

CONTRIBUTION OF KAUTILYA ARTHASASHTRA TOWARDS DRAVYAGUNA, RASASASTRA AND BHAISHAJYAKALPANA BRANCHES OF AYURVEDIC MEDICINE

¹**GOLI PENCHALA PRASAD**, Research officer (Ay), ¹**G.C.BHUYAN**,
Research officer (Ay), ¹**V.NAGALAKSHMI**, Research Officer (Ay),
¹**G. BABU**, Research Officer (Ay.), ²**G. K. SWAMY**,
Assistant Director-in-charge
Regional Research Institut(Ay), Vijayawada – 520010.

³**UTTAMA VAIDYA SHRI PAMMI SATYANARAYANA SASTY**
Managing trustee of Dr. Achanta Lakshmi pathi Ayurveda library and Member
Ethical committee *Regional Research Institut(Ay), Vijayawada – 520010.*

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About the text:

It is believed *Kautilya*, whose name was *Vishnugupta* and is popular as *Chanakya* (The son of Chanaka) wrote *Arthashastra*. This article is mainly based on *Kautilya's Arthashastra*, translated by R. Shamasastri. In the preface of 1st to 5th edition of this text, the translator Dr. R. Shamasastri tried to clarify the uncertainty regarding the name of the author and the time of the text. Kamandaka and Dandi quotation support the time of this treatise some where between 321 and 300 B.C. These quotations also support the authorship of Vishnugupta. According to Kadambari, the author of *Arthashastra* was *Kautilya* and according to Manu and *Dharmasastras*, *Chanakya* had written this *Arthashastra*. Though there are some controversies regarding the name of the author and time of this text, translator R. Shamasastri tried his level best in providing proper support for naming this text as *Kautilya's Arthashastra* as the original available manuscript contains the name of *Kautilya* at the end of each of the hundred and fifty chapters of the work. Still there is controversy regarding the exact time of this text. If views of many scholars is considered, time of the text can be placed between 3rd century B.C. to 3rd century A.D. This translated original text contains 15 books (Basic discussions of the text), 150 chapters, 180 sections and 6000 *Slokas* (Thirty two syllables are considered as one *Sloka*).

A. DRAVYAGUNA (MATERIAMEDICA) RELATED DESCRIPTION

Season wide Plantation of Some Ayurvedic Herbs (Book-II, Chapter- XXIV):

Sali (a kind of rice), *Vrihi* (rice),
Kodrava (*Paspalum scrobiculatum*),

Tila (*Sesamum*), *Priyangu* (*Callicarpa macrophylla*), *Daraka* (?) and *Varaka* (*Phaseolus tribolus* (?)) are to be sown at the commencement (*Purvavapah*) of the rainy season.

Mudga (*Phaseolus mungo*),
Masha (*Phaseolus radiatus*), and *Saibya*

(?) are to be sown in the middle of the season.

Kusumbha (safflower), *Masura* (*Ervum hirsutum*), *Kuluttha* (*Dolichos biflorus*), *Yava* (barley), *Godhuma* (wheat), *Kalaya* (*Leguminus seseds*), *Atasi* (*Linum usitatissimum*), and *Sarsapa* (mustard) are to be sown towards the end of the season.

Cultivation of Medicinal Plants, Vegetables based on Water source, type of land etc., (Book-II, Chapter-XXIV)

Lands that are beaten by foam (*Phenaghatah*, i.e., banks of rivers, etc.) are suitable for growing *Valliphala* (pumpkin gourd and the like); lands that are frequently over flown by water (*Parivahanta*) for long pepper, grapes (*Mrdvika*), and sugar-cane; the vicinity of wells for vegetable and roots; low grounds (*Haraniptyanatah*) for green crops; and marginal furrows between any two rows of crops are suitable for the plantation of fragrant plants, medicinal herbs, cuscus roots (*Usinara*), *Hira* (?), *Beraka* (?), and *Pindaluka* (a type of tuber), and the like.

Such medicinal herbs as grown in marshy grounds are to be grown not only in grounds suitable for them, but also in pots (*Sthalyam*).

The seeds of grains are to be exposed to mist and heat (*tusharapayanamushnam cha*) for

seven nights; the seeds of *Kosi* are to be treated similarly for three nights; the seeds of sugar-cane and the like (*kandabijanam*) are to be plastered at the cut end with the mixture of honey, clarified butter, the fat of hog, and cow-dung; the seeds of bulbous roots (*Kanda*) with honey and clarified butter; cotton seeds (*Asthibija*) with cow-dung; and water pits at the root of trees are to be burnt and manured with bones and dung of cows on proper occasions.

The sprouts of seeds, when grown, are to be manured with a fresh haul of minute fishes and irrigated with the milk of *Snuhi* (*Euphorbia antiquorum*).

Types of *Candana* (Sandal wood) and their qualities (Book-II, Chapter-XI)

Satana is red and smells like earth, *Gosirshaka* is dark red and smells like fish; *Harichandana* is of the colour of the feather of the parrot and smells like tamarind or mango fruit likewise *Tarnasa*, *Grameruka* is red or dark red and smells like the urine of goat, *Daivasabyeya* is red and smells like lotus flower; likewise *Aupaka* (*Japaka*) *Jongaka* and *Taurupa* are red or dark red and soft *Maleyaka* is reddish white; *Kuchandana* is as black as *Agaru* (resin of the *Aquilaria agalocha*) or red or dark red and very rough; *Kalaparvataka* is of pleasant appearance; *Kosakara parvataka* (that which is the bud shaped product of that mountain) is black or

variegated black; *Sitodakiya* is black and soft, and smells like louts flower; *Nagaparvataka* (that which is the product of *Naga* mountain) is rough and is possessed of the colour of *Saivala* (*Vallisneria*) and *Sakala* is brown.

Light soft, moist (*Asyana*, not dry), as greasy as ghee, of pleasant smell, adhesive to the skin, of mild smell, retentive of colour and smell, tolerant of heat, absorptive of heat, and comfortable to the skin; are the characteristics of sandal (*Chandana*).

Types of *Agaru* (*Agalocham*) and their qualities (Book-II, Chapter-XI):

Jongaka is black or variegated black and is possessed of variegated spots, *Dongaka* is black and *Parasamudraka* is of variegated colour and smells like cuscus or like *Navamalika* (jasminum).

Agaru is heavy soft, greasy, smells far and long, burns slowly, gives out continuous smoke while burning, is of uniform smell, absorbs heat, and is so adhesive to the skin as not to be removed by rubbing; these are the characteristics of *Agaru*.

Types of *Taila Parnika* and their qualities (Book-II, Chapter-XI):

Asokagramika, the product of *Asokagrama*, is of the color of meat and smells like a lotus flower; *Jongaka* is reddish yellow and smells like a blue

lotus flower or like the urine of a cow; *Grameruka* is greasy and smells like cow's urine. *Sauvarnakudyaka*, product of the country of *Suvarnakudya* is reddish yellow and smells like *Matulunga* (*Citrus medica*); *Purnadvipaka*, the product of the island, *Purnadvipa*, smells like a lotus flower or like butter; *Bhadrasriya* and *Paralauhityaka* are of the colour of nutmeg; *Antaravatya* is of the color of cuscus-the last two smell like *Kushtha* (*Saussurea lappa*); *Kaleyaka*, which is a product of *Svarna Bhumi*, gold-producing land, is yellow and greasy; and *Auttara-parvataka* (a product of the north mountain) is reddish yellow.

Well known forest products having medicinal importance at the time of text (Book-II, Chapter-XVII):

Saka (teak), *Tinisa* (*Dalbergia ougeinensis*), *Dhanvana* (*Grewia tiliifolia*) *Arjuna* (*Terminalia arjuna*), *Madhuka* (*Madhuca indica*), *Tilaka* (*Wendlandia exerta*), *Tala* (palmyra), *Simsupa* (*Dalbergia sissoo*) *Arimeda* (*Acacia farnesiana*), *Rajadana* (*Manilkara hexandra*) *Sirisha* (*Albizia lebbek*) *Khadira* (*Acacia catechu*), *Sarala* (*Pinus longifolia*), *Talasarja* (sal tree or *Shorea Robesta*), *Asvakarna* (*Dipterocarpus turbinatus*), *Somavalka* (a kind of white *Khadira*), *Kosamra* (*Scheleichera oleosa*) *Priyaka* (yellow sal tree), *Dhava* (*Anogeissus latifolia*)etc., are trees of strong timber.

Utaja, *Chimiya*, *Chava*, *Venu*, *Vamsa*, *Satina*, *Kanaka*, *Bhalluka*, etc.,

form the group of bamboo.

Vetra (cane), *Sokavalli*, *Vasi* (*Justicia gendarussa?*), *Syamalata* (*Ichnocarpus?*), *Nagalata* (betel), etc., form the group of creepers.

Well known products which were grouped and stored for medicinal and other important purposes (Book-II, Chapter-XV):

Oils group (*Sneha Varga*):

Clarified butter, oil, serum of flesh, and pith or sap (of plants, etc.), are classified under oils (*Sneha*).

***Kshara Varga*:**

Decoction (*Phanita*), jaggery, granulated sugar, and sugar candy are termed *Kshara*.

***Lavana Varga* (Salts group):**

Saindava, that which is the product of the country of *Sindhu*; *Samudra*, that which is the product from sea water; *Bida*; *Yavakshara*; *Sauvarchala*- that which is the product of country of *Sauvarchala*; and *Udbhedaja*, that which is extracted from saline soil are termed as *Lavana*.

***Madhu Varga* :**

The honey of bee as well as juice extracted from grapes is called *Madhu*.

***Sukta Varga* :**

Mixture made by combining

any of the substances such as the juice of sugar cane , jaggery , honey , the juice of grapes , the essence of fruits of *Jambu* and of jacktree; with the essence of *Mesha Srunga* (*Gymnema sylvestre*) and long pepper , with or without the addition of the essence of *Chirbhita* (a kind of gourd) , cucumber sugar cane , mango fruit and the fruit of myrobalan, the mixture being prepared so as to last for a month , or six months or a year, constitute the group of astringents (*Sukta-Varga*) .

***Amla Varga* (Acid group):**

The fruits of those trees which bare acid fruits , those of *Karamarda* (*Carissa carandas*) , those of *Vidalamalaka* (myrobalan), those of *Matulunga*(*Citrus medica*), those of *Kola* (small jujuba), those of *Badara* (*Zizyphus mauritiana*), those of *Sauvira* (?), and those of *Parushaka* (*Grewia asiatica*) and the like come under the group of acid fruits. Curds, acid prepared from grains and the like are acids in liquid form.

***Katu Varga* (Pungent group)**

Long pepper, black pepper, ginger, cumin seed, *Kiratatikta* (*Swertia chirata*), white mustard, coriander, *Choraka* (*Angelica glauca*), *Damanaka* (*Artemisia indica*), *Maruvaka* (*Vangueria spinosa?*), *Sigru* (*Moringa pterigosperma*), and the like together with their roots (*Kanda*) come under the group of Pungent substances (*Katu varga*).

Saka Varga (Edibles):

Dried fish, bulbous roots (*Kandamula*), fruits and vegetables, form the group of edibles (*Sakavarga*).

Different groups of drugs and their modified quantities By Cooking, Soaking and Frying (Book-II, Chapter-XV):

Kodrava (Paspalam scrobiculatum), *Varaka* (Phaseolus trilobus?), *Udaraka* (Panicum), and *Priyangu* (Callicarpa macrophylla) tend to increase three times the original quantity when cooked. *Vrihi* (rice) increase four times when cooked. *Sali* (a kind of rice) increases four times when cooked.

Grains are expected to increase twice the original quantity when moistened, and two and a half times when soaked to sprouting condition.

Grains fried will increase by one-fifth the original quantity, leguminous seeds (*Kalaya*) when fried will increase twice the original; likewise rice when fried.

Quantities of Extracted oils of various seeds (Book-II, Chapter-XV):

Oil extracted from *Atasi* (linseed- *Linum usitatissimum*) will be one-sixth (of the quantity of the seed), that extracted from the seeds, *Nimba* (*Azadirachta indica*), *Kusamra* (?) and *Kapittha* (*Feronia elephantum*) will be

one-fifth, and oil extracted from *Tila* (sesamum), *Kusumba* (a sort of kidney bean), *Madhuka* (*Madhuca indica*), and *Ingudi* (*Balanite aegyptica*) will be one-fourth of the quantity of seed used.

B. BHAISHAJYA KALPANA (PHARMACY) RELATED DESCRIPTIONS

Liquor, its types, mode of preparation etc.

Liquor, its qualities, and restrictions regarding its use (Book-II, Chapter-XXV) :

With intake of liquor, workmen spoil the work in hand. *Aryas* violate their decency and virtuous character, and lest firebrands commit indiscreet acts. Liquor shall be sold to persons of well-known character in such small quantities as one-fourth or half a *Kudava* (approximately-100 gm. (2phalas)), one *Kudava*, half a *Prastha* (approximately 400gm.), or one *Prastha*. Those who are well known and of pure character may be allowed taking liquor out of the shop.

According to the text types of Liquor:

Medaka, *Prasanna*, *Asava*, *Arishta*, *Maireya*, and *Madhu* are the types of liquor.

Mode of preparation of different types of liquor and their qualities mentioned in this text

(Book-II, Chapter-XXIV): -

Medaka is manufactured with one *Drona* (According to Vaidya yoga ratnavali of IMPCOPS, 12.8 Kg.) of water, half an *Adhaka* (According to Vaidya yoga ratnavali of IMPCOPS, 3.2K.g) of rice, and three *Prasthas* of *Kinva* (ferment).

Twelve *Adhakas* of flour (*Pishta*), five *Prashtas* of *Kinva* (ferment), with the addition of Spices (*Jatisambhara*), together with the bark and fruits of *Putraka* (a type of tree), constitute *Prasanna*.

One hundred *Palas* (According to Vaidya yoga ratnavali of IMPCOPS one pala is approximately 50gm; According to formulary of India 48 gm.) of *Kapittha* (*Feronia elephantum*), 500 *Palas* of *Phanita* (sugar) and one *Prastha* of honey (*Madhu*) form *Asava*.

With an increase of one quarter of the above ingredients, a superior kind of *Asava* is manufactured; and when the same ingredients are lessened to the extent of one quarter each, it becomes of an inferior quality.

A sour gruel or decoction of the bark of *Meshasrngi* (*Gymnema sylvestre*) mixed with jaggery (*Guda*) and with the powder of long pepper and black pepper or with the powder of *Triphala* (3 Fruits namely *Terminalia chebula*, *Terminalia bellirica*, and

Phyllanthus emblica) form *Maireya*.

To all kinds of liquors mixed with jaggery, the powder of *Triphala* is always added. The juice of grapes is termed *Madhu*, based on its own native place (*Svadesa*) it can be called as *Kapisayana* and *Harahuraka*.

One *Drona* of either boiled or un-boiled paste of *Masha* (*Phaseolus radiatus*), three parts more of rice, and one *Karsha* (according to Vaidya yoga ratnavali of IMPCOPS 12.5 gm; according to formulary of India 12gm) of *Morata* (*Alangium hexapetalus*) form *Kinva* (ferment.).

In the manufacture of *Medaka* and *Prasanna*, five *Karshas* of the powder of each *Patha* (*Cissampelos pareira*), *Lodhra* (*Symplocos racemosa*), *Tejovati* (*Zanthoxylum alatum*), *Elavaluka* (*Prunus cerasus*), honey, the juice of grapes (*Madhurasu*), *Priyangu* (*Callicarpa macrophylla*), *Daruharidra* (*Berberis aristata*), black pepper and long pepper are added as *Sambhara* requisite spices.

The decoction of *Madhuka* (*Madhuca indica*) mixed with granulated sugar (*Katasarkara*), when added to *Prasanna*, gives a pleasing colour.

The requisite quantity of spices to be added to *Asava* is one *Karsha* of the powder of each of *Chocha* (bark of Cinnamon), *Chitraka* (*Plumbago*

zeylanica), *Vilanga* (*Embelia ribes?*), and *Gajapippali* (*Piper chaba*) and two *Karshas* of the powder of each of *Kramuka* (betel nut), *Madhuka* (*Madhuca indica*), *Musta* (*Cyperus rotundus*), and *Lodhra* (*Symplocos racemosa*).

The addition of one-tenth of the above ingredients i.e. *Chocha*, *Kramuka*, etc is termed as *Bijabandha*.

The same ingredients are added to *Prasanna* are also added to white liquor (*Svetasura*).

The liquor that is manufactured from mango fruits (*Sahakarasura*) may contain a greater proportion of mango essence (*Rasottara*) or of spices (*Bijottara*). It is called *Mahasura* when it contains *Sambhara* (spices as described above)

When a handful (*Antarnakho Mushtih* i.e. so much as can be held in the hand of the finger being so bent that the nails cannot be seen) of the powder of granulated sugar dissolved in the decoction of *Morata* (?), *Palasa* (*Butea monosperma*), *Datura* (*Datura metel*), *Karanja* (*Pongamia pinnata*), *Meshasrng* (*Gymnema sylvestre?*) and the bark of milky trees (*Kshira vrkshas*) mixed with one-half of the paste formed by combining the powder of *Lodhra* (*Symplocos racemosa*), *Chitraka* (*Plumbago zeylanica*), *Vilanga* (*Embelia ribes?*), *Patha* (*Cissampelos pareira*), *Musta* (*Cyperus rotundus*),

Kalaya (leguminous seeds), *Daruharidra* (*Berberis aristata*), *Indivara* (blue lotus), *Satapushpa* (*Anethum sowa*), *Apamarga* (*Achyranthes aspera*), *Saptaparna* (*Alstonia scholaris*) and *Nimba* (*Azadirachta indica*) is added to (even) a *Kumbha* (Approximately 1,064 phalas), it renders it very pleasant. Five Palas of *Phanita* (sugar) are added to the above in order to increase its flavor.

Some special formulations and their indications (Book-XV, Chapter-II)

Preparations, used in fasting: -

1) A dose of the powder of *Sirisa* (*Albizia lebbek*), *Udumbara* (*Glomerous fig-tree*), and *Sami* (*Prosopis cineraria*), mixed with clarified butter, renders fasting possible for half a month.

2) The scum prepared from the mixture of the root of *Kaseruka* (*Scirpus grossus*), *Utpala* (*Nymphaea stellata*), and sugar-cane mixed with *Bisa* (*Lotus*), *Durva* (*Cynodon dactylon*), milk, and clarified butter enables a man to fast for a month.

3) The powder of *Masha* (*Phaseo lus mungo*), *Yava* (barley), *Kulutta* (horsegram), and the root of *Darbha* (sacrificial grass- *Imperata cylindrica*), mixed with milk and clarified butter, the milk of *Valli* (a kind of creeper), and clarified butter derived from it, and

mixed in equal proportions, and combined with the paste prepared from the root of *Sala* (*Shorea robusta*) and *Prsniparni* (*Uraria picta*) when drunk with milk, or a dose of milk mixed with clarified butter and spirituous liquor, both prepared from the above substances, enables one to fast for a month.

Preparations, which alter colour of skin and hair: -

1) The oil prepared from mustard seeds previously kept for seven nights in the urine of a white goat will, when used (externally) after keeping the oil inside a large bitter gourd for a month and a half, alter the colour of both biped and quadruped animals.

2) The oil extracted from white mustard seeds mixed with the barley-corns contained in the dung of a white donkey, which has been living for more than seven nights on a diet of butter, milk and barley, causes alteration in colour.

3) The oil prepared from mustard seeds which have been previously kept in urine and fluid dung of any of the two animals, a white goat and a white donkey, causes (when applied) such white colour as that of the fiber of *Arka* (*Calotropis*) plant or the down of a (white) bird.

4) Whoever eats the mixture of the powder of the roots of *Kukkuta* (*Marsilia denta ta* ?), *Kosataki* (*Luffa acutangula*), and *Satavari* (*Asparagus*

racemosus) for a month will become white.

5) Whoever bathes in the decoction of *Vata* (Banyan tree) and rubs his body with the paste prepared from *Sahacara* (yellow barleria) becomes black.

4) A bitter gourd, a stinking insect (*Putikita*), and a white house lizard, when a paste prepared from these is applied to the hair, the latter becomes as a white as a conch shell.

Miraculous preparations :-

1) When the body of a man is rubbed over with the powder of charcoal of the bark of *Paribhadra* (*Erythrina indica*) mixed with the serum of the flesh of *Manduka* (a frog), it can be burnt with fire (without causing hurt).

2) When the body of a man is smeared over with *Sesamum* oil mixed with equal quantities of the serum of the flesh of a frog, crab, and other animals, it can burn fire (without hurt).

3) When a man makes a journey, wearing the shoes made of the camel's skin, smeared over with the serum of the flesh of an owl and a vulture and covered over with the leaves of the banyan tree, he can walk fifty *Yojanas* (ancient linear measurement) without any fatigue.

4) When the shoes are smeared over with the pith, marrow or sperm of the

birds, *Syana*(?), *Kanka*(?), *Kaka*(crow), *Grdhra*(eagle), *Hamsa*(Swan), *Krauncha*(?), and *Vichiralla*(?), (the traveler wearing them) can walk hundred *Yojanas*(ancient linear measurement) without any fatigue.

C. RASASHASTRA (Calcemical Medicine)RELATED DESCRIPTIONS: -

Names of different gems, their availability and qualities (Book-II, Chapter-XI)

Names of pearls and their availability:

Tamraparnika, that which is produced in the *Tamraparni*; *Pandyakavataka*, that which is obtained in *Pandyakavata*; *Pasikya*, that which is produced in *Pasa*; *Kauleya*, that which is produced in the *Kula*; *Chaurneya*, that which is produced in the *Churna*; *Mahendra*, that which is obtained near the mountain *Mahendra*; *Kardamika*, that which is produced in *Kardama*; *Srautasiya*, that which is produced in the *Sortasi*; *Hradiya*, that which is produced in (a deep pool of water known as) *Hrada*; and *Haimavata*, that which is obtained in the vicinity of the *Himalayas* are the varieties of pearls.

Inauspicious Pearl Qualities: -

Pearl which is like *Masura* (*Lens culinaris*), that which consists of three joints (*Triputaka*), that which is like a tortoise (*Kurmaka*), that which is

semi-circular, that which consists of several coatings, that which is double (*Yamaka*), that which is scratched, that which is of rough surface, that which is possessed of spots (*Siktakam*), that which is like the water-pot used by an ascetic, that which is of dark-brown or blue colour, and that which is badly perforated are inauspicious.

Auspicious Pearl Qualities: -

That which is big, circular, without bottom (*Nistalam*), brilliant, white heavy, soft to touch, and properly perforated is the best.

Identification of different Gems:

Gem which possess such pleasant colour as that of the red lotus flower, or that of the flower of *Parijata* (*Nyctanthus arbortristis*), or that of the rising sun is *Saugandhika* gem.

That which is of the colour of blue lotus flower, or of *Sirisha* (*Albizia lebbeck*) or of water, or of fresh bamboo or of the colour of the feather of a parrot is the *Vaidurya* gem; *Pushyara*,; *Gomutraka*, and *Gomedika* are other varieties of the same.

That which is characterized with blue lines, that which is of the colour of the flower of *Kalaya* (a kind of *Phaseolus*) or which is intensely blue, which possesses the color of *Jambu* fruit (rose-apple), or which is blue as the clouds is the *Indranila* gem; *Nandaka*

(pleasing gem), *Sravan Madhya* (that which appears to pour water from its centre). *Sitavrshiti* (that which appears to pour cold shower), and *Surya Kanta* (sunstone) are other forms of gems.

Qualities and defects of Gems: -

Gems are hexagonal, quadrangular, or circular, possessed of dazzling glow, pure, smooth, heavy, brilliant, transparent (*Antargataprabha*) and illuminating are the qualities of gems. Faint color, sandy layer, spots, holes, bad perforation, and scratches are defects of Gems.

Inferior varieties of Gems: -

Vimalaka (pure), Sasyaka (plant-like), Anjanamulaka (deep dark), Pittaka (like the bile of a cow), Sulabhaka (easily procurable), Lohitaka (red), Amrtamsuka (of white rays), Jyotirasaka (glowing), Maileyaka (colour of asafoetida), Acichchhatraka (procured in the country of Ahichchatra), Kurpa (sandy layer inside), Putikurpa (like honey comb), and Sugandhikurpa (like phaseolus), Kshirapaka (like milk), Suktichurnaka (like the powder of an oyster shell), Silapralalaka (like coral), Pulaka (dark inside), Sukrapulaka (white inside) are varieties of inferior gems.

Auspicious, inauspicious qualities of Diamond: -

The colour of diamond may be like that of cat's eye, that of the flower

of *Sirisha* (*Albizia lebbek*) the urine of a cow, the bile of a cow, like alum (*Sphatika*) the flower of *Malati* (*Jasminum* species?), or like that of any of the gems (described above).

Diamond, which is big, heavy, hard (*Praharasaham*, tolerant of hitting), regular (*Samakona*), capable of scratching on the surface of vessels (*Bhajanalekhi*), refractive of light (*Kubhrami*) and brilliant is the best. That which is devoid of angles, uneven (*Nirasrikam*), and bent on one side (*Parsvapavrttam*) is inauspicious.

Types and qualities of Coral: -

Ajakandaka and Vaivarnaka are (the two) varieties of coral, which is possessed of ruby-like colour, hard, and is free from contamination of other substances.

Identification of metals by examining the liquids that oozes from pits, caves, slopes or deep excavations of well-known mountains (Book-II, Chapter-XII): - Identification of Gold, Silver and Bitumen: - Liquids which have the colour of fruit of rose-apple (*Jambu*), of mango, and of fan palm; which are as yellow as ripe turmeric, sulphurate of arsenic (*Haritala*), honeycomb, and vermilion; which are as resplendent as petals of a lotus, or the feathers of a parrot or a peacock; which are adjacent to (any mass of) water or shrubs of similar colour; and which are greasy (*Chikkana*), transparent (*Visada*) and very heavy are

ores of gold (Kanchanika). Likewise liquids which, when dropped on water, spread like oil, to which dirt and filth adhere, and which amalgamate themselves more than cent percent (Satadupari Veddharah) with copper or silver.

Those ores which are obtained from plains or slopes of mountains; which are either yellow or as red as copper or reddish yellow; which are disjoined and marked with blue lines; which have the colour of black beans (*Masha*), green beans (*Mudga*), and sesamum; which are marked with spots like a drop of curd and resplendent as turmeric, yellow myrobalan, petals of a lotus, aquatic plant, the liver or the spleen; which possess a sandy layer within them and are marked with figures of a circle or a *Svastika*; which contain globular masses (*Sagulika*); and which when roasted do not split, but emit much foam and smoke are the ores of gold (*Suvarnadhatavah*).

Those ores which have colour of conch shell, camphor, alum, butter, a pigeon, turtle dove, *Vimalaka* (a kind of precious stone), or the neck of peacock; which are as resplendent as opal (*Sasyaka*), agate (*Gomedaka*), cane-sugar (*Guda*) and granulated sugar (*Matsyandika*); which has the colour of flower of *Kovidara* (*Bauhinia variegata*), of lotus, of *Patali* (*Stereospermum suaveolens*), of *Kalaya* (a kind of *Phaseolus*), of *Kshauma* (flax), and of *Atasi* (*Linum*

usitatissimum); which may be in combination with lead or Iron (*Anjana*); which smell like raw meat, are disjoined grey or blackish white, and are marked with lines or spots; and which, when roasted, do not split, but emit much foam and smoke are silver ores.

Of similar appearance as the above (*Tatpratirupakam*), but of piercing smell and taste, is Bitumen.

Identification of Copper: -

Those ores, which are obtained from plains or slopes of mountains; and which are heavy greasy, soft, tawny, green, dark bluish-yellow (*Harita*), pale red, or red are the ores of copper.

Identification of Lead: -

Those ores that have the colour of *Kakamechaka* (?), pigeon, or cow's bile, and which are marked with white lines and smell like raw meat are the ores of lead.

Identification of Tin: -

Those ores which are as variegated in colour as saline soil or which have the colour of a burnt lump of earth are the ores of tin.

Identification of *Tikshna* (Iron): -

Those ores that are of orange colour (*Kurumba*), or pale red (*Pandurohita*) or of colour of the flower of *Sinduvra* (*Vitex trifolia*) are the ores

of Tikshna (Iron).

Identification of Vaikranta: -

Those ores that are of colour of leaf of *Kanda* (?) or of leaf of birch are the ores of *Vaikrantaka*.

Identification of Precious stones: -

Pure, smooth, effulgent, sounding (when struck), very hard (*Sitativrah*), and of little colour (*Tanuraga*) are precious stones.

Removal of Impurities from Ores: -

The impurities of ores, whether superficial or inseparably combined can be got rid of when the metal is melted and when the ores are (chemically) treated with *Tikshna*(?), urine (*Mutra*), and alkalis (*Kshara*), and are mixed or smeared over with the mixture of the powder of *Rajavraksha* (Cassia fistula), *Vata* (*Ficus bengalensis*), and *Pilu* (*Salvadora persica*), together with Cow's bile and the urine and dung of a buffalo, an ass and an elephant.

Special procedure for making metals smooth: -

Metals are rendered soft when they are treated with (the powder of) *Kandali* (mushroom), and *Vajrakanda* (?) together with the ashes of barley, black beans, *Palasa* (*Butea frondosa*), and *Pilu* (*Salvadora persica*), or with the milk of both cow and sheep. Whatever metal is split into a hundred thousand

parts is rendered soft when it is thrice soaked in the mixture made up of honey (*Madhu*), *Madhuka* (*Madhuca indica*), sheep's milk, sesamum oil, clarified butter, jaggery, *Kinva* (ferment) and mushroom.

Permanent softness (*Mrdustambhana*) is also attained when the metal is treated with the powder of cow's teeth and horn.

DISCUSSION AND CONCLUSION:

In this text, which was translated by R. Sama Sastry, many Ayurvedic herbs were supported with suitable botanical names. Though they provide better understanding, some of these names differ from latest Ayurvedic books. Because of this, some botanical names have been changed by referring standard Ayurvedic books like P.V. Sarma Dravyaguna Vignan, Dravyaguna kosh; Indian medicinal plants of Warriar, Bhavap rakasa Nighantu (edited by Sri K.C. Chunekar) etc.

This text has many drugs, which are not known or cannot be found in latest Ayurvedic books. There is a need of research for proper identification of those ancient herbs with reference to modern botanical names. Planning of sowing different seeds in different seasons and knowledge of suitable timings for suitable herbs in the olden days is really amazing. There is a need of research in present era to find out

suitable timing for plantation of various Ayurvedic herbs. This text also deals with different soils, climates, which are suitable for cultivation of various herbs. Even today as many herbs are at the wedge of extinction, research on cultivation of medicinal plants, finding suitable soil and climates for those herbs is also needed. Medicinal plants classified under different *Vargas* (groups); that are available in forests; for future usage shows the foresight of ancient scholars.

There are many innovative measures and methods in preparation of different types of alcohols which can also be considered as supportive information to *Bhaisajya Kalpana* branch of Ayurvedic system of medicine. Some miraculous preparations and methods to change the color of the skin, to travel long distances without fatigue, to fast for

months without any side effects and hunger etc., which have scope for research

Identification of metals by observing the liquids oozing out from pits, caves and slopes is really an area of research not only for the branch of *Rasasastra* of Ayurvedic medicine but also to the modern geologists. Knowledge on different gems their qualities; purification methods of ores, smoothening of metals etc. Literature of this text can also be considered as a supportive information to ancient *Rasasastra* branch of Ayurvedic medicine. It can be concluded that this is an ancient text with important medical literature and enormous scope for further study and research in various fields like herbal cosmetics, standardization etc.

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