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Notes

रसरत्नसमुच्चयः
अथ नवमोऽध्यायः

यन्त्रनिरूपणम्

अथ यन्त्राणि वक्ष्यन्ते रसतन्त्राण्यशेषतः ।
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धूपयन्त्रम्

विधायाष्टाङ्गुलं पात्रं लोहमष्टाङ्गुलोच्छयम्।
कण्ठाधो ह्यङ्ग गुले देशे गलाधारे हि तत्र च ॥ 68 ॥
तिर्यक् लोहशलाकाश्च तन्वीस्तिर्यग् विनिक्षिपेत्।
तनूनि स्वर्णपत्राणि तासामुपरि विन्यसेत् ॥ 69 ॥
पत्राधो निक्षिपेद्धूमं वक्ष्यमाणमिहैव हि।
तत्पात्रं न्युब्जपात्रेण छादयेदपरेण हि ॥ 70 ॥
मृदा विलिप्य सन्धिं च बह्निं प्रज्वालयेदधः।
तेन पत्राणि कृष्णानि हतान्युक्तविधानतः ॥ 71 ॥
रसश्चरति वेगेन द्रुतं गर्भे द्रवन्ति च।
धूययन्त्रमिदं प्रोक्तं जारणाद्रव्यसाधनम् ॥ 72 ॥
धूपनं स्वर्णपत्राणां प्रशस्तं परिकीर्तितम्।
तारार्थं तारपत्राणि मृतवंगेनधूपयेत् ॥ 73 ॥
धूपयेच्च यथायोग्यरन्यैरुपरसैरपि।

कन्दुकयन्त्रम्

स्थूलस्थाल्यां जलं क्षिप्त्वा वासो वद्ध्वामुखेदृढम् ॥ 74 ॥

तत्र स्वेद्यं विनिक्षिप्य तन्मुखं प्रपिधाय च।
अधस्ताज्ज्वालयेदग्निं यन्त्रं तत्कन्दुकाभिधम्॥ 75॥
स्वेदनीयन्त्रमित्यन्ये प्राहुश्चेदं मनीषिभिः।

द्वितीयकन्दुकयन्त्रम्

यद्वा स्याल्यां जलं क्षिप्त्वा तृणं क्षिप्त्वा मुखोपरि॥ 76॥
स्वेद्यद्रव्यं परिक्षिप्य पिधानं प्रपिधाय च।
अधस्ताज्ज्वालयेदग्निं यन्त्रं तत्कन्दुकं स्मृतम्॥ 77॥

खल्वयोग्यशिला

खल्लयोग्यशिला नीला श्यामा स्निग्धा दृढा गुरूः।

खल्लप्रमाणम्

षोडशाङ्गुलकोत्सेधा नवाङ्गुलकविस्तरा॥ 78॥
चतुर्विंशाङ्गुला दीर्घा घर्षणी द्वादशाङ्गुला।
विंशत्यङ्गुलदीर्घा वा स्यादुत्सेधे दशाङ्गुला॥ 79॥
खल्लप्रमाणं तज्ज्ञेयं श्रेष्ठं स्याद्रसकर्मणि॥ 80॥

खल्लयन्त्रप्रकारा

खल्लयन्त्रं त्रिधा प्रोक्तं रसादिसुखमर्दने।
निरुद्गारौ सुमसृणौ कार्यौ पुत्रिकया युतौ॥ 81॥

नौकाकृतिखल्लः

उत्सेधे तु दशाङ्गुलः खलु कलातुल्याङ्गुलायामवान्।
विस्तारेण दशाङ्गुलो मुनिमितैर्निम्नस्तथैवाङ्गुलैः॥
पाल्यां ह्यङ्गुलविस्तरश्च मसृणोऽतीवार्धचन्द्रोपमः।
घर्षो द्वादशकाङ्गुलश्च तदयं खल्लो मतः सिद्धये॥ 82॥
अस्मिञ्जपञ्चपलः सूतो मर्दनीयो विशुद्धये।
तत्तदौचित्ययोगेन खल्लेष्वन्येषु योजयेत्॥ 83॥

वर्तुलखल्लः

द्वादशाङ्गुलविस्तारः खल्लोऽतिमसृणोपलः।
चतुरङ्गुलनिम्नश्च मध्येऽतिमसृणीकृतः॥ 84॥
मर्दकश्चिपिटोऽधस्तात्सुग्राह्यश्च शिखोपरि।
अयं हि वर्तुलः खल्लो मर्दनेऽतिसुखप्रदः॥ 85॥

तप्तखल्लः

लौहो नवाङ्गुलः खल्लो निम्नत्वे च षडङ्गुलः।
मर्दकोऽष्टाङ्गुलश्चैव तप्तखल्लाभिधोऽप्ययम्॥ 86॥
कृत्वा खल्लाकृतिं चुल्लीमङ्गारैः परिपूरिताम्।
तस्यां निवेश्य तं खल्लं पार्श्वे भस्त्रिया धमेत्॥ 87॥
तदन्तर्मर्दिता पिष्टिः क्षारैरम्लैश्च संयुता।
प्रद्रवत्यतिवेगेन स्वेदिता नात्र संशयः॥ 88॥

कान्तायसखल्लस्य वैशिष्ट्यम्

कृतः कान्तायसा सोऽयं भवेत्कोटिगुणो रसः॥ 89॥

इतिश्री वैद्यपतिसिंहगुप्तस्य सूनोर्वाग्भटाचार्यस्य कृतौ रसरत्नसमुच्चये यन्त्रनिरूपणं नाम नवमोऽध्यायः।

RASA RATNA SAMUCCAYA

NINTH CHAPTER

ENGLISH TRANSLATION

After studying all the Rasa Tantra texts critically the various apparatuses invented by the highly expert scholars (alchemists) taking all possible care, are being mentioned here precisely by Soma Deva to perform *Svedana* (heating through liquids/vapours) procedures. (1-1½).

Yantra Nirukti:

These are known *Yantras* as these can control/restrict mercury drugs while precessing. (2)

Dolā Yantra:

Fill the pot to its half with the prescribed liquid. Make two holes/openings carefully at the neck of the pot. Fix a rod in the holes, suspend *Rasa-poṭṭalī* (bundle containing mercury & other drugs) in the middle of the rod and apply heat through boiling liquid. The assembly is known as *Dolā Yantra*. (3,4).

Svedanī Yantra:

Tie a cloth over the mouth of the pot containing prescribed liquids. Place the material to be subjected to heating on the cloth. Cover the material and apply heat to the pot from down. It is known as *Svedanī Yantra*. (5).

Pātana Yantra:

Take a pot having the width of eight *aṅgulas* and the length of ten *aṅgulas*. Prepare a *Toyādhāra* (water tank) having the height of four *aṅgulas* below the neck of this upper pot. Insert the mouth of the lower pot into the mouth of the upper pot which was sixteen *aṅgulas* width *pṛṣṭha deśa* (back surface), in such a way that it fixes in it tightly. Seal the joint by applying a paste made of *Cūrṇa* (lime powder), *Maṇḍūra* (iron oxide/rusted iron). *Phāṇita* (jaggery) and *Mahiṣī Kṣīra* (buffalo milk) and dry it. Fill the water in the *Toyādhāra* (water tank) prepared on the back surface of the upper pot. Place the assembly on the *culhi* (furnace) for applying heat. This is known as *pātana yantra*. (6-8).

Adhaḥpātana Yantra:

Apply the paste of mercury on the inner surface of the upper pot. Keep the lower pot in water. Apply heat through burning cowdung cakes over the upper pot. In this way *Adhaḥpātana* (down ward sublimation) could be done taking due care of the apparatus. (9).

Tiryak Pātana Yantra:

Put mercury in a long pot which is fitted with a tube transversely. The other end of the tube should be attached to the other pot, cover the mouth of both the pots and seal their joints with cloth and clay. Apply strong heat to the pot containing mercury from beneath. The other pot should contain pure cold water. The experts of *Rasa Śāstra* call it *Tiryakpātana Yantra*. (10-12).

Kacchapa Yantra:

Place a shallow bowel shaped lower half of a pot (like begger's bowl) over the pot filled with water. Place a *mūṣa* (crucible) containing mercury covered all around with *viḍadravya* in the bowel shaped half pot. Cover it with small iron cup, seal the joints with a cloth immersed in mud and allow it to dry. Apply heat through *khadira* and *kola aṅgāra* (burning charcoal) inside the bowel.

This *kacchapa yantra* helps to consume and assimilate *dhātu-satvas* on being subjected to *svedana* and *mardana* etc. processes. In this way all the *Satvas* get liquified inside mercury by the effect of heat (13-15).

Dīpikā Yantra:

Prepare an earthen platform inside the *kacchapa yantra*. Place a *dīpikā* (small shallow earthen lid) containing mercury over it. Cover it (*dīpikā*) and seal the joint. Apply heat as said above. In this way mercury sublimes down-ward in the *kacchapa yantra* and it is known as *dīpikā yantra*. (16).

Dhekī Yantra:

Insert a bamboo tube in a hole made just below the neck of the earthen pot. Fix the other end of the tube in a *kāṃsya saṃpuṭa* (made of two bell metal vessels) containing water. Seal both the joints tightly. Mercury associated with prescribed drugs should first be kept in the earthen pot. This mercury when heated with fire starts distilling into the water through the tube. The distillation process continues till the whole vessel remains hot. This is known as *Ḍhekī yantra*. (17-19).

Jāraṇa Yantra:

Prepare two mūṣās of twelve *aṅgula* size. Put sulphur in one *mūṣā* containing a small hole. Keep it in the second *mūṣā* containing mercury. Put the mercury containing *mūṣā* in water. Apply heat from both sides i.e. from lower and upper sides. Filter the juice of *Rasona* (garlic) with a cloth and add it in sufficient quantity with mercury and sulphur carefully. Keep these in a *sthālī* over it. Seal the joint with cloth and clay properly. Apply mild heat through the *Kapota puṭa* to the upper *sthālī* and apply medium or strong heat from downwards to the apparatus. Continue the heating for 3 days and then separate the apparatus. Don't do the cooling while the furnace or the

water is hot. By this process neither there is a loss of mercury nor it goes any where as fumes. In this way *Gandhakā-jāraṇa* can be done. (20-26).

Vidvādhara Yantra:

Joining and sealing of two wide mouth pots over each other is known as *Vidyādhara Yantra*. Make a furnace having four openings. Place the pot of the apparatus over it. Keep the drug in it and close its mouth with another pot. This is described as *Vidyādhara yantra* by the experts of *Rasa Śāstra*. (27-28).

Somānala Yantra:

Here fire is kept above, water is kept below and the mercury is kept in-between. This is known as *somānala yantra*. By this apparatus *Jāraṇa* (consumption and assimilation) of *Abhraka* etc. is done in mercury. (29).

Garbha Yantra:

Garbha yantra is being described here for converting the *piṣṭi* of *pārada* into the ashes. For this prepare a strong *mūṣā* with the *mṛt* (soil) having a length of four *aṅgulas* and the breadth of one *aṅgula*. Its mouth should be to fill the material (paste of mercury). Wrap the *mūṣā* tightly again and again with the paste prepared with twenty parts of salt, one part of *guggulu*, half part of soil to salt (i.e. 10 parts) for 1-3 days. Apply mild heat to it through *Tuṣāgni* (husk fire) over the earth for 1 or 3 days. By this method mercury gets converted to ashes. (30-33).

Haṃsapāka Yantra:

Take a shallow earthen vessel, fill it with sand. Place another such vessel over the sand. Put 5 types of *Kṣāras*, various types of *Mūtras*, *Lavaṇas* and *Viḍa-dravyas* in it. Apply mild heat to it. This is known as *Haṃsapāka Yantra*. (34-35).

Vālukā Yantra:

Take a narrow mouth and long neck glass bottle, wrap it with cloth and clay in one aṅgula thickness, allow it to dry. Fill this glass bottle with the drug upto one third. Place it in a pot filled with sand at the depth of one *vitasti* (9"), fill the empty portion of the pot with sand upto ¾th of the bottle. Cover the mouth of the pot with suitable earthen lid. Seal the joint with clay and cloth. Place the entire apparatus on the furnace and heat it till a grass piece kept over the lid of the apparatus starts burning. This is known as *Vālukā yantra*. (36-38).

Another Vālukā Yantra:

There is a description of another *Vālukā yantra* also. For this five *āḍhakas* (approx. 20 kg) of sand is filled in the pot and a ball made of mercury etc. is placed in the middle of the sand and applied heat. This is also known as *Vālukā yantra*. (39).

Lavaṇa Yantra:

If '*Lavaṇa*' (salt) is used in place of '*Vālukā*' (sand), then that is known as '*lavaṇa yantra*'. (40).

Second Lavaṇa Yantra:

Anoint a paste of mercury prepared with prescribed drugs in-side a copper vessel. It should be placed in the base of another earthen pot, making its mouth down. Seal the joint with soil and salt. Fill the earthen pot containing mercury vessel either with salt or *kṣāra* and apply heat from below just like *Vālukā yantra*. This *Lavaṇa yantra* is considered best for mercurial operations. (41-42).

Nālikā Yantra:

An iron tube filled with mercury is kept in a pot filled with *lavaṇa* (salt), close it and heat it as per the method mentioned for *Vālukā Yantra*. This is known as *Nālikā Yantra*. (43).

Bhūdhara Yantra:

Dig a *garta* (pit) in the ground. Place mercury containing *mūṣā* in it and cover it all around with sand. Apply heat from above with burning cowdung cakes. This is known as *Bhūdhara yantra*. (44).

Puṭa Yantra:

Mercury or any other drug closed in a *Sarāva Saṃpuṭa* (a union of two shallow earthen lids) is put inside the furnace of cowdung cakes to apply heat for two *yāma* or as required is known as *puṭa yantra*. (45).

Koṣṭhikā Yantra:

Furnace having the width of sixteen aṅgulas and length or height of one *hasta* and uniform from all sides is known as *Koṣṭhikā yantra*. It is used for extracting the *satva* (metal content) from the *dhātus* (ores).

Fill good quality charcoals in the furnace and blow air in sufficient quantity through the lower opening for burning the fire.[1] (46).

Valabhī Yantra:

Prepare an iron vessel with two circular rings fitted on its sides. Prepare another small iron vessel of same design. Fix it on the circular rings of the first vessel and place it over bigger pot. (47). Put the *mūrcchita rasa* (finely divided mixture of mercury) in the small vessel and fill the large vessel with *kāñjī* (acidic liquid). (48). Apply *svedana*

(heat) to *mūrcchita* mercury by this way for 6 hours. This is done to regain mercury into its original form. This is known as *valabhī yantra* and it helps to make 6 fold potentiation of mercury. If the vessel is made from best variety of *kānta loha* (magnetic iron) then much more potentiation of mercury is possible or expected. (49-50).

Pālikā Yantra:

Round iron cup having a long handle curved at its upper end is known as *Pālikā yantra*. It is meant for *bali jāraṇa* (burning of sulphur in mercury) purpose. (51).

Ghaṭa Yantra:

A pot of four *Prastha* capacity and having a four aṅgula wide mouth is known as *Ghaṭa Yantra*. It is also known as *Āpyāyana*. (52).

Iṣṭikā Yantra:

Make a round *garta* (hole) on the ground, place a *śarāva* (an earthen shallow vessel) on it. Keep a good quality brick having a cavity in its centre in the *śarāva*. (53). Built a wall of one *aṅgula* height around the cavity on the brick. Put mercury in the cavity and cover the mouth of the cavity with a cloth piece. (54). Keep sulphur over the cloth and close the cavity with well-fitting *malla* (shallow earthen vessel) and seal the joint with cloth and clay carefully and apply *kapota puṭa* heat using *vanyo palas* (cow-dung cakes obtained from the forest). This is known as *Iṣṭikā Yantra*. It is used for *Gandhaka Jāraṇa*. (55-56).

Hiṅgulā Kṛṣṭi Vidyādhara Yantra:

Place a *sthālī* (earthern pot of round bottom and wide mouth) over another *sthālī*. Cover it and seal its joints well. Fill water in the upper *sthālī*. Apply fire to lower *sthālī* from beneath. This is known as *Vidyādhara Yantra*. It is meant for extracting mercury from *Hiṅgula* (56-57).

Ḍamaru Yantra:

Put one *sthālī* inversely (upside down) over the other *sthālī* in such a way that the mouth of both the pots come in a close proximity. Seal the joint tightly. This is known as *Ḍamaru Yantra*. It is good for making *rasa bhasma*. (58).

Nābhi Yantra:

Make a *garta* (cavity like structure) in the middle of the *śarāva* (shallow earthen lid). Put mercury with sulphur in it and built a wall of one *aṅgula* height around the cavity. Cover it with a *gostanākāra mūṣā* (cow's *udar* like crucible) and seal the joint with *to yamṛt* to be mentioned later and allow it to dry. Fill water in the *śarāva* and apply fire from downwards. This is known as *Nābhi-Yantra* mentioned by the learned

scholar *Nandi*. By this method pure sulphur gets *Jirṇa* (digested) in mercury without producing fumes. (59-61).

Toyamṛttikā:

Fine powder of decayed *maṇḍūra* (rusted iron) mixed with *guḍa* (molases) and *cūrṇa* (lime stone) and ground well with concentrated *babbūla kvātha* (decoction of acacia indica) is known as *Toyamṛttikā*. This is claimed to be impermeable to water. (62).

Vahnimṛttikā:

Fine powder of *khaṭī* (chalk),*lavaṇa* (salt) and *maṇḍūra* (rusted iron) when ground well with buffalo milk is known as *vahnimṛttikā*. It can resist intense heat. Mercury restricted/sealed by this mixture (*vahnimṛttikā*) can not escape even as vapours just like a man bound tightly in an ardent love of lustful mature young lady, no one else than *Nandi*. Nāgārjuna, Brahmajyoti, Munīśvara and Somadeva knows it (*vahnimṛtsnā*) on the earth. (63-65).

Grasta Yantra:

Insert one *mūṣā* inside the other *mūṣā*, whose body is uniformly round from lower end to upper end and whose bottom is flat. This is known as *Grasta Yantra* by the scholars. Experts of *Rasa Śāstra* have mentioned it for enclosing/encapsulating mercury. (66).

Sthālī Yantra:

Place copper etc. metals in a *sthālī*, cover its mouth with a *malla* (half earthen pot), seal the joint and apply fire from beneath. This is known as *sthālī yantra*. (67).

Dhūpa Yantra:

Prepare an iron pot of eight *aṅgulas's* breadth and height. Arrange to keep the long and thin iron rods transversely across the *Galādhāra* made one *aṅgula* below the neck of the pot. Place thin gold sheets/leaves on the rods. Put prescribed *dhūma dravyas* to be described later in the bottom of the iron pot below the iron rods. Cover the iron pot with another same type of pot keeping its mouth down. Seal the joint with cloth and clay and apply fire from beneath to this assembly. Gold leaves so treated turn black and get reduced to ashes. Such gold will be consumed readily by mercury and quickly get liquified. This is known as *Dhūpa yantra* which is useful for the preparation of *Jāraṇa dravyas* (68-72).

Dhūpana Dravyas:

Gandhaka, Tālaka, Manaḥśilā, Kajjalī and *Nāga-bhasma* are the *dhūpana dravyas* mentioned for *svarṇapatras*.

For making silver, *Tārapatras* are to be subjected to *dhūpana* with *vaṅgabhasma*. In the same way other *uparasas* may also be used for *dhūpana karma* as per suitability. (73).

Kanduka Yantra:

Fill water in a strong *sthālī* (wide mouth earthen pot). Tie a cloth on its mouth. Place *svedya* dravyas (materials to be subjected to svedana) over it and close its mouth and seal. Apply fire from beneath. This is known as *kanduka yantra*. Other scholars described it as *svedanī yantra*. (74, 75).

Second type:

Fill water in a *sthālī*. Place the dried grass on its mouth and keep *svedana dravyas* over the grass. Close the mouth of the pot and apply fire from beneath. This is also known as *Kanduka yantra*. (76-77).

Khalva Yantra:

For making *khalva yantra* blue, black, smooth, hard/strong and heavy stones are suitable. Ordinarily, *Khalva yantra* should have sixteen *aṅgulas* height, nine *aṅgulas* breadth, and twenty four *aṅgulas* length, or twenty *aṅgulas* length and ten *aṅgulas* height. Its pestle should also be of twelve *aṅgulas* height. These are the measurements of the *khalva yantra*, which is considered best for being used in mercurial operations. (78-80).

Types of Khalva Yantra:

Three types of *khalva yantra* are mentioned for doing the grinding of mercury comfortably.

All the *khalva yantras* should be smooth and free from unevenness and should have pestles. (81).

Ardhacandrākāra khalva Yantra (Boat shaped/semilunar mortar):

This semilunar type mortar should have ten *aṅgulas'* height, ten *aṅgulas* length. ten aṅgulas breadth and seven *aṅgulas* depth. Its surrounding margins should be of 2 *aṅgulas* in breadth. It should be smooth and very much semilunar in shpae. Its pestle should be of twelve *aṅgula* in size. Such *khalva yantra* is considered best for achieving success in all the operations. (82).

In this 5 *palas* (250 grams) of mercury can be ground for *śodhana*. The other suitable *khalva yantras* may be used according to the need. (83).

Vartule Khalva Yantra (Round mortar):

This should be made from very smooth stone. It should have twelve *aṅgulas* breadth and four *aṅgulas* depth. Its lunar surface should be made very smooth. Pestle should have a flat base and comfortable handle or upper end. This is known as *vartula khalva* (round mortar). It is very comfortable for grinding. (84-85).

Tapta Khalva:

Tapta khalva should be made of iron, should have nine *aṅgulas* breadth and six *aṅgulas* depth. Its pestle should be of eight *aṅgula* in size. This is known as *tapta khalva* (86).

Method for its use:

Make a small furnace suitable for *khalva*. It should be filled with burnt charcoal or goats feces or *tuṣa* and place *khalva* to be made *tapta* on it. Blow it from sides slowly to burn the fuel. (87).

Use of 'Tapta Khalva':

Piṣṭi triturated in this hot mortar along with *kṣāra* and *amla* gets liquified quickly, beyond any doubt. (88).

If the *tapta khalva yantra* is made from *kāntaloha* it helps to make mercury potentiated million times more. (89).

NOTES ON THE CHAPTER NINTH

This chapter deals with various *Yantras* (apparatuses) recommended for different pharmaceutical operations. The chapter starts with the definition of *Yantra* and according to this the term *Yantra*, used in this contexts is exclusively restricted for the apparatuses recommended for mercurial operations only. But, in general sense the term *Yantra* refers to all kinds of apparatuses used for all types of pharmaceutical operations.

In this text though, 36 *yantras* (apparatuses) have been described this does not mean that there only 36 *yantras*. There are many more *yantras* for which references are seen in other *Rasa* Texts.

From description point of view all the *yantras* described in this text may broadly be classified into two major groups on the basis of their usefulness, viz.

I. *Yantras* useful for mercurial operations.

II. *Yantras* useful for other pharmaceutical operations.

I. *Yantras* useful for mercurial operations

The first group may again be subdivided into following sub-groups, viz.

A. *Yantras for Svedana Karma:*

1. *Dolā yantra*, 2. *Svedinī Yantra*, 3. *Kenduka Yantra* and 4. *Valabhī Yantra*.

B. *Yantras for Mardana Karma:*

1. *Khalva Yantra* and its types, 2. *Taptakhalva Yantra*, 3. *Silāpaṭṭa* with *Mardaka*.

C. *Yantras for Pātana Karma:*

1. *Ūrdhvapātana Yantra*, 2. *Adhaḥpātana Yantra, 3. Tiryakpātana Yantra*, 4. *Ḍamaru Yantra*, 5. Vidhyādhra Yantra, 6. *Kinnara Yantra*.

D. *Yantras for Tiryak-Pātana Karma:*

1. *Tiryak-Pātana Yantra*, 2. *Dīpikā Yantra, 3. Ḍhekī Yantra*, 4. *Siddhasāra Yantra*, 5. *Garbhasāra Yantra*, 6. *Vāruṇī Yantra*.

E. *Yantras for Grāsa Jāraṇa Karma:*

1. *Kacchapa Yantra*, 2. *Jalakūrma Yantra*, 3. *Haṃsapāka Yantra*, 4. *Somānala Yantra*, 5. *Dhūpa Yantra*, 6. *Tapta Khalva Yantra*, 7. *Antarālika Yantra*.

F. *Yantras for Sāraṇa Karma:*

1. *Sāraṇa Yantra*.

G. *Yantras for Gandhaka Jāraṇa Karma:*

1. *Bālukā Yantra*, 2. *Tulā Yantra*, 3. *Iṣṭikā Yantra*, 4. *Pālikā Yantra*, 5. *Sthalakūrma Yantra*, 6. *Jalakūrma Yantra*, 7. *Jāraṇa Yantra*, 8. *Nābhi Yantra*, 9. *Koṣṭhī Yantra*, 10. *Antarālika Yantra*.

H. *Yantras for Rasabhasmīkaraṇa Karma:*

1. *Garbha Yantra, 2. Damaru Yantra*, 3. *Bālukā Yantra*, 4. *Lavaṇa Yantra*, 5. *Bhasma Yantra*, 6. *Puṭa Yantra*, 7. *Bhūdhara Yantra*, 8. *Nalikā Yantra*.

II. Yantras used for other pharmaceutical operations

This group may also be subdivided into following subgroups, viz.

A. *Taila Pātana Karma*

1. *Pātāla Yantra*, 2. *Ākāśa Yantra.*

B. *Satvapātana Karma*

1. *Jyoti Yantra*, 2. *Vāruṇī Yantra*, 3. *Sādhya Yantra*, 4. *Ḍamaru Yantra*, 5. *Koṣṭhī Yantra*, 6. *Aṅgāra Koṣṭhī Yantra*, 7. *Pātāla Koṣṭhī Yantra.*

C. *Śodhana Karma*

1. *Dolā Yantra*, 2. *Khalva Yantra*, 3. *Pātana Yantra*. 4. *Kaṭāha Yantra*, 5. *Darvī Yantra*, 6. *Piṭhara Yantra*, 7. *Mūṣā Yantra.*

D. *Māraṇa Karma*

1. *Puṭa Yantra*, 2. *Bālukā Yantra*, 3. *Lavaṇa Yantra*, 4. *Bhasma Yantra*, 5. *Ḍamaru Yantra*, 6. *Kaṭāha Yantra.*

E. *Anya Karmas (Miscellaneous purposes)*

1. *Ghaṭa Yantra*, 2. *Sthālī Yantra*, 3. *Culhī Yantra*, 4. *Cakra Yantra*, 5. *Kūpī Yantra* etc.

Description of yantras

Here only those *yantras* will be discussed about which either different types of descriptions are available in different texts or where some addition, alternation or modification is seen with regards to their description or construction.

1. *Dolā Yantra:*

It is described in *Rasa Ratna Samuccaya*, *Rasa-Kāmadhenu* and in the commentry of *Rasendra Cintāmaṇi* with little difference. It is named as *Dolā yantra*, because in this *yantra*, *Rasa Poṭṭalī* or *Auṣadha Poṭṭalī* is hung or suspended like a *dolā* (swing) inside or over the liquid (boiling liquid). Here the point of difference is about the position of the *poṭṭalī* inside the *yantra*. Some scholars mention that the *Rasa/Ausadhi Poṭṭalī* should be immersed into the liquid but should not touch the bottom of the pot while others are silent on this point. In the commentry on *Rasendra Cintāmaṇi* it is clearly mentioned that it should get *svedana* (heat-treatment) through liquid bath. The advantage of this method is that there the drugs directly come into the contact of the boiling liquid which helps to make the drugs soft and then allow the impurities of the softened drugs to be dissolved into the liquids. This is the most common apparatus for applying *svedana* (heat treatment) to the drugs for their purification.

2. *Khalva Yantra:*

The *Khalva yantras* are described in *Rasendra Cūḍāmaṇi, Rasa Ratna Samuccaya* and *Rasa Kāmadhenu*. Its types are based on its shape and the materials used for its construction.

a. On the basis of shape:

i. *Ḍroṇīrūpa Khalva* (Boat shaped)
ii. *Vartula Khalva* (Round shaped)

b. On the basis of materials used for:

i. *Loha Khalva-Sāmānya Loha- Kānta Loha*
ii. *Pāṣāṇa Khalva*
iii. *Mṛṇmaya Khalva*

2.1 *Dimensions of Khalvas as per Different Texts*

According to *Rasendra Cūḍāmaṇi* the height of an ordinary *khalva* should be 9 *aṅgulas*, length — 16 *aṅgulas*, breadth — 9 *aṅgulas*, depth — 6 *aṅgulas* and the neck thickness — 2 *aṅgulas*. *Raṣa Prakāśa Sudhākara* followed *Rasendra Cūḍāmaṇi* as regards the height, length and depth and added there the dimention of *pṛṣṭhatala vistāra* ie. 2 *aṅgulas*. But, as per *Rasa Ratna Samuccaya* its height should be 16 *aṅgulas*, breadth 9 *aṅgulas* and length 24 *aṅgulas*. It further mentions about the dimension of *Gharṣaṇī* (pastle) which should be either 12 *aṅgulas* or 20 *aṅgulas* long. Its *utsedha* (thickness) should be of 10 *aṅgula*.

For boat shaped mortar it is further mentioned in this text that it should be 10 *aṅgulas* in height, 16 *aṅgulas* in length, 10 *aṅgulas* in breadth and 6 *aṅgulas* in depth. Its pālī (neck edge) should have 2 *aṅgulas* breadth. Thus, in *Rasa Ratna Samuccaya* the *Ardha Candrākṛti Khalva* is mentioned to be of two sizes viz.

i. Big Size: having the length of 24 *aṅgulas* and the height of 16 *aṅgulas*.

ii. Small size: having the length of 16 *aṅgulas* and the height of 9 or 10 *aṅgulas*.

In *Rasa Kāmadhenu* the breadth and depth of Boat shaped mortar is mentioned as 10 and 7 *aṅgulas* instead of 9 or 6 *aṅgulas* mentioned in other texts.

2.2 *Tapta Khalva*

The shape of *Tapta Khalva* is generally round and its circumference is mentioned as 12 *aṅgulas* and depth 4 *aṅgulas*. The length of its *Mardaka* should be 8 *aṅgulas*. For making it hot a small pit equal to the size of *khalva* and having 2 *aṅgulas* depth and breadth, should be dig and filled with *ajāśkṛt* (goats excreta) and *tuṣa* (husk) and burnt

to apply heat to *khalva* during grinding. It is called *Tapta Khalva* becaue here *khalva* is constantly kept hot during whole grinding process. It is recommended for *Pārada Mardana Saṃskāra*, where grinding of mercury is recommended in hot condition so as to allow chemical reaction, if any, to take place and go on smoothly. In *Tapta Khalva* the temperature of *Khalva* should be maintained between 60° to 70°C only and should not be allowed to go up as high temperature may abstract manual grinding and may cause burning of organic materials being used in the process. Now a days instead of *culhi* electric hot plates may be used for this purpose as in these plates temperature control is easy and may be given constantly without much variation.

3. *Pātana Yantras*

Pātana Yantras have been described in *Rasa Ratna Samuccaya, Rasa Paddhati* and *Rasa Kāmadhenu*. From modern point of view *Pātana* may be said as Sublimation or Distilation. In ancient times also three types of *Pātanas* have been mentioned, such as *Ūrdhva, Adhaḥ* and *Tiryak*. And for these three types of *yantras* have also been mentioned i.e. *Ūrdhva Pātana Yantra, Adhaḥ Pātana Yantra*, and *Tiryak Pātana Yantra*. These are described in the context of *Rasa Saṃskāras* where *Pātana* is fifth *Saṃskāra* of *Pārada* and which is recommended to remove the *doṣas* (impurities) of *rasa* (mercury). For preparing these *yantras* earthen wares and tubes were recommended and used in ancient times. But, due to their porosity these may allow the leakage of mercury vapours even if their joints are sealed properly before heating. Further , due to heat some times these may break also hence by using these apparatuses greater amount of mercury is found lost during this process. Thus, with a view to avoid this difficulty and the expected greater loss of mercury the scholars of 20th cent. started to use iron vessels instead of earthen wares for preparation of these *yantras* which solved this problem to some extent. But, in these apparatuses the condensation became a problem hence with a view to overcome this a combination of *ūrdhva* and *tiryak pātana yantra* has been evolved by Prof. V.M. Dwivedi in fifties. He has used mercury bottle made of iron and a bent long iron tube attached to the apparatus and a glass flask or a steel iron bracket for collecting mercury. The condensation was done by constant water pouring on iron tube throughout the process. He acheived success also in getting the murcury distilled but some vapours may come out even without being condensed with mercury. For heating also he was using firewood charcoal furnace. This apparatus was in use for many years. But, the author did not felt satisfied with this modification in the apparatus and thought to improve it further which is as follows:

3.1 *Modified Pātana Yantra*

As per the author's view modification is needed in three directions, viz.

i. *Modification in the Size and Shape of Iron Pot*:

In previous modification Prof. Dwivedi has used big mercury bottle made of iron and used a curved long iron tube fitted to it. But, author prepared a small iron pot having the height of 6" and the circumference of 8" with its upper mouth open and having threads all around at its outer surface. Its cover is also made of iron having the threads in

its inner surface with a curved bent tube of 4" lenght in its upper portion. After filling the mercury or mercury paste prepared as per the directions of the text the mouth of the lower part of the iron pot was covered with its upper part and fitted tightly with the help of threads and also sealed with clay and cloth pieces smeared in mud so as to make it completely air tied.

ii. *Modification in Condensation Arrangement*:

For condensing mercury vapours the distilation apparatus, made of glass, it attached to the transversly bent iron tube of the iron pot or flask with the help of rubber cork, glass tube and rubber tube. This glass condensor is then fitted on its stand and connected with tap water to maintain continuous flow of water for condensing mercury vapours properly. A conical glass flask is also attached to the condensor's other end to collect distilled mercury.

iii. *Modification in Heating Device*:

For heating the iron pot containing mercury or its paste charcoal furnace was being used previously but there the temperature control was not possible hence, author designed a vertical electric muffle furnace having the thermostatic control and temp. recorder. This furnace was successfully used by the author for applying heat to the iron pot of *Patana Yantra*. This pot fitted with all attachments is placed in the furnace for heating. After switching on the furnace temperature starts to rise and when it reaches above five hundred degree centigrade mercury fumes starts to emerge and become condensed while passing through condenser. Within half an hour of starting of mercury fumes the whole gets recovered by distilation and the furnace is swithched off. This is a very safe, easy, convenient and most successful apparatus assembli and could be used for '*Pātana Karma*' and even for extracting mercury from Cinnabar also.

This improved *Pātana Yantra* has replaced all the *pātana yantras* mentioned or described earlier. It serves the purpose of *Ūrdhva, Adhaḥ* and *Tiryak* — all the three types of *Pātana Yantras*.

As per the *Rasa Ratna Samuccaya* description, *Pātana Yantra* should have two *bhāṇḍas*. The upper *bhāṇḍa* should be big and should have *toyādhāra* on its back or uper surface so that mercury vapours may be condensed and the mouth of the lower pot should be inserted in the mouth of the upper pot in such a way that it should reach to its neck and then the joint should be sealed properly with the paste made *Maṇḍūra Cūrṇa, Phāṇita* and *Mahiṣī Kṣīra* to make it air tight. It should then be placed over *Culhi* (furnace) for heating. As per the description of *Rasa Paddhati* also it should be made with two pots. Lower pot should contain *Piṇḍīkṛt Pārada Piṣṭhi* made by adding ¼th part copper with mercury. Upper pot should have water over its upper portion. Both the pots are made into *Saṃpuṭa* form and sealed properly. Slow heat was advised to be given for two praharas (6 hours) continuously. Thus, if we combine both the descriptions then almost all the important points with regards to apparatus and its heating schedule are covered. In some texts instead of making *toyadhāra* and filling it with water frequently the use of *Ārdra Plotaka* is also found advised for coo[illegible] the

upper pot to condense mercury vapours. In some text 4 *prahara* (12 hours) heating is also recommended. These description are indicative of gradual development in the *yantra* making and its working schedule in ancient times. And in view of this the author has also made or suggested some improvement in the making of this apparatus and its working and heating system.

4. *Bālukā Yantra*

This is a most important and widely used apparatus for making *Kūpīpakva rasāyanas* and *Rasa Bhasma* etc. preparations. It is described in *Rasendra Cūḍāmaṇi, Rasa Ratna Samuccaya* and *Rasakāmadhenu*. It is also known as *Saikata Yantra*. Because in this apparatus heat is being applied to the preparation through *Bālukā/Sikatā* (Sand) hence, it is named as *Bālukā* or *Saikata yantra*. The idea of applying heat through *Bālukā* was probably to give uniform heating from all sides throughout the process. Various types of pots for filling *Bālukā* and various types of fuel and furnaces have been found mentioned for this purpose. But, here two main principles are seemed involved, viz.

i. Application of Uniform heating.

ii. Application of graded heating i.e. slow, medium and strong heating serially. That means initially there should be slow heat then it may be raised to medium heat and finally to strong heat. Generally *Kāca Kalaśa* or *Kūpī* is used for keeping medicines in this apparatus but sometimes *saṃpuṭa* or *Mūṣā* may also be used for keeping medicines.

In literature three/four types of descriptions of *Bālukā Yantra* are available. All mention about some important points i.e. either about the measurement of *bhāṇḍa* used for filling *bālukā, kāca, kūpī* or its position, or the quantity of *bālukā*, and mode of applying heat to the *yantra*. Hence, if all are put together then that makes the ideal *Bālukā Yantra* description complete.

Description of Bālukā Yantra

Make a pit on the earth, prepare a *koṣṭhī* (furnace) over it having many holes in its lower portion. Now take a *bhāṇḍa* or *sthālī* made of soil having a hole of first finger size at its centre. The size of the *bhāṇḍa* should be selected as per the size of *kācakalaśī*. Fill the sand in it upto its neck. This is known as *Saikata Yantra*.

For this *yantra kācakūpī* of the 7 *aṅgula* size may be taken and should be wraped with cloth smeared in mud all around in the thickness of one *aṅgula* and dry it. Now a days seven layers of cloth smeared in mud are applied on the glass bottle and dried. Now fill ⅓ part of the *kūpī* with the material to be heated and put a cork on its mouth and place the *kūpī* in the *bhāṇḍa* containing *bālukā* or *lavaṇa* in its lower part. It should be placed in the middle of the *bhāṇḍa* and the *bhāṇḍa* be filled with remaining portion portion of *bālukā*. Cover it with a *māṇikā* (earthen lid) on its upper side and seal it with

mud. It should then be heated from below till the dried grass put on *māṇikā* starts to burn. This is known as *Bālukā Yantra*.

According to the text the height of the *bhāṇḍa* should be of one *vitasti* (9"). The breadth of the *bhāṇḍa* should be as much that may accomodate five *aḍhakas* (20 *prasthas*/20 Kg.) of *bālukā* in it. It may be used for preparing *Rasa Bhasma, Rasa Sindūra* and other *bhasma Sindūra Kalpas* and also for making *Jāraṇa*. As regards the heating time and schedule texts advised to heat it continuously for 3, 4, 5 or even 6 days.

Bālukā Yantra currently in use

1. The *Bālukā Yantra* which is in use at present is not covered and sealed with *māṇikā* (earthen lid).

2. If earthen *bhāṇḍa* is used for filling *bālukā* then it should contain a big hole in the middle of the bottom portion and as per tradition an *abhraka patra* (mica sheet) is put on the hole to prevent *bālukā* from falling down. And at least some sand is put at the bottom of the *bhāṇḍa* and then *kūpī* is placed.

3. Now a days earthen *bhāṇḍa* is replaced with iron pot at many places and in that case bottom hole is not required and the size of the pot may also be made smaller.

4. Instead of firewood, hard coak furnace is being used in many places.

5. Total heat period is divided in three phases i.e. initially or in first phase slow heat is applied then in second phase medium heat is applied and in third phase strong heat is applied. Now, question is that how it can be decided. One way for this may be by measuring the temperature and another way may be by seeing the changes that are taking place in the product. In ancient times there were no methods for measuring the temperature hence during that time it might have been determined by seeing the changes only though it is not clearly mentioned. The author has tried to determine these phases as follows on the basis of changes and experiences.

In case of *Kūpīpakva Rasāyanas* we may consider the limit of *mṛdu agni* (mild heat) till the *kajjali* mixture melts and fumes may starts to come out. From temperature measurement point of view its maximum limit may be taken as the two hundred degree centigrade (200°C). It is the observation of the author that till 200°C temperature is reached the *kajjali* mixture of almost all the preparations is found melted and fumes may start coming out of the bottle mouth. It should be allowed to take one third part of the total time prescribed.

The limit of *madhyama agni* (medium heat) is till the boiling of the melted *kajjali* mixture and coming out of sulphur fumes profusely to burn extra sulphur and to change the materials into desired compounds due to the effect of chemical reactions taking

place during heating. Here maintaining of boiling of the product is important. From temperature point of view boiling of the product and profuse fuming between 350°C to 400°C, Temperature. For this also ⅓rd part of the total period should be allowed to be consumed. During this period sudden rise of temperature should not be allowed as by this sometimes boiling liquid may outburst or comes out of the bottle and the neck of the bottle should not be allowed to be obstructed by the condensed fumes. And for this hot iron rod should frequently be inserted into the bottle mouth and neck to clean the neck from the deposited fumes. During this phase a cold iron rod if inserted in the bottle the boiling liquid will stick to it and may give an impression of liquidity of the mixture and even of boiling.

The limit of *tibrāgni* (strong heat) may be the disappearence of flame from the bottle mouth and bright redness of the bottom of the bottle. From temperature point of view it may be above 400°C and between 400° to 500°C. The strong heat is essential for burning extra Surphur from the product and converting the black compound into the red compound. Without raising the temp. above 400°C flame would not appear at the bottle mouth and then burning of extra sulphur may take much longer time hence when two third part of total period is passed and still extra sulphur remains present in the bottle then in the last phase strong heat is applied to burn extra sulphur quickly and to convert the product into red compound. Then after corking the mouth properly the red compound is allowed to sublime and to get deposited at the neck of the bottle. Some Scholars advised strong heating for one or two hours more after corking for getting the product to be sublimed, but as per the authors experience it is not necessary.

Modification in the Kūpīpāka Method

Generally *Kūpīpāka* preparations are prepared by using *Bālukā yantra* till now. But, author has modified this method by introducing the use of vertical type electric muffle furnace for this purpose and deliting the use of *Bālukā yantra*. The principle of using *Bālukā yantra* for this preparation was to apply uniform heating to the *kūpī* containing the materials. And by using the electric furnace heating this uniformity of temp. can be maintained even without using *Bālukā yantra*. Further, in electric furnace heating the temp. controlling facilities prove greatly helpful in controlling and maintaining temp. at any particular point without any difficulty. The only thing required in furnace heating is a prior standardisation of the temp. oi *mṛdu, madhya* and *tībrāgni* heat which could be done easily by the signs mentioned for the preparations. And once the standardisation of temp. of different heat is done, then that may be followed for further heatings without any problem.

On the basis of the signs and the experience the temp. limit of *mṛdu agni* has been fixed to 200°C and of *madhyamāgni* to 350°C to 400°C and for *tībrāgni* it is over 400°C and upto 500°C to 600°C. It is the experience of the author that if the above temp. schedule is followed almost all the *Kūpīpakva Rasāyanas* could be prepared without any problem. The duration for *mṛdu, madhya* and *tībrāgni* may be adjusted as per the contents and their quantity.

This modification in the method of *kūpīpakva* preparation is working very satisfactorily and with full success. The advantage of this method of heating is that by this method no *kūpī* has so far been found broken or damaged due to heat. The product could also be prepared quickly as there is no chance of heat loss rather total heat is being consumed in this method of preparation. It does not require an all time presence of attendent as continuous fueling is not required here which was essential in the case of firewood or even hard coak furnace heatings.

Besides above this furnace is also being used successfully for distilling mercury through modified *pātana yantra* from *pātana piṣṭi* or *Hiṅgula* paste. Thus, introduction of this furnace has replaced the use of *Bālukā yantra* as well as of *Ḍamaru Yantra* for *kūpīpāka* preparation and for extracting mercury from *Hiṅgula*. By this furnace and apparatus one can extract mercury even from the large quantities of *Hiṅgula* without much difficulty. This is also a quick method for extraction of mercury from *Hiṅgula* as in the *Ḍamaru Yantra* method a small quantity of *Hiṅgula* requires 8-12 hours (much more time) heating for extraction of mercury and even then some times there may not be complete extraction. As in the case of *Ḍamaru Yantra* strong heat could not be given because of the earthen pots used for the apparatus and the strong heat could not be maintained for long time also as once the charcoals or firewoods are burnt the temp. is bound to come down for sometimes and when the earth is changed again then only the temp. may rise again. All these problems may not arise in the furnace heatings and moreover once the extraction process is started it would stop on completion only. Hence, this furnace has proved to be very advantageous and successful for many purposes.