

Knowledge of pollination in ancient India

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This article compiles a few anecdotal evidences suggesting that ancient Indians had the knowledge of sexes, and the different events of pollination and fertilization, in plants.

ANCIENT Indian literature mainly comprising the Vedas, the Upanishads, the Puranas, Epics like the *Ramayana* and the *Mahabharata*, poetry and plays written by early Sanskrit scholars and playwrights of ancient India are replete with scientific information¹. Translations of most, if not all, of these works are available in several Indian languages as well as in English. However, there have been rumblings in the corridors of Indian science in recent years about the quality and authenticity of these translations. The main argument being that, most translators while highlighting the scientific aspects were either biased or influenced by modern science in their interpretations² (Tejaswi, pers. commn.). These in fact have served as the bases for some to suggest that Vedas and Upanishads contain information on whatever the modern science is discovering^{3,4}.

In the present article we have analysed whether the ancient Indians were aware of details and importance of pollination. Our analysis is based on the ancient Indian literature and anecdotes from Indian mythology. We present our analysis in three sections. In the first section, we deal with the knowledge of flower morphology among ancient Indians, in the second, with that of events of pollination, and in the third, with that of pollinators.

Flower morphology

In the Vedic literature⁵, the flower is referred as *pushpaha* and there are several references to the flower and flower structure in the Vedas and the Upanishads. Flowers were and are the major offerings to the Gods among the Hindus, and the ancient Indians (the Aryans) did bother to examine the structure of flowers, the way it is borne on the plants, etc. While describing the structure of a flower, mention has been made of *urintham* meaning stalk or flowers are borne on a stalk; *dalam* or *pushparekha* meaning petals of the flower. The unopened flower or bud is referred to as *kalika* or *kudmalaha* and an inflorescence or a bunch of flowers as *sthabhakaha* or *guchchaha*. There is a mention in the

Rigveda about opening of flower buds in the morning hours of the day *kudmalaha eshadvikasonmukhaha*⁶.

In *Shisupala vadhe*, a section in the great epic *Mahabharata*, there are further descriptions wherein the word pollen has at least three equivalent terms *paragaha*, *pushparenu* and *pushparajaha*. The stigma of the flower is referred to as *pushpagarbaha*. There is also a reference to the presence of nectar *pushparasaha* or *makarandaha* in the flowers. One of the vedic hymns in fact states *madhumaanno vanaspathihi* meaning let our plants be enriched profusely with nectar⁷.

Pollination

The process of transfer of pollen grains from the anthers to the stigma has been suggested in the *Mahabharata* as *pushpa renu patanannava kusumodga maha* which literally means pollination. In the *Rigveda* it has been said that the act of pollen falling on the stigma of a fully bloomed flower *phalayogyatvam* is essential for fertilization and for further setting of fruit. In *Shisupala vadhe* there is an apt statement *udethi poorvam kusumam thathaha phalam* meaning 'before fertilization/pollination a flower, after (later) a fruit'.

Pollinators

Significantly there are frequent mentions about pollinators in the earlier texts than about flowers or pollination. *Prasoonam prasuyate shud prani prasave ethyadighatunishpannam* means pollination can occur by various means including animals (*Shisupala vadhe*). The animals referred to here could be insect pollinators like the honey bees which are mentioned as *bhramaraha*. An elaborate review of bees and honey in ancient India is available⁸. Wakankar and Brook⁹ and Mathpal¹⁰ discovered several rock paintings in caves in central India depicting bee hives and honey collection. Most of these date back to the Mesolithic era (15000 to 11000 BC)¹⁰.

Dave, a bee keeper and a Sanskrit scholar made a detailed analysis of the *Rigveda* and found several important facts known to the ancient Indians about bees¹¹⁻¹⁷. Though much was known to the early Indians about social organization and behaviour of bees, it is interesting to note that the Queen bee was in

fact referred to as the 'King bee'. The 'King bee' was compared to 'Life' in an organism or the king bee itself was considered as the life of the super organism—the colony.

Prashopanishad

'Just as in the event of a 'king bee' leaving the hive' all the other bees also leave or when he re-establishes himself in a hive all other bees also re-establish—in the same manner when the *prana* (life) leaves the body, all the other senses have to leave it as they cannot exist apart from *prana*, the vital entity. All other senses, therefore, admit the supremacy of *prana* as they cannot live apart from it just as the honey bees cannot live without their king bee¹⁸.

In the *Ramayana*, which is about 4000 years old, there are elaborate descriptions of *madhuvana*, the bee gardens¹⁹. Here either the bee hives were kept in gardens or gardens were maintained for the bee hives for a richer honey flow. Honey was an essential element in the sacrificial rites of ancient Indians.

In *Abhignana Shakuntala*, a play written by Kalidasa around 400 BC, Shakuntala will be enjoying the sight of a bee visiting flowers one after the other, in a garden. This is used as an analogy for comparing Shakuntala herself to a flower and the bee to Dushyantha, who later courts her. This is probably the only instance where a direct account of pollination and pollinator behaviour on flowers is given.

There is also an interesting episode in the *Mahabharata* referring to the behaviour of another pollinator. Karna, the eldest son of Kunthi, was discarded by her as he was born before her marriage. He grew up among fishermen. With the blood of Kshathriyas running in him, he could not resist the urge to learn archery. He chose Parasurama as his teacher who had taught Dronacharya, who, in turn, was teaching archery to the Pandavas, arch rivals of Duryodhana, a close friend of Karna. But one major hitch Karna had to face was that, due to some reason Parasurama would not teach archery to any body but Brahmin students. He had taken a vow never to teach archery to Kshathriyas. With a great desire to learn, Karna lied to Parasurama and started learning archery in the guise of a Brahmin.

During one of the field lessons, Parasurama felt tired and wanted to rest. Karna offered his lap for his master to lie down. When Parasurama was fast asleep, a bee approached Karna and started boring into his thigh. Thinking that even a slightest movement would disturb his teacher, Karna sat with a firm mind controlling all the pain. However, the blood that started flowing out of the hole made by the bee wetted the body of Parasurama and woke him up. Parasurama was startled to see blood and more than anything he was amazed to find Karna sitting with his eyes closed, controlling the pain. Soon he realized that Karna was in fact a Kshathriya and not a Brahmin for, no Brahmin can tolerate such an intense pain. Angered by the fact that Karna lied about his caste, Parasurama cursed Karna that he should forget all that he had learnt when he needed it most. It appears that the insect responsible for this curse could be the carpenter bee (*Xylocopa* sp.), used in the logo of the International Symposium on Pollination in Tropics, 1993, Bangalore.

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