beans had been for 5,000 Hz [wavelength = 2.7 inches], so that 6,000 Hz was chosen as one of the two remaining frequencies to be tested. It has a wavelength of 2.3 inches and, as can be seen in the results [Figure 3], gave the best growth curve for the bean plants⁹⁴.

Another two scientists have done experiments in Rose plant exposing different mode sound waves and got the following remarkable results :

The present experiment is aimed to study the effect of music on 30 Rose (*Rosa chinensis*) plants taken in separate pots. The plants were divided into five groups and each group was subjected to one of the following types of music, Indian Classical music, Vedic chants, Western Classical music, and Rock music while one group was kept in silence as the control group. The elongation of shoot, internode elongation, the number of flowers and the diameter of the flowers were recorded and changed studied over a period of 60 days. Significant differences have been noted.

It was seen that the plants exposed to Vedic chants showed the maximum elongation of shoot, maximum number of flowers and highest diameter of flowers. The internode elongation was highest in plants exposed to Indian classical music. This clearly shows that the subjecting the plants to Vedic chants or Indian classical music promotes the growth of plants as compared to the control group or subjecting them to Western classical or Rock music.

Fig. 1 shows average increase in the shoot length of each plant group. It can be clearly seen that the slope of the plants subjected to Vedic chants (0.1358) is greater than the slope of plants subjected to Indian classical (0.1217) which is greater than the plants subjected to Western classical (0.0728). The control group came in fourth (0.0675) while the growth was

minimal in the plants subjected to Rock music (0.0464). The average shoot length of the plants exposed to Vedic chants, Indian classical music, Western classical, control set and Rock music on the 1st day was 36.583cm, 36.416cm, 37.916cm, 35cm, and 36.333cm respectively. The average shoot length of the plants on the 62nd day was 44.417cm, 43.75cm, 43.167cm, 39.833cm, and 40cm respectively. The increase in the shoot length of the plants is 7.834cm, 7.334cm, 5.251cm, 4.833cm, and 3.667cm respectively indicating that the rate of increase of the shoot length is the maximum in plants exposed to Vedic chants followed by the plants exposed to Indian classical

music, then the plants exposed to Western classical music, the control set and least in the plants exposed to Rock music⁹⁵.

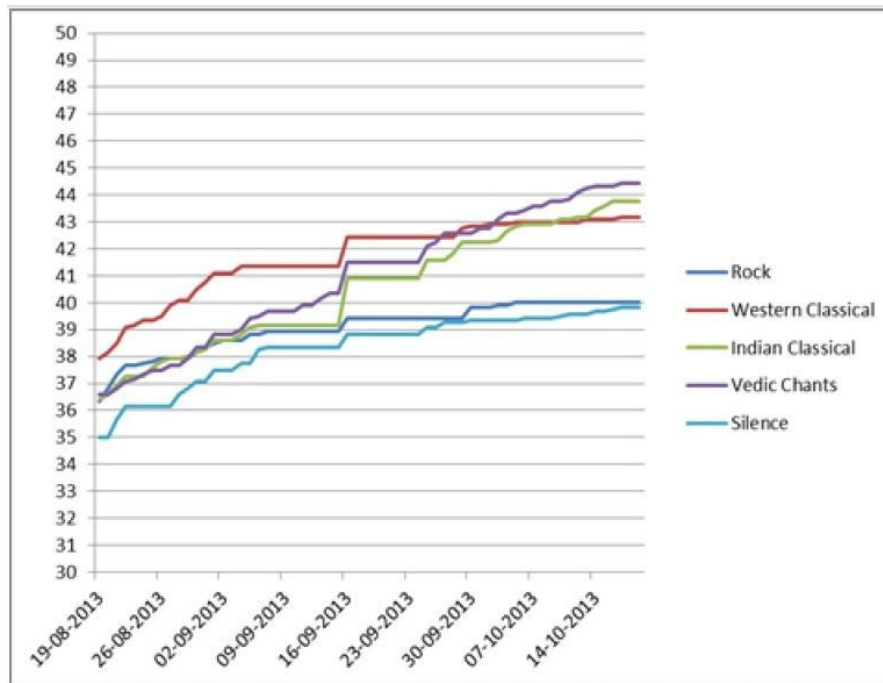


Fig. 1. Graph showing the average rise in shoot length of each plant group.

Diagram-29: The effect of different music on Plant growth

The creeper automatically reaches upto the top of the trees. This phenomenon indicates that the plant can see. Though plant has no classified vision organ or nerve to carry the signal of object, but in behaviour they show some sort of vision type perception. Plant can recognize the UV light and infra-red light.

“That’s what plants do. They don’t see pictures. But they see colors, they see directions, they see intensities. But on a certain level, plants might think that we’re visually limited. Because plants see things that we can’t see. They see UV light and they see far red light, and we can’t see that at all. So I think we can say that plants see. It knows quite a bit, much more than we give them credit for.” —Steve Mirsky⁹⁶

What do plants see? The obvious answer is that, like us, they see light. Just as we have photoreceptors in our eyes, they have their own throughout their stems and leaves. These allow them to differentiate between red and blue, and even see wavelengths that we cannot, in the far red and ultraviolet parts of the spectrum. Plants also see the direction light is coming from, can tell whether it is intense or dim and can judge how long ago the lights were turned off.

Studies have shown that plants bend to the light as if hungry for the sun's rays, which is exactly what they are. Photosynthesis uses light energy to turn carbon dioxide and water into sugar, so plants need to detect light sources to get food.

We now know they do this using phototropins – light receptors in the membranes of cells in the plant's tip. Phototropins are sensitive to blue light. When they sense it, they initiate a cascade of signals that ends up modulating the activity of the hormone auxin. This causes cells on the shaded side of the stem to elongate, bending the plant towards the light⁹⁷.

Good or bad smell also affects the growth of the plants. The plant can recognize the good smell which is evident in the Mahabharata. This indicates that they can smell though they have no classified smelling organs.

But to answer this we have to define for ourselves what “smell” is. When we smell something, we sense a volatile chemical that's dissolved in the air, and then react in some way to this smell. The clearest example in plants is what happens during fruit ripening. You may have heard that if you put a ripe and an unripe fruit together in the same bag, the unripe one will ripen faster. This happens because the ripe one releases a ripening pheromone into the air, and the green fruit smells it and then starts ripening itself. This happens not only in our kitchens, but also, or even primarily, in nature. When one fruit starts to ripen, it releases this hormone which is called ethylene, which is sensed by neighboring fruits, until entire trees and groves ripen more or less in synchrony.

Another example of a plant using smell is how a parasitic plant called dodder finds its food. Dodder can't do photosynthesis, and so has to live off of other plants. The way it finds its host plant is by smelling. A dodder can detect minute amounts of chemicals released in the air by neighboring plants, and will actually pick the one that it finds tastiest! In one classic experiment scientists showed that dodder prefers tomato to wheat because it prefers the smell⁹⁸.

Many of these aromas are used in complex communication between plants and animals. The smells induce different pollinators to visit flowers and seed spreaders to visit fruits, and as author Michael Pollan points out, these aromas can even seduce people to spread flowers all over the world. But plants don't just give off odors; as we have seen, they undoubtedly smell other plants. Plants obviously don't have olfactory nerves that connect to a brain that interprets the signals. But *Cuscuta*, Heil's plants and other flora throughout our natural world respond to pheromones, just as we do.

Plants detect a volatile chemical in the air, and they convert this signal (albeit nerve-free) into a physiological response. Surely this could be considered olfaction⁹⁹.

Plant can taste through the root though it has no possession of taste organ. In Mahabharata it is mentioned that trees drink water and nutrient through the roots when water and nutrients are put into the root. All water soluble portions of the food go to the leaf for further assimilation into the body.

Dr. Tony Trewavas of the University of Edinburgh has shown that plants also respond to wind or touch. If plants are in a windy spot they build thicker and tougher stems to resist wind buffeting. Plant roots have molecules on the surface of their cells which taste soil for pockets of nitrate. US Department of Agriculture scientists have shown that corn, cotton, and tobacco plants recognize what kind of caterpillar is munching on them by the taste of the caterpillar's spit. The molecules in the caterpillar saliva triggers the plants to produce a turpentine like chemical defense that matches the kind of caterpillar. Different kinds of caterpillars cause different chemicals to be secreted. This turpentine-like material not only causes other plants to secrete the same material, but it attracts a wasp that eats the caterpillar¹⁰⁰.

Plant can think and remember some sort of short term impulse. It is also support by the researchers' point of view.

Plants definitely have several different forms of memory, just like people do. They have short term memory, immune memory and even transgenerational memory! I know this is a hard concept to grasp for some people, but if memory entails forming the memory (encoding information), retaining the memory (storing information), and recalling the memory (retrieving information), then plants definitely remember. For example a Venus Fly Trap needs to have two of the hairs on its leaves touched by a bug in order to shut, so it remembers that the first one has been touched. But this only lasts about 20 seconds, and then it forgets. Wheat seedlings remember that they've gone through winter before they start to flower and make seeds. And some stressed plants give rise to progeny that are more resistant to the same stress, a type of transgenerational memory that's also been recently shown also in animals. While the short term memory in the venus fly trap is electricity-based, much like neural activity, the longer term memories are based in epigenetics — changes in gene activity that don't require alterations in the DNA code, as mutations do, which are still passed down from parent to offspring¹⁰¹.

In Anusasanaparva it is mentioned that people in Mahabharata know very well the use of the different plants as medicine. It is described in the text that there are five types of medicine i.e. Urga (strong), Saumya (mild), Tejasvini (energetic), Bahuvirya (virile) and Baburupa (various forms)¹⁰².

The Mahabharata gives a good collection of plants and trees which have botanical values and have great importance in human civilization. Their Botanical names are given below¹⁰³:

Asoke (Saraca Indica)
Champa (Michelia Champaca)
Madhavilata (Hiptage Benohalensis)
Punnaga (Mesua Ferrea)
Karnikara (Nerium Indicum)
Bakula (mimusops Elengi)
Narikela (Cocos Nucifera)
Chandan (Santalum Album)
Arjuna (Terminalia Arjuna)
Vilva (Aegle Marmelos)
Aka (Calotropis Gigantea)
Khadira (Acacia Suma)
Kapittha (Limonia Acidissima)
Dhava (Anogessus Latifolia)
Sala (Shorea Robusta)
Kakubha (Terminalia Arjuna)
Kadamba (anthocephalus Indicus)
Ketaka (pandnus Tectorius)
Vata (Ficus Benghalensis)
Varunaka (Crataeva nurvala)
Vatsanabha (aconitum Spec.)
Sarala (Pinus spec.)
Priyala (Buchanania lanzan)
Tarala (borassus Flabellifer)
Badari (Zizyphus nauritiana)
Amra (Mangifera indica)
Madhuka (Madhuca Indica)

Panasa (Artocarpus heterophyllus)
 Udumbera (Ficus Glomerata)
 Salliki (Boswellia Serrata)
 Guggula (Commiphora Mukul)
 Sami (Prosopis Soicigera)
 Pilu (Salvadora persica)
 Inguda (Balanites Aegyptiaca)
 Palasa (Butea monosperma)
 Arimeda (Acacia leucophlaea)
 Pippala (Ficus Elastica)
 Salmali (Salmalia Malabarica)
 Badari (Zizyphus Mauritiana)
 Kasyarya (Gmelina Arborea)
 Karusha (Acacia Leucophlaea)
 Parijata (Nyctanthes Arbor-tristis)
 Atasi (linum Usitatissimum)
 Vasa (Adhatoda Vasica)
 Kanchanara (Bauhinia Racemosa)
 Arishta (Azadirachta indica)
 Kinsuka (Erythrina Variegata Varorientalis)
 Lodha (Symplocos Spec.)
 Priyala (Buchanania Kanzan)
 Priyangu (Callicarpa Spec.)
 Billata (Semecarpus Anacardinmm)
 Dhava (Anogeissus Latifolia)

One of the described forests in *Gandhamadan* mountain is called *Saugandhikavana* which is full of wild elephant, bears, bisons and lions. The forest is full all natural beauty with enormous different types of plant both flower producing and fruit producing. Moreover it has green grass, plenty of birds, animals, ponds, waterfalls and rivers coming out from mountains¹⁰⁴.

पुष्पितैः पादपैः कीर्णमतीव सुखशाब्दलम्।

विपुलं मधुरारावैर्नादितं विहगैस्तथा॥

प्रवृद्ध विटपैर्वृक्षैः सुखच्छायैः समावृतम्।

षट्पदाघूर्णितलतं लक्ष्म्या परमया युतम्॥

नापुष्पः पादपः कश्चिन्नाफलो नापि कण्टकी।

षट्पदैर्वाप्यनाकीर्णस्तस्मिन्वै काननेऽभवत्॥

In *Mahabharata* several forests are being described. All are full of natural resources and minerals. All are vividly described in the text but at present all names and location are changed due to change in climate and change in river flow. So identification of all forests in present context is very difficult. Here some forests are being identified according to the resource available in the *Mahabharata*¹⁰⁵.

The forest of *Chaitraratha* may located in the north-east of *Kurukshetra*, the place may be located around *Dehradun*.

The another forest is called *Kadalivana* which is located to the north, near about modern *Tehri*.

The *Saugandhikavana* is located on the bank of *Mandakini*. On the basis of geography the place may be around modern *Karnaprayag* and *Joshimath*.

In *Mahabharata* it is mentioned that king *Yudhishtira* started from *Kurujangala* towards the north of the bank of river *Saraswati* in search of another thick forest. The forest *Kurujangala* may located around *Kurukshetra*, *Thanesvara* and *Sirhind*.

After that they entered the forest *Dvaitavana*. So it is located in the northern direction of the bank of river *Saraswati*. This may located near about the region called *Nahan*, *Chhacharauli* and *Sirmur*. According to Sri N.L.Dey the *Dvaitavana* is located near *Deoband* about fifty miles north of *Meerut*.

After that *Pandavas* move to *Kamyakavan*. They reach the outskirts of forest *Kamyakavana* in three days and three nights. According to the topographical data given in the text this forest may be identified with the area from *Thanesvara* to *Kalka*. It is about 200 miles from the site of *Dvaitavana*. Considering the normal speed of man which is not more than 40 miles a day, *Pandavas* could move 180 to 200 miles from *Dvaitavana*.

The *Mahabharata* refers the forest of *Nishadhbhumi* which is located in *Narwar* and *Guna* in *Madhyapradesha*. Even today this forest is still dense.

Another forest is called *Hidimbavana* near *Eakchakranagari* which is the residence of *Hidimba*. *Eakchakranagari* is identified with *Chakranagar* near *Etawah*, UP by Dr. Fuhrer. Evidently this area has a forest in present time.

Mahabharata mentions *Khandavana*. The forest may be located in the area from Hardwar to *Bulandshar* and *Saharanpur*.

In *Anisasanparva* *Yudhishtira* asks *Bhishma* about the significance of digging tanks or reservoir. Water is important component for sustaining life. It is understood by the people in *Mahabharata*. So great importance is attached on digging reservoir or tank for other. It is mentioned that people could make tank separately for men and animals. सर्वदानैर्गुरुतरं सर्वदानैविशिष्यते।

पानीयं नरशार्दूल तस्माद् दातव्यमेवहि॥

In *Mahabharata* time ponds and tanks are existed. One of such lake is mentioned in *Mahabharata* which is in the northern direction beyond the *Gangadvara* where *Raja Marutta* performs the *Yajnas*. This tank may be *Harkipaidhi* near *Hardwar*¹⁰⁶. In *Dronaparva* it is mentioned that *Brahmasarovara* is present in the north direction. A huge lake is named *Dvaipayanahrida* has been described in *Mahabharata* which is near *Kurukshetra* and it becomes dry now. So water bodies are important part in the time of *Mahabharata* and every effort has been made to restore the water body and its proper use.

Sanjaya is the narrator of the whole episode. He starts the description with different classes of living beings i.e. *andaja*, *svedaja* and *jarayuja*.

दिविधानीह भूतानि त्रसानि स्थावरसणि च ।

त्रसानां त्रिविधा योनिरण्डस्वेदजरायुजाः ॥ Mahabharata, Bhishmaparva, 75.10

Jarayuja has fourteen divisions which described in Vedas. Man belongs to this class and among all animals man is superior.

In *Gorakhpur* edition of *Mahabharata* it is mentioned that fourteen *Jarayuja* beings, seven wild animals, seven are village animals and 12 are domestics. Among the wild animals lions, tigers, boars, bison, elephants, bears, and monkeys are mentioned in the texts. Similarly the domesticated animals are cows, she-goats, sheep, horses, zebras and donkeys¹⁰⁷. In *Mahabharata* we see three words i.e. *bhujanga*, *sarpa* and

naga. But we see in the text the word *naga* has been used in several places with elaborate description regarding their dynasties. In northern India Naga tribes are predominant. This word denotes the name of a tribe is established by the fact that some *kashatriyas* are present in *Nagavamsa*. In *Adiparvas* have reference of 184 classes of the nagas who are divided into four Kulas i.e. Naga of *Takshakakula*, *Nagas* of *Airavatakula*, the *Nagas* of *Kauravakula* and the *Nagas* of *Dhritarastrakula*¹⁰⁸. These division once again indicates that the Nagas are the name of the tribe. In Mahabharata the cases of snakebite have been mentioned. In all these cases the word used are most cases are *sarpa* or *bhujanga*. In *Mahabharata* several varieties of birds have been mentioned. These are given below¹⁰⁹ :

Hamsa (Swan)

Karndava (duck)

Sarasa (sarasa)

Mayura (Peacock)

Kraunch (Heron)

Sukra (Parrot)

Syena (Hawk)

Giddha (Vultures)

Hariti (Haritals pigeon)

Kaka (crow)

Kanka (a species of heron)

Baka (cattle-egret)

Kokila (cuckoo)

In *Mahabharata* different types of horses and their characteristics are described clearly. In the story *Nala-Damyanti* the king *Nala* is known as the master of the horses and is well known as horseman throughout India. In India several places are located for availability of good varieties of horses. Horses of *Balhikadesa* are known for their limbs¹¹⁰. The horses of the *Sindhudes* have been described as the faster than other varieties. There several marks in the horses which indicates that the qualities of a horse. In the *Mahabharata* it is mentioned that a subject is known as *Aswavidya* is present and the acharya or teacher is available to teach the subject is also available. One of the *acharya* known as *Salihotra* who is the author *Salihotra-sastra*¹¹¹. The teacher in this field has a good ideas about the nature and language of the horses. So

they can easily understand the language of the horse and communicate with them. Nowadays we see similar thing in the horseman or trainer.

Because people rely so much on verbal communication, it's natural to focus on a horse's vocalizations when trying to figure out what he is saying. But like many animals, horses communicate much more through postures, gestures and expressions than they do with their vocal cords.

The ability to read and respond to this body language is what sets great trainers apart from the rest. From a distance, it may look like these experts are "mind reading," but in reality, they're noticing and responding to the subtlest of cues from the horse, both on the ground as well as in the saddle.

This isn't a mystical skill. Anyone who spends time around horses can learn to tune in to their unique forms of nonverbal communication. It may take some time and attention, but a better understanding of the language of horses will improve your horsemanship skills, and you'll be able to read your horse more clearly and fine-tune your training and handling accordingly¹¹².

The regions where well-bred horses are available called *Asvatirtha* in Mahabharata. It is mentioned in the text that 400 good horses are washed away due to the current of *Vitasta* in the *asvatirtha* of *Balhikadesa*¹¹³. Regarding colour of the horse several colour are mentioned in the text. In *Sabhaparva* it is mentioned that *Rishikas* have given horses of parrot like colour. In *Karnaparva* it is mentioned that horse have yellowish and cream colour. In the army of *Kuru* and *Pandava* horses are used. Some horses are mentioned which have *saranga* colour i.e. white, blue and red¹¹⁴. Different marks or *avartas* are recorded in the text. And all these indicates the quality of horse. These marks may also indicate the auspicious and inauspicious sign which is mentioned in Mahabharata¹¹⁵.

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