REVIEW ARTICLE

Macroscopic Pharmacognostical Identification and Authentication of Collected Specimens of Lekhaneeya Mahakashaya with Rasapanchaka Profiling and Therapeutic Insights in Arbuda

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Access the article online

Quick Responde Code

www.jacjournal.org

DOI: https://doi.org/10.51648/jac149

ABSTRACT

Background: *Laghu* (lightness), *Ushna* (hot), *Tikshna* (sharpness), *Vishada* (clear), *Rukshya* (dryness), *Sukshma* (minuteness), *Khara* (roughness) and *Sara* (mobility) are the inherent attributes of the *Dravyas* included in *Lekhaneeya Mahakashaya*. These characteristics of Dravyas promote the depletion of *Kapha Dosha*, stimulate Agni (fire) and facilitate the drying of undesirable *Dhatus* (body tissues) and *Malas* (body excreta). Vitiation of Tridosha leads to the derangement of *Mamsa* and *Rakta Dhatus*, resulting in the formation of *Arbuda* (tumor). Due to their *Ushna*, *Tikshna* and *Ruksha Gun*a, the *Lekhaneeya Dravyas* act on the abnormal overgrowth of *Dhatus* through their *Lekhana Karma* and play a vital role in reducing the size of *Arbuda*.

Materials and Methods: Plants were collected from Jaipur (India); Kirtipur, Manichud Dada, Kathmandu and Hetauda (Nepal). The collected plant specimens were authenticated at the National Herbarium and Plant Laboratories (KATH), Godawari, Nepal; Council of Scientific and Industrial Research (CSIR), NIScPR, New Delhi, India and Rajasthan University, Jaipur, Rajasthan, India. Ayurvedic textbooks were consulted to verify *Rasapanchaka* of the plants.

Results and Discussion: The species of the *Lekhaneeya Mahakashaya* from India and Nepal were identified and authenticated for this study. These plants, characterized by predominantly Katu and *Tikta Rasa* and *Ruksha*, *Tikshna*, *Laghu Guna*, exert *Lekhana Karma*. The plants of *Lekhaneeya Mahakashaya* are ingredients of various Ayurvedic formulations and are clinically utilized in the management of *Arbuda* due to their *Lekhana* and *Arbudahara Karma*.

Conclusion: R*uksha*, *Laghu* and *Tikshna Guna* are predominant in all ten *Lekhaneeya Dravyas*. Due to these specific pharmacological attributes, *Lekhaneeya Mahakashaya* is utilized in the management of various types *of Arbuda*.

Keywords: *Lekhaneeya Mahakashaya, Lekhana, Agni, Arbuda*, Cancer

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Received: 08/09/2025
Accepted: 05/10/2025
Published: 17/10/2025

INTRODUCTION

Arbuda is defined as "*Doshas* that have become vitiated in any part of the body and are affecting the *Mamsa*, resulting in a swelling that is round, fixed, slightly painful, large in size, widespread, slow-growing and does not suppurate". Cancer is a disorder when certain body cells proliferate out of control and invade other bodily areas. *Arbuda* arises from the vitiation of *Tridosha*, *Dhatus*, *Agni* and *Malas* with abnormal cell proliferation associated with aggravated *Vata Dosha*. All the enzymatic activities and hormonal dysregulation are governed by vitiated *Pitta Dosha*, whereas vitiated *Kapha Dosha* confers structural stability and defines the morphology of the tumor. Those *Dravyas* which have *Vayu* and *Agni* predominance they have *Lekhana* properties. Majority of *Lekhana Dravayas* have *Laghu*, *Ushna*, *Tikshna*, *Vishada*, *Rukshya*, *Sukshma*, *Khara* and *Sara* properties. *Acharya Charaka* has documented *Lekhaneeya Mahakashaya* which constitutes the ten drugs viz. *Daruharidra,*

Vacha, Ativisha, Musta, Kustha, Haridra, Katurohini, Chitraka, Chirabilva and *Haimavati*. *Lekhaneeya Dravyas* are *Dravyas* having the ability to scarp out the excess tissues from the area where it is located. *Dravyas* possessing *Dhatu-Mala Shoshana* properties facilitate the removal of unwanted *Dhatus* and *Malas*, thereby reducing obesity and inducing emaciation. Such drugs, which promote the depletion of body tissues and impart a lean and light physique, are classified as *Lekhaneeya Dravyas.* Cancer is a major global health concern, responsible for the highest disease-related deaths (244.6 million DALYs), with higher rates in men. Among people aged 15–49, breast (13%), liver (12%), and lung (9%) cancers are most common. In the 50–59 age group, lung (18%), liver (11%), and breast (9%) cancers predominate. For individuals over 60, lung, colorectal and stomach cancers are most frequent.

According to *Ayurveda,* Human body is composed derivatives of five basic elements *Akasha, Vayu, Agni, Jala and Prithivi* in the form of *Dosha*, *Dhatu* and *Malas*. *Doshas* are the subtle entities, all- pervasive physiological factors are categorized into *Vata*, *Pitta* and *Kapha*. *Vata* is the sign for movement and the nerve system. *Pitta* is for the basis of all bodily metabolic processes and biotransformation. *Kapha* have functioning through bodily fluids and is cohesive quality. *Dhatus* are classified in the seven categories: *Rasa* (plasma), *Rakta* (blood cells), *Mamsa* (muscular tissue), *Meda* (adipose tissue), *Asthi* (bone tissue), *Majja* (bone marrow) and *Sukra* (reproductive tissue). There are thirteen major categories of *Agnis* for the body's metabolic activities. *Jatharagni* is responsible of the three phases of digestion that is *Madhurapaka*, *Amlapaka* and *Katupaka.* There are seven types *Dhatwagnis*, each for the assimilation of the seven tissues. The *Panchabhutas* (five fundamental ingredients) are processed by five different *Agnis* known as *Panchabhutagnis*.

According to *Ayurveda*, any illness is associated with an imbalance in the *Doshaj*. The primary pathological status of the diseases is also caused by disruption of the *Agni* (biological factors), creation and storage of *Ama* (undigested nutrients), S*rotorodha* (blockage of body channels) and disordered absorption in the tissues.

Excessive exposure to causative factors such as unhealthy diet and lifestyle introduces components that vitiate *Kapha Dosha*, thereby impairing *Jatharagni* and leading to *Mandagni*. In the phase of *Mandagni*, the food is not digested properly and *Ama* is formed by the mixing of the aggravated *Doshas*. Thus, pure form of *Rasa* is not formed properly. This leads to the *Srotorodha* (obstruction of the body channel), which causes to flow all these vitiated components to the *vimargagamana* (alternative route). Pathological factors such as vitiated *Doshas*, vitiated *Dhatus*, malfunctioning of *Agni*, *Ama* formations, will lead to a vitiation of *Rakta*, *Mamsa* and *Meda Dhatus*. It affect specially on the *Mamsa Dhatu* which help in nourishes the skin. After *Ama* formation the injury of the *Rohini* (sixth layer of skin) occurs. If this process continues, it leads to the formation of an *Arbuda* (flowchart figure 1). Several types of *Arbuda* mentioned in the *Ayurvedic* literature: from the vitiated *Doshaj- Vataj*, *Pittaj*, *Kaphaj Arbuda*; *Raktaj, Mamsaja* and *Medoja Arbuda* from vititated *Dhatus*. Other types are the organ specific such as- *Netrarbuda*- eye, *Karnarbuda*-ear; *Nasarbuda*, *Gilayu*; *Kacchapa*; *Kakanaka Kustha.*

Dravya exerts its action through *Rasapanchaka*, namely *Rasa*, *Guna*, *Vipaka*, *Virya* and *Prabhava*. *Rasa* are six in numbers– *Madhura*, *Amla*, *Lavana*, *Katu*, *Tikta* and *Kashaya*. At least two of the five *Mahabhutas* predominantly make up each *Rasa*. Following digestion, the state of the food ingredients is also described in terms of *Rasa*, which is referred to as *Vipaka* and comes in three varieties: *Madhura*, *Amla* and *Katu*. *Virya* is the inherent potency of a *Dravya* responsible for manifesting its therapeutic action. *Virya* is expressed in term of the highest active potency of eight major *Gunas*. *Guna* is overall property of the *Dravyas*. *Prabhava* is the specific property of the *Dravyas*. *Karma* is the action of *Dravyas*. The *Katu*, *Tikta, Kashaya Rasa,* and *Laghu, Ruksha* and *Tikshna Guna* of the *Lekhaneeya Dravayas* are primarily *Katu Vipaka* and *Ushna Virya*; which elevate the *Pitta* and *Vata Doshas* (table 1).

Table 1. Basics of Rasapanchaka and its Guna-Karma according to Ayurveda

Rasapanchaka and their properties					
S.No.	***Rasa***	***Mahabhutas***	***Guna***	***Karma***	***Atiyogaj Lakshana***
1.	*Tikta*	*Vayu+Akash*	*Ruksha* (Dry), *Sheeta* (Cold), *Laghu* (Light)	Relieves *Deepana* (Appetisers); *Pachana* (Digestive); *Stanyasodhana* (Purifies breast milk); *Lekhana* (Scraping); Dries up excess moisture, fat, marrow, lymph, pus, sweating, urine, *Pitta* and *Shleshma*.	*SrotasamKharatvamUpapadayati* (Brings about roughness to the body channels); *Karshayati* (Depletes body weight)
	Katu	*Vayu + Agni*	*Laghu* (Light), *Ushna* (Hot), *Ruksha* (Dry)	*AgnimDipayati* (Improve digestive strength); *Upachaya* (Obesity); *VrananAvasadayanti* (Decrease Excessive growth of ulcer); *MamsamVilikhanti* (Scrapes down muscle tissue)	*Karshayati* (Produce leanness); *Kampa* (Tremor); *Toda* (Piercing); *Bheda* (Sabbing pain) in leg, hands and back.
	Kashaya	*Vayu+ Prithivi*	*Ruksha* (Dry), *Sheeta* (Cold), *Laghu* (Light)	*Samsamana* (Healing), *Sandhanakara* (Wound healing), *Ropana* (Healing), *Sosana* (Dries of moisture), *Stambhana* (Blocking)	*SrotamsiAvabadhnati* (Consstriction of channels); *Karshayati* (Causes emaciation)

2.	***Guna***	***Mahabhuta***	***Karma***	
	Laghu	*Vayu+Akash+Agni*	*Karma- Langhana (Hemadri); Dosha Prabhav- Kaphaghna*	
	Ruksha	*Prithivi+Agni+Vayu*	*Karma- Soshana; Dosha Prabhav- Vatakara, Kaphahara*	
	Tikshna	*Agni*	*Karma- Shodana; Dosha Prabhav- Kaphahara; Pittakara*	
3.	***Vipaka***	***Mahabhuta***	***Guna***	***Karma***
	Katu	*Vayu+Agni*	*Ruksha+ Laghu*	*Dosha karma- Vata vardhaka* *Dhatu karma-Sukranasaka* *Mala karma- Baddhavidmutra*
4.	***Virya***	***Mahabhuta***	***Karma***	
	Ushna	*Agni*	*Dahana, Pachana, Murchana, Swedana, Bhrama-Trishna-Glanijanana, Laghu, Abrishya; Doshakarma- Kaphavata samana, Pittakara*	
5.	***Prabhava***	Specific Potency	*Vacha* as *Medhya*	

MATERIALS AND METHODS

Samprapti model of *Arbuda* shows the abnormal cell growth function is governed by vitiated *Kapha Dosha.* Activity of *Pitta* results in augmented metabolic processes, which is concomitantly associated with a reduction in *Kapha Dosha*. Since *Kapha* and *Vata Doshas* exhibit mutually antagonistic dynamics, an elevation of *Vata Dosha* leads to the suppression of *Kapha Dosha.* Hence, *Pitta* and *Vata Doshas* were identified as the principal determinants. Based on their elemental composition, highest priority is accorded to drugs with *Agni* dominant properties, as they augment *Pitta Dosha,* followed by those exhibiting attributes of *Vayu* and *Akasha*, which potentiate *Vata Dosha. Dravyas* possessing *Laghu, Sukshma, Ushna* and *Tikshna* properties by potentiating *Pitta Dosha* are indicated, whereas drugs with *Guru, Sthula, Sthira, Śita* and *Snigdha* attributes, which elevate *Kapha Dosha* and thereby favor tumor growth are restricted. With these criteria, *Lekhaneeya Mahakashaya* drugs were selected for the study. *Daruharidra, Vacha, Ativisha, Musta, Kustha, Haridra, Katurohini (Kutaki), Chitraka, Chirabilva* and *Haimavati* shows anti-cancerous properties. These plants are used traditionally in the treatment of cancer, shown previously to have cytotoxic activity and written in *Ayurveda* as a *Arbudahara* property.

In this study the plants were collected from the different regions as from Kathmandu, Hetauda, Nepal and Jaipur, India. These plants were authenticated in India and Nepal during different periods. From Shivapuri Nagarjuna national park, Madichud Dada (*Berberis aristata* DC.; 27.4742^{0}N, 85.2324^{0}E; authentication voucher number of KATH: 077/78, Cha.no.165; CSIR authentication number- NIScPR/RHMD/Consultant/2021/3837-38-2; University of Rajasthan, Jaipur- RUBL 21623-28.07.2024); Kritipur (*Acorus calamus* Linn.; 27.6655^{0}N, 85.2775^{0}E; authentication: University of Rajasthan, Jaipur RUBL 21624-28.07.2024) were collected and authenticated. From Nardevi market, *Kustha*, *Kutaki* and *Ativisha* were collected. From Hetauda (*Haridra*; 27.4050^{0}N, 85.0407^{0}E, authenticated at University of Rajasthan, Jaipur RUBL 21622-28.07.2024) and from Kamane Dada, Hetauda (*Cyperus rotundus* L.; 27.3885^{0}N, 85.0421^{0}E, authenticated by DG Dept. museum curator) were collected and authenticated. From Jaipur-Jagga ki Babri (*Plumbago zeylanica* Linn 26.9185^{0}N, 75.8476^{0}E; authenticated at University of Rajasthan, Jaipur RUBL 21625-28.07.2024); *Chirbilva* from Amer fort, Amer Road (*Holoptelia integrifolia* Planch 26.9854^{0}N, 75.8539^{0}E; authenticated at University of Rajasthan, Jaipur RUBL 21626-28.07.2024); and *Haimavati* collected from Jaipur herbal market. The plant parts were collected and authenticated the various usable parts as described in Ayurveda and API.

Ayurveda explains the concepts of *Rasa, Guna, Virya, Vipaka* and *Prabhava* as a framework to understand the pharmacokinetic and pharmacodynamic properties of *Dravyas* (drugs). On the basis of this, compilation and tabulation of *Rasapanchaka* of *Lekhaneeya Mahakashaya Dravyas* (table 2) were done from *Charaka Samhita* and *Bhavprakasha Nighantu*. Different articles were studied from google scholar, PubMed Journals. Different plants morphological pictures were obtained from the PubMed, google scholar for the authenticate of original species.

RESULTS

Details of collection of plants:

In this study the plants were collected from different locations of Jaipur, India and Kritipur, Kathmandu and Hetauda, Nepal. *Cyperus rotundus* Linn. is found in moist lands in Nepal up to an altitude of 6000 ft and the sample was collected from Kamane Dada, Hetauda. *Curcuma longa* Linn. is cultivated throughout Nepal, especially in the tropical and subtropical regions. The sample for this study was collected from cultivated land at Hetauda. *Acorus calamus* Linn. is found in wet and marshy lands up to an altitude of 6000 ft, especially in the subtropical and hilly regions of Nepal. The sample for this study was collected from Kirtipur (Kathmandu). The dry sample of *Kustha, Ativisha* and *Kutaki* were collected from markets of Naradevi (Kathmandu), Nepal. These plants were found at altitudes ranging from 6,000 to 15,000 ft. The plant *Picrorhiza kurroa* Royle ex Benth. has not yet been identified in Nepal; however, a related species, *Neopicrorhiza scrophulariiflora* (Pennell) Hong, is found in the market under the name '*Kutaki*'.

So, two different samples under the name of *Kutaki* were collected. *Berberis aristata* DC. is found at altitudes of 6,000–10,000 ft in the Himalayan range. The plant sample was collected from Madichud Dada (Shivapuri Nagarjuna national park), Kathmandu, Nepal. *Plumbago zeylanica* Linn. and *Holoptelia integrifolia* Planch. were found in natural habitat of Jaipur (India).The natural habitat of *Hemavati* is the Himalayan region and the rhizome was collected from Jaipur herbal market. For the proper morphological differential pictures of habit and inflorescence of *Saussurea Lappa* C.B. Clarke; *Aconitum heterophyllum* Wall.; *Neopicrorhiza scrophulariiflora* (Pennell) Hong; *Iris germanica* Linn. were collected through different articles, google scholar, PubMed.

Macroscopic pharmacognostical identification of *Lekhaneeya Mahakashaya* with *Rasapanchaka* profiling and therapeutic insights in *Arbuda*

Macroscopic pharmacognostical identification of *Dravyas* are evaluated by visual inspection and assessment and also sensory organs without help of a microscope. They include shape (flat, curved, re-curved, channeled, quill); outer surface (scaly, smooth, cracks, fissures, wrinkle, furrows); inner surface (striations, corrugations, network of raised lines, smooth); fracture (complete, incomplete, fibrous, flexible, brittle, hard); colour (white to black), odour (aromatic, rancid, unpleasant, characteristics) and taste (bitter, sweet, sour, astringent, salty, pungent).

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Mustha* for potential uses in *Arbuda*

Macroscopical study: *Cyperus rotundus* (Sanskrit: *Musta)* belongs to Cyperaceae family. *C.rotundus* is a rhizomatous perennial herb. Stem is rigid trigonums, solid and septate. Leaves are basal, lower ones often scale like, sometimes reduced to sheaths, several, flat Inflorescence is spike with spikelets. Flower is small, bisexual. Fruit is nut. Rhizome is oval, rounded, scaly, brown dark outside, white-inside. Odour is fragrant; taste is slightly pungent and fracture is tough, mealy which shows dots of stelar vascular bundles and distinct endodermal margin.

***Rasapanchaka* analysis and recent studies on *Musta* for uses in *Arbuda*:** Due to *Tikta Rasa*[28] (table 2), *Musta* acts as *Dipana, Pachana, Grahi* and *Krimighna.* Due to *Laghu, Ruksha Guna; Katu Vipaka,* it acts as *Lekhana. Shiva Gutika,* a *Samana* medicine containing *Mustaka*, *Chitraka Moola* and *Kutaki* as a main ingredient is used for stages I, II and IIIA breast cancer in patients with an ECOG 0-full active patient performance without restriction and ECOG1-restricted in physically strenuous activity (*Kaphaja Granthi* and *Sopha*). *Chyavanaprashaavaleha* is an *Avaleha* preparation in *Ayurveda* that contains *Musta*, while *Brahma Rasayana* contains with *Musta* and *Haridra* as its main ingredients, serves as a *Rasayana* therapy. These formulations are indicated for patients having cancer who have completed conventional therapy and are on maintenance therapy (ET/targeted therapy). In cancer patients with *Ojakshaya*, *Agnimandya* and *Daurbalya* these *Rasayanas* are prescribed to support rejuvenation and overall health. *Invitro* study such as in leukemia cells (K562 and L1210), lymphoma cells (L5178 mice), in cervical cancer (HeLa cells and SiHa cells), Ehrlich's ascites carcinoma breast cancer*Cyperus rotundus* shows significant activity. Ethanol extract of *Cyperus rotundus* induces apoptosis and alters autophagic activity in triple-negative breast cancer cells (MDA-MB-231 and MDA-MB-468). Based on the pharmacological properties of its ingredients such as *Musta*, *Haridra, Ardaka* in *Chandraprabha Vati* have role for effective co-therapy indicated in all patients undergoing conventional treatment for addressing treatment-induced adverse effects. Patient of cancer having *Agnimandhya, Ojakshaya, Mukhapaka* and *Amlapitta* symptoms are subsided after taking this medicine.

Table 2. *Rasapanchaka* of *Lekhaneeya Mahakashaya Dravyas* as described in *Samhita* and *Nighantu*

Dravya	*Rasa*			*Guna*			*Vipaka*	*Virya*		*Dosha Karma*
	Katu	*Tikta*	*Kashaya*	*Laghu*	*Ruksha*	*Tikshna*	*Katu*	*Sheeta*	*Ushna*	
Musta	+	+	+	+	+		+	+	-	*Kapha-pittahara*
Kustha	+	+	-	+	+		+	-	+	*Kapha-vatashamak*
Haridra	+	+	-	+	+		+	-	+	*Kapha-vatashamaka, Pittarechaka*
Daruharidra	-	+	+	+	+		+	-	+	*Kapha-pittashamaka*
Vacha	+	+	-	+	-	+	+	-	+	*Kaphvatasamak and Pitta vardhak*
Ativisha	+	+	-	+	+	-	+	-	+	*Tridoshahara*
Katurohini	-	+	-	+	+	-	+	+	-	*Kapha-pittahara*
Chitrak	+	-	-	+	+	+	+	-	+	*Kaphavat Saamaka; Pitta vardhak*
Chiravilva	-	+	+	+	+	-	+	-	+	*KaphaPitta Saamaka*
Haimavati	+	+	-	+	+	+	+	-	+	*Kaphavata Saamaka*

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Kustha* for potential uses in *Arbuda*

Macroscopic study: *Saussurea lappa (*Sanskrit: *Kustha)* is an erect robust perennial herb of 1-2 m tall. Heart-shaped, big leaves with two lobes at the base that are sometimes smaller and borne on winged stalks are present. The spherical flower head-bluish purple or nearly black flowers. Fruits are hairy. Drug received was dry, mature, dull brown colour, thick, stout, 7-10 cm long, 1-4 cm broad, thicker roots with collapsed centre, cut surface shows two regions, outer periderm ring thin, inner porous woody portion lighter in colour showing fine radial striations, fracture short and horny, odour strong, characteristically aromatic, taste slightly bitter.

Rasapanchaka* analysis and recent studies on *Kustha* for potential uses in *Arbuda: Due to *Tikta Rasa*, *Kustha* acts as *Deepana, Pachana, Anulomana* and *Shoolaprasmana*. In *in-vivo* study, *Kustha* improves cardiac function and inhibit cancer progression via apoptosis, highlighting its potential as a natural, metabolism adapted chemotherapeutic agent.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Haridra* for potential uses in *Arbuda*

Macroscopic study: *Curcuma longa* (Sanskrit*: Haridra*) belongs to the family zingiberaceae. *Curcuma longa* has oblong rhizome, externally yellowish to yellowish-brown in colour with root scars and annulations of leaf bases, fracture horny, fractured surface orange to reddish brown, central cylinder twice as broad as cortex; odour and taste are characteristic. Leaves are large, simple, oblong-lanceolate with a long sheath and parallel venation; the inflorescence is a terminal spike with bracts enclosing the flowers.

Rasapanchaka* analysis and recent studies on *Haridra* for potential uses in *Arbuda: Due to *Tikta Rasa*, *Haridra* acts as *Raktaprasadaka*, *Raktavardhaka*, *Kaphagna*, *Sthnyasodhaka* and *Sukrasodhaka*; and it is *Kaphavata Samaka,Pitta Rechaka* because of *Ushna Veerya*. *Haridra, Lodhra, Patranga, Dhooma* and *Manahshila* along with honey can be used as thick local application in fatty or *Medoja Arbuda.* The *Lekhana Karma* of *Haridra* can be attributed to the action of chemical compound curcumin in promoting apoptosis, inhibiting cell cycle progression and preventing the growth of cancerous cells. *Haridra*, with its anti-cancer activity have adjuvant therapy for cancer treatment as well as for prevention. The single drug *Haridra* demonstrates anti-cancer activity against gall bladder carcinoma, administered as a *Churna* at a dose of 3 gm three times daily with milk as the *Anupana* (vehicle). The polyherbal formulation *Arbudahara Kashaya*, containing equal parts of *Shigru*, *Varuna*, *Kanchanara* and *Haridra* is indicated in *Arbuda*, *Granthi* and *Gulma* at a dose of 40 ml twice daily.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Daruharidra* for potential uses in *Arbuda*

Macroscopical study: *Berberis aristata* (Sanskrit: *Daruharidra*) is a shrub which belongs to family Berberidaceae. Bark of *B. aristata* is 0.4-0.8 cm thick, pale yellowish-brown in colour, soft, closely and rather deeply furrowed, rough, brittle. Yellowish-brown when dried, fracture short in bark. Taste is bitter. *B. aristata* has prominent primary venations with alternate, simple leaves. Age of plant and twig of plant of *B. aristata* varies color from green to pink to dark red. Mature plant with old leaf is dark red and young one has pink to green leafy color.

Rasapanchaka* analysis and recent studies of *Daruharidra* for potential uses in *Arbuda: Due to *Tikta Rasa*, *Daruharidra* acts as *Deepana, Yakritutejaka, Pittasaaraka, Grahi, Raktasodhaka;* and because of *Ushna Virya,* it acts as *Kaphagna. B. aristata* has anti-proliferative efficacy against MCF-7; a breast cancer cell lines. Local application, such as *Dashangalepa* in which *Daruharidra* and *Haridra* are the main ingredients-is used in *Kaphaja Granthi* of *Sthana Arbuda (*breast cancer*)*.Berberine from *B.aristata* and curcumin from *C.longa* are found synergetic anticancer activity on different types of cancer cell line models like A549, Hep-G2, MCF-7, Jurkat, and K562.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Vacha* for potential uses in *Arbuda*

Macroscopical study: *Acorus calamus* (Sanskrit:*Vacha*) is perennial terrestrial herb belonging to family Acoraceae. *A.calamus* has stout thumb like branches at nodes; sub cylindrical, upper side marked with alternately arranged, large, broadly, triangular, transverse leaf scars which almost encircle the rhizome; at nodes leaf sheath mostly presenting an appearance; lower side shows elevated tubercular spots of root scars; light-brown with reddish-tinge to pinkish externally, buff coloured internally; fracture, short; odour, aromatic; taste is pungent and bitter.

Rasapanchaka* analysis and recent studies on *Vacha* for potential uses in *Arbuda: Due to *Katu*, *Tikta Rasa;Katu Vipaka, Ushna Virya, Vacha* is *Kapha Shamaka* and because of *Ushna Virya, Kaphvatasamaka* and *Pitta Vardhaka;* it is *Deepana, Lekhana, Triptrighna*, *Krimigna.* Due to *Tikshna,* it is *Medhya, Syangasthapana. In-vitro* study, *Acorus calaus* on human cancer cell lines found that it was effective on Glioblastoma (U251 cells) and Colon cancer (LoVo cells). *Chandanaditaila*, that contains *Vacha* and *Kutaki* as a main ingredient is taken with milk as an *Anupana* helps in the management of *Apachi* (Glandular swelling*)*.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Ativisha* for potential uses in *Arbuda*

Macroscopical study: *Aconitum heterophyllum* (Sanskrit: *Ativisha*) is an herbaceous perennial plant belonging to family Ranunculaceae. Stem is arial, erect, hairy. Leaves are cauline and ramal, simple, petiolate. Inflorescence is raceme; flowers are bisexual. Drug available in market is root, ovoid-conical, tapering downwards, 1.0-3 cm long, 0.4-1.0 cm thick at its upper extremity, gradually decreasing in thickness towards tapering end, externally light ash-grey, while internally starch white, external surface wrinkled marked with scars of fallen rootlet and with a rosette of scaly rudimentary leaves on top: fracture, short, starchy,

showing uniform white surface, marked towards centre by 5-7 concentrically arranged yellowish-brown dots, taste-bitter.

***Rasapanchaka* analysis and recent studies on *Ativisha* for potential uses in *Arbuda*:** Due to *Tikta, KatuRasa* and *Ushna Guna Ativisha* acts as *Deepana, Pachana, Chardinigrahana, Grahi, Arsoghna, Krimighna.* Due to *Tikta,* it is *Raktasodhaka, Sthanyasodhaka*. Due to *Ushna Guna,* it is *Vajikarana*. Due to *Ruksha Guna,* it acts as *Lekhana*. Ethanolic root extract of *Aconitum heterophyllum* treated MDA-MB-231 cell lines shows its anti-cancer activity.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Kutaki* for potential uses in *Arbuda*

Macroscopical study: *Neopicrorhiza scrophulariiflora (Nepali: Kutaki)* belongs to family Scrophulariaceae. Two sample drugs available as rhizomes measuring 7–10 cm in long and 6–10 mm in thick, subcylindrical and slightly curved, externally greyish-brown with a rough surface due to longitudinal wrinkles, circular scars of roots and bud scales with roots attached. The tip ends in a growing bud surrounded by a tufted crown of leaves. In some places, the cork exfoliates, exposing the dark cortex. The fracture is short; odour is pleasant; taste is bitter. This is the genuine sample of *'Neopicrorhiza scrophulariiflora* (Pennell) Hong. Second sample has a short rhizome measuring 5–7 cm in length and 0.5–1 cm in thickness, with circular scars on the surface no root seen, indicating that it is an adulterant sample of *Kutaki*.

***Rasapanchaka* analysis and recent studies of *Katuki* for potential uses in *Arbuda*:** Due to *Tikta Rasa, Katuki* acts as *Rochana, Deepana, Pittasaaraka, Krimighna, Kusthagna*. Due to *Sita Virya,* it is *Daahaprasamana. Neopicrorhiza scrophulariiflora* (Pennell) Hong enhances cytokine production and stimulates NK-cell cytotoxicity.*Kutaki* is the main ingredient of *Arogyavardhani Vati*, which is administered at a dose of 250 mg twice daily with warm water as *Anupana*. It is used in cases of liver metastasis, providing hepatoprotective action.Additionally, *Kutaki Churna* at a dose of 5gm twice daily with warm water as *Anupana* is given to patients of hepatocellular carcinoma.[41]

Macroscopical study, *Rasapanchaka* analysis, recent studies on *Chitraka* for potential uses in *Arbuda*

Macroscopical study: *Plumbago zeylanica* (Sanskrit: *Chitraka*) belongs to family Plumbaginaceae, is a perennial herb, stem is woody, spreading, terete, striate and glabrous. Leaves are ovate, subacute, entire, glabrous, reticulately veined. Inflorescence is elongated spikes, flower-arranged in glandular rachis, white. Fruits are capsule. Collected sample drug root is 8-10cm in length, 6-8mm in diameter as long as short stout pieces, including root stocks reddish to deep brown, scars of rootlets present, bark thin and brown, internal structure striated; odour is disagreeable and taste is acrid.

Rasapanchaka* analysis and recent studies on *Plumbago zeylanica* for potential uses in *Arbuda: Due to *Ushna* and *Tikshna Chitraka* acts as *Kaphavata Saamaka* and *Pitta Vardhaka*, *Lekhana* and *Visphotajanana*. Due to *Katu, Ushna, Tikshna Guna,* it is *Deepana, Pachana, Pittasaraka, Grahi* and *Krimighna.* Plumbagin, a quinoid component extracted from the roots of *Plumbago zeylanica* suppresses pancreatic cancer cell proliferation in both *in-vitro* and *in-vivo* models. Plumbagin treatment induces apoptosis and inhibits cell viability of Pancreatic cancer cells (PANC1, BxPC3, and ASPC1). *Mahasankhavati,* which contains *Chitrakamoolatwaka* as one of its ingredients, is used to alleviate the symptoms associated with gall bladder cancer.

Macroscopical study, *Rasapanchaka* analysis and recent studies on *Chirvilva* for potential uses in *Arbuda*

Macroscopical study: *Holoptelia integrifolia* (Sanskrit: *Chirvilva*) is a large deciduous tree belonging to family Ulmaceae has 25m high. Leaves are simple, ovate, alternating, glabrous above, appressed pubescent punctate below, distantly serrate when young. Flowers of *Holoptelia integrifolia* are polygamous; appear before leaves, greenish-purple. Fruits are samara and one seeded. Bark is whitish grey, blaze yellowish-grey; streaked with light brown, 0.5-1cm thick fracture, short and fibrous; odour is unpleasant; and taste is bitter.

Rasapanchaka* analysis and recent studies on *Chirvilva* for potential uses in *Arbuda: Due to *Tikta Rasa* and *Ushna Virya*, *Chiravilva* acts as *Kapha Pitta Samaka*. Due to *Tikta Rasa,* it acts as *Deepana, Anulomana, Pittasaraka, Bhedana, Krimighna*. Due to *Ruksha Guna,* it acts as *Lekhana*. Hexane and ethyl acetate extracts from *Holoptelea integrifolia* bark had strong cytotoxic effects on breast and prostate cancer cell.

Macroscopical study, *Rasapanchaka* analysis, recent studies on *Haimavati* for potential uses in *Arbuda*

Macroscopical study: *Iris germanica* (Sanskrit: *Haimavati*) belongs to family Iridaceae. Drug available was dried mature rhizome with adventitious root on their underside, dark brown measuring 2-4cm length, 1-3cm diameter. The leaves are simple, sessile, glaucous, ensiform with parallel veins and flattened blades. Flowers are yellowish blue in colour.

Rasapanchaka* analysis, recent studies on *Haimavati* for potential uses in *Arbuda: Due to *Tikta, Ushna Rasa*; *Haimavati* acts as *Kaphavata Saamaka,* due to *Katu, Tikta Rasa* and *Rukshya Guna;* it is *Sothahara, Vranasodhaka* and *Lekhana.* Species of iris plants have polyphenolic chemicals in their flowers and rhizomes and that have strong antiproliferative effects on human skin and lung cancer cell lines. In the rural area of Nepal, *Paris polyphylla* Sm. (*Haimavati, Satuwa*-Nepali name) having *Madhura*, *Kashaya Rasa*; is used as immune-enhancing agent for those patients who are immunosuppressed from cancer.

DISCUSSION

Stem bark of *Daruharidra,* is mentioned as the officinal part of drug *Daruharidra* in API. So, in order to assess its' authentication of collected sample, it was compared with genuine sample of stem bark of *Berberis aristata* DC., which is called '*Chutro* in Nepali'. In

Berberis aristata, the stem bark is yellowish brown in color, whereas in *Berberis asiatica,* it is ash gray. In macroscopic evaluation of leaf, *Berberis aristata* exhibits a distinctive leaf morphology with clearly defined primary and secondary venation with prominent mid rib, which differentiate it from *Berberis asiatica,* whose leaves are coriaceous and display prominent venation on both surfaces. The rhizome of *Acorus calamus,* used for macroscopic pharmacognostical study, is characterized by transverse leaf scars on the upper side and tubercular root scar spots on the lower side with aromatic odour which are indicative of the genuine *Vacha.* The genuine roots of *Aconitum heterophyllum* are internally white and starchy, with 4-7 concentric yellowish brown dots toward the center. The genuine rhizome of *Musta* is white internally, tough on fracture and exhibits stelar vascular bundle dots with a distinct endodermal margin. The *Kustha* rhizome sample has thick roots that are very hard with a collapsed central root bark, cracked and fissured outer surface and a smooth inner surface. For *Haridra*, the part used for the study is rhizome which is yellow, aromatic and bitter in taste. For *Kutaki,* first collected sample has a long rhizome with intact roots, whereas the short rhizome with only root scars in the second sample indicates an adulterant *Kutaki*. Both samples had scaly rudimentary leaves at the top. The root bark of *Chitraka*, used for macroscopic study, is light yellow when fresh and pale brown when dry and warty outer texture. The stem bark of *Chiravilva* is slightly curved, with a rough, whitish grey outer surface bearing lenticels and warts and having a fibrous inner surface and an unpleasant odour. The dry rhizomes of *Haimavati* exhibit an pale brown exterior with circular nodes and scars. These genuine samples were collected for further study on their effects in various cancer cell lines and *in-vivo*. The *Lekhana Karma* of the given *Dravyas* is utilized in various Ayurvedic formulations that have demonstrated *Arbudaharakarma* in *in-vivo* and clinical studies. In early-stage cancers *Haridra*, *Kustha* and *Musta* exhibit significant efficacy. *Daruharidra* and *Kutaki* act as potent inhibitors during angiogenesis and tumor progression. In the metastatic stage, *Ativisha*, *Chitraka* and *Kutaki* exhibit limited but adjunctive benefits. *Lekhaneeya Mahakashaya* plants are most effective in the early to intermediate stages of cancer, where their anti-inflammatory, antiproliferative and anti-angiogenic properties help prevent disease progression and support tumor regression while their role in advanced and metastatic cancers is more supportive.

CONCLUSION

The present study elucidates key macroscopic pharmacognostical characteristics of the *Lekhaneeya Dravya* and provides authentication of the plant and its parts used for therapeutic purposes. The macroscopic features of the sample drugs including color, odour, taste, appearance as well as size, shape and texture were accurately evaluated and authenticated for further study. From the study, *Lekhaneeya Mahakashaya* plants exhibit significant potential in the management of cancer, particularly in early and intermediate stages. Different Ayurvedic formulations of these plants play multiple roles in different stages of cancer. Understanding the *Arbudaharakarma* of *Lekhaneeya Dravyas* through *Rasapanchaka* and its integration into modern oncology treatments, improve overall therapeutic outcomes in cancer patients.

CONFLICTS OF INTEREST: None

SOURCE OF FUNDING: Nil

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