IJPSR (2021), Volume 12, Issue 9 (Review Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 27 June 2020; received in revised form, 27 January 2021; accepted, 23 May 2021; published 01 September 2021

EXPLORING THE PATH OF NIRYASA (EXUDATES): AN OVERVIEW

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Keywords:

Niryasa, Exudate, Resin, Gum, Gum-resin, Oleogum resin

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ABSTRACT: Ayurveda (Indian system of medicine) chikitsapaddhati treats the patient with herbal, animal, and mineral drugs. Among the three, plant-based products acquire prime importance because of their wide utility and negligible side effects. Various parts of the plant are used solely or in different formulations. Niryasaor exudate broadly includes all types of secretory products like gum, resins and sometimes latex. From immemorial period niryasais being used in numerous disease conditions in Ayurveda but it is left unexplored so far. Hence, an effort is made to enlighten the path towards niryasa. Source, type of exudate, Rasa, Guna, Veerya, Vipaka and karma of several niryasa like Hingu, Dikamali, Srivesthaka, Dhava, Kankusttha, Vamshalochana, Garjanataila, Bola, Laksha, Bhimseni Kapoor, Aloe, Kunduru, Rala, Palasha, Khadira, Guggulu, Shigru, Rumimastagi, Sarja, Karpura, Gond kateera, Nimbaniryasa, Babbula, Arimeda, Mocharasa, Beejakaniryasa, Shilarasa, Tailaparni, Lobana, Charasand Raktaniryasaare tabulated as per available description in classics. Botanical identity along with illustration regarding exudate collection of above plants is catalogued based on published data from authorized journals. Apart from medicinal significance theyare also used in adhesives, printing and finishing textiles, sizing for paper, in paints and candy industries. Exudates are more effective because it contains a high number of secondary metabolites compared to other parts of the plant; hence the dose will be minimum. This article will help physicians to incorporate various niryasa in the routine practice as till now only few niryasa were in use like Hingu, Guggulu, and Shallakiniryasa.

INTRODUCTION: Plant parts and their products have been used by mankind from the prehistoric period. India is enriched with an herbal wealth of about 5000 plant species, having known medicinal and aromatic properties. It has a variety of agroclimatic conditions, which increases its biodiversity and gives rise to many ethnic groups of users.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.12(9).4635-46

The article can be accessed online on www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.12(9) 4635-46

The practitioners of the Indian Systems of Medicine used medicinal plants in preventive, promotive, and curative applications. Analysis of information on medicinal plants indicates that around 8000 plant species are used by different systems of medicine in India.

Each part of a plant is used as a separate medicine source like the leaves, flowers, fruits, stem bark, root bark, and resins, *etc*. The whole plant, bark, and roots are used in the majority of medicines, while secretory products, seeds and stems are used in some cases. Charaka mentioned 18 useful parts of audbhidagana (drugs originated from plant source), including niryasa [1], Susrutha also quoted niryasa as useful part of plant [2].

Susrutha explained tvaksaraniryasavisha in sthavaravisha (poisons of plant origin) [3]. Kaiyadevanighantu mentioned dashanga (10 useful parts of the plant) in mishrakavarga namely pushpa (flower), phala (fruit), tvak (bark), moola (root), patra (leaf), sara (heartwood), niryasa (gum and resin), shaka (branches), shunga (bud) and dugdha (latex) [4]. The above references signify the importance of niryasa and its usage from ancient times. In Saraswati Nighantu, synonyms of niryasa are interpretedas tarupiccha, piccham, and tarumajjakam [5]. In Sutra sthana of Charaka Samhita, three milk secretory plants are mentioned in which latex obtained from Snuhi (*Euphorbia neriifolia*) acts as a strong purgative, Akra (*Calotropis procera*) latex acts as an emetic and laxative, while the secretion from Ashmantak (*Ficus rumphii*) acts as emetic [6].

Niryasa broadly includes all types of secretory products like gum, resins and sometimes latex. Secretory products are secretions obtained either naturally or by making incisions to the plant. Secretory cells may occur in any plant part and are mainly of two types, excretory cells and secreting cells. External secretory structures are found on the plant surface, either in the epidermis layer or as derivatives of the epidermis and of deeper lying cells (emergences). These comprise trichomes, glands, nectaries, hydathodes and osmophores among others. Internal secretory structures are located below the epidermis layer. These consist of glands and ducts, which secrete oils, gums, and resins, and laticifers, which secrete latex.

Gums are translucent and amorphous substances produced by plants. Gums are usually pathological products and are produced when the plant is growing under unfavorable conditions or is injured. Thus, they are the abnormal products of plant metabolism [7].

Resins are amorphous mixture of essential oils, oxygenated products of terpenes, and carboxylic acids, obtained as exudates from plants and considered as end product of metabolism. These are solid or semi-solid amorphous products of complex chemical nature, usually insoluble in water but soluble in organic solvents like alcohol, volatile oils, fixed oils, benzene, and ether [8]. Generally, resins are local irritants and hence act as local cathartics (*e.g.*, Jalap and Ipomea), as anticancer (Podophyllum), in bronchial asthma (*e.g.*, Cannabis) also used externally as a mild antiseptic in the form of tinctures (Benzoin) ointment and plasters (Turpentine and Colophony). Resins are also used in the preparation of emulsion and sustained-release formulations. **Table 1** shows a classification of resins based on various factors.

TABLE 1: REVEAL CLASSIFICATION OF RESINS BASED ON VARIOUS FACTORS

1.	**On the basis of their formation**	
A	Physiological Resins	Schizogenous glands: *e. g.* Copaiba Secretion cells: *e. g.* Ginger Oil glands: e. g. Clove Oil ducts: *e. g.* Umbelliferous fruits
B	Pathological Resins	*e. g.* Benzoin, Colophony, Balsams, Aloe resin etc.
2.	On the basis of chemical nature	
A	Resin acids	*e. g.* Colophony: Abietic acid, Copaiba: Copavic acid, Myrrh: Commiphoric acid, and Shellac: Alleurhetic acid
B	Resin alcohols	*e. g.* Gurjan balsam- (gurjuresinols), Gauecum Resins- (gaucoresinols), Storax- (storesinols).
C	Resin phenols (Resinotannols)	*e. g.* Peru balsam- (peruresinotannols), Tolu balsam- (toluresinotannols), Benzoin- (siaresinotannols).
D	Ester Resins	*e. g.* Benzoin- Conyferyl benzoate, Storax- cinnamyl cinnamate
E	Resenes	*e. g.* Asafoetida (assaresene), Gum copal, Colophony, Gutta parcha and Dammar etc.
3.	On the basis of occurrence with other secondary metabolites	
A	Oleoresins	*e. g.* Copaiba, Canada balsam, Capsicum, Ginger and Turpentine.
B	Gum resin	*e. g.* Gamboage and Ammoniacum.
C	Oleogum resins	*e. g.* Myrrh, Guggul, Asafoetida, Olibanum and Gamboage.
D	Glycoresins	*e. g.* Jalap, Ipomoea and Podophyllum.
E	Balsams	*e. g.* Benzoin, Balsam of tolu, Balasam of peru, Storax *etc.*

1. Hingu (Asafoetida): It is an oleo-gum resin obtained from rhizomes and roots of Ferula narthex Bioss. The resin is collected after making incisions at the upper part of taproot of more than five-year-

old plants by scrapping in March April just before flowering, whole process repeated many times after one or two days or after a few weeks when it gets hardened. Approximately 200-600 gm Hing is extracted from a single plant [9]. Asafoetida contains three main fractions resin (40-64%), gum (25%), and essential oil (10-17%) [10]. Asafoetida has a strong, tenacious, and sulphurous odour. The digestive stimulant actions of asafoetida are the most commonly experimented with beneficial physiological effect *via* enhanced secretion of saliva and activity of salivary amylase. It plays an important role in the digestion of dietary lipids by stimulating bile flow and enhances the bile acid secretion and also enhances the activities of digestive enzymes of the pancreas and small intestine [11]. Charakahas mentioned Hinguniryasa as chedhaniya dipaniya anulomika vatakapha prashamana [12] and included in katuskandha dravya [13].

2. Dikamali (*Cambin resin*): It is a gum resin. The botanical source of Dikamali is controversial between *Gardenia gummifera* Linn. and *Gardenia lucida* Roxb.; some researchers consider both. However, TLC, HPTLC, and UPLC/MS analysis confirmed the source of Dikamali as *Gardenia lucida* Roxb. The gum resin oozes from the leaf buds/shoot tip of this tree in the form of yellow transparent tears. The resin has a strong offensive, disagreeable odour and pungent taste [14]. The resinous substance is secreted by collectors occurring at adaxial basal part of the stipule and calyx. About 350-400 such secretory collectors were found to occur at the base of a single stipule or calyx [15].

3. Srivesthaka (Gandhabiroja): It is an oleoresin exudate obtained by *Pinus roxburghii* Sargent syn. *P. longifolia* Roxb [16]. Tapping the wood of Sarala produces a transparent oleoresin somewhat thin or thick, later it solidifies and turns to yellow coloured. It is sticky soft, possessing strong odour. Red coloured oil is extracted by heating Gandhabiroja without water is called Khannutaila or Satabiroja, having a similar fragrance like that of Gandhabiroja. When Gandhabiroja is heated with steam, Turpentine oil is extracted. Approximately 8-pound oil is extracted from 56-pound Gandhabiroja. The remnant after oil extraction is called as colophony, from which Gandhabiroja damber is prepared [17]. The pine tar is produced by blending the terpenes available as by-products in the manufacture of synthetic camphor [18].

4. Dhavaniryasa: Dried exudate from the bark of *Anogeissus latifolia* (Roxb. ex. DC.) Wall. Ex Guillem. & Perris, a gum resin used alternative to Babbula (gum Arabic). It is also called gum ghatti; the name suggests its transportation through mountain passes or Ghats. It is used as a food additive, and also it has non-food applications19. The dried gum exudate is collected in the form of glassy nodules. Then it is subjected to series of processes like dissolution, filtration, sterilization, and spray drying, which is then powdered and used [20].

5. Kankusttha: It is yellow colored gum resin obtained from the incision of Tamala tree identified botanically as *Garcenia morella* (Gaertn.) Desr. 10-year-old tree is preferred and the incision is done in spiral manner during the rainy season. The bamboo pieces are kept below in which resin is collected and stored for 1 month to solidify. Then it is heated, including bamboo; the resin gets separated with bamboo marks on it. The dried resin is called Gamboge. It is available in the form of brownish-yellow coloured pieces (2-5 cm) in the market having pungent taste. The other Garcinia species also produce resin possessing low quality [21].

6. Vamshalochana: A major source in India is *Bambusa arundinacea*, though other species of Bambusa are also used. This is the secreted, dried sap from the joints and from surface injuries (caused by parasitic wasps) of Bamboo. It has a yellowish appearance. Pieces of Vamshalochana are found in the central hollow area, depositing at the joints; sometimes shaking the plant reveals their presence as they knock against the side. It is sweet, cold, clears heat, resolves phlegm, anti-convulsive; used in convulsion, fever, or loss of consciousness associated with phlegm-heat; especially used in remedies for children's feverish disorders and epilepsy. Tavaksheer is one of the main substances from bamboo used in Ayurvedic and Tibetan medicine; it is often called bamboo-manna or bamboo silica (because it is rich in silica). In Tibet, formulations with tavaksheeras the main ingredient, are used for treating lung diseases [22].

7. Garjana Taila: *Dipterocarpus turbinatus* C. F. Gaertn (Ashwakarna) yields an oleoresin locally named as Garjan oil. The resin obtained from dipterocarps genus are called dammer, which is solid or brittle resin results from hardening of the exudate following evaporation of the small content of essential oils. In India the oil was collected by cutting a hole into the centre of the tree. Sometimes a large notch was cut into the trunk of the tree about 75 cm above the ground level, in which fire was maintained until the wound was charred and the liquid began to ooze out. A small gutter was cut into the wood to a vessel attached to receive the oil. The average yield from the best trees was 180 liters per season. At 3 to 4-week intervals, the old charred surface was cut off and burnt afresh. Tapping is done from Nov to Feb, and sick trees were rested for 1 to 2 years. The exudate is milky and faintly acidic. It separates in 2 layers when allowed to stand, a brown oil floats on the surface and viscous whitish-grey emulsion below [23].

8. Bola (Myrrh): It is oleo gum resin obtained from the stem of *Commiphora myrrha* (Nees) Engl. It is obtained from several species of Commiphora, notably *C. abyssinica* (Berg) Engler, *C. schimperi* (Berg) Engler, and *C. myrrha* (Nees) Engler var molmol Engler. Genus Commiphora accounts for about 200 species native to Africa, Arabia, Madagascar, and India. In order to collect gum, the natives make incisions into the bark, causing the exudation of a yellowish oleoresin. Exposed to the air, it dries, hardens, and turns reddish-brown. Myrrh is partly soluble in ethanol (~ 30% alcohol-soluble material) and is also partly soluble in water and in ether. Since, antiquity myrrh has served as a constituent of incense. Oil of myrrh is a valuable ingredient in perfumes (balsamic, heavy odour). In more recent times, the gum has found medical usage as an antiseptic, the tincture being applied to inflammatory and ulcerated conditions of the throat and mouth [24].

9. Laksha: Laksha/ Lac is a resinous encrustation formed around the bodies of microscopic tiny lac insect by its own secretions and excretions after it has been cultured on the barks of lac host trees, the most important of which are the Kusum, the Palash, and the Badara. The resinous secretion which is known as sticklac contains about 4-5% wax and 1% water-soluble colouring material known as lac-dye (laccaic acid). Actually, lac is the oldest form of resin known to humankind. Among the lac insect species reported, only Kerria lacca (kerr) is being cultivated for production while others are still unexplored. Lac is also explained inunani literature under the animal origin drug with effective medicinal benefits. It has been in practice since ages for its anti-obesity, deobstruent and is an excellent liver tonic. Recently it has been pre-clinically evaluated for its hypolipidemic and antifertility actions showing promising results [25].

10. Bhimaseni kapoora: Exudate obtained from *Dryobalanops sumatrensis* (J. F. Gmel.) Kosterm. Syn. *D. aromatica*. It closely resembles the camphor from *Cinnamomum camphora*, but it is heavier than that. The camphor is found in cavities or fissures in the wood in the form of solid camphor or a light fluid called camphor oil. The tree is felled, cut into blocks and split into wedges to remove camphor. 100 trees rarely yield more than 8-10 kg solid camphor. In solid form, it occurs in white crystalline translucent fragments [26].

11. Kunduru: It is an oleogum resin exudate of *Boswellia serrata* Roxb. [27,] which comes out from cortex after an injury or natural crack in the bark. It is fragrant, transparent, and golden yellow. After concretion, it turns into brownish yellow tears or drops and crusts. Its size varies from pea size to walnut size. The smell is agreeable. Tapping should start from November and stopped before the monsoon. The oleo-gum resin is scraped off and collected in a circular tray suitably placed around the trunk. It is collected in a semi-solid state, and the vegetable impurities are manually removed. It is then kept in baskets up to 30 days on a cemented and sloping floor, whence the fluid portion containing the volatile oil is collected and used in paints and varnishes. The remaining semi-solid to solid part is mainly gum resin which is thoroughly dried and sometimes treated with soapstone powder to make it brittle. It is then broken into small pieces, cleaned, and graded for marketing [28].

12. Rala: On tapping the Sal tree (*Shorea robusta* Gaertn.) it yields an oleoresin known as Rala/Sal Dammar / Bengal Dammar. The method of tapping employed is to cut 3-5 narrow strips of bark above the ground. In about 12 days, the grooves become filled with resin, which oozes as a whitish liquid,

but soon becomes brown on drying. This is collected, and the cavities of the grooves are freshened, after which the exudation continues, and the resin is removed as before. This process is repeated several times during the year. Altogether 3 crops are obtained in a year, 1st in July, the 2nd in October, and the 3rd in January. The first is the best, both in quality and quantity. It usually occurs in rough brittle pieces pale creamy yellow in colour nearly opaque, and having a faint resinous balsamic odour. Sal resin on dry distillation yields an essential oil known as Chua oil [29].

13. Palasha: It is a gum resin exuding from natural cracks and artificial incisions in the stem bark of *Butea monosperma* (Lam.) Kuntze Syn. *B. frondosa* Koen. ex Roxb [30]. In classics palashatvakniryasais are mentioned in the context of yonivyapat chikitsa [31].

14. Khadira (Khair gum/Gum acacia): The gum obtained from *Acacia catechu* Willd, is of very good quality and is regarded as a good substitute for true gum arabic. It occurs in pale yellow tears and is said to give a thicker and better mucilage than babbul gum. It is not collected separately and is generally mixed with other acacia gums. The gum has sweetening taste and forms a strong mucilage with cold water [32]. The gum exudes from the cracks on the bark of the tree under difficult conditions such as heat, dryness, wounds and diseases. The gum flows naturally from the bark of the trees in the form of a thick and rather frothy liquid and speedily concretes in the sun into tears.

To accelerate exudation and to improve and regulate gum production, Acacia trees are tapped by means of incisions (60 cm × 5 cm) made in their branches some weeks ahead of time. Usually, mature trees, 4.5-6 m high and 5-25 years old, are tapped by making incisions in the branches and stripping away bark. The gum starts to collect in the wound within 3-8 weeks, but this depends on the weather conditions. Gum droplets are about 0.75-3 cm in diameter, and they gradually dry and harden on exposure to the atmosphere. These gum tears are manually collected. Collection of gum arabic takes place at intervals during the dry season from November to May. A tree, on average yields 250 grams of gum arabic per annum, although production may range from a few grams to as high as 10 kg. The highest yields are observed on trees aged from 7 to 12 years [33].

15. Guggulu: It consists of an oleo-gum resin obtained as an exudate from the tapping of stem and branches of *Commiphora wightii* (Arnott) Bhandari [syn. *Commiphora mukul* (Hook. Ex Stocks)]. It is a small thorny tree and produces a yellowish gum resin guggulu in small ducts located throughout its bark. The trees are tapped by making an incision on the bark.

The resin that flows out is allowed to solidify before it is collected. The tree is tapped from November to January, and the resin is collected through May to June. A guggul tree yields between 250 to 500 gm of dry resin during each collection season. Guggulu occurs in vermicular pieces of pale yellow or brown coloured mass with aromatic odour and bitter, astringent taste; when fresh it is viscid and golden coloured [34].

There are 5 Types of Guggulu as Per Classics:

1. Mahisaksha: Bhranga anjana varna (black coloured)

2. Mahaneela: Neela varna(Bluish coloured)

3. Kumuda: Similar to Kumuda or having kapisha varna

4. Padma: Similarity with Manikya varna

5. Hiranyaksha: Resembles svarna (Gold) in colour

Mahisaksha and Mahaneela type are ideal for treating elephants, Kumudaand Padma is useful in treating horses, and Hiranyakshais are used in human treatment.

Features of ideal Guggulu: Navinaguggulu – Snigdha (unctuous), picchila, colour resembling that of gold, Pakvajambuphalasadrishya, Sugandhayukta (having pleasant odour). Puranaguggulu-Shushka, durgandhayukta, devoid of natural colour and veeryavarjita. Things to be avoided during Guggulusevana- Amla rasayuktatikshnaahara, Ajirnakarakadravya, Madya sevana, Vyavaya, Shrama, Krodha and Atapa sevana [35]. Vagbhata mentioned that Guggulu is medo anilahara [36].

16. Shigru: It is a gum resin obtained from the stem of the *Moringa oleifera* tree. It is initially white in colour but changes to reddish-brown or brownish-black on exposure. It is sparingly soluble in water but swells in contact with it, giving a highly viscous solution [37].

17. Rumimastagi: It is a gum resin obtained from Pistacia lentiscus, also known as Arabic gum.

18. Sarja: It consists of resinous exudate of *Vateria indica* Linn. obtained by making semi-circular incisions on the stem through the cork cambium up to the surface of sapwood [38]. The trees are tapped either using semi-circular incisions or fire is lit at the base of the tree so as to scorch the bark, which then splits, and the resin exudes [39].

19. Karpura: It is exudate of *Cinnamomum camphora* (L.) Sieb. Charaka mentioned Karpuraniryasainmukhasugandhika dravya [40].

2 types of Karpura has been mentioned in classics based on formation/preparation-

1. Apakva Karpura: It is artificially prepared using plant parts. Root, stem, branches, and leaf of Karpura plant are heated in urdhvapatana yantra and karpurais obtained in the form of powder. It floats on water. It is more potent compared to pakvakarpura.

2. Pakva Karpura: It is a naturally collected exudate of plant in cut openings of tree. It sinks in water41.

20. Gond kateera (Gum karaya/Indian tragacanth): Gum exudate from Kateera (*Sterculia urens* Roxb.) bark. It exudes naturally but most of it is generally produced by tapping, blazing or by stripping off the bark. The gum begins to exudate immediately after blazing. Though the exudation continues for several days, the maximum amount of gum is produced within the first 24 h after blazing. The gum is allowed to thicken, and the collection is made every third or fourth day. The yield of gum from mature trees has been estimated at 1-5 kg per tree per season. The tree should be given rest for 2-3 years between successive trapping seasons and may safely be tapped 5 times during the lifetime. After collection, the large lumps are broken into small pieces and the colour varies according to quality or grade. The best grades are white; the intermediate is greyish or pinkish and the poorest is dark brown. The fresh gum has an acetous odour [42].

21. Nimbaniryasa: The bark of *Azadirachta indica* A. Jussexudates a clear, bright, amber coloured gum resin known as East Indian Gum, which blackens with age. It forms into small tears or vermiform pieces and the surface is cracked or fissured. The gum resin is non bitter. The trees in drier areas produce the gum freely but in wet climate the gum is liable to be washed away or spoiled before collection. It is substitute of Acacia gums. In Gujarat the annual production is estimated to be up to 4200 kg [43].

22. Babbulgum: The gum of *Acacia nilotica* (Linn.) Willd. ex. Even though called gum arabic, it is not the true gum arabic. The true gum arabicis obtained from A. Senegal. The gum exudes from wounds in the bark, mostly during March-May. Though some trees yield a maximum of 1 kg per year, the average in only few grams. The yield lessens with the increase in the age of trees and it is believed that tapping accelerates the flow, but it is not often practiced. It occurs in the form of rounded or ovoid tears possessing pale-yellow to brown or almost black colour according to age of tree and condition of collection. It is considered inferior to true gum Arabic in properties. In trade, in Bombay, 3 chief varieties are recognized

(1) True gum Arabic-imported from Saudi Arabia and Africa

(2) East Indian gum-imported from Aden and other Red sea ports

(3) Indian gum Arabic-commodity of Indian origin. It consists of a mixture of Babbul and other acacia gums. Two varieties of this gum are gum babbul and gum ghatti.

Gum babbul consists of gum of acacia species and gum ghatti found mixed with gums of *Anogeissus latifolia*, *Azadirecta indica*, and *Feronia elephantum* Correa. It has only 40% of acacia gums [44].

23. Arimeda: Gum exudate from *Acacia farnesiana* Willd.

24. Mocharasa (Shalmali vestaka): *Salmalia malabarica* Schott. & Endl. bark exudates a gum, known as semul gum or Mocharasa, from natural wounds caused probably by decay or by insects or as a result of some functional disease. The gum is not exuded from artificially made wounds on healthy bark. It occurs in light brown, nodular, hollow tears; these tears turn deep brown and later become opaque and dark. The gum is edible. It is credited with astringent, tonic, and demulcent properties. The gum is almost insoluble in water but absorbs it and swells like true gum tragacanth [45]. Charaka included shalmaliniryasa in preparation of picchabasti given in Arsha [46].

25. Beejaka niryasa: *Pterocarpus marsupium* Roxb. yield an exudate called Indian kino gum or Beejakaniryasa. The exudate discharges when an incision is made through the bark up to the cambium. It is collected and dried in the sun or shade, and yield of dried gum is approximately 340 gm per tree. It occurs in small, angular, glistening, brittle fragments. It is odourless and bitter with astringent taste and colours saliva pink when masticated [47].

26. Shilarasa: The gum resin is obtained by incising the trunk of Silhaka (*Altingia excelsa* Noronha). The exudate hardens after some time and then is collected, which is used as incense.

27. Tailaparni: 3 varieties are considered in the name of tailaparni. Bluegum from *Eucalyptus globules* Labill, a stickygum-like substance exudes from their trunks, Redgum from Eucalyptus rostrate Sm. and Citron gum from *Corymbia maculata* (Hook.) K. D. H & L. A. S. Johnson.

28. Charas: It is the resinous substance collected from the leaves and flowering tops of the female plants of *Cannabis sativa* L. The female flower heads are collected, dried, and crushed. This powder kneaded by means of wooden rods into a mass from the charas. Alternatively, the flower heads are crushed and squeezed and the resin is scraped off. Charas is a greenish mass with a characteristic odour. When kept for some time, it turns brownish grey, becomes hard and friable, and loses some of its narcotic activity. It is generally sold compressed into lumps of various shapes. Big tufts of flowers appear in Sep-Oct on these plants. In India, the cultivated plants do not yield sufficient resin. Charas is collected in parts of central Asia from plants grown for this purpose [48].

29. Lobana: It is benzoin/balsamic resin obtained from *Styrax benzoin* Dryand. Tapping of resin started when the trees are 7-10 years old, coinciding with the first flowering, and can continue for 60 years if the trees are kept in good condition. These trees are tapped once a year, and up to three flows can be collected; the first tap provides the highest quality resin. The first flow is collected after 3 months of tapping. About 1-3 weeks after tapping, the tapping cuts with benzoin are sealed, but sap and resin will continue to be secreted. During cooler & dryer winter season the resin will dry, becomes hard and fragile. A tree produces around 200-500 gm resin for the first flow. Benzoin resin is harvested manually using simple tools, but the activity requires skills to climb the trees. The resin is soft and sticky, quite pale in colour when collected freshly from the tree but darkens gradually during storage to a sandy orange colour. It melts easily when heated and has a pleasant smell with a touch of vanilla [49].

30. Rakta niryasa: Exudate from *Daemonorops draco* (Willd.) Blume.

31. Kumari niryasa (Aloe): It is a gum resin from Aloe barbadensis Miller

TABLE 2: BELOW SHOWS SOURCE, TYPE OF EXUDATE AND RASA PANCHAKA OF AVAILABLE EXUDATES IN CLASSICS COLLECTED FROM BHAVA PRAKASHA NIGHANTU AND DRAVYAGUNAVIGYANA PART 2 OF PROF. P. V. SHARMAJI [50, 51]

Name	Source	Type of exudate	*Rasa*	*Guna*	*Virya*	*Vipaka*	*Karma*
Hingu	Stem and rhizome of *Ferula narthex*Bioss.	Oleo-gum resin	Katu	LaghuSnigdha Tikshna	Ushna	Katu	VataKaphahara, Chedaniya, Dipaniya, Anulomana
Dikamali	leaf buds/shoot tip of *Gardenia lucida*Roxb.	Gum resin	Katu Tikta	Laghu Ruksha Tikshna	Ushna	Katu	Kapha Vatashamaka, Arti shantikrit, Vibandhahara

Srivesthaka (Sarala/ Gandhabiroja)	Stem of *Pinus roxburghii* Sargent	Oleoresin	Madhura Tikta Kashaya Sara	Snigdha	Ushna	…….	VataKaphahara, Rakshoghna, Sveda Daurgandhya hara
Dhava	Bark of *Anogeissus latifolia*	Gum resin	…….	……	……	…..	……
Kankusttha	Stem of*Garceniamorella*(Gaertn.) Desr.	Gum resin	Tikta Katu	Laghu Ruksha	Ushna	Katu Prabhava-Recana	Recana, Varnakaraka, Kaphahara, Shoolaghna
Vamshalochana	Nodes of female plant *Bambusabambos*	Siliceous resin	Kashaya Madhura	……..	Shita	Madhura	Brahmani, Vrshya, Balya Vatahara
Garjanataila Ashvakarna	Stem of *Dipterocarpus turbinatus*	Oleo resin	Katu Tikta	Laghu Ruksha	Ushna	Katu	Kandughna, Shirodoshartikrntana, Puyasravanashana
Bola	Stem of *Commiphoramyrrha*	Oleo gum resin	Madhura Katu Tikta	RukshaLaghu	Ushna	Katu	TridoshaRaktadoshahara, Raktadosha Dipana, Pachana, Medhya
Laksha	*Lacciferlacca*(kerr)	Resin gum	Kashaya	Snigdha Shita	Anushna		Balya, Varnya, Kapharaktapittahara, Indicated in Hikka KasaJvaraVrna.
Bhimsenikapoora	Wood of *Dryobalanopssumatrensis*	Oleo resin	……	…….	……	……	…….
Kumari	Leaf of *Aloe barbadensis* Mill.	Gum resin	……	Laghu Ruksha Tikshna	Ushna	……..	Agnijanana, Pitta nirharana, Rechana, Pushpa janana, Garbha patina, Balakrit
Kunduru	*Boswellia serrata* Roxb.	Oleogum resin	Madhura Tikta Katu	Tikshna	Ushna	Katu	VataShleshmahara, Used for Pana and Lepa
Rala	Stem of *Shorearobusta*	Oleoresin	Tikta Kashaya	Guru	Shita	……	Grahi, Doshahara
Palasha	Stem bark of *Butea monosperma*	Gum resin	……	…….	……	……..	Indicated in Grahani, Mukharoga, Kasa, Atisveda
Khadira	Stem of *Acacia catechu*	Gum resin	Madhura	…….	……..	…….	Balya, Shukravivardhana
Guggulu	Stem and branches of *Commiphora mukul*	Oleogum resin	Tikta Katu	Navina-Snigdha, Picchila Purana-Laghu, Ruksha, Tikshna, Vishada, Sukshma, Sara, Sugandhi	Ushna	Katu Prabhava-Tridoshahara	Navina- Brahmana, Vrshya Purana-Atilekhana, Kaphavatahara, Malapittanut, putikosthaghna, Agnidipana, Medohara
Shigru	Stem of the *Moringa oleifera*	Gum resin	……..	……	…..	…….	……
Rumimastagi	Trunk and branches *Pistacia lentiscus*	Gum resin	Madhura Kashaya	Laghu Ruksha	Ushna	Madhura	Kaphaghna, Mutrala, Vrshya, Sangrahi, Dipana
Sarja	*Vateria indica* Linn.		Kashaya Tikta	Snigdha	Shita	…….	Pittasradoshakusthaghna, Vatajit
Karpura	*Cinnamomum camphora*	Oleo resin	Tikta Katu Madhura	Laghu Tikshna	Shita	Katu	Tridoshahara, Vrshya, Chakshusya, Lekhana, Vishahara, Daurghandhanashana

Gond kateera	*Sterculia urens* bark.	Oleo resin	…….	…….	…..	…….	……..
Nimbaniryasa	Bark of*Azadirachta indica* A. Juss(Meliaceae)	Gum resin	…….	……..	……	……..	……..
Babbula	Stem of *Acacia Senegal*	Gum resin	Madhura Kashaya	Snigdha	Shita	Madhura	Grahi, Pittanilahara, Bhagnasandhanakara, Shonitasrutivarana
Arimeda	*Acacia farnesiana*Willd.	Gum resin	Kashaya		Ushna		Mukhadantavyadhi hara. Indicated in Raktavikara, KanduVishaShleshmaKrimiKusthaVisha and Vrnavikara.
Mocharasa	Stem of *Salmaliamalabarica* Schott. & Endl.	True gum	Kashaya	Snigdha	Shita	Katu	Grahi, Vrishya, Ama kapha pitta raktanut
Beejakaniryasa	Stem of *Pterocarpus marsupium*Roxb.	True gum	…….	…….	……..	…….	Tvachya, Keshya, Rasayana, Shleshmasrapittahara. Indicated in Kustha, Visarpa, Svitra & Meha.
Shilarasa	Trunk of *Altingiaexcelsa* Noronha	Gum resin	Katu Madhura	Snigdha	Ushna	…….	Vrshya, Kanthya, Shukrakantikrit, Dahagrahapaha
Tailaparni	Trunks of 1.*Eucalyptus globules*Labill (Blue gum) 2.*Eucalyptus rostrate* Sm. (Red gum) 3.*Corymbia maculate* (Citron gum)	…….	……	……	…..	……	……..
Lobana	*Styrax benzoin*Dryand.	Benzoin/ Balsamic resin	Madhura Tikta	Ruksha Laghu Tikshna	Ushna	Madhura	Kaphanissaraka, Mutrajanana, Pratidushaka, L/A in skin disorders and wound
Charas	Leaves and flowering tops of the female plants of *Cannabis sativa* L.	Dried latex	……	……	……	…….	…….
Raktaniryasa	*Daemonoropsdraco* (Willd.)Blume.	Resin gum	…….	…….	…….	…….	……

DISCUSSION: Incorporation of Niryasa from ancient classics in audbhidagana of Charaka, sthavaravisha of Sushruta, and dashanga of Kaiyadeva Nighantu etc. shows its significance in chikitsa. Niryasa broadly includes all types of secretory products like gum, resin, and sometimes latex. Secretory products are secretions obtained either naturally as defensive mechanisms in plants after injury or artificially by making an incision to secreting part of plants. True gums are formed from the disintegration of internal plant tissues in gummosis process from the decomposition of cellulose. Resins are formed as oxidation products of various essential oils that comprise complex chemical nature. The resin is usually secreted in definite cavities or passages. Hingu, Bola, Kunduru, and Guggulu are oleo gum resins that contain a mixture of volatile oil, gum, and resin. Dikamali, Dhava, Kankusttha, Kumariniryasa, Palasha, Khadira, Shigru, Rumimastagi, Nimbaniryasa, Babbula, Arimeda, and Silarasa are gum resins that contain true gum and resin as chemical constituents. Srivesthaka, Ashvakarna, Bhimseni Kapoor, Ralaand Karpura belongs to the oleo resin category as they contain volatile oil and resin. Vamshalochana and Lobana are siliceous and balsamic resins, respectively. Balsams are oleoresins that contain benzole or cinnamic acid;

hence they are highly aromatic. In addition to these Mocharasa & Beejakniryasa are true gums, Charas is dried latex and Raktaniryasa & Lakshaare resinous gums.

Srivesthaka, Bola, Kunduru, Khadira, and Lobana possess Madhura Tikta rasa so they act as pittahara. Rumimastagi and Babbul have Madhura Kashaya rasa hence subside pitta. Laksha, Sarja, Arimeda and Mocharasa acquire Kashaya rasa hence they are used in stambhana and sandhana karma. Hingu, Dikamali, Ashvakarna and Silarasa have Katu rasa therefore act as kaphahara and srotoshodaka. Kankusta, Rala, Guggulu, and Karpuraacquire TiktaKatu rasa; accordingly, they do subside kapha. Vamshalochana acts as an expectorant due to its alkaline property.

Hingu, Dikamali, Srivesthaka, Kankusta, Ashvakarna, Bola, Kumari, Kunduru, Guggulu, Rumimastagi, Arimeda, Shilarasa and Lobanaare Ushna while the rest possess sheetaveerya. Rasa panchaka of niryasa of Dhava, Bhimsenikapoor, Palasha, Shigru, Gond kateera, Nimba, Beejaka, Tailaparni, Charas and Raktaniryasa are not clearly mentioned in classics. Shodhana of some niryasa like Hingu, Guggulu, Karpura, and Kankusttha are explained in classical texts as below-

Hingu-Equal part of Hingu and Ghee are heated on low flame till Hingufloats on Ghee.

Kankusttha-shodhana is carried out by giving three bhavana (trituration) with Shunthi kvatha [52].

Guggulu-It has been mentioned in classics that administration of crude Guggulu leads to skin rashes, irregular menstruation, diarrhoea, headache, mild nausea, and with very high doses, it causes liver toxicity so there is a need of purification of Guggulu before using it in formulations. In the initial process of purification, foreign matter is removed manually from crude Guggulu, and it is then broken into small pieces. The broken pieces are covered in a piece of cloth to make potli and hanged indola yantra containing any of the ingredients like gomutra, triphalakashaya, vasapatrakashaya, vasapatrasavrasa, dugdha and water. The fluid is subjected for boiling and guggulu is kept immersed till all the soluble matter of guggulu is dissolved in any of the above-mentioned purifying solutions. The insoluble part of guggulu that remained in the cloth is taken out and discarded. After removing potlipurifying solution is boiled till guggulu forms a soft mass. It is then poured out over a smooth wooden board smeared with cow ghee or castor oil and dried in the sun. The dried mass is called suddhagugguluin, the purified form.

These exudates are regarded as poisonous internally in raw form. Shodhana procedures take care of the adverse effects and also enhances the therapeutic potential of the drug. It is possible that some of the properties (chemical and biological) of shodhana materials are transferred to the drug during shodhana process. It is seen that some of the toxic or harmful constituents of the crude drug are neutralized, detoxified, or removed during this process.

Conclusion-Exudates (gum and resins) are components of many pharmacological formulations in Ayurveda. Apart from medicinal significance, it is also used in adhesives, printing and finishing textiles, sizing for paper, in paints and candy industries. Exudates are more effective because it contains a high number of secondary metabolites compared to other parts of the plant; hence the dose will be minimum. This review help researcher to investigate new pharmacological activities of resins and gums. This article will help physicians to incorporate various niryasa in the routine practice as till now; only a few niryasa were in use like Hingu, Guggulu, and Shallakiniryasa. Researchers are suggested to explore rasa panchaka and pharmacological actions of exudates like Dhava, Bhimseni kapoor, Palasha, Shigru, Gond kateera, Nimba, Beejaka, Tailaparni, Charas, and Raktaniryasa, which are not clearly mentioned in classics.

ACKNOWLEDGMENT: Very thankful to Prof. A. K. Singh, Prof B Ram sir for their guidance on this work.

CONFLICTS OF INTEREST: Nil

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How to cite this article:
Kanashetti DS, Nagar L and Dwivedi KN: Exploring the path of niryasa (exudates): an overview. Int J Pharm Sci & Res 2021; 12(9): 4635-46. doi: 10.13040/IJPSR.0975-8232.12(9).4635-46.