ANALYTICAL STUDIES IN THE EVIDENCES REGARDING CHEMICO-CULTURE IN THE HISTORY OF INDIAN MEDICINE IN ANCIENT PERIOD—ALLIUM SERIES

S. S. Kamavisdar

Department of Chemistry
Government P. G. College, Rajnandgaon (M. P.) 491441.

(Received 28 June 1978; after revision 29 May 1979)

Undoubtedly smiling is an indication of good health, happiness and prosperity (i.e. Mens sana in corpore sana, i.e. a sign of sound mind in a sound body).

The reference to Buddhist’s canons, the pitaka (basket) of Vinaya (law of ethical principles), Sutte (rules of monastic life and abhidhamma (metaphysical principles and other allied non-medical texts having influences from diverse sources, contributing to the flowering chemico culture of Indian genius in multiple fields cannot be ignored for this purpose. The vitality of Indian chemico-culture is evidenced by the fact that healthy physicochemical ideas and institutions were easily assimilated without disturbing the organic unity of the original views in the field of history of Indian medicines and that too in Indian medicinal plants described in the non-medical texts. With the knowledge in the etiological field the treatment was prescribed for attaining health through extracts from flowers, roots, fruits regulated in terms of consumption and non-consumption techniques by physicians who were granted special privilege and prestige with the follow of certain ethics in the society. They were quite conversant with the decoctions of various plants for studies in the ailments. Not only this, hunger suppression preparations were used in case of scarcity of foodstuffs. The support of establishments of shops for sale of green herbs, medicinal roots and experiments of various drugs in relation to the symptoms carried over in Divyananda including references of Lord Buddha critically appraise the knowledge of chemico-culture established those days. The efficacy not established by Piper nigrum (marica) Piper longum (pippali) Zingiber officinale (suni) in intestinal obstructions is explained on the basis of physico-chemical principle involved in the ingredients of Pandalu series. The digestive tract in relation to reaction with Allium sativum has been incorporated in this paper and a clue regarding chemico culture has been suggested for the modus operandi for Allium used those days.
Undoubtedly smiling is supposed to be an indication of good health, happiness and prosperity, i.e. a sign of sound mind in a sound body. This *modus operandi*’s reference to the Buddhist’s canons, the *piṭaka* (basket) of *vinaya* (law of ethical principles), *sutta* (rules of monastic life)* abhidhamma* (metaphysical principles) and other allied non-medical texts which have influences from diverse sources and contribute towards the flowering chemico-environment of Indian genius in multiple fields cannot be ignored for the studies in this series. The vitality of Indian chemico-culture in the history of Indian medicines is evidenced by the fact that mostly physico-chemical ideas assimilated those days combine the aetiological conditions in terms of the organic unity of the original thoughts especially established in the medicinal plants described in the non-medical texts. The *tripiṭaka* (500 B.C. –86 A.D.), *Buddhacarita* and *Saundarananda* of Āśvaghoṣa (1st cent. A.D.) and Bhadrabāhu’s *Kalpasūtra*, I.42 mention 434, 57 and 40 medicinal plants respectively in this series of investigation. The unearthing of five rods (in Altekars’s *Kumrahan excavations*—two of them broken, both the ends of one of the rods clubbed but not pointed) made of copper for smearing the eyes and several collyriums prepared from various techniques with the help of antimony rods (Kalayi aṇjani kalākā), i.e. the use of five types of aṇjana (antimony), i.e. kāla, rasa, sola, geruka and kapall gives the indication for procurement of various metals and minerals in this chemico-culture series.

Regarding attainment of health in case of diseased person the four *ārya* truths are equated as disease, its cause, health (*ārogya*) and medicine (*bhaisajya*) and Saundarananda XIV, 40 stresses the importance on proper understanding of the cause cum treatment of the ailment in this respect.

The geography of Strabo (B.C. 54—A.D. 24) throws important light on the positions of the medicines in India those days, through knowledge in bio-chemical antidotes and their actions caused by a plant like that of laurel in the form of epileptic side effects along with symptoms like that of foaming mouth. The damage to the eyes through a prickly plant like cucumber, throat choking by consumption of unripe dates was also known those days. It is said that among the orients, the arrows which were made of wood and hardened in fire were besmeared in deadly poisons. At the time when Ptolemy was wounded and was in danger of losing his life, (although Alexander was found asleep) someone stood beside him and showed him a root and branch, which he bade Alexander to crush and apply to the wound. After awakening from sleep Alexander remembered the vision, sought and found the root, which grew in abundance there and simultaneously made use of it, both for himself and for others. When the barbarians saw that the antidote had been discovered they surrendered to the King.
The Manumṛti\textsuperscript{2,3} mentioning edible preparations envisages the extracts from pure flowers, roots and fruits for consumable items. Saundarananda visualises medicines possessing very rarely both the properties, i.e. taste and disease pacifying actions. Soft (bhojaniya), hard (khūdiya), relishable or likeable (lehyā). foods were used for this purpose. The syrups prepared from the fruits were used in addition to the intoxicating drinks. Five kinds of beverages along with surā, varuni, prasanna, and sidhu with adherence to certain rules are mentioned in the series.\textsuperscript{2,4}

Although the physicians those days were granted special previlege and prestige in the society (i.e. the envoy (pranidhi) on mission, in disguise of of physician, the Prince apprehending imprisonment or death or exile with allotment of land free from taxes and other burdens (including provision of royal rations for them) they were not authorised to sell or mortgage these items and were also restricted not to monopolise their business secretly, i.e. they had to report the cases approaching them secretly for treatments of patients suffering from ulcer or symptoms exhibited by consumption of excess of unwholesome food or drinks. Otherwise both the patients and physicians were proved guilty and were liable for heavy\textsuperscript{4,5} punishments. The physicians were supposed to be the true followers of the old sages and ancient traditions. They were supposed to be practical men, skilled in diagnosis, master of efficacious treatment, collector of medicinal herbs and capable of curing every disease. The use of ghṛta, butter, oil, honey and mollasses was considered to be of medicinal efficacy in this respect.

Milindapanho’s IV.7.20. (sabbe pi acariya rogupattim ca nidānam ca sabhavam samuthanam ca kiriyam ca siddhasiddham ca) can be traced for the knowledge in interpreting aggravation, prognosis, cure, management and mutual coordination in interpreting knowledge of other systems for the betterment of the patients. Caraka samhitā\textsuperscript{5} mentions of the celebrated physician Bahlīka (Balakha) to have participated in various seminars organised by Punarvasu Ātreya\textsuperscript{5} in this regard. A person aspiring to become a surgeon, was supposed to acquaint himself with the application of ointments (bheṣajtanulimpana) which is definitely noteworthy from the point of chemico-culture. The Mahāvagga of Vinayapitaka (VIII, civarakkhandaka, Iyakavatthu) lauds the medico-surgical achievements of Iyaka in this respect. Iyaka on his way to Rājgrha from Taxila University had cured a case of chronic headache through a medicated oil which was used as errhine (Nattihakamna-Skt-naṣṭahkarma) at Saket (modern Ayodhya). Fistula in anus of king Bimbisāra of Rājgrha was cured by the application of one ointment only by him. He had also given a very mild purgative to Lord Buddha through a lotus flower soaked in the
medicines. The use of collyrium in ocular disorders is also note-worthy. The eight causes of ailments include super abundance of vāta, pitta, ślesman (semha), the union of the aforesaid dośas, variations in seasons (utu-parinamaja), the avoidance of dissimilarities (visamahāra), the external agency (opakkama) and deeds (kamma-vipaka). Regarding medico-terminological instincts Kātyāyana on Aṣṭādhyāya affixes ‘nas’ and ‘ul’ respectively after the words ‘pārsu’ and ‘vāta,’ thus forming the words ‘pārsva’ and ‘vātula’ in this series of ailments. The affix ‘la’ comes after the word Klima for denoting indication to the eyes and ‘cilla’ and ‘pilla’ are substitutes of ‘klinna’ (bleared) for bleared eyes, which is called ‘cilla’ or ‘pilla’. The term ‘culla’ is also another substitute. A person having the disease ‘kaccu’ (scabies) is denoted as ‘kacoura.’ The affix ‘vini’ is added diversely to the terms ‘marma’ (vital part) and amaya (disease) in the sense of possession. Besides these affixes, the vowel is also lengthened optionally. In the Vedas the above substitution (pūrva-savarna) takes place in the case of ‘skanda,’ preceded by ‘ud’ as ‘agreduram utkandah’ (meaning a disease ‘utkandako rogaḥ’). Alternatively this form may have been derived from the root ‘kanda’ and not ‘skandir.’ Milindapanho discusses technical differences between matured (kālamarana) and pre-matured (akālamarana) situations along with eight causative factors of the later origins. The Caraka Saṁhitā mentions these facts aphoristically. The exponential vividness mentioned in various texts for four bhūtas (pāthavi, apo, teja and vāyu) except ākāśa cannot be ignored for these explanations. The term ‘dhatu’ has been incorporated in Buddhist’s literatures from the medical innovations.

Buddhacurita in describing the sickness or disease (roga) explains it as an effect of the provocation of the dhatus three in number, namely, vāta, pitta and ślesman (tri-dhātu-prakopaprabhāvah) characterized by a swollen belly with shaking frame as if one paints with arms hanging loosely and shoulders having the thin and pale body juxtaposed by embracing the stranger. Diseases arisen from rajas, tamas, physical factors, were especially treated by the psychiatrists known as ādhyātmavid. As the dośas (vāta, pitta and ślesman) are brought forth (urkleṣa) before samśodhan (eliminatory) treatment likewise the diseases are also aggravated before their treatments.

In the Saddharmapuṇḍarīka, diseases (vyādhayaḥ) are classified as vātika, paitika, ślaismika and sannipātika. The Lalitavistara also mentions persons suffering from diseases coming under the classification of vāta, pitta, ślesman and sannipāt. Patañjali, the celebrated scholiast on Pāṇini’s Aṣṭādhyāyī refers to the course of form jvaraja as curd or dadhi and fie or musk melon (trapusa) and says that a bed of reeds with water (navalodaka) tends to increase the diseases of foot (pada-roga). Buddhist’s canons mention ‘tikiccha’ instead of Ayurveda. The 21 principal professions mentioned in Jātaka II,
include medical science as one of the major professions to earn livelihood. (*vejjakamma Skt. valdyakarma*).

Kauṭilya *Ārthasastra* mentions the remedial decoction mixtures prepared from various substrates to be consumed for a month or fortnight (also produced from vivid sources) carry the symptoms as follows:

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Cause</th>
<th>Preparations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Destruction of eyes and madness</td>
<td>Smoke</td>
<td>Burning mixture of powder of <em>krikana</em> (a kind of partridge) <em>kṛkalāsa</em> (lizard), <em>grhagodhika</em> (a small house lizard) and <em>andhabhika</em> (a blind snake)</td>
</tr>
<tr>
<td>Leprosy</td>
<td>Smoke</td>
<td>Burning of mixture of (<em>Kṛkalāsa</em> and <em>grhagodhika</em>)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Smoke</td>
<td>Burning of mixture of <em>kṛkalāsa</em> and entrails of <em>citrabehka</em> (a kind of variegated colour) and <em>madhu</em> (celtis orientalis of honey).</td>
</tr>
<tr>
<td>Consumption</td>
<td>Mixture</td>
<td>Same mixture mixed with human blood</td>
</tr>
<tr>
<td>Destruction of tongue</td>
<td>Powder</td>
<td>Powder of <em>duṣṭivṛṣa</em> (drugs having the property of slow poisoning), <em>madana</em> (<em>Randia dumetorum</em> Linn) and <em>kodrava</em> (<em>Paspalum scuobiculatum</em>)</td>
</tr>
<tr>
<td>Atrophic fever</td>
<td>Mixture</td>
<td>Of the powder of <em>matruvahaka</em>, <em>jālloka</em> (leech) the tail mixture of a peacock, the eyes of a frog and <em>piluk</em> (salvadra periṣca)</td>
</tr>
<tr>
<td>(paralysis of tongue)</td>
<td></td>
<td><em>Mixture of</em> paṇcakūṭha kandinyaka, rājñīkṣa (<em>Cassia fistula</em>) madhupuspā (<em>Bassia latifolia</em>) and <em>madhu</em> (honey)</td>
</tr>
<tr>
<td>Viśveikā</td>
<td>Mixture</td>
<td><em>Mixture from the powder of the knot of the tongue of</em> bhasa (the bearded vulture), <em>nakula</em> (mongoose) reduced to a paste with the milk of a she donkey</td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>Mixture</td>
<td></td>
</tr>
<tr>
<td>Dumbness and deafness</td>
<td>Mixture</td>
<td></td>
</tr>
</tbody>
</table>
Leprosy  Paste (Kalka)  Prepared from tīṇḍuka (Diospyrus paniculata) and arīṣṭa (Sapindus trifoliatus) and cowdung, smeared over the joint of bhallataka (Semecarpus anacardium)

Leprosy  Paste  Prepared from guṇīja (Abrus precatorium) kept for seven nights in the mouth of a white cobra or a house lizard

Leprosy  External liquid  Of essence of the eggs of a parrot and a cuckoo

White in colour  Mixture eating  Of the powders of the roots of the kūkkuṭa (Maristillamenta), kośatakī (Dawpapentandra) and śatavarī (Asparagus racemosa) for a month

Black colours  Decoctions  Of vata (Ficus bengalensis) and rubhis body with the paste prepared from sahacara (Berberis perionitis)

Dark blueness  Mixture  Hariṭāla (orpiment or sulphate of arsenic) and manahśīla (realgar or red arsenic) mixed with the oil extracted from sakuna (a kind of bird) and kāṅka (a vulture).

In addition to these observations Kauṭīlya’s *Arthaśāstra* mentions various recipes for the diseases which are experimentally produced. The decoctions of the roots of śrāgala vartā (Bignonia indica) or madana (Rondia dumentorum) or varuna (Crataeva roxburghii) or vali (a creeper or a group of drugs), vidārī (Pueraria tuberosa), sarīva, rajani-harīḍrā (Curcuma longa), guḍucī (Sida cardifolia) and ajasraṇī (Pistacia integerring) or taḍara (Valeriana wallchil) or all of these mixed with the milk, and drunk, removes the effects of the mixtures of madana. The stinking oil extracted from Kaliyā (Vangueria spinosa) removes madness. The mixtures prepared from priyāṅgu (Agliesia roxburghiana) and naktamala (Pongamia pinnata) when applied through the nose removes leprosy. The mixture prepared from the kuṣṭa (Sausurea lapp) and lodhra (Symplocos racemosa) pacifies the consumption. Likewise the
mixture prepared from kāṭphala (Myrica nagi), dravanti (Anthericum tuberosum) and vīdaṅga (Embella ripa) removes the headache, and other disorders of the head when applied through the nose.

The prominent achievement in the field of military medicines during the Mauryan age was the knowledge of the application of the drugs along with hunger-suppressive characteristics, which had the quality of inducing capabilities in the soldiers to work even for 15 days or a month, in case of scarcity of food stuffs. Kauṭilya mentions four such compounds in the sequence as follows:

A dose of powder of śirīṣa (Albizzia lebbeck), udumber (Ficus racemosa) and sami (Prospis spicigera) mixed with ghṛta (clarified butter) render fasting possible for half a month.

The scum prepared from the mixture of the roots of kaserulīa (Scripus grossus), utpalakāṇḍa (root of Nelumbium speciosum), ikṣumāla (root of Saccharum officinarum), dūryā (Cymadon daclylon) milk and ghṛta enables the man to fast for a month.

The powder of māsa (Phaseolus mungo), yava (Hordeum vulgare), kulattha (Dolichus biflorus), darbha (Desmostachyabipinnata) mixed with milk and ghṛta: the milk of vālli (Phaseolus aconitifolius) and clarified butter derived from it and mixed in equal proportions, combined with the paste prepared from the root of śālaparṇī (Desmodium gangeticum) and praśniparṇī (Uraria picta) when drunk with the milk, or a dose of milk mixed with clarified butter and honey, both prepared from the above substrates enable one to fast for a month.

Ghṛta, butter, oil, honey, molasses compensate these views. These food and drinks (beverages etc.) had been safeguarded by the female nurses in this regard. The green herbs and medicinal plants (roots needed for this purpose) were sold at the shops at Śrāvastī (identified with Sahet Mahet on the bank of Rapti river in the district of Gonda of Uttar Pradesh). In the Divyānanda there is a mention of one experiment of various drugs on human being with symptoms resembling on advanced type of intestinal obstruction caused by roundworms. Once Emperor Aśoka suffered from a severe disease. Faecal odour from mouth was the main symptom. The queen consort of Aśoka, Tiṣyaśrīkṣita, asked the physicians to bring the patients of either sex with the same symptoms. Accordingly a cowherd suffering from
these symptoms was shifted to a hidden and lonely place and after making him unconscious (jīvita vyāparopitah), she opened his abdomen and observed that a long roundworm went upwards which caused vomiting with disagreeable odour (probably faecal odour) so that when it moved downwards it caused purging with the same odour. The role played by the stomach in the digestive system cannot be ignored for this purpose. Although the stomach works energetically when one is young, repeated stretches and contractions in rubber-like muscles and muscular layers of the same, looses the flexibility and strength (necessary to perform this vital digestive action) as one gets advanced in age. Successful pregnancy and childbirth responds actively to digestion upto 40 years of age. A sound stomach actively performs mechanical churning of food which is accomplished by the waves of muscular contraction only mixed with sufficient but not excessive gastric secretions. Some drugs partially stimulate the upper portion of the stomach for the digestive action. Over 40 years, the upper portion generally looses the digestive power and the digestion is limited to lower half only. The remaining half is left unemployed during the digestion. This can eventually cause ulceration and even carcinogenous growth in that region after these years.

The remedial drugs used in this series should atleast possess the properties of disinfecting the stomach walls, stimulating the digestive action and gastric secrets, intensifying the stomach's rhythmic churning of food and increasing the movement of musculature contractions, thus reducing undesired burden on the intestine with simultaneous stimulation to supply pure oxygen-rich blood to the capillaries of the stomach walls by the liver.

The gastrities or the ulcer originated in this consecutive patterns can be divided into exogenous and endogenous varieties. The exogenous mode is caused by overeating or drinking, or by eating spoiled food, drinking too much or taking excessive amount of stimulants. The endogenous characteristics is originated by the toxins released by bacteria of typhoid, diphteria, dysentery, T.B., syphilis, side-tracks and mismanged liver, kidney, heart and other allied internal organs. The overall symptoms exhibited are—pain in stomach,
dullness, headache, lack of appetite, belching, nausea, bad breathing, vomiting sensations, slight rise of temperature, peritonitis in advanced stages, whereas endogenous envisages lack of appetite, poor digestion, considerable stomach pain. This series can be compared with the symptoms mentioned in the Buddhist's texts.**

1. Faecal odour comes out from the mouth (*mukhad uccāro nirgacchatil*), i.e. vomiting, copious and projectile, first of all food, then bile, and later materials alkaline to litmus and finally the faecal.

2. Presence of worms in the intestine. (*pakwasāyasthane antarayam krimiprä-durbhutiḥ*).

3. When a worm goes upwards the faecal odour sprinkles out from the mouth (*kriyau urdhwam gaechati mukhatosuchipt pradharanti*).

4. When a worm comes downwards the faecal material sprinkles out from the anus (*adho gaechati kramau asuchini adhyat pradharanti*) comprising stereoraceous in intestine, abdominal distention, flanks with obstruction in colon centred more with obstruction to small intestine.

For these observations Lord Buddha** once consumed mild purgative through snuffing the lotus flower already soaked in purgative medicines. This process is testified in the *Caraka Samhita*. VII. I.19. The *marica* (*Piper nigrum*), *pippali* (*Piper longum*) and *sunthi* (*Zingibire officinale*) although tried in intestinal obstructions could not prove effective although drug-ingredients belong to the *Palandu* series. The properties such as aphrodisiac, diuretic, vermifuge, external rubefacient in action. stimulant to the skin, antipyretic, stimulant to gastro-intestinal tract, carminative flavouring agent, used in dyspepsia, flatulant colic, adjunct to many tonics, stomachic, salagogue, digestive stimulant, has been supplemented by the studies of the physico chemical ingredients in the *Palandu* series with the use of pulvis, decoctum, confection, pleoresina, syrups, tintureae, tabellae preparations as such with special reference to *Allium sativum* in this series of investigation (**)**.

Russian Botanist, Pavlov, reported that *Allium sativum* grew wilder in Central Asia exhibited the properties such as (i) invigoration and used in seasoning for foods, maintenance and stimulation of the health, mystic religion to protect the person from the evils, and as stimulant cum elixir of life. Although many physico-chemical ingredients for their actions in the intestinal obstructions with the fungi *Erysiphe taurica* Lev., *Alternaria palamundi* and *Rhizopus sp.* have been recognised in this series of investigation, the stimulation and vermifugicity cannot be ignored here because the garlic oil
from the bulb is supposed to be allin with the composition:

\[ CH_2-CH-CH_2-S-CH_2CH-(NH_3)-COOH. \]

The membrane originated aminase gives smell to the allin. The combination of allin and aminase gives rise to allicine:

\[ CS\bar{H}_5-S-SC\bar{H}_5. \]

which surpasses manifold activities of antibacteria as compared to penicilamine. The allicine possesses oxidising action with composite action on vitamins, proteins, stimulation towards digestive ingredients and ferment, bacteria thereby are destroyed. When combined with oxygen it converts into volatile diallyl disulphide and therefore is used immediately after its slicing. The glucoside from the Allium sativum possesses the scorginine or Allium scorobprasum which fetches properties equivalent to consumption of 65% water, 16% albumin, 5% Ca, 14% fat and is associated with small amounts of sugar in liver, blood and tissues. Hence it is beneficial for use as nutrient and health harmonising agents.

The SH radical in a deoxidising process combines readily with noxious elements introduced from the outside to neutralise and excrete them easily. The scorginine and a portion of this ingredient is metabolised inside the body and the sugar of the glucoside is hydrolysed and turned into scorgen, having fructulous acid and SH radical at both the ends. It ventilates the cells, various systems and organs and removes the detrimental products. The breath which delivers the smell of anything taken inside the mouth, circulates only through the mouth and lungs and never enters the stomach. As a result the smell of the Allium sativum is kept away from the teethlips, tongue and rest of the mouth's surface. For this reason the oblate is supposed to be most effective in the series. The essential oil absorbed into the circulation, is consumed, excreted through the lungs and bronchial mucosa, it acts as a good antiseptic and hence antispasmodic membranes are thus removed in many of the ailments. The juice is rich in organic bound S (organic sulphide), iodine, salicylic acid, vitamins etc. and therefore used as stimulant, carminative, vermifuge expelling roundworms, antiseptic and a tonic dyspeptic agent.

In addition to these physico-chemical observations the findings in the following chart clarifies the action of the allicin in the destruction of the worms which was not established through the rest of the Palando series mentioned in the ancient texts.
<table>
<thead>
<tr>
<th></th>
<th>Garlic</th>
<th>Chive</th>
<th>Welsher</th>
<th>Moly</th>
<th>Onion</th>
<th>Stone</th>
<th>Leck</th>
<th>Allium</th>
<th>Wild</th>
<th>Allium</th>
<th>Bakery</th>
<th>Allium</th>
<th>Grayi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schone</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Schone</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Methyl alllicin</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Methyl Allyl alllicin</td>
<td>(++</td>
<td>(-)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Methyl propyl-alllicin</td>
<td>(+</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Allicin</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Allyl propy alllicin</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Propyl alllicin</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
<td></td>
</tr>
<tr>
<td>Total amount</td>
<td>500</td>
<td>120</td>
<td>30</td>
<td>60</td>
<td>80</td>
<td>280</td>
<td>110</td>
<td>300</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Increases in the order (+), +, ++, ++++, +++++

(−) not found.

REFERENCES

1 Jyotir Mila, History of Indian Medicines from Pre-Mauryan to Kushan period, Varanasi, 1974, Chapt. I. p. 3.
   (ii) Cullavagga, 1956.
   (iii) Pacittiya, 1958.
   (v) Vinaya Piṭaka (The book of the discipline), Vols. I-IV. PTS.
   (ii) Majjhimaṅka, (I, II, III-1958)
   (iv) Khuddanikāya, I to VII. 1959.
Vedekar, R D., Milinda panho, Univ. of Bombay, 1940.
David, Rhys (Mrs.) ‘Dhammapada’ (The minor anthologies of the Pali canon.) Pt. I. SBB, London, 1931.
Law, B. C. ‘Carisapitaka’. (The minor anthologies of the Pali canon, Pt. III), PTS. 

Cowell, E. B. ‘Tātaka’. (the stories of the Buddha’s former birth(s), vols. I to IV and 
VII (Index) PTS, 1907. First edn. and reprint in 1969.

Davids, Rhys (Mrs). ‘Khuddakapatha’ (The minor anthologies of the Pali Canon, Pt. I) 
SBB. London, and also by the name the minor reading—translated by Bhikku 

Faushall, V. ‘Suttanipata’ SBE (X) 1898 and also by R. Chalmers, Harvard Oriental 
Series, Cambridge, 1932 and also by name of Woven cadences of Early Buddhists, 
EM. Hare SBB, London, 1944.

Davids, Rhys (Mrs). ‘Therigatha’ (Psalms of the early Buddhists, Psalms the sisters), PTS, 

Woodwards, F. L. ‘Udana’ (Verses of Uplifts), SBB. London, 1935 & also by D. M. 

Bhikku Jagdīsa Kasyapa. ‘Abhidhammapitaka’ Pali Pub. Board, Govt. of Bihar, 


Warren Henery Clarke, ‘Viśuddimagga’ by Buddhaghoṣa’ (A.D. 380-440) revised by 
Dharmananda Kausambhi, Harvard Oriental Series, Harvard University Press, 
Harvard.

Bhikku Nanamali. ‘Viśuddimagga’ (The Path of Purification), Colombo, Ceylon, 1956.


Vaidya, P. L. Divyavadāna Mithila Institute, Darbhanga, 1959.

Jacobi, H. Kalpasūtra of Bhadrabahu, SBE, XXII, Motilal Banarasidas, Delhi, 1964.


Chaudhari, Suryanarayan. Saundarāṇanda, Motilal Banarasidas, Delhi; 2026, V. E. X.


Lallani Gopal. History of Indian medicine from Premauryan to Kushan Period, 

Sharma, P. V. History of Indian medicine from Premauryan to Kushan Period, Intro- 

Ibid.

Jotir Mitra. Appendix No. 1 (a), 434. Medicinal plants referred to in Tripiṭaka 
(500 B.C.-56 A.D.) pp. 73-129.

Appendix No. 3 (A)-57 Medicinal plants referred to in Buddhacarita of Saundarananda 
of Aśwaghosa (1st. Cent. A. D. pp. 136-139.)

49 Medicinal plants in Bhadrabahu’s Kalpasūtra, I. 42.

Saundarananda. XIV. 40. ibid, XVI. 41.

Buhler, G. *Manusmrti* (The laws of Manu); SBE, XXV. Motilal Banarasidas, Delhi 1964.
18 18 18 18 19 20 21 22 Details as mentioned in above cited references.
34 Nadkarni, K. M. *Indian Materia Medica*, pp. 63. 64. 65—71. 350. 352. 359.
35 Watt, G. *Commercial Products of India*, 1908, 58.
37 Knott, J. E. *Vegetable Growing*, 1941. Fig. 56.
*Health Bulletin*, Delhi, No. 23, 1941, 31. 33