# PHYTOCHEMICAL STUDY OF *KUSTHA* (*Saussurea lappa* C.B. CLARKE.) AND ITS MARKET SAMPLES.

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**Abstract:** Due to excessive deforestation and extreme weather conditions adulteration of Himalaya herbs is rampant. Moreover, to our misfortune, medical practitioners started depending upon the traders for obtaining the raw materials. Hence, the need for identification of these herbs through botanical surveys, pharmacognostic studies and the assessment of the quality of the material available in a particular area or market is essential. Different parts of medicinal plant raw materials, in dry form, show different features most of which are being common to many drugs thus creating lot of confusion and controversy in identification of the crude drug. Same is the case with *Kustha* (*Saussurea lappa*). So to check the status of *Kustha* in markets a market study was done by the author in the department of Dravyaguna, NIA, Jaipur in the year 2012, which covers six major markets from all over India. Phytochemical study of market samples of *Kustha* was done and compared with the genuine source collected from its native habitat. Samples from three markets of India matches with *Kustha* i.e. roots of *Saussurea lappa* C.B Clarke. Samples from two markets were identified as roots of *Nagauri Ashwagandha* i.e. *Withania ashwagandha* and one market sample were identified as roots of *Pushkarmool* i.e. *Inula racemosa*. Quality of the market samples along with the price of the drug varies from market to market.

Index Terms*: Saussurea lappa*, Phytochemical, Adulteration, Market study.

## Introduction:

Due to excessive deforestation and extreme weather conditions adulteration of Himalaya herbs is rampant. There are about 50 medicinal plants from the Himalaya which are extensively used in Ayurvedic formulations out of which 32 plants are scarce and found adulterated in the market study.[1] *Kustha* has been used in the indigenous system of medicine since a long time. The Botanical source of *Kustha* constitute of dried roots of *Saussurea lappa* (C.B. Clarke.) belonging to family Asteraceae as per.[2] It is commonly known as Costus in trade, has however no connection with the botanical genus Costus. *Kustha* is well known both in the Ayurvedic and Tibetan medicine. It grows in the Northern temperate regions i.e. in the Himalayas at an altitude ranging from 8000- 13000 ft. above mean sea level. *Kustha* have tonic, disinfectant, stomachic, spasmolytic, carminative and stimulant properties. It is well known medicine used as anti-spasmodic in asthma, cough and cholera and as alterative in chronic skin diseases and rheumatism. It is also used for preserving silk and expensive wool fabrics, as incense in religious ceremonies and as insect repellent.

*Kustha* has become almost extinct in many places by uncontrolled exploitation. Due to this, many places of different states of Himalayan has undertaken for cultivation. It is majorly cultivated in Lahaul - Spiti, Kinnaur in Himachal Pradesh. It is also undertaken for small scale cultivation in hilly areas of Uttaranchal.

## Chemical Constituents

Roots of *Saussurea lappa* contains heptadecatetrane, 12- methoxy dihydrocostunolide, 22-dihydrostigmasterol, 3- isopropylpentanoic-acid, 3- methylbutyric-acid, 4-ethyloctanoic acid, 7-octanoic acid, acetic acid, alkaloids, alpha humulene, alpha phellandrene, alpha costene, alpha amorphenic acid, alpha

amyrin-stearate, alpha ionone, aplotaxene beta-sitosterole, beta-selinine, beta costene, beta-ionone, beta-elemene, beta-amyrin-stearate, betulin, camphene, caryophyllene, caryo-phyllene-oxide, cedrene, cedrol, cis-dihydroionone, costic- acid, costol, costunolide, costus lactone, di-hydrocostus lactone, dihydro dehydrocostus lactone, dihydroaplotaxene, dihydrocostunolide, hepatanoic acid, inulin, isozaluzanin, kushtin, lactones, linalool, lupeol, myrcene, nephthaline, palmitic acid, saussurine, stigmasterol, tannin, taraxasterol.[3-7]

## Aim and Objective

There is a vast document available with regard to morphology of green drugs. However for physicians who are totally dependent on market for the procurement of medicinal plant raw materials, it is not of much relevance even if he has sound knowledge of identification of green drug. Different parts of medicinal plant raw materials, in dry form, show different features most of which are being common to many drugs thus creating lot of confusion and controversy in identification of the crude drug. Same is the case with *Kustha* (*Saussurea lappa*). So to check the status of *Kustha* in markets a market study was done by the author in the department of Dravyaguna, NIA, Jaipur in the year 2012, which covers six major markets from all over India. Phytochemical study of market samples of *Kustha* was done and compared with the genuine source collected from its native habitat.

*Kustha* i.e. root of *Saussurea lappa* C.B. Clarke. can be identified organoleptically by following points- It is woody, stout, fusiform, arched, and slightly twisted. Outer surface is saddle brown in colour having longitudinal wrinkles with ridges running straight or spiral. It does not explore minute particles on its fracture and shows cutting surface same as that of the cutting surface of Horn of deer (Chakrapani Dutta). A transverse cutting portion shows a brownish surface with three distinct regions i.e. periderm as thin outer blackish ring followed by a woody portion with fine radical striation and a central pith region. The root has peculiar characteristic and strong aromatic odour. It has a sweet taste in the start just for the few seconds and after that it has bitter taste.

## Methodology

### Collection of genuine sample and their adulterants/ substitute from the field:

An authentic source of *Kustha* i.e. *Saussurea lappa* roots were collected from the hills of *Shatargala* Tehsil- Bhaderwa, Dist. Doda, State- Jammu and Kashmir, the genuine root samples of *Pushkarmool* i.e. roots of *Inula racemosa* were collected from Bhadarwa Dist. Doda, State- Jammu and Kashmir and root samples of *Arctium lappa* was collected from the hills of *Sarthal* Dist. Kathua, State- Jammu and Kashmir. After collection Herbarium were made and authenticated at IIIM Jammu.

**Table I- Date and place of collection of genuine samples.**

| Plant name | Date of collection | Place of collection | Herbarium account no. |
|---|---|---|---|
| *Saussurea lappa* | 11-09-2012 | Dist. Doda | 17279 |
| *Inula racemosa* | 11-09-2012 | Dist. Doda | 13697 |
| *Arctium lappa* | 11-09-2012 | Dist. Kathua | 19370 |

### Collection of Market Samples

Exclusive dependence on traders has created serious malpractice of adulteration and selling of substandard medicinal plant raw materials in the market. So it is mandatory to study the market samples to check the adulteration. Six markets from all over India were selected these six markets are Kullu (H.P.), Amritsar, Jaipur, Kolkata, Mumbai and Cochin. Fallowing points were kept in mind while collection of market samples. Markets samples were collected as such and not verified on spot. All the available grades were collected with the simple order method. Sample purchased or received from contacts were properly labelled, stored and subjected to investigation.

**Table II: Collection of Market samples**

| Markets | Date of Purchasing or Receiving | Collector | Local name | Price (Rs/Kg) |
|---|---|---|---|---|
| Kullu | 18-04-2012 | Scholar | *Kuth* | 240 |
| Amritsar | 05-04-2012 | Scholar | *Kuth* | 300 |
| Jaipur | 05-05-2012 | Scholar | *Kustha* | 180 |
| Kolkata | 10-04-2012 | Contacts | *Koorh* | 240 |
| Mumbai | 25-04-2012 | Contacts | *Kustha* | 800 |
| Cochin | 20-07-2012 | Contacts | *Kottam* | 220 |

## Results

### Physiochemical Analysis

Values of foreign matter, Loss on drying, Total ash, acid insoluble ash, water soluble ash, water soluble extractive and alcohol soluble extractive are given in table III.

**Table III: Physicochemical tests (% w/w)**

| S.no | Sample | Foreign matter* | Moisture content | Total Ash# | Acid Insoluble^ | Water soluble | Water Extract¤ | Alcoholic Extract¥ |
|---|---|---|---|---|---|---|---|---|
| 01 | Genuine | Zero | 8.007 | 3.852 | 0.806 | 0.224 | 75.225 | 25.894 |
| 02 | Kullu | 1.043 | 8.438 | 3.976 | 0.742 | 0.371 | 78.274 | 38.264 |
| 03 | Amritsar | Zero | 7.472 | 9.877 | 1.843 | 1.269 | 37.807 | 19.373 |
| 04 | Jaipur | 1.3818 | 6.595 | 9.652 | 1.543 | 1.583 | 27.950 | 12.360 |
| 05 | Mumbai | Zero | 10.647 | 4.875 | 0.542 | 0.251 | 62.140 | 21.562 |
| 06 | Kolkata | 0.666 | 11.047 | 3.962 | 0.469 | 0.562 | 56.794 | 25.147 |
| 07 | Cochin | 1.313 | 7.746 | 4.243 | 0.612 | 0.451 | 52.372 | 23.724 |

*Standard- Not more than 2 % (API Part I Vol. I Page no. 106)
#Standard- Not more than 4 % (API Part I Vol. I Page no. 106)
^ Standard- Acid insoluble not more than 1 % (API Part I Vol. I Pg no. 106)
¤ Standard Water extract Not less than 20% (API Part I Vol. I Pg no. 106)
¥ Standard Alcoholic Extract Not less than 12% (API Part I Vol. I Pg no. 106)

### Qualitative tests for various functional groups

Qualitative tests were performed to check the presence of various functional groups i.e. carbohydrates, proteins, alkaloids, tannins, resins and glycosides and results are given in table IV & V

**Table IV: Qualitative tests**

| S.No | Metabolites | Tests | Genuine | kullu | Amritsar | Jaipur | Mumbai | Kolkata | Cochin |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Carbohydrate | Molish | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| | | Iodine | -ve | -ve | +ve | +ve | -ve | -ve | -ve |
| | | Seliwanoff | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| | | Fehling | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| | | Bendict | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| 2 | Proteins | Ninhydrin | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| | | Millons | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| | | Lead Sulphide | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| | | Xanthoprotic | -ve | -ve | -ve | -ve | -ve | -ve | -ve |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | Alkaloids | Dragendorff's | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| | | Mayer's | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| | | Wagner's | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| 4 | Tannins | Iron Salt | +ve | +ve | -ve | -ve | +ve | +ve | +ve |
| | | Lead acetate | +ve | +ve | +v | +v | +ve | +ve | +ve |
| 5 | Resins | $FeCl_3$ | +ve | +ve | -ve | -ve | +ve | +ve | +ve |

**Table V: Qualitative tests of Glycosides in *Kustha* and its Market samples**

| S.No | Glycosides | Tests | Genuine | kullu | Amritsar | Jaipur | Mumbai | Kolkata | Cochin |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Anthraquinone | Borntrager's | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| | | Modified Borntrager's | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| 2 | Saponin | Foam | -ve | -ve | +ve | +ve | -ve | -ve | -ve |
| 3 | Steroid | Salkovaski | +ve | +ve | +ve | +ve | +ve | +ve | +ve |
| 4 | Cardiac | Keller Killiani | +ve | +ve | -ve | -ve | +ve | +ve | +ve |
| | | Legal | -ve | -ve | -ve | -ve | -ve | -ve | -ve |
| 5 | Coumarin | $FeCl_3$ | +ve | +ve | -ve | -ve | +ve | +ve | +ve |
| 6 | Flavonoid | Ammonia | +ve | +ve | -ve | -ve | +ve | +ve | +ve |
| | | Shinoda | -ve | -ve | -ve | -ve | -ve | -ve | -ve |

## Discussion

The market samples of *Kustha* were collected from the markets of Kullu, Amritsar, Jaipur, Kolkatta, Mumbai and Kochin. After study all the samples, it had been observed that, the samples collected from the markets of Kullu, Kolkatta and kochin were having all diagnostic characters & same appearance with the characters of roots of authenticated genuine sample of *Saussurea lappa*. In Amritsar *Nagauri Ashwagandha* was sold under the name '*meetha Kuth'* after some inquiry the merchant told that it comes from Rajasthan and in Jaipur market it is sold by the name *Kustha* only, Jaipur merchant told that if somebody asked for Himalayan *Kustha* than we gave *Pushkarmool*. Mumbai sample was collected by source and *Pushkarmool* was sold under the name *Kustha.* After analyzing all samples average size were taken and among size the best sample was Cochin sample.

All the market samples had foreign matter under the standard limit (source table III). Moisture content or loss of moisture or volatile content maximum was found in the sample of Kolkata. Kolkata sample had maximum loss of moisture but the sample was not damp, whereas sample from Mumbai market was damp and had also some green colour moss over the surface (source table III). So Kolkata sample had maximum amount of volatile content.

The ash value is the indicator of the presence of inorganic & earthy matter in the plant. The higher ash value is suggestive of thermo-non labile/ heat stable or inorganic constituents.. All the samples were having total ash value within the standard value except the samples of Amritsar and Jaipur market which matches with *Nagauri Ashwagandha* (source table III). The acid insoluble content indicates the presence of siliceous matter. All the samples were having acid insoluble and water soluble ash value within the limits of standard as per the API (source table III). Extractive value is the tool to assess the solubility of drug in particular solvent. Water and alcoholic extractive value of all the samples were found above the standards as per prescribed minimum limits mentioned in API (source table III).

Qualitative analysis of inorganic matter showed the presence of carbohydrate, proteins, alkaloid, tannin, resins, steroids, cardiac glycosides, caumarine glycosides, flavonoid in all the samples that resembles with the genuine sample of *Kustha* and also *Pushkarmool* .Whereas sample which resembled with *Nagauri Ashwagandha* showed the presence of carbohydrates, proteins, alkaloids, tannins, sapponin, and steroids. Resins, cardiac glycosides, caumarine glycosides, flavonoid were found absent. Also in carbohydrate Iodine test (Starch test) was positive in *Nagauri Ashwagandha* samples and negative in *Kustha* and *Pushkarmool* sample (source table IV & V).

**Conclusion**

During the market survey of Amritsar and Jaipur, *Kustha* is being sold under two name *Meetha kuth* and *Kadwa kuth*. Normally when we ask for *Kustha* they gave *Meetha kuth* i.e. *Nagauri Ashwagandha* which is taxonomically and phytochemically different plant, had no reference in texts for substituting *Kustha*, where as substituting *Pushkarmool* in place of *Kustha* had many references in texts, which is sold under the name *Kadwa Kuth* in Jaipur market. So in Amritsar and Jaipur market Physician and researchers should ask for *Kadwa Kuth* while procuring *Kustha*.

**References**

1) Dr. G V R Joseph. 2008 Healing Herbs of Himalaya; Edited by Dr. G S Lavekar: CCRAS Publications, New Delhi.
2) The Ayurvedic Pharmacopoeia of India. National institute of Science communication and information resources, CSIR; Published by the controller of Publications Civil Lines, Delhi; Part I, Vol. 1, pp 105.
3) Rastogi et al. 1993 Compendium of Indian medicinal plants. Vol I; New Delhi: CSIR; pg. 364.
4) Rastogi et al.1993 Compendium of Indian medicinal plants. Vol I; New Delhi: CSIR; pg. 613.
5) Kalsi, P.S. et al. 1980 Evaluation of some essential oils as plant growth regulators; PAU, Ludhiana, Journal of Research, vol 17 (1); pg 75-80.
6) Jamshaid, M. et al. 1986 Chemical constituents of Saussurea lappa and their pharmacology; Lahore: Pak journal of Science, vol 38 (1-4); pg 51-59
7) Yang Hui et al. 1997 Study on chemical constituents of Saussurea Lappa, Chemistry department of Yunnan univ, Kunming, Acta botanica Yunnanica, Vol 1 (1); pg 92-96.