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## PHARMACEUTICO ANALYTICAL STUDY OF PALASHA KSHARA BHAVITHA PIPPALI

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### ABSTRACT

**Background:** Kshara is one of the important dosage forms told in Ayurveda. Kshara means a caustic substance derived from the ashes of medicinal plants. According to Ayurvedic Formulary of India, kshara are alkaline substance obtained from the ash of drugs. Palasha kshara bhavitha Pippali is a rasayana yoga mentioned in Charaka samhitha for diseases like Kasa, shwasa, kshaya, hikka etc.

**Materials and Methods:** Pippali churna was given bhavana with Palasha ksharodaka for seven times to prepare Palasha kshara bhavitha Pippali. The prepared Palasha kshara bhavitha Pippali was subjected to organoleptic and physico-chemical parameters.

**Observations and Results:** The results of organoleptic characters like appearance, colour, odour, taste, touch and physico-chemical parameters like pH, loss on drying, total ash, acid insoluble ash, water soluble extractive value and alcohol soluble extractive value were carried out. **Discussion and Conclusion:** From first to seventh bhavana, Palasha kshara bhavitha Pippali showed increase in pH indicates the increase of kshareeya guna (alkaline properties) and decrease in acid-insoluble ash indicates that the product is well digestible when ingested orally. Thus, helpful in managing the symptoms of kasa, shwasa, kshaya, hikka etc. Therefore, to analyze the formulation pharmaceutically and analytically, this study was taken up.

**Keywords:** Palasha kshara bhavitha Pippali, Kshara, Bhavana, Pharmaceutico-analytical study, Rasayana, Shwasa

## INTRODUCTION

According to Ayurvedic Formulary of India, kshara are alkaline substance obtained from the ash of drugs. Kshara has been recommended for use in both local and systemic modes of administration in a wide range of clinical conditions [1]. The term Kshara is derived from two words, 'Chhan' and 'Chhar', which together means destroyer because of its ability to eradicate harmful materials from the body [2].

Palasha Kshara is an alkali prepared from the water-soluble ash of the Palasha plant. Palasha kshara is referred to as "Kshara Shreshta" i.e, the best among all kshara. It is indicated in Agnimandya, Gulma, Pliha-yakritvrudhi, Mutrakrcchra, Ashmari, Sharkara, Grahani, Anaha, Visuchika etc. [1].

Acharya Charaka lists numerous Rasayana formulations for various ailments. Palasha kshara bhavitha pippali is one among them, which comes under Pippali Rasayana. The person desirous of rasayana effect should take five, seven, eight, or ten Pippali along with madhu and ghrita for a whole year. It is recommended to have three Pippali fruits in the morning, before meal, and after meal along with madhu. Pippali fruits should be impregnated with Palasha

ksharodaka and then fried in ghrita. This is recommended for those who desires rasayana effect especially in cases of kasa, kshaya, shosha, shwasa, hikka, gala disorders, arshas, grahani dosha, pandu, vishama jwara, vaiswarya, pinasa, shopha, gulma and vata-balasaka [3].

Acharya Charaka has not mentioned the number of bhavana (impregnation) but Acharya Gangadhara, in his commentary has mentioned that the number of bhavana should be seven [4]. Palasha kshara bhavitha Pippali is prepared by giving bhavana to Pippali churna with Palasha ksharodaka for seven times. Here an attempt is made to evaluate Pippali churna, Palasha ksharodaka and Palasha kshara bhavitha Pippali pharmaceutically and analytically.

## MATERIALS AND METHODS

### Collection and authentication of raw drug

Raw drug Pippali was collected from the local market of Mysore. Karnataka and Palasha was collected from the native areas of Mysore. Karnataka. Authentication of raw drugs was done by the Department of Dravya Guna vijnana of Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan.

Table 1: Ingredients details of Palasha kshara bhavitha Pippali

Sl. No.	Ingredients	Botanical name	Family	Part used
1	Pippali [5]	<i>Piper longum</i> Linn.	Piperaceae	Fruits
2	Palasha [6]	<i>Butea monosperma</i> (Lam.) Kuntz.	Fabaceae	Stem bark, leaves and flowers

### Pharmaceutical study

Preparation of Palasha kshara bhavitha Pippali was done in the practical laboratory of Department of Rasashastra and Bhaishajya kalpana of Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan.

#### a. Preparation of Pippali churna

Raw pippali fruits were dried and pounded into coarse powder in a clean khalwa yantra. Later it was converted into fine powder and sieved (Table 2).

#### b. Preparation of ash

Palasha stem-bark, leaves and flowers were taken and dried under sunlight. Complete drying was tested by breaking the Palasha. When Palasha broke easily without bending, it was considered as completely dried. Dried Palasha was arranged in a heap in a wide mouthed iron vessel. It was then ignited in a windless place. Later allowed for Swangasheetha (cooling on its own). Then the obtained white ash was collected (Table 3).

#### c. Preparation of Ksharodaka

The obtained ash was dissolved in six parts of potable water in a stainless steel container. Later, macerated well and kept

undisturbed overnight. Ash and water were measured volumetrically. Next day morning, the supernatant liquid was decanted carefully and filtered for 21 times using a clean cloth. Thus, obtained liquid is known as Ksharajala. The obtained ksharajala was taken in a wide-mouthed iron pan. It was then heated on madhyamagni (medium flame). The temperature was maintained between 280<sup>0</sup>C to 400<sup>0</sup>C. It was slowly stirred using a ladle until it attained dark brownish colour and slimy consistency known as Ksharodaka [7] (Table 4, 5).

#### d. Preparation of Palasha kshara bhavitha Pippali

210g of Pippali churna was taken in a clean khalwa yantra. It was then added with Palasha ksharodaka until it became a soft mass. The amount of ksharodaka added was sufficient to generate a soft mass and keep the Pippali churna moist during the grinding process [8]. Then levigation was done until Subhavitha lakshana<sup>9</sup> were obtained. This procedure was repeated for seven times. Thus, obtained product is known as Palasha kshara bhavitha Pippali (Table 6, 7).

### Photographs of raw drugs used in pharmaceutical study



Fig 1: Palasha



Fig 2: Pippali

### Photographs of stages of preparation of Palasha ksharodaka



Fig 1: Dried Palasha



Fig 2: Palasha ignited



Fig 3: Palasha ash



Fig 4: Ash mixed with water



Fig 5: Filtration process



Fig 6: Ksharajala



Fig 7:Evaporation process



Fig 8: Ksharodaka

### Photographs of stages of preparation of Palasha kshara bhavitha Pippali



Fig 1: Pippali churna



Fig 2: Palasha ksharodaka



Fig 3: Pippali churna in khalwa yantra



Fig: Bhavana process in Khalwa yantra

### Analytical study

In this study, organoleptic characteristics [10], physico-chemical analysis [10] and phyto-chemical tests [11, 12, 13] of Pippali churna, Palasha ksharodaka and Palasha kshara bhavitha Pippali were done in the quality control laboratory of teaching pharmacy of Department of Rasashastra and Bhaishajya kalpana of Sri Dharmasthala Manjunatheshwara College of Ayurveda & Hospital, Hassan.

### OBSERVATIONS AND RESULTS

#### A Observations and results of pharmaceutical study

Powdering pippali fruits was easy as it was taken in completely dried form (Table

2). Palasha burnt quickly and easily leaving behind very less carbon as it was dried completely. Comparatively stem bark took more time to burn. 48.6 % of weight loss was observed after drying. The ash obtained was whitish grey in colour. 5.3ltr ash was obtained from dried palasha (Table 3). After addition of water, the content had a characteristic odour and was yellow with brownish tinge in colour. 28ltr kshara jala was obtained after filtering for 21 times. Filtrate after 21 filtrations attained Gomutra varna (Table 4). On heating Kshara jala the colour changed from brownish tinge yellow to brownish colour and was boiling with a bubbling sound. Total time taken to prepare ksharodaka was 5hr 30min. As boiling

continued, the content gradually turned to dark brownish and slimy consistency. Yield of 15% was obtained from 5.3ltr of ash (Table 5). The mass absorbed the liquid quickly and dried soon. Creaking sound was heard during trituration in the 1<sup>st</sup> bhavana and the sound gradually reduced in the successive bhavana. After the first bhavana, the mass was slight rough in nature, which

turned into smooth after seventh bhavana. Quantity of ksharodaka required for bhavana reduced for successive bhavana. However, the duration of bhavana to obtain samyak bhavitha lakshana increased. On observation, the particles of Pippali churna were seen after first bhavana, which gradually became finer in the subsequent bhavana (Table 7).

Table 2: Results of preparation of Pippali churna

Sl. No.	Results	Before	After
1	Raw Pippali fruit	250g	-
2	Prepared Pippali churna	-	223g
3	Loss in weight	-	27g
4	Loss in percentage	-	10.8%

Table 3: Results of preparation of Palasha ash

Sl. No.	Parameters	Quantity
1	Weight of fresh Palasha	33.5kg
2	Weight of dried Palasha	17.2kg
3	Loss of weight after drying	16.3kg
4	Percentage of loss after drying	48.6%
5	Ash obtained in weight	780g
6	Ash obtained in volume	5.3ltr
7	Percentage of ash obtained from dried Palasha (w/w)	4.53%

Table 4: Results of preparation of Palasha kshara jala

Sl. No.	Parameters	Quantity
1	Ash obtained in weight	780g
2	Ash obtained in volume	5.3ltr
3	Quantity of water added	32ltr
4	Kshara jala obtained after filtering for 21 times	28ltr
5	Loss of kshara jala after filtering for 21 times	4ltr
6	Percentage of loss of kshara jala	12.5%

Table 5: Results of preparation of Palasha ksharodaka

Sl. No.	Parameters	Quantity
1	Kshara jala obtained after filtering for 21 times	28ltr
2	Time taken to prepare Ksharodaka	5hr 30min
3	Quantity of Ksharodaka obtained	800ml
4	Percentage of yield obtained from Palasha ash (v/v)	15%

Table 6: Results of preparation of Palasha kshara bhavitha Pippali

Sl. No.	Results	Before bhavana	After bhavana
1	Initial weight of Pippali churna	210g	-
2	Final weight after 7 <sup>th</sup> bhavana	-	359g
3	Total weight gain	-	149g
4	Percentage weight gain	-	70.9%

Table 7: Results of quantity of Palasha ksharodaka and duration of bhavana procedure

Bhavana	Quantity of Palasha ksharodaka	Duration
1	250ml	2hr 30min
2	100ml	2hr 30min
3	80ml	2hr 45min
4	70ml	3hr
5	60ml	3hr 30min
6	40ml	3hr 30min
7	30ml	3hr 15min
Total	630ml	21hr

## B Observations and results of analytical study

Analytical study like organoleptic characteristics, physico-chemical

parameters and phyto-chemical screening of Pippali churna, Palasha ksharodaka and Palasha kshara bhavitha Pippali were carried out and the results are given in **Table 8-13**.

**Table 8: Organoleptic characteristics of Pippali churna, Palasha ksharodaka and Palasha kshara bhavitha Pippali.**

Sl. No.	Parameters	Pippali churna	Palasha kshara bhavitha Pippali	Palasha ksharodaka
1	Appearance	Powder form	Powder form	Liquid consistency
2	Colour	Brownish cream	Dark brownish cream	Dark brown
3	Odour	Pungent	Pungent alkaline	Alkaline
4	Taste	Pungent	Pungent alkaline	Salty
5	Touch	Fine powder	Very fine powder	Slimy

**Table 9: Physico- chemical parameters of Pippali churna**

Sl. No.	Parameters	Pippali churna	API limits
1	pH	5.8	-
2	Loss on drying at 105 <sup>o</sup> C	1%	-
3	Total ash	6%	Not more than 7%
4	Water soluble extractive	20.04%	Not less than 7%
5	Alcohol soluble extractive	9.6%	Not less than 5%
6	Acid insoluble ash	0%	Not more than 0.5%

**Table 10: Physico- chemical parameters of Palasha Ksharodaka**

Sl. No.	Parameters	Palasha Ksharodaka
1	pH	10.86
2	Specific gravity	1.113
3	Refractive index	1.363
4	Total solids	17.85%
5	Viscosity	0.0165 g cm <sup>-1</sup> s <sup>-1</sup>

**Table 11: Physico- chemical parameters of Palasha kshara bhavitha Pippali after each bhavana**

Sl. No.	Parameters	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>
1	pH	9.40	9.44	9.43	9.59	9.70	9.72	10.12
2	Loss on drying at 105 <sup>o</sup> C	13.6%	13.2%	16.6%	13.2%	17.8%	16.2%	14.8%
3	Total ash	18%	16%	21%	30%	31%	34%	36%
4	Water soluble extractive	38.4%	39.2%	39.2%	42.4%	41.6%	41.6%	43.2%
5	Alcohol soluble extractive	25.6%	23.2%	21.6%	16%	15.2%	9.6%	7.2%
6	Acid insoluble ash	1%	1%	1%	0%	0%	0%	0%

**Table 12: Particle size analysis**

Sl. No.	Samples	Particle size	Percentage of particles remaining in mesh no. 80
1	Pippali churna	Moderately fine	56.2%
2	Pippali churna after 1 bhavana	Moderately fine	40.6%
3	Pippali churna after 7 bhavana	Moderately fine	12%

**Table 13: Phytochemical screening of Pippali churna, Palasha ksharodaka and Palasha kshara bhavitha Pippali.**

Phytochemical tests	Pippali churna		Palasha ksharodaka	Palasha kshara bhavitha Pippali	
	Aq.	HA		Aq.	HA
<b>Carbohydrates</b>					
Benedict's tests	+	+	+	+	+
<b>Proteins and Amino-acids</b>					
Biuret test	+	+	-	-	-
<b>Alkaloid</b>					
Mayer's test	-	-	-	+	+

Dragendroff's test	+	+	-	-	-
Wagner's test	+	+	-	-	-
<b>Tannins</b>					
Lead acetate test	+	+	+	+	+
<b>Glycosides</b>					
Born Trager's test	+	+	-	-	-
<b>Cardiac glycosides</b>					
Keller-Killani test	+	+	-	-	-
<b>Steroids and Sterols</b>					
Salkowski reaction	+	+	-	-	-
<b>Flavonoids</b>					
Alkaline reagent test	+	+	+	+	+
Ammonia test	+	+	+	+	+
Lead acetate test	+	+	+	+	+
Sulphuric acid test	+	+	+	+	+
<b>Phenols</b>					
Lead acetate test	+	+	+	+	+
<b>Saponins</b>					
Foam test	-	-	-	-	-
Gums and mucilage	-	-	+	-	-
Resins	-	-	-	-	-
Coumarins	+	+	+	+	+

Note: Aq= Aqueous, HA= Hydro-alcoholic, + = Positive, - = Negative

## DISCUSSION

### Pharmaceutical study

Sukshma churna is recommended due to its rapid absorption in liquid media and its ability to achieve desirable qualities. 250g of raw Pippali fruits yielded 223g of Pippali sukshma churna resulting in a loss of 27g. This loss is due to the unpassed particles of Pippali through the mesh size mentioned for sukshma churna.

After complete drying about 17.2 kg of Palasha, 48.6% of loss was observed. This may be due to complete evaporation of moisture, drug is burnt in open air to get sufficient supply of air, which helps to burn completely into grey ashes and prevents the formation of carbon.

The percentage of Kshara jala lost during filtration is 12.5%; this could be due to water molecules being absorbed by the

cloth, absorbance by the ash or spilling. The colour of Kshara jala was dark yellow, which gradually turned Gomutra varna (deep orange yellow colour) after 21 filtrations, this could be due to dispersed ash particles being trapped by the cloth.

During boiling of Kshara jala, white froth is observed in the beginning, which may be due to the beginning of separation of soapy alkaline salts present (sodium, potassium, chloride and carbonate) [14] in Kshara jala. At the same time, even characteristic smell of kshara is appreciated, which complements the process of initiation of separation of alkaline material from Ksharodaka. This is observed at the end of completion of the process of evaporation of water part from Kshara jala. Regarding the colour, Gomutra Varna (deep orange yellow colour) kshara jala started turning to dark

brownish colour due to the concentration of alkaline material and loss of water molecules. However, at the end, the colour of ksharodaka obtained was blackish brown. 28ltr of Ksharajala was reduced to 800ml of ksharodaka. This reduction was done to get concentrated ksharodaka. The temperature was maintained between 280<sup>0</sup>C to 400<sup>0</sup>C. At this temperature, the entire kshara jala took around 5 hour 30 minutes to turn into ksharodaka.

The process of Bhavana involves triturating the drug with an adequate quantity of liquid medium for a specified duration until it achieves desirable characteristics [9]. Here the bhavana dravya taken as Palasha ksharodaka and bhavya dravya is fine powder of Pippali. Each time sufficient quantity of ksharodaka was added and trituration was done for specific time, which was noted. Initially it required more amount of ksharodaka to satisfy the criteria of wetting or immersing the drug in liquid media. Later it was found that in subsequent bhavana, the quantity of ksharodaka required was decreased, this may be because the drug was not in completely dry form. Time taken to complete the subsequent bhavana process increased; this may be due to the addition of nature of alkaline substances, which delayed the drying process. It was observed that softness and smoothness was developed in the material in the later process of trituration which may be

due to application of force and pressure by trituration and also may be due to decrease in particle size. 210g of Pippali churna required 630ml of ksharodaka. The quantity obtained after bhavana is 359g, total gain is 149g. This may be due to the addition of alkaline salts to Pippali churna hence total bulk might have increased. Also, particle size was decreased when compared to Pippali churna.

#### **Analytical study**

Colour of Pippali churna was Brownish cream, which was given bhavana with Palasha ksharodaka that possess Dark brown colour resulting in the Dark brownish cream colored product. The odour of Pippali churna was Pungent and of Ksharodaka was Alkaline, which resulted in Pungent-alkaline product. The taste of Pippali churna was Pungent and of Ksharodaka was salty, which resulted in pungent-alkaline product. Pippali churna was in fine powder form and Ksharodaka was in liquid form whereas the final product was in a very fine powder form. The changes in the organoleptic characteristics were due to addition of the properties of Ksharodaka into Pippali churna.

The pH value indicates the degree of acidity or alkalinity of a sample solution. The pH of Pippali churna was 5.8. The pH of Palasha kshara bhavitha Pippali from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 9.40, 9.44, 9.43, 9.59, 9.70, 9.72 and 10.12, this gradual increase in

pH may be due to the addition of Palasha ksharodaka, which was of pH 10.86. All the pH of the above samples were alkaline in nature due to addition of alkaline salts. If the drug is very acidic or less alkaline, there will be more decomposition of the drug [15].

Loss on drying is one of the important parameter to determine the shelf life of the drug [16]. The loss on drying of Pippali churna was 1%, which indicates that the Pippali used was having very less moisture as it was taken in a dry form. The values of loss on drying of Palasha kshara bhavitha Pippali from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 13.6%, 13.2%, 16.6%, 13.2%, 17.8%, 16.2% and 14.8%. These values indicates the presence of little moisture in the drug. This may be because kshara is hygroscopic in nature, which absorbs water quickly. Due to this even after drying the final product completely it absorbs water quickly.

The total ash of plant materials includes "physiological ash," which is formed from plant tissue itself, and "non-physiological ash," which is frequently obtained from external contaminants such as sand and soil [17]. Ash value indicates the identity and purity of the drug. A high ash value implies contamination, adulteration, or even improper manufacturing [18]. The ash value of Palasha kshara bhavitha Pippali from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 18%, 16%, 21%, 30%, 31%, 34% and 36%. This increase in ash value indicates that the

inorganic matter increased at the end of 7 bhavana due to the addition of Palasha ksharodaka. The total ash value of Pippali churna was 6%, which is less than 7% i.e, within API limits. This indicates the raw drug Pippali was of genuine quality.

Acid insoluble ash is a common test used to determine the percentage of insoluble inorganic component of a sample in dilute acid. This test has therapeutic value since all substances ingested orally undergo digestion in hydrochloric acid [19]. Kshara is made by dissolving this ash in water and then drying it with heat. During this process, an insoluble component such as silica is removed by filtration while soluble chemicals like potassium and sodium remain in the solution. The acid insoluble ash value of Pippali churna was 0%, which is less than 0.5% i.e, within API limits. This indicates the raw drug Pippali was of genuine quality. The acid insoluble ash value of Palasha kshara bhavitha Pippali from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 1%, 1%, 1%, 0%, 0%, 0% and 0%, suggesting that this substance may be digestible when ingested orally.

Water-soluble extractive indicates the percentage of the constituents soluble in water. Some of the water-soluble components are tannins, sugars, plant acids and mucilage [20]. The water-soluble extractive value of Pippali churna was 20.04%, which is not less than 7% i.e, within

API limits. This indicates the raw drug Pippali was of genuine quality [20]. The water-soluble extractive values of the drug from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 38.4%, 39.2%, 39.2%, 41.6%, 41.6% and 43.2%. This shows that the incorporation of active principles from 1<sup>st</sup> to 7<sup>th</sup> bhavana has increased significantly. This may be due to the addition of kshara that is easily soluble in water, reduction of particle size of the drug and increase in its surface area due to bhavana process.

Alcohol-soluble extractive indicates the percentage of the constituents soluble in alcohol. Some of the alcohol-soluble components are tannins, resins and alkaloids [20]. The alcohol-soluble extractive value of Pippali churna was 9.6%, which is not less than 5% i.e, within API limits. This indicates the raw drug Pippali was of genuine quality. The alcohol-soluble extractive values of the drug from 1<sup>st</sup> to 7<sup>th</sup> bhavana were 25.6%, 23.2%, 21.6%, 16%, 15.2%, 9.6%, 7.2%. This decrease in the values indicates that as the percentage of kshara increased in the drug, there is decrease in alcohol solubility. This implies kshara have less solubility in alcohol.

Particle size indicates the dissolution rate; suspend ability, uniform distribution, penetrability and non-grittiness [21]. Particle size of Pippali churna, Pippali churna after one bhavana and Pippali churna after seven bhavana came under moderately

fine category. Where, percentage of particles remained in the mesh no. 80 varies in Pippali churna, Pippali churna after one bhavana and Pippali churna after seven bhavana were 56.2%, 40.6% and 12% respectively. This indicates bhavana has an effect on particle size. Among Pippali churna and Pippali churna after one bhavana, there was no much reduction, but when Pippali churna after one and seven bhavana were compared there is significant reduction in the particle size. Thus suggests that the final product (Palasha kshara bhavitha Pippali) is finer and suggests that it has high dissolution rate and good penetrability.

Specific gravity indicates the percentage of solutes or the active principles present in the solvent. The specific gravity of Ksharodaka was 1.113. The specific gravity of water is 1. That which is having specific gravity more than 1 will sink in water and that which is less than 1 will float. This indicates ksharodaka had specific gravity more than water, which implies it is denser than water, and have more solutes in it [22].

Refractive index indicates the purity and concentration of the substance. When the refractive index is high, the risk of deterioration due to oxidation increases [23]. The refractive index of Ksharodaka was 1.363. The refractive index of water is 1.33. This suggests that the Ksharodaka is

denser than water and is more concentrated. This is because the Kshara jala was made concentrated by boiling and reducing.

Total solids includes the weight of total suspended solids, total soluble solids and settle-able solids per unit volume of water [24]. The total solids value of Ksharodaka was 17.85%. This indicates the presence of more active principles.

Viscosity indicates the percentage of solutes or the concentration of the liquid [25]. The viscosity of Ksharodaka is  $0.0165 \text{ g cm}^{-1} \text{ s}^{-1}$ . The viscosity of water is  $0.0101 \text{ g cm}^{-1} \text{ s}^{-1}$ . The viscosity of Ksharodaka is slightly more than that of water. This indicates more solutes in Ksharodaka when compared to water.

Preliminary phyto-chemical analysis of Pippali churna revealed the presence of carbohydrates, proteins, amino-acids, alkaloids, tannins, glycosides, cardiac glycosides, steroids and sterols, flavonoids, phenols and coumarins. Palasha ksharodaka revealed the presence of carbohydrates, tannins, flavonoids, phenols, gums, mucilage and coumarins. Palasha kshara bhavitha Pippali revealed the presence of carbohydrates, tannins, alkaloids, flavonoids, phenols and coumarins. As Flavonoids, Tannins, Phenols and Coumarins were present in both Pippali and Palasha ksharodaka, they were also found in the final product, Palasha kshara bhavitha Pippali.

Flavonoids are the secondary metabolites that possess anti-ageing, anti-bacterial and anti-oxidant properties and with their ability to inhibit carcinogenesis at different stages. They also act as effective chemo preventive agents. Tannins are the water-soluble polyphenols. They have antimicrobial properties and hence can enhance the shelf life of the preparations [26]. Phenolic compounds are the most common secondary metabolites in plants, and they are found in a wide range of higher plant organs, including vegetables, fruits, spices, grains, legumes, and nuts. They possess various health benefits such as anti-carcinogenic, anti-thrombotic, antiulcer, anti-arthrogenic, anti-allergenic, anti-inflammatory, antioxidant, immunomodulating, antimicrobial, cardio-protective and analgesic activities [27]. Coumarins are the most common organic compounds that are used in medicine for their pharmacological and biological actions, which include anti-inflammatory, anti-coagulant, anti-hypertensive, anti-oxidant, anti-proliferative, antimicrobial, and neuroprotective properties. It is also found that coumarin derived compounds have therapeutic effects against several human diseases and types of cancer including breast, lung, colorectal, liver and kidney cancer [28].

## CONCLUSION

The aim of this article was to assess the Palasha kshara bhavitha Pippali pharmaceutically and analytically. On observation, we can see that the water-soluble extractive values are more than the alcohol-soluble extractive values. These demonstrates the product has better absorption in water media. The phyto-constituents like flavonoids, tannins, phenols and coumarins shows potent anti-cancer activity of Palasha kshara bhavitha pippali. Therefore, as this formulation is simple in terms of ingredients and preparation, further research studies have to be conducted to know its clinical applicability and effectiveness.

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