Chapter 3

Review of Literature

Drug Review/Pippali – Ayurvedic literature

Pippali in Vedic Period:

*Pippali* is frequently mentioned in Vedic literature. In Atharvaveda *Pippali* is mentioned as Rasayana, Ksipta Bhesaji, Atividdha Bhesaji and Vatikrta Bhesaji. Sayana quotes that it is useful in the treatment of Dhanurvata, Aksepaka etc., Vatavyadhis. Hindu mythology reveals that *Pippali* has its origin during Samudramathana along with Amrta. One context from Jaiminiya Bramana delineate that the son of saint Vasistha consumed *Pippali* to attain health and wealth (Jai.Br.3/149). In Koushika dharma sutra (10/16 & 16/38) *Pippali* and Sarsapakhandha are advocated for administration to neonates along with other herbs. This process is claimed to be Medhya. It is enumerated among the Bhesaja Gana of Atharva Parisista (32/1/4). According to Kesava Paddhati (26/33-40) it is indicated for Vata vikaras.

All these references indicate that *Pippali* is a very old drug known to Indians for a long time and its antiquity goes beyond 2000-3000 yrs.

**Synonyms:**

Pippali: It gives protection from diseases.
Nagavalleedala: Leaves resembles to Piper betel leaves.
Magadhee: More grows in Magadha-South Bihar.
Vaidehee: Grows more in Northern Bihar.
Capala: Pungent in nature.
Upakulya: Grows near damp region.
Shoundee: Fruit resembles to tiny elephant trunk.
Kana: Having granules or fruits having granules like structure.
Teekshna tandula: Seeds are pungent in taste.
Krishna: Fruit is black in colour.
Kola: Fruit appears as a solidified rod consisting of different small round particles.
Usana, Krikara, katubija, Korangi, Tikta tandula, Shyama, Dantaphala, Magadodbhava, Smrtyahva.
Table 1: Classification on *Pippali*

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**Rasapanchaka:**

- **Rasa:** Katu
- **Guna:** Laghu, Snigdha, Teekshna.
- **Vipaka:** Madhura.
- **Virya:** Anushnasheeta.
- **Doshakarma:** Vatakapha shamaka.

Green or fresh fruit is Guru Guna, Madhura Rasa, Sheeta Veerya and Vatakaphakara-Pittahara.
Karma:

Rogaghnata:

Prayojya anga: Phala and Mula.

Matra: Churna 1-3g.

Charaka and Sushruta have extensively quoted Pippali among the Dasaimani group and Ganas respectively. It is quite interesting to note that Vagbhata did not mention it in any of his Vargas (AH.Su-15). However he used it in the therapeutics extensively. Moreover he also happened to quote Pippali dvaya three times (AH.Ci.3/133;Ci.8/45 & Ci.9/105) against Susruta who quoted only once about Pippali dvaya (SS.Ci.37/36). It appears Caraka did not describe Pippali dvaya. But he mentioned about GajaPippali. Caraka described Vardhamana Pippali Rasayana. Caraka mentioned that Pippali should not be used in excessive quantities. However it may be used as Rasayana. In this context Cakrapani clarifies that the restriction is limited in diet and not for medicinal usage (CS.Vi.1/12-13). Vagbhata indicate Pippali specifically for Pleeha rogas.

Pippali is used as Aaharayogi Varga (CS.Su.27).

The fruits of Pippali were used as condiment (S.Su.46/221) and leaves as potherb (S.Su.46/262).

Three substances not to be used in excess:
Of all the substances, one should not resort too much to the three drugs viz. Pippali, Kshara and Lavana.

Justification for not using Pippali in excess:

Pippali inspite of their pungent taste are sweet in vipaka, heavy, neither too unctuous nor too hot, deliquescent and useful as medicine when administered afresh. Depending upon the frequency of use, they are both useful and harmful. When properly used they produce good results instantaneously, otherwise, they are responsible for the accumulation of doshas. When continuously used in large dose, they aggravate kapha owing to their heaviness and deliquenscent property; they aggravate pitta owing to their hot property. They do not alleviate
vata because they are not adequately unctuous or hot. They intensify the action of drugs to which they are added. Therefore, *Pippali* should not be used in excess.

**Pippali – Rasayana Drug:**

The fruits of *Pippali* and Amalaki are ground for preparing a powder which is further impregnated with amalaki juice. It is mixed with sugar, honey and ghee. This recipe is given (licked) with milk to a person requiring use of rasayana. As a result of administration of rasayana properly, even the old person becomes like young.

**Pippali Rasayana: (CS.Ci.1-3/32-35)**

a) Person desirous of availing the benefits of rasayana effects should take *Pippali* in numbers of five, seven, eight or ten with honey and ghee for a year. There is also another course where the use in terms of number of fruits is gradually increased such as three *Pippali* fruits should be taken in morning, after meal and before meal. These fruits should first be impregnated with alkali of palasha and then fried in ghee.

b) These should be taken (in the morning) with honey by those who want rasayana effect particularly in order to alleviate cough, wasting, phthisis, dyspnoea, hiccup, throat disorders, haemorrhoids, disorders of grahani, anaemia, intermittent fever, disorders of voice, chronic rhinitis, swelling, abdominal lump and vatabalasaka ailments.

This kind of provision of rasayana has been made by Caraka in order to achieve both types of objectives of medicine that is protective or preventive and curative, through oral administration of drug *Pippali*. As rasayana drug, *Pippali* has been prescribed for getting results of promotive therapy and simultaneously its applications as clinical measure has been indicated in various diseases.

**Pippali Vardhamana Rasyana:**

On the first day ten *Pippali* fruits should be taken with milk. From the second day, onwards upto the tenth day ten fruits of *Pippali* should be decreased gradually in the same order till it comes back to ten (on the nineteenth day). After the drug is digested the person should take sastika rice with ghee extracted from milk. Thus, the use of *Pippali* is total number of one thousand prescribed for rasayana palasa kalpa for rasayana effects of *Pippali* based promotive therapy.

The *Pippali* fruits should be taken by the person with high strength in the form of paste, by those with medium strength in that of decoction and by those with low strength in the form of powder keeping the dosas and diseases in view.
The initial use of ten *Pippali* fruits is superior, that of six ones is medium and that of three fruits is inferior. These numbers are also applicable according to the degree of strength of the patient.

The rasayana use of *Pippali* is bulk promoting, beneficial for voice, increases life span, alleviates splenomegaly, sustains age and promotes intellect.

**Pippali – Potential drug:**

As a rasayana drug, *Pippali* has its important place in the field of Indian Medicine. The potential of *Pippali* fruits is widely utilized in therapeutics which makes it a valuable indigenous drug in common use of medicinal practice. The drug covers wide range in clinical management of many diseases through common application in different modes, forms and pharmaceutics. It is a component of a prominent triad known as Trikatu (Comprising Shunti, Marica and *Pippali*) which is much used in clinical practice as well as pharmaceutical preparations of many compounds. Simultaneously *Pippali* is also component of Pancakola and Sadushana which are also frequently used in indigenous medicine.

**Kinds and Varieties:**

The fruits of *Pippali* as crude drug (in trade) appear to be derived from two or more species, including one which is Indonesian. Indian Long Pepper is a product either of *Piper longum* Linn or *Piper retrofractum*, while the Indonesian or Java Long Pepper imported from Malaysia is *Piper sylvaticum* Roxb. The products of these species are used for the same purposes, though they vary in their effectiveness. Indian Long Pepper is mostly procured from the wild plants grown in some particular regions of its availability in more or less quantity. Some other relevents species include *Piper sylvaticum* Roxb.

As per Raja Nigantuh, four types.

a. *Pippali*: It is *Piper longum* Linn. which is found in Magadha etc., places.

b. Gaja*Pippali*: It is *Piper chaba* Hunter which is considered as fruit of Chavika plant, found in Bengal, Assam.

c. Saimhali: It is *Piper retrofractum* Vahl., which is imported from Sri Lanka, Singapore.

d. Vana*Pippali*: It is *Piper sylvaticum* Roxb. or *Piper peepuloides roxb.* which is found in forests of Bengal, Assam.

In crude drug market, there are two types of *Pippali* sold and procured for catering the requirement of drug, under the current names of raw material of chhoti pipal (small) and Badhi pipal (large) which are indigenous and imported respectively, for practical purpose of drug utilization.
Amayika Prayoga (Therapeutic Uses):

Jwara:
1. In fever, use of Pippali, triphala, curd, buttermilk, panchagavya ghrita and milk is efficacious (CS.Ci.3.303).
2. One should also use Pippali Vardhamana with diet of swastika with milk and ghee (CS.Ci.1.3.36-40).
3. Boiled milk, sugar, Pippali, honey and ghee – these should be churned together and taken. These Panchasara is useful in malarial fever, wasting due to chest-wound, consumption, dyspnoea and heart disease (SS.U.39.254-255).
4. Decoction of Pippali made in four times water should be taken (AS.Ci.2.41).
5. In case of constipation, gruel prepared of barley with Pippali and amalaka and fried with ghee should be given. It helps excretion of impurities and pathogenic material (AH.Ci.1.31).
6. Pippali mixed with honey alleviates cough, dyspnoea, fever, splenomegaly and hiccough. It is particularly recommended for children (BP.Ci.1.377,820).
7. Water boiled with Pippali is free from sliminess, stimulates digestion and alleviates disorders caused by vata and kapha, splenomegaly and fever (VM.1.136).
8. Pippali mixed with jaggery is prescribed in cough, indigestion, anorexia, asthma, anaemia, worms, chronic fever and deficient digestive power (VM.1.206).
9. One who takes goat’s or cow’s milk mixed with Pippali powder and honey definitely becomes free from heart disease, cough and irregular fever (RM.21.15).
10. In fever, Pippali should be given with equal quantity of triphala, while in cough and asthma, it should be given with honey and ghee (BP.Ci.1.378).
11. Pippalyadi Ghrita (Vangasena.jwara.74).

Atisara:
1. By taking Pippali with honey, buttermilk with citraka and by eating tender fruits of bilva one becomes free from bowel disorders (CS.Ci.19.113).
2. By using fine powder of Pippali or marica, dysentery even if chronic is destroyed (AH.Ci.9.40).

Visucika:
1. Paste of Pippali mixed with that of sunthi should be taken with hot water (SS.U.56.18).
2. One should take Pippali, ajamoda and ksavaka or Pippali and danti in equal quantity or paste of Pippali with danti along with the juice of kosataki (SS.U.56.17).
Arshas:

1. The use of buttermilk kept in a vessel anointed internally with the paste of *Pippali*, *Pippalimula*, cavya, citraka, vidanga, sunthi and haritaki is wholesome (SS.Ci.6.13).

2. *Pippali* in increasing doses beginning with ten and tila 20 g should be taken with milk. It promotes strength of the body as well as digestive fire (AH.Ci.8.62).

3. Haritaki fried with ghee and mixed with jaggery and *Pippali* or trivrut and danti should be taken. It acts as carminative (VM.5.9).

Kasa:

1. Pippalyadi Ghrita (CS.Ci.18.36-38).

2. Pippalyadi lehya (CS.Ci.18.135-137).

3. Paste of *Pippali* 10 g fried in oil and mixed with sugarcandy should be dissolved in kulatha water and taken. It alleviates cough caused by kapha (AS.Ci.4.65).

4. One should take *Pippali* mixed with rocksalt with warm water or sunthi mixed with sugar along with curd-water or *Pippali* powder with curd (AH.Ci.3.16).

5. Milk boiled with amalaka powder and added with ghee should be taken or *Pippali* should be used by the method of rasayana (AH.Ci.3.78).

6. Ghee cooked with *Pippali* and jaggery along with goat’s milk is useful (AH.Ci.3.164).

7. Intake of *Pippali* with honey is useful in cough (BP.Ci.12.34).

8. *Pippali* kept in mouth with malayavaca, yavani and betel leaf checks dry cough (BP.Ci.1.335).

Hikka and Swasa:

1. Ghee cooked with purgatives checks hiccoough immediately. Similarly the juices of amalaki and kapittha mixed with *Pippali* and honey (CS.Ci.17.135).

2. Old ghee, *Pippali*, kulatha, meat-soup of wild animals, wine, sour gruel, hingu, juice of matulunga, honey, draksha, amalaka and bilva-these are useful in asthma and hiccoough (SS.U.51.46).

3. Root of ankota mixed with *Pippali*, salt, oil and ghee controls asthma immediately (KK.16.13).

4. Powder of *Pippali*, amalaka and sunthi mixed with honey and sugar should be given frequently. It checks hiccoough and asthma (VM.12.6).

5. *Pippali* mixed with peacock’s feather and taken with honey controls hiccoough (RM.11.4).

6. *Pippali* mixed with sugar and taken as snuff checks hiccoough (GN.2.11.50).
7. Pills made of *Pippali* and sunthi with rocksalt, honey and jiggery is kept in mouth in night. It alleviates asthma, wasting and cough caused by chest-wound (HS.3.12.34).

8. *Pippali* taken with honey in morning alleviates cough, asthma, anorexia, and wasting (VD.3.20).

9. In case of curable asthma, one should take *Pippali*, sunthi and rocksalt with honey in morning (VD.3.24).

**Swarabheda:**

1. *Pippali* and haritaki or sharp wine should be taken (CS.Ci.26.281).

**Kshaya and Shosa:**


2. Boiled milk added with sugar, *Pippali* powder, ghee and honey should be taken. It alleviates cough and fever (CS.Ci.11.79).

3. Sitopaladi churna (CS.Ci.8.103).

4. The linctus prepared of *Pippali*, draksa and sarkara mixed with honey and oil alleviates wasting. Similarly acts the same of *Pippali*, asvagandha and sarkara with honey and ghee (VM.10.9).

5. One who takes powder of *Pippali* and triphala with honey at the time of food becomes free from consumption, dyspnoea, aggravation of kapha, fever and chronic coryza (RM.11.3).

**Adhmana:**

1. Narayana churna which consists of *Pippali*, trivrut and sugar (BP.Ci.24.95).

**Udara:**

1. Satpala Ghrita or *Pippali* or haritaki with jiggery and also group of alkali and aristas is useful (CS.Ci.13.78).

2. One thousand *Pippali* fruits impregnated with snuhi latex should be consumed gradually (SS.Ci.14.10).

3. *Pippali*-Vardhamana as prescribed in rasayana should be used (SS.Ci.14.10).

4. In kaphaja udara, one should use *Pippali* with hot water (GN.2.32.49).

5. *Pippali* is the best remedy for pleeha vriddhi (AH.U.40.48).

6. Alkali of pearl-oyster or *Pippali* should be used with milk for alleviation of enlarged spleen (VM.37.44).

7. Intake of *Pippali* powder mixed with lauhabhasma with milk alleviates enlargement of spleen (GN.2.32.145).
8. *Pippali* impregnated with alkaline water of palasha alleviates gulma and splenomegaly and improves digestive power (VM.37.46).

**Gulma:**
1. Intake of wine mixed with *Pippali*, *Pippalimula*, jeeraka, citraka and rocksalt destroys gulma even if severe (VM.30.31).

**Shula:**
1. Combination of *Pippali* and sunthi is the remedy for colic caused by kapha (SS.U.42.110).
2. *Pippali* Ghrita is effective in parinamashula (VM.27.18-19).
3. Powder consisting of *Pippali*, haritaki and lauhabhasma mixed with honey and sugar should be taken. It relieves severe pain immediately (VM.27.11).

**Chardi:**
1. *Pippali* taken with ghee, honey and sugar checks vomiting (SS.U.49.32).

**Trisna:**
1. One should keep *Pippali* in mouth and then take the churned drink mixed with sugar (CS.Ci.22.53).

**Amlapitta:**
1. *Pippali* with profuse honey should be taken (VM.53.17).
2. The patient should take in morning ghee cooked with *Pippali* decoction and paste and added with profuse honey (VM.53.22).
3. Sweet bolus made of equal quantity of jiggery, *Pippali* and haritaki should be used. It pacifies pitta and kapha and stimulates digestive fire (VM.53.29).
4. *Pippali* Ghrita mixed with honey (CD.52.53).

**Sheetapitta:**
1. One should use *Pippali*-Vardhamana or lasuna ao madhuka mixed with sugar or amalaka mixed with jiggery (VM.52.3).

**Shotha:**
1. Powder consisting of jaggery, *Pippali* and shunti alleviates oedema, indigestion, colic and dysuria (VM.39.10).
2. One should use *Pippali* with milk (CD.39.16).

**Vatarakta:**
1. *Pippali* Vardhamana is useful (SS.Ci.5.12).

**Urustambha:**
1. The use of *Pippali* Vardhamana with honey or jiggery is recommended (VM.24.13).
2. By taking the paste of *Pippali, Pippalimula* and bhallataka with honey one becomes free from urustambha (VM.24.10).

3. One should take *Pippali* or shunti with urine or dashamula decoction (CD.24.3).

**Vatavyadhi:**

1. Gridhrasi: Powder of *Pippali* should be taken with cow’s urine and castor oil (BP.Ci.24.139).
2. Hanugraha: *Pippali* and fresh ginger should be chewed frequently and spitten followed by mouth-wash with hot water (BP.Ci.24.27).

**Mukharoga:**

1. Adhimamsa: *Pippali* mixed with honey should be used as gargle (SS.Ci.22.25).
2. Dantashula: *Pippali* mixed with honey and ghee should be kept in mouth. It is excellent remedy for toothache (VM.58.17).

**Netraroga:**

1. Timira: Nayanasukha vartti consisting of *Pippali* one part and haritaki two parts pounded with water alleviates defects of vision, pterygium, cataract.
2. Naktandhya: Liver of iguana is split open, filled with *Pippali* and cooked on fire. By using this as collyrium night blindness is alleviated (SS.U.17.24).
3. Pishtaka: When the fruit of brhati is maturing paste of *Pippali* is put there in. After sometime it is taken out and mixed with srotanjana and used as collyrium (SS.U.11.14) and Pippalyadi Gudikanjana is used (CS.Ci.30.150).

**Shukradosha:**

1. Use of *Pippali*, amalaki, lauha, triphala and bhallataka as rasayana alleviates disorders of semen caused by kapha (CS.Ci.30.150).

**Streeroga:**

1. Yoni dosha: Use of *Pippali*, lauhabhasma and haritaki with honey is efficacious (CS.Ci.30.84).
2. Antarvatni cikitasa: Jaundice during this period is treated with *Pippali*, ankota root, juice of horse’s faeces and buffalo’s curd (KS.P.300).
3. Sutika roga: During puerperium, if impurity is still there, powder of *Pippali, Pippalimula, gajaPippali,* citraka and shunti should be given with hot jaggery-water. This should be continued for 2-3 days until impurity of blood is removed (SS.Sa.10.16).
4. Garbhanirodha: The woman who takes powder of *Pippali*, vidanga, tankana, all in equal quantity, with milk does not conceive (BP.Ci.70.33).
Rasayana:
1. *Pippali* rasayana (CS.Ci.1.3.32-40).
2. *Pippali* and amalaka powder are impregnated with amalaka juice and then mixed with sugar, honey and ghee. By taking it with milk even the old becomes like young (AH.U.40.27).
3. Ghee cooked with *Pippali* and milk alleviates all diseases (VS.7).

Raktapitta:
1. *Pippali* impregnated with vasa juice seven times and taken with honey (CD.9.29).

Kamala:
1. Vidanga or *Pippali* should be used as navana or anjana (GN.2.7.52).

Gandamala:
1. *Pippali* Vardhamana is useful (GN.4.1.44).

Dantodgamana:
1. For dentition gum should be rubbed with *Pippali* powder mixed with honey (GN.6.11.33).

Karnashula:
1. *Pippali* is put in a cotton-pouch and kept for a while on heated charcoal. The ear is fumigated with the smoke so coming out. It relieves pain (GN.3.2.71).

Ajeerna:
1. *Pippali* mixed with jiggery should be taken (SG.2.7.24).

Urdhvajatrugata roga:
1. *Pippali* taken with decoction of dashamula or triphala alleviates supraclavicular diseases (CK.323).

*Pippali* in various therapeutic formulations:

**Curna:**

**Avaleha-paka:**
Narikela khanda, Brahma rasayana, Vasavaleha, Vasaharitaki avaleha, saubhayasunthi paka, Agastyaharitaki avaleha, Drakshadi lehyam, Cyavanaprasham.
Ghrita:
Amritadi Ghrita, Astamangala Ghrita, Indukanta Ghrita, Kamadeva Ghrita, kumarakalyanaka Ghrita, Dasamulasatpala Ghrita, Dadimadya Ghrita, Dhanvantara Ghrita, Patoladya Ghrita, Pancakola Ghrita, Brihat Shatavari Ghrita, Brihat Asvagandha Ghrita, Mahakhadiraka Ghrita, Mahatriphala Ghrita, Sarasvata Ghrita, Sukumara Ghrita, Pippalyadi Ghrita.

Rasayogas:
Agnitundi vati, Agnimukha rasa, Ajirnari rasa, Antravrddhinasaka rasa, Abhrakadi vati, Arskakuthara rasa, Anandabhairava rasa, Kanakasundara rasa, Kaphaketu rasa, Kasturibhairava rasa, Jalodarari rasa, Dantodhagadantaka rasa, Nagavallabha rasa, Brahmi vati, Mritasanjivana rasa, Shirashuladri vajra rasa, Svacchandabhairava rasa, Hingulesvara rasa.

Vati:
Sarpagandhaghana vati, Sansamani vati, Suvarnamuktadi vati, Apatantrakanasini vati, Akarakarabhadi gutika, Eladi vati, Gorocanadi gutika, Vidalavanadi gutika, Maricyadi gutika, Mahalaksmivilasa vati.

Guggulu:
Amrita guggulu, Triphala guggulu, Kancanara guggulu, Kaishora guggulu, Gokshuradi guggulu, Yogaraja guggulu, Mahayogaraja guggulu, Saptavimsitaka guggulu, Simhanada guggulu.

Asava-Arishta:
Pippalyasava, Vidangarishta, Sarasvatarishta, Candalasava, Rohitakarishta, Kanakasava, Khadirarishta, Draksharishta, Asvagandharishta, Dashamularishta, Kumaryasava, Punarnavasava.

Lauha:
Candanadi lauha, Pippalyadi lauha, Raktapittantaka lauha.

Kwatha:
Citrakadi kwatha, Trptighna kwatha, Devadarrvadi kwatha, Pippalyadi kwatha, Bharngyadi kwatha, Bhunimbadi kwatha, Maharasndi kwatha, Vyoshadi kwatha, Elakanadi kwatham, Dashamula katuratra kwatham, Dhanadanayanadi kwatha.

Anjana-Netra vartti:
Candrodayavartti, Candraekalanjana, Candraprabha vartti, Maricyadi curnanjana.

Nasya:
Pinasahara nasya, Madhukasaradi nasya.
Taila:
Kacchuradi taila, kasisadi taila, Pippalyadi taila, Vasacandanadi taila, Ksara taila, Nagaradi taila, Arimedadi taila, Bala taila.

Drug Review/Pippali – Modern literature

Vernacular names:
Sanskrit: Pippali, Tikshnatandula, Magadhi.
English: Dried catkins, Long Pepper.
Hindi: Pimpli, Pipal, Pipli.
Bengali: Pipli, Pepul.
Gujarati: Pipara, Pipli.
Marathi: Pimpli.
Telugu: Pippallu.
Tamil: Tippali.
Malayalam: Tippli.
Kannada: Hippali.
Punjabi: Pipal.
Oriya: Bhaihehi, Krykola.
Malay: Lada.
Sind: Fildray.
Tulu: Ippali.
Arab: Darfilfil.
Burma: Peikchin, Peikkhyen.
Canarese: Hippali, Tippali.
Chinese: Pi Po.
Deccan: Pipplie.
French: Poivre long.
German: Langer Pfeffer.
Greek: Peperi makron.
Italian: Pepe lungo.
Java: Chabijawa.
Lepcha: Kantin.
Mexican: Tlathancuaye.
Nepal: Pipal, Popal.
Persian: Filfilidaraz, Filfildray.
Portuguese: Pimenta longa.
Santal: Ralli.
Sinhalese: Tippili.
Spanish: Pimentera larga.
Urdu: Pipul.

**Systemic Position:**
Classification by Bentham and Hooker:
Kingdom – Plantae.
Class – Dicotyledons.
Division – Monochlamydeae or Incompletae.
Series – Micrembryae.
Family – Piperaceae.
Genus – Piper.
Species – longum.
Classification of Hutchinson:
Kingdom – Plantae.
Phylum – Angiospermae.
Sub phylum – Dicotyledons.
Division – Herbaceae.
Order – Piperales.
Family – Piperaceae.
Genus – Piper.
Species – longum.

**Piperaceae:**
Herbs or shrubs often with swollen nodes, usually aromatic. Leaves alternate, opposite or whorled, often gland dotted; stipules 0 or 2, connate, or adnate to the petiole. Flowers minute hermaphrodite or unisexual, in axillary or terminal catkin-like spikes subtended by a peltate bract. Perianth 0. Stamens 2-6 (rarely 7-8), hypogynous; anthers often jointed on the filaments, the cells sometimes confluent; dehiscence longitudinal.

Ovary of 3-4 carpels with many ovules; less commonly ovary 1-celled with 1 ovule; ovules orthotropous; stigmas distinct on the free carpels or ovary lobes or terminal on the undivided ovary, occasionally solitary, sessile, terminal simple or penicillate. Fruit small, indehiscent in
the 1-celled species or of cocci or follicles in the many-carpelled species. Seeds globose, ovoid or oblong; testa thin; albumen copious, floury; embryo enclosed in an amniotic cavity at the end of the albumen remote from the hilum; cotyledons minute or obsolete; radical superior.

Genera 7. Species 1150. Aromatic, stimulant, sialogogue. The three alkaloids jaboridine, piperine and piperovatine have been isolated from various species of piper. Jaboridine from Piper reticulatum Linn., Piperine from P.chaba Hunter, P.clusii C.DC., P.longum Linn., P.nigrum Linn. and Piperovatine from P.ovatum Vahl.

**Piper longum Linn.**
This is a glabrous undershrub/climber with erect or subscandent nodose stem and slender branches. Rootstock erect, thick, jointed, branched, stems numerous, 0.6-0.9 m., ascending or prostate, much branched, stout, cylindrical, thickened above nodes, finely pubescent. Leaves simple, alternate, stipulate and petiolate or nearly sessile according to their position on the plant, numerous, 6.3-9 cm., long, 3-5 cm. wide, lower ones broadly ovate, very cordate with broad rounded lobes at base; upper ones oblong-oval, cordate at base, all subacute, entire, glabrous, thin, bullate with reticulate venation sunk above and raised beneath, dark green and shining above, pale and dull beneath; petiole of lower leaves 5-7.5 cm., stout, of upper leaves very short or none; stipules about 1.3 cm., membranous, lanceolate, obtuse, soon falling.

Inflorescence and Flowers: Flowers unisexual, dioecious, minute, sessile, bracteate, without perianth very densely packed in spikate inflorescence, the male and female on separate thickness.

Spikes solitary, pedunculate, male larger and slender, 2.5 to 7.5 cm, bracts narrow, female spikes 1.3-2.5 cm. long and 4-5 mm. diameter; bracts circular, flat, peltate; stamens 2; stigmas 3 or 4, short, spreading, persistent. Fruits: Small about 2.5 mm. in diameter, greyish green or nearly blackish when ripe and are partially sunk in the fleshy axis of the spike. The fruiting spikes are 2.5 to 3 cm. long and 2.5 to 3.5 mm. thick, erect, blunt, ovoid-oblong.

**Flowering and Fruiting season:**
Plant bears flowers during rainy season and fruiting afterwards, in autumn months.

**Flower morphology:**

Flower: Minute, naked, sessile.


Perianth: Zero.
Androecium:
Number of stamens: 2-3.
Gynoecium:
Number of carpels: One (Monocarpellary).
Position of ovary: Ovary sunk in and more or less confluent with the thick rachis.
Number of loculi: One (Monolocular).
Seed:
Type: Adherent to the endocarp, globose, ovoid or oblong, testa thin.
Albuminous: Albumen floury.
Number of cotyledons: Two (Dicotyledonous).
Nature of Embryo: Embryo in a cavity remote from the hilum; radical superior.
Nature of Cotyledons: Minute or absolute.
Fruit drug: In transaction of the fruiting spikes are seen one seeded fruitlets, arranged in a circle on the main axis. The pericarp of the fruit has zones of Epicarp, Mesocarp and endocarp. Secretory cells are present in the outer parts of epicarp and round and oval type cells of sclerenchyma. Mesocarp has thin walled collapsed parenchymatous cells. Epicarp is waxy and filled dark brown contents. Sometimes the outer end of endocarp forms a dome like structure covering a few cells of endosperm and embryo. The major portion of the fruit under endocarp consists of perisperm, the cells of which are stocked with starch grains.
Habitat: Pippali plant is indigenous to North-Eastern and Southern India and Ceylon and cultivated in Eastern Bengal. It occurs in hotter parts of India from Central Himalayas to Assam, Khasi and Mikir hills, lower hills of Bengal and evergreen forests of Western Ghats from konkan to Travancore. Long pepper as sold in India appears to be derived from two or three species, including one which is Indonesian.
Indian Long pepper is a product either of Piper longum or Piper peepuloides, while the Indonesian or Java Long pepper imported from Malaysia is from Piper retrofractum. The product of these species is used for the same purposes, though they vary in their effectiveness. Indian Long pepper is mostly derived from the wild plants, the main sources of supply being Assam, West Bengal, Nepal and Uttar Pradesh. Small quantities are also available from evergreen forests of Kerala, West Bengal and certain parts of Andhra Pradesh.
**Chemical Constituents:** The plant contains essential oil consisting of long-chain hydrocarbons, mono and sesquiterpenes, caryophyllene being the main product. Other constituents are piperine, pipilartine, piplerlongumine, piperlonguminine and its dihydro-derivative, pipernonaline, piperuncaledidine, piperide and guineensine, sesamin, dieudesmin, β-sitosterol and dihydrostigmasterol. Four aristolactams (cepharanone B, aristolactam AII, piperlactam A and piperlactam B) and five 4, 5 – dioxoaporphines (cepharadione A, cepharaadione B, norcepharadione B, piperadione (2 – hydroxy-1-methoxy-6-methyl-4H-dibenzo quinoline-4, 5-(6H)-dione), its 6-demethyl derivative and aminoacids, dehydropipernonaline from the fruit and tetrahydropiperine from the plant have been isolated.

Two alkaloids Piper longumine and Piper longuminine characterized as N-(3,4,5-trimethoxy cinnamoyl)-piperidin-2-one and isobutylamide of piperic acid respectively(stem and roots); n-hexadecane, n-heptadecane, n-octadecane, terpinolene, zingiberene, p-cymene, p-methoxy acetaphenone, traces of dihydrocarveol, phenylethyl alcohol and two sesquiterpenes (essential oil from the dried fruit); piperine, pipilartine, triacantane, dihydro-stigmasterol, an unidentified steroid, reducing sugars, glycosides, sesamin and methyl 3,4,5-trimethoxy cinnamate (roots); major alkaloid piperine 4-5%and sesamin (stem and fruits); sesquiterpene hydrocarbon, caryophyllene, a sesquiterpene alcohol, carbonyl compound (essential oil); N-isobutyldeca-trans-2-trans-4-dienamide, piperine, pipilartine, and a lignin d-sesamin, two piperidine alkaloids-piperuncaledidine (fruit); sylvatin, sesamin and diaeudesmin (seed). Resin, volatile oil, starch, gum, fatty oil, inorganic matter.

The dried fruit (on steam-distillation) yields 0.7% of an essential oil with spicy odour resembling that of pepper and ginger oil.

**Parts Used:** Dried unripe fruits or fruiting spikes and Roots.

**Actions and Uses:**

Dried spikes are acrid, vermifuge, mildly thermogenic, stomachic, aphrodisiac, carminative, expectorant, febrifuge, tonic, laxative, digestive,emollient and antiseptic. They are useful in anorexia, dyspepsia, vomiting, flatulent colic, diarrhea, cholera, dysentery, asthma, bronchitis, coryza, hiccough, consumption, gastric disorders, epilepsy, insomnia, fever, gonorrhoea, haemorrhoids, gout and lumbago.

The fruits are used after childbirth to check postpartum haemorrhage, as a cholagogue in bile duct and gall bladder obstruction. Unripe fruit is used as an alternative and tonic. A decoction of immature fruits and roots is used in chronic bronchitis, cough and cold; also used in palsy, gout, rheumatism and lumbago.
The root is pungent; heating, stomachic, laxative, anthelmintic, carminative; improves the appetite; useful in bronchitis, abdominal pains, diseases of the spleen, tumours, ascites; causes biliousness. The unripe fruit is sweetish; cooling; useful in biliousness. The ripe fruit is sweetish, pungent; heating, stomachic, aphrodisiac, alterative, laxative, antidiarrhoeic, antisyphilitic; useful in ‘vata’ and ‘kapha’, asthma, bronchitis, abdominal complaints, fevers, leucoderma, urinary discharges, tumours, piles, diseases of the spleen, pains, inflammations, leprosy, insomnia, jaundice, hiccough, tuberculous glands; increases biliousness (Ayurveda).

The root and fruit are used in palsy, gout, lumbago. The fruit has a bitter, hot, sharp, taste; carminative, tonic to the liver, stomachic, emmenagogue, abortifacient, aphrodisiac, haematinic, diuretic, digestive; general tonic; useful in inflammation of the liver, pain in the joints, lumbago, snake-bite, scorpion-sting, night blindness (Unani).

In Travancore, an infusion of the root is prescribed after parturition, with the view of causing the expulsion of the placenta. It appears to partake, in a minor degree, of the stimulant properties of the fruit.

As an alternative tonic, long pepper is recommended for use in a peculiar manner. An infusion of three long peppers is to be taken with honey on the first day, then for ten successive days the dose is to be increased by three peppers every day, so that on the tenth day the patient will take thirty at one dose. Then the dose is to be gradually reduced by three daily, and finally the medicine is to be omitted.

Thus administered, it is said to act as a valuable alterative tonic in paraplegia, chronic cough, enlargements of the spleen and other abdominal viscera. Long pepper enters into the composition of several irritating snuffs; boiled with ginger, mustard oil, butter milk and curds it forms a liniment used in sciatica and paralysis. The dried immature fruit and the root in the form of decoction were extensively used in acute and chronic bronchitis attended with cough and was found to give gradual relief in all such cases.

The fruits are used as spice and also in pickles and preserves. They have a pungent pepper-like taste and produce salivation and numbness of the mouth.

Old long pepper is more efficacious in medicine than fresh article. Powdered long pepper administered with honey will relieve cough, cold, asthma, hoarseness and hiccup. For catarrh and hoarseness a mixture of long pepper, long pepper root, black pepper and ginger in equal parts is a useful combination. A compound powder consisting of the same ingredients and in equal parts and called Chaturushana Churnam is useful in colic and flatulence besides cough and coryza. It was tested and found successful.
For diseases of the Respiratory system, Vaidyas & Hakims use an extract prepared by boiling together 4 seers of Adhatoda leaves, 1 seer of white sugar, 16 tolas each of long pepper and ghee to the consistence of an extract and adding, when cool 1 seer of honey and mixing well. Dose is 1 to 2 tolas. A compound powder consisting of long pepper, ginger, black pepper, cinnamon and caraway in equal parts is a good expectorant; and infusion made of 10 peppers with honey makes a good expectorant. A powder called Sringyadi Churna consisting of karkataashringi, atis, long pepper and Nagaramotha, made into a linctus with honey is useful especially for coughs among children. In dry cough a compound powder made up of equal parts of long pepper, round zedoary, ginger, root of Clerodendron siphonanthus, karkataashringi, and raisins, is a very useful remedy given in doses of 30 grains with honey. In catarrhal fever with difficulty of breathing, a powder made of equal parts of karkataashringi, bark of Myrica sapida and long pepper is given with honey.

Unani physicians recommend a pill for asthma; it is made of filaments of Calotrops gigantea 2 parts, long pepper and rocksalt 1 part each. Pills are of the size of a jangli bor; dose is one such pill thrice daily. For bronchitis a pill of the same size but made up of various other ingredients viz.-black pepper, long pepper, borax, karkataashringi, cloves, alum, bharangi, harka chilka, dry ginger and nimak Lahori, all equal parts is recommended in Ilaj-ul-Gurba. Two such pills to be taken at bed time. As a valuable alterative tonic in paraplegia, asthma, chronic bronchitis, chronic cough, enlargements of the spleen and other abdominal viscera etc, it is used thus-An infusion of three long peppers is taken with honey or sugar on the first day, then for ten successive days the dose is increased by 3 peppers every day, so that on the 10th day the patient takes 30 at one dose. Then the dose is gradually reduced by 3 daily so as to finally omit the medicine. In rheumatism, roasted aments are beaten up with honey; they are also given powdered with black pepper and rocksalt (in the proportion of 2, 3 & 1 part respectively) in half tola doses for colic. A compound powder consisting of equal parts of long pepper, embllic and chebulic myrobalans and Saindhava salt, is a good digestive in doses of half to one drachm. In catarrh and bronchitis, a compound powder known as, cough powder is generally in use; it is prepared thus-Take of black pepper, ajowan, long pepper, rock salt, black salt and borax each 1 tola and Adhatoda leaves 40 tolas; put them all in a small pot, close the mouth carefully and put the pot over fire for a while till the ingredients within are completely burnt. Use the burnt powder 2 to 6 grains mixed with honey.

A fermented decoction called Pippali Arista, used in asthma, cough, anorexia, piles etc., is composed of long pepper, lodhra, black pepper, grapes and Cissampelos pareira. Dose is ½
to 2 tolas twice a day. With black pepper, long pepper is used in the preparation of irritating
snuffs for using in coma and drowsiness e.g., take of black pepper, long pepper, seeds of
Moringa pterygosperma and ginger equal parts, powder the ingredients and rub them together
with the juice of the root of Agati grandiflora. This preparation is used as a snuff in coma and
drowsiness.
For indigestion, chronic and painful dyspepsia, dilatation of the stomach and chronic gastritis,
a compound powder known as Bhaskara Lavanam is much in use; it is made up of long
pepper, root of long pepper, coriander, nigella seeds, saindhava lavana, vida lavana,
Cinnamon leaves, talisa patra, nagakesara, 2 palas each; pepper, omum, dry ginger and
Runex vasicarius, 1 pala each; cinnamon and cardamom seeds 6½ palas each; pomegranate
fruit rind 4 palas, black salt 5 palas and samudra lavana, varieties of rock salt 8 palas all well
powdered, mixed and sifted through cloth, the dose ½ to 1½ drs., or even 1 tola, twice a day
with the first bolus of rice and butter milk. Another powder generally taken along with this, in
case of dyspepsia and containing 8 ingredients and called Ashta churnam is made of equal
quantities of black pepper, long pepper, dry ginger, omum, Saindhava salt, cumin seeds,
nigella seeds and asafoetida.
Dose is 20 to 40 grains twice or thrice a day before meals. A compound powder of 5
pungents named Pancha Kola Churnam and consisting of long pepper, long pepper root, dry
ginger, stem of pepper plant and chitraka is a good appetizer useful in dyspepsia, cough,
flatulence and enlarged spleen. This was tried and found efficient. Dose is 10 to 30 grains
twice a day. As rubefacient, oil containing it and ginger is applied in sciatica and paraplegia, as
for instance the Astakatvara Taila recommended by Chakradatta, which consists of ginger
and long pepper each 16 tolas, mustard oil 4 seers, butter milk 32 seers, curdled milk 4 seers,
boiled together in the usual way.
This oil is rubbed externally in sciatica and paraplegia. Both fruit and root are much
prescribed in palsy, gout, rheumatism, lumbago etc. Fruit is given to women after parturition
to check haemorrhage and to ward off fever. As vermifuge it is one of the best remedies for
colic in children. Fruit is used to some extent as a spice. Root is much used as a stimulant
remedy and spice. The drug is also used in snake bite and scorpion sting.

**Therapeutic uses:**
The drug is very much considered useful for consumption. The study conducted on the drug
Pippali has shown antitubercular activity in the active constituents derived from the plant
drug. Piperine isolated from the drug possesses anticolic and analeptic potentialities.
The drug has a peculiar odour and a pungent bitter taste producing numbness on the tongue. The fruits are used as spice and also in pickles and preserves. They have a pungent pepper like taste and produce salivation and numbness of the mouth.

The fruits as well as roots, known as *Pippali* and *Pippalimula* respectively, are attributed with numerous medicinal uses and may be used for diseases of respiratory tract viz., cough, bronchitis, asthma and other allied ailments. It is used as counter-irritant and analgesic when applied locally for muscular pains and inflammations. A snuff in coma and drowsiness is used and internally as carminative; as sedative in insomnia and epilepsy. It is given as general tonic and haematinic. As cholagogue in obstruction of bile duct and gall bladder it is taken. It is used as an emmenagogue and abortifacient, and for miscellaneous purpose as antihelmintic and in dysentery and leprosy.

The drug *Pippali* is a prominent drug of Indian Medicine and it is most common and highly valuable medicine finding clinical, pharmaceutical and therapeutical uses in early classical texts of ancient medical system and presently the role of *Pippali* as an effective and potential drug predominantly continues in medical practice carrying support of experimental studies and multi-disciplinary investigations.

*Pippali* is chiefly an esteemed drug in cough, hiccough and asthma, bronchitis, pulmonary tuberculosis and allied diseases of respiratory system. It is specifically useful in chronic fever. *Pippali* belongs to valuable Rasayana group of drugs.

Therapeutically, the drug *Pippali* covers large number of clinical managements where *Pippali* is employed various forms, modes and formulations in addition to a single drug as well as a component of Trikatu (comprising Shunti, Marica and *Pippali*), trio-pungent drugs group occupying significant role in the therapeutics of indigenous system of medicine.

*Pippali* acts as Rasayana and its use as Vardhamana *Pippali* is well appreciated for the purpose of rasayana. The drug *Pippali* is administered for treatment of several diseases. It is frequently used in liver disorders, splenic enlargement, anaemia, haemorrhoids, worms, dyspepsia, anorexia, loss of appetite, constipation, abdominal colic, gout, rheumatism, urinary complaints, dysmenorrhoea, chronic fever, seminal disorders and general debility.

The use of *Pippali* in the mode Yogavahi (synergistic or potentiating way) may be preferred. The prolonged and excess use of single or individual drug may produce some adverse effects as cautioned by Caraka. Besides as a major drug, *Pippali* is commonly used as a spice.

Recent work on the fruit of Piper longum has shown the presence of the alkaloids Piperine (4-5%) and Piplartine, and two new liquid alkaloids, one of which is designated as alkaloid A.
This is closely related to Pellitorine producing marked salivation, numbness and a tingling sensation of mucous membranes of the mouth. Alkaloid A showed significant In vitro antitubercular activity against Mycobacterium tuberculosis H-37 Rv strain; It inhibited the growth of the bacillus in 20µg. /ml. concentrations. Sesamin, dihydrostigmasterol and a new sterol, Piplasterol are also present.

The fruits as well as the roots are attributed with numerous medicinal uses and may be used for diseases of respiratory tract viz., cough, bronchitis, asthma etc., as counter-irritant and analgesic when applied locally for muscular pains and inflammation, as snuff in coma and drowsiness and internally as carminative, as sedative in insomnia and epilepsy; as general tonic and haematinic, as cholangogue in obstruction of bile duct and gall bladder, as an emmenagogue and abortifacient; and for miscellaneous purposes as anthelmintic and in dysentery and leprosy.

Alcoholic extracts of the dry fruits and aqueous extracts of the leaves showed activity against Micrococcus pyogenes var.aureus and Escherichia coli. Ether extract of the fruits showed larvicidal properties.

**Pharmacology:**
Antibacterial, anti-inflammatory, insecticidal, antimalarial, CNS stimulant, antitubercular, antihelmintic, hypoglycaemic, antispasmodic, cough suppressor, anti-igiardial, immune stimulatory, hepatoprotective, analeptic, antinarcotic, antiulcerogenic.

**Toxicology:**
LD<sub>50</sub> value of Piperine in mice was 750-800 mg/Kg,P.O.

**Chemistry:** Alkaloids (Piperine), resin (Chavicin) and aromatic oil. Actions: Carminative and laxative. Therapeutics: Indigestion and constipation. Dose: Decoction (50-100 ml), Powder (1-3 g).

**Structure of Piperine:**
Antiprotozoal activity: Piper longum fruits have shown activity against experimental Giardia lamblia infection in mice at doses ranging from 250-900 mg/kg. Piper longum demonstrated efficacy against caecal amoebiasis (Entamoeba histolytica) in rats.

Piperine:
Gastroprotective activity: In a pharmacological study, piperine was found to protect against gastric ulceration; it also inhibited gastric acidity and pepsin A activity.

**Propagation and Cultivation:**
Piper longum is cultivated on a large scale in limestone soil, 450-600 m. below the Cherrapunji region which receives very heavy rains from the end of March to the middle of September and where the relative humidity is high. Long pepper is cultivated mainly by layering of mature branches or by suckers planted at the beginning of the rainy season. The vines are well manured with cowdung cake and start bearing three to four years after planting. The spikes are harvested in January, while still green and unripe, as they are most pungent at this stage. They are dried in the sun when they turn grey. The yield increases from 560 kg.per hectare in the first year to 1,680 kg.per hectare in the third. After the third year, the vines become less productive and should be replaced.

Plant regeneration from Callus ultures of Piper longum was achieved through organogenesis. Invitro grown shoots were used as explants for callus injunction. Competent callus was initiated around the nodal ring of tissue using Murashige and Skoog’s medium supplemented with 1.0 mg/1 α-napthaleneacetic acid and 0.2 mg/1 N⁶-benzyladenine. Optimum growth regulator concentrations for shoot induction and shoot elongation were found to be 0.5 mg/1 indole-3-acetic acid with 1.5 mg/1 benzyladenine and 0.1 mg/1 indole-3-acetic acid with 0.2 mg/1 benzyladenine respectively. Elongated shoots were rooted on half strength Murashige and Skoog’s medium having 0.1 mg/1 indole-3-acetic acid. The rooted plantlets were successfully established in soil.

Morphogenetic potential of root, leaf, node and internode explants of P.longun have been reported. The highest number of shoot buds was produced on root explants followed by node, internode and leaf explants. Benzyladenine was suitable for shoot induction and its optimum concentration is 1-2 mg/l.
Market samples of Pippali:
In market we will get two types of Pippali. one is small in size and another of big size. Small sized Pippali is from India only, which comes from Assam-Bengal, also from wild and cultivation. Large sized Pippali is imported from Singapore, Srilanka. Small sized Pippali’s amentum is 2.5 cms to 3.75 cms or 1 inch to 1.5 inch length, straight, blackish green in colour and shining. It looks like unripened fruit. Large sized Pippali length and breadth is more than small Pippali and blackish red in colour but when washed in water becomes dark red. There will be no odour in fresh Pippali but while drying one type of odour is produced. On taste causes tingling sensation with salivation.

Collection and Preservation: Pippali is stored in air tight bottles and placed in a dry place. While collecting, only ripened fruits should be collected and before preserving it should be dried properly.

Veeryakalavadhi (Potency): 2 years.

Substitutes and Adulterants:
The fruiting spikes of Piper longum are often adulterated with other Piper species like Piper peepuloides Roxb., Piper retrofractum Vahl and Piper betle Linn., the roots of Piper longum are adulterated with its stem pieces.

Macroscopic features of Fruits:
Fruit greenish-black to black, cylindrical, 2.5 to 5 cm long and 0.4 to 1 cm.thick, consisting of minute sessile fruits, arranged around an axis; surface rough and composite; broken surface shows a central axis and 6 to 12 fruitlets arranged around an axis; taste, pungent producing numbness on the tongue; odour, aromatic.

Microscopic features of Fruits:
Catkin shows 6 to 12 fruits, arranged in circle on a central axis, each having an outer epidermal layer of irregular cells filled with deep brown content and covered externally with a thick cuticle; Mesocarp consists of larger cells, usually collapsed, irregular in shape and thin walled; a number of stone cells in singles or in groups present; endocarp and seed coat fused to form a deep zone, outer layer of this zone composed of thin-walled cells and colourless, inner layer composed of tangentially elongated cells, having reddish brown content; most of endocarp filled with starch grains, round to oval measuring 3 to 8µ in dia.

Powder:
Deep moss green shows fragments of parenchyma, oval to elongated stone cells, oil globules and round to oval, starch grains, measuring 3 to 8µ in dia.
Identity, Purity and strength:
Foreign matter – Not more than 2 percent.
Total ash - Not more than 7 percent.
Acid insoluble ash - Not more than 0.5 percent.
Alcohol soluble extractive – Not less than 5 percent.
Water soluble extractive – Not less than 7 percent.

Thin Layer Chromatography:
T.L.C. of alcoholic extract of the drug on silica gel 'G' plate using Toluene:Ethylacetate
(90:10) as mobile phase. Under U.V. (366nm) six fluorescent zones are visible at Rf. 0.15,
0.26, 0.34, 0.39, 0.50 and 0.80. On exposure to Iodine vapour seven spots appear at Rf. 0.04,
0.15, 0.26, 0.34, 0.39, 0.50 and 0.93 (all yellow). On spraying with Vanillin-Sulphuric acid
reagent and heating the plate at 105° for ten minutes five spots appear at Rf. 0.04, 0.22, 0.35,
0.43 and 0.82. On spraying with Dragendorff reagent three spots appear at Rf. 0.15, 0.26 and
0.34 (all orange).

Organoleptic characters of the dried female spike:
Shape – Cylindrical, ovoid-oblong, slightly tapering or blunt.
Size – Length: 2.5-4 cms, diameter: 5-7 mm.
Fruit:
Type – Drupe, indehiscent.
Shape – Ovoid.
Size – Diameter about 2.5 mm.
Arrangement – Many fruits are closely packed on the axis and partially sunk in the solid
fleshy spike.
Colour – Blackish green.
Odour – Aromatic.
Taste – Pungent.

Parameters for quality control:
Piperine (alkaloid): 1-2%
Foreign organic matter: <2%
Total ash: 6.95
Acid insoluble ash: 3.74
Water soluble ash: 1.39
Piperine is usually considered as a marker as well as a therapeutic compound. There is similarity in this molecule of other Piperaceae members like black pepper. But each of them can be differentiated through chromatographic techniques.

**Table 2: Histochemical Tests**

<table>
<thead>
<tr>
<th>Sl no.</th>
<th>Reagents used</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Conc. HNO₃</td>
<td>Kernel grayish yellow, ground tissue yellow, endocarp brown, stone cells yellowish brown.</td>
</tr>
<tr>
<td>b.</td>
<td>H₂SO₄</td>
<td>Endocarp dark brown, kernel grey, ground tissue light brown.</td>
</tr>
<tr>
<td>c.</td>
<td>Hcl</td>
<td>Ground tissue yellow, endocarp brown, kernel light yellow and stone cells brownish yellow.</td>
</tr>
<tr>
<td>d.</td>
<td>Ferric chloride</td>
<td>Ground tissue yellowish brown, kernel yellowish grey and endocarp brown.</td>
</tr>
<tr>
<td>e.</td>
<td>Iodine</td>
<td>Entire tissue in general and kernel in particular except the endocarp gets bluish blacks.</td>
</tr>
</tbody>
</table>

**Isolation of Piperine:**

Piperine is isolated from unripe fruit (Black Pepper) and Kernel of the ripe fruit (White Pepper) of *Piper nigrum*, from the fruit of ashanti (*Piper clusii*), from long pepper (*Piper longum*), seeds of *Cubea censii*, *Piper fainechotti* and *Piper chaba*. The Piperine content of black pepper varies from 6 to 9%.

Finely powdered 20 g of black pepper is extracted with 300 ml 95% ethanol in a soxhlet extractor for 2 h. The solution is filtered and concentrated in vacuum on a water bath at 60°C. 20 ml of alcoholic potassium hydroxide is added to the filtrate residue and after it while decanted from the insoluble residue. The alcoholic solution is left overnight, whereupon yellow coloured needle shaped crystals are deposited. The yield of Piperine is 0.3 g. Melting point: 125-126°C.
Review of Previous Research works

Research works carried out on *Pippali* not referred to *Nava* and *Purana Pippali* specifically. Research works carried on *Piper longum* Linn are:

**Overview for various aspects of the health benefits of *Piper longum* Linn. fruit.**
Kumar S, Kamboj J, Suman, Sharma S.

**Antioxidant activity of combined ethanolic extract of *Eclipta alba* and *Piper longum* Linn.**
Ramesh V, Hari R, Pandian S, Arumugam G.
J Complement Integr Med. 2011 Dec 7; 8.

**Studies on the neuroprotective role of *Piper longum* in C6 glioma induced rats.**
Subramanian U, Poongavanam S, Vanisree AJ.

**Protective effect of *Piper longum* Linn on monosodium glutamate induced oxidative stress in rats.**
Thomas M, Sujatha KS, George S.

**HPLC assisted chemo biological standardization of alpha-glucosidase-I enzyme inhibitory constituents from *Piper longum* Linn-An Indian Medicinal plant.**
Pullela SV, Tiwari AK, Vanka US, Vummenthula A, Tatipaka HB, Dasari KR, Khan IA, Janaswamy MR.
Antifertility activity of Piper longum Linn in female rats.
Lakshmi V, Kumar R, Agarwal SK, Dhar JD.

Immunomodulatory and antitumour activity of Piper Longum Linn and Piperine.
Sunila ES, Kuttan G.

Effect of Piper longum Linn, Zingiber officinalis Linn and Ferula species on gastric ulceration and secretion in rats.
Agrawal AK, Rao CV, Sairam K, Joshi VK, Goel RK.

A rapid method for isolation of Piperine from the fruits of Piper nigrum Linn.
Kanaki N, Dave M, Padh H, Rajani M.

Hypolipidemic effects of a new Piperine derivative GB-N from Piper longum in high-fat diet-fed rats.
Bao L, Bai S, Borijihan G.

A clinical trial of Pippali with special reference to Abheshaja.
Pathak M, Vyas H, Vyas MK.

Molluscidal activity of Piper cubeba Linn, Piper longum Linn and Tribulus terrestris Linn and their combinations against snail Indoplanorbis exustus Desh.
Pandey JK, Singh DK.
**Piper longum Linn extract inhibits TNF-alpha-induced expression of cell adhesion molecules by inhibiting NF-kappa B activation and microsomal lipid peroxidation.**
Singh N, kumar S, Singh P, Raj HG, Prasad AK, Parmar VS, Ghosh B.

**Anti-inflammatory activity of Piperine.**
Mujumdar AM, Dhuley JN, Deshmukh VK, Raman PH, Naik SR.
Disease Review - Bronchial Asthma

Bronchial Asthma is a chronic airway disorder which can affect people of all age groups. According to the global initiative for asthma (GINA), asthma is defined as a chronic inflammatory disorder of airways which is associated with airway hyper-responsiveness. It leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing, particularly at night or early morning. The increasing global prevalence of asthma, the large burden it now imposes on patients and the high health care costs have led to extensive research into its mechanisms and treatments.

**Prevalence:** Asthma is one of the most common chronic diseases globally and currently affects approximately 300 million people worldwide. In developing countries where the prevalence of asthma had been much lower, there is a rising prevalence, which is associated with increased urbanization. Asthma can present at any age, with a peak age of 3 years.

In childhood, twice as many males as females are asthmatic, but by adulthood the sex ratio has equalized. The severity of asthma does not vary significantly within a given patient; those with mild asthma rarely progress to more severe disease, whereas those with severe asthma usually have severe disease at the onset.

Major risk factors for asthma deaths are poorly controlled disease with frequent use of bronchodilator inhalers, lack of corticosteroid therapy and previous admissions to hospital with near-fatal asthma.

**Etiology:** Asthma is a heterogeneous disease with interplay between genetic and environmental factors. Several risk factors have been implicated.

**Risk factors and Triggers involved in Asthma:**

**Endogenous factors:**
- Genetic predisposition
- Atopy
- Airway hyper responsiveness
- Gender

**Environmental factors:**
- Indoor allergens
- Outdoor allergens
- Occupational sensitizers
- Passive smoking
Respiratory infections

**Triggers:**
Allergens
Upper respiratory tract viral infections
Exercise and hyper ventilation
Cold air
Sulfur dioxide and irritant gases
Drugs (β-blockers, Aspirin)
Stress
Irritants (Household sprays, paint fumes).

**Pathogenesis:**
Asthma is associated with a specific chronic inflammation of the mucosa of the lower airways. One of the main aims of treatment is to reduce this inflammation.

**Pathology:**
The airway mucosa is infiltrated with activated eosinophils and T lymphocytes and there is activation of mucosal mast cells. A characteristic finding is thickening of the basement membrane due to sub epithelial collagen deposition. The epithelium is often shed or friable, with reduced attachments to the airway wall and increased numbers of epithelial cells in the lumen.

Another common finding in fatal asthma is occlusion of the airway lumen by a mucous plug, which is comprised of mucous glycol proteins secreted from goblet cells and plasma proteins from leaky bronchial vessels. There is also vasodilatation and increased number of blood vessels. Direct observation by bronchoscopy indicates that the airways may be narrowed, erythematous and edematous.

**Inflammation:**
There is inflammation in the respiratory mucosa from the trachea to terminal bronchioles, but with predominance in the bronchi. There is good evidence that the specific pattern of airway inflammation in asthma is associated with airway hyper responsiveness, the physiologic abnormality of asthma, which is correlated with variable airflow obstruction. Many inflammatory cells are known to be involved in asthma with no key cell that is predominant.

**Mast cells:** Mast cells are important in initiating the acute bronchoconstrictor responses to allergens and several other indirectly acting stimuli such as exercise and hyperventilation, as well as fog. Activated mast cells are found at the airway surface in asthma patients and also in the airway smooth muscle layer. Mast cells are activated by allergens through an IgE-
dependent mechanism and binding of specific IgE to mast cells renders them more sensitive to activation. Mast cells release several bronchoconstrictor mediators, including histamine, prostaglandin D$_2$ and cysteinyl leukotrienes, but also several cytokines, chemokines, growth factors and neutrophins.

**Macrophages and dendritic cells:** Macrophages may traffic into the airways in asthma and may be activated by allergens via low affinity IgE receptors. Macrophages have the capacity to initiate a type of inflammatory response via the release of a certain pattern of cytokines. Dendritic cells take up allergens, process them to peptides and migrate to local lymph nodes.

**Eosinophils:** Eosinophil infiltration is a characteristic feature of asthmatic airways. Allergen inhalation results in a marked increase in activated eosinophils in the airways at the time of the late reaction.

**Inflammatory Mediators:** Many different mediators have been implicated in asthma and they may have a variety of effects on the airways that could account for the pathological features of asthma.

**Inflammatory cells:** Mast cells, Eosinophils, Basophils, Neutrophils, Platelets.

**Structural cells:** Epithelial cells, Smooth muscle cells, Endothelial cells, Fibroblasts, Nerves.

**Mediators:** Histamine, Leukotrienes, Prostanoids, Kinins, Adenoline, Endothelins, Nitric oxide, Cytokines, Chemokines.

**Effects:** Bronchospasm, Plasma exudation, Mucus secretion, Structural changes.

**Asthma Triggers:**
Several stimuli trigger airway narrowing, wheezing and dyspnea in asthmatic patients. Allergens, Virus infections, Pharmacological agents, Exercise, Physical factors, Food, Air pollution, Occupational factors, Hormonal factors, Gastro esophageal Reflux, Stress.

**Clinical features:**
The characteristic symptoms of asthma are wheezing, dyspnea and coughing, which are variable, both spontaneously and with therapy. Symptoms may be worse at night and patients typically awake in the early morning hours.

There is increased mucus production in some patients, with typically tenacious mucus that is difficult to expectorate. Typical physical signs are inspiratory and to a greater extent expiratory, rhonchi throughout the chest and those may be hyper inflation.

**Differential diagnosis:**
Many other conditions can cause symptoms similar to those of asthma. In children, other upper airway diseases such as allergic rhinitis and sinusitis should be considered as well as other causes of airway obstruction including: foreign body aspiration, tracheal
stenosis or laryngotracheomalacia, vascular rings, enlarged lymph nodes or neck masses. In adults, chronic obstructive pulmonary disease, congestive heart failure, airway masses, as well as drug-induced coughing due to ACE inhibitors should be considered. In both populations vocal cord dysfunction may present similarly.

**Aims of Asthma Therapy:**

1. Minimal chronic symptoms, including nocturnal.
2. Minimal exacerbations.
3. No emergency visits.
4. Minimal use of a required $\beta_2$–agonist.
5. No limitations on activities, including exercises.
6. Peak expiratory flow circadian variation $\leq$ 20%.
7. Normal PEF.
8. Minimal adverse effects from medicine.

**Management:**

The most effective treatment for asthma is identifying triggers, such as cigarette smoke, pets, or aspirin, and eliminating exposure to them. If trigger avoidance is insufficient, the use of medication is recommended. Pharmaceutical drugs are selected based on, among other things, the severity of illness and the frequency of symptoms. Specific medications for asthma are broadly classified into fast-acting and long-acting categories.

Bronchodilators are recommended for short-term relief of symptoms. In those with occasional attacks, no other medication is needed. If mild persistent disease is present (more than two attacks a week), low-dose inhaled corticosteroids or alternatively, an oral leukotriene antagonist or a mast cell stabilizer is recommended. For those who have daily attacks, a higher dose of inhaled corticosteroids is used. In a moderate or severe exacerbation, oral corticosteroids are added to these treatments.

**Medications:**

Medications used to treat asthma are divided into two general classes: quick-relief medications used to treat acute symptoms; and long-term control medications used to prevent further exacerbation.

**Short term control:** Short-acting beta$_2$-adrenoceptor agonists (SABA), such as salbutamol are the first line treatment for asthma symptoms. They are recommended before exercise in those with exercise induced symptoms.
Anticholinergic medications, such as ipratropium bromide, provide additional benefit when used in combination with SABA in those with moderate or severe symptoms. Anticholinergic bronchodilators can also be used if a person cannot tolerate a SABA. Older, less selective adrenergic agonists, such as inhaled epinephrine, have similar efficacy to SABAs. They are however not recommended due to concerns regarding excessive cardiac stimulation.

**Long-term control:** Corticosteroids are generally considered the most effective treatment available for long-term control. Inhaled forms such as beclomethasone are usually used except in the case of severe persistent disease, in which oral corticosteroids may be needed. It is usually recommended that inhaled formulations be used once or twice daily, depending on the severity of symptoms.

Long-acting beta-adrenoceptor agonists (LABA) such as salmeterol and formoterol can improve asthma control, at least in adults, when given in combination with inhaled corticosteroids. In children this benefit is uncertain. When used without steroids they increase the risk of severe side-effects and even with corticosteroids they may slightly increase the risk.

Leukotriene antagonists (such as montelukast and zafirlukast) may be used in addition to inhaled corticosteroids, typically also in conjunction with LABA. Evidence is insufficient to support use in acute exacerbations. In children they appear to be of little benefit when added to inhaled steroids. In those under five years of age, they were the preferred add-on therapy after inhaled corticosteroids by the British Thoracic Society in 2009.

Mast cell stabilizers (such as cromolyn sodium) are another non-preferred alternative to corticosteroids.