ADULTERATION AND SUBSTITUTION IN ENDANGERED, ASU HERBAL MEDICINAL PLANTS OF INDIA, THEIR LEGAL STATUS, SCIENTIFIC SCREENING OF ACTIVE PHYTOCHEMICAL CONSTITUENTS

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ABSTRACT: Endangered Indian medicinal plants have used as traditional and alternative Indian system of medicine (ISM) from last several ancient time. In 20th and 21st century generation are becoming aware of the side effect and adverse reaction of synthetic drugs and so there is an increasing interest, Scope of innovating in herbal medicinal plants based Ayurvedic, Siddha, Unani (ASU) medicinal products. In the continuously using of Adulteration and Substitution, Spurious drugs on the place of original Indian endangered and costly ASU. Herbal medicinal plants hence today generate the major task of Indian drug regularity affaire, drug controlling approach, as well as herbal industries, face the burning problem. Resulted growing high altitude region many endangered and rare, costly original medicinal species such as these are Vatsnabh, (Aconitum Chasmanthum stapfex. Haines), Ativishaor Atis, (Aconitum heterophylum Wall. Ex. Royal), Kutki, (Picrorhiza kurroa royleex), Kuth or Kustha, (Saussurea lappa C.B.CL.), Puskarmooll, (Inularacemosa Hook.F.), Riddhi, (Habenariainte media D. Don), Vriddhi, (Habenariaedge worthii Hook.f.ex.Collett), Kakoli, (Roseea purpurea Smith), Kshirakakoli, (Fritillaroylei Hook) and (Lilium polyphyllum D. Don), Jeevak, (Creipipiuma cumi tum D. Don.) Szlach.), Meda, (Polygonatum verticillatum Linn.) Allioni), Mahameda, (Polygonatum cirrhifolium (wall.) Royal) and (Polygonatum Vertecillatum Alloi), Rakta Chandana, Sandal Surkh, (Pterocarpus santalinus Linn.), Sveta Chandana, Sandal Safed, (Santalum album Linn.), Kesar, Keshar or Kum Kum, Zafran , (Crocus sativus Linn.), etc. completely endangered and incorrect identification of their intestinally or unintentionally, Finally they become effectively adulterated and substituted in condition. The present communication investigates research review has reported their drug regularity affaire and drug controlling, pharmacovigilance approach of Adulteration and Substitution, Spurious drugs with active phytochemical constituents, extensive taxonomica and ethnobotanical authentication, medicinal properties of these several endangered and costly medicinal plants.

INTRODUCTION: Natural medicinal plants are after unable to meet the demand for popular of patent, Shastra oushadhee, preparatory ASU. Herbal products as well as used as Alternative and Traditional medico care therapy in ISM.

Populations of many species have limited distribution in their natural habitats, requiring conservation strategies for protection . Unavailability of such medicinal plants has led to arbitrary substitution and adulteration in the raw drug market . Adulteration it is a practice of substituting the original crude drug partially or fully with other substances which is either free...
from or inferior in therapeutic and chemical properties or addition of low grade or spoiled or spurious drugs or entirely different drug similar to that of original drug substituted with an intention of enhancement of profits 6,7. A adulteration may also be defined as mixing or substituting the original drug material with other spurious, inferior, defective, spoiled, useless other parts of the same or different plant or harmful substances or drug which do not conform with the authenticated official standards. A drug shall be deemed to be adulterated if it consists, in whole or in part, of any filthy, putrid or decomposed substance 7. A treatise published two centuries ago (in 1820) on adulterations in food and culinary materials is a proof for this practice as an age-old one. Due to adulteration, faith in herbal drugs has declined 7,9.

Adulteration in market samples is one of the greatest drawbacks in promotion of herbal products. Many researchers have contributed to checking adulterations and authenticating them 3-10. In the health aspects as drug regularity affaire and drug controlling approach and burning problem of herbal industries of Adulteration and Substitution, Spurious drugs used in place of Indian original endangered and costly ASU.

Herbal medicinal plants have used as traditional and alternative medicines of ISM from last several ancient time in India. It is invariably found that the Adverse Event or side effects. Reports are not due to the intended herb, but rather due to the presence of an unintended herb 11. Medicinal plant dealers have discovered the scientific methods in creating adulteration of such high quality that without microscopic and phytochemical and physicochemical analysis, it is very difficult to trace these adulterations 12. Medicinal plants constitute an effective source of traditional (e.g., Ayurvedic, Chinese, Homeopathy, and Unani) and modern medicine. Herbal medicine has been shown to have genuine utility. Germany and France, together represent 45% of the $23 billion global retail markets as per current expect 2013 year. In India, about 80% of the rural population depends on medicinal herbs and indigenous systems of medicine. Today, approximately 70% of “synthetic” medicines are derived from plants. Popularity among the common people increased the usage of medicinal plants/herbal drugs. Herbal adulteration is one of the common malpractices in herbal raw material trade 13,24.

**MATERIAL AND METHODS:** Authentic complete Information about the plant of Adulteration and Substitution in endangered, costly Ayurvedic Siddha Unani (ASU.) Indian medicinal plants (Actual confirmation of Plant Occurrence, Hearbesting, Cultivation, authenticated plant species and family, photographs, etc.) were collected from source from standard, authenticated online world encyclopaedia, High altitude medicinal plants Archie and flora online Google searching engine or authenticated text, Wealth of India 1948-1976 (CSIR.), Anonymous, 2000, Quality control methods for medicinal plant materials, World Health Organization, Geneva, (Anonymous The Ayurvedic Pharmacopeia of India, part-I, Volume I to VI, First Edition., Anonymous The Unani Pharmacopeia of India, part-I, Volume I to VI, First Edition) and authenticated literature survey by the scientific help by botanical, taxonomists expertise researchers of SMPU. Research Council (ISM, AYUSH) and another’s extensive, authenticated related literature survey has done from FRI., Dehradun, Uttarakhand state, PLIM. (AYUSH.), Ghaziabad, Uttarperdash state, NIPER, Mohali, Chandigarh, Punjab state, India.

Adulteration and substitution in medicinal plants have also conformably reported by several related references mention as; (Vasudevan 1983; Uniyal 1987; Tewari 1991; Sunita 1992; 1993; 1997; Sarin 1996; Pandeya, 1997; Afaq 1999; Saraswathy 2001; Mukherjee 2002; Mishra et al., 2002; Gupta 2003; Dubey 2004; Chunekar 2004; Shastri 2005; Kokate et al., 2007; Poornima 2010; Balakrishnan et al., 2012; Roy et al., 2013) for identification and conformity of endangers, original Herbs adulteration and substitution appearance found in various plant, species naturally growing in Himachal and Northern Himalayan higher altitude from 1200 to 4500 m asl. hill valleys and dense forest areas of Himachal and Uttarakhand state, a various region of India.

Selective and reported plant species were confirmed and identified with the help of standard flora, standard Ayurvedic and Unani pharmacopeia Govt. of India, variously reported volume in part
fist- Single drugs, Standard connected textbooks authenticated references, noted were prepared on their morphological attributes (Krishnamurthi et al., 1969; Zalkaw 1984; Soler et al., 1988; Paraschas 1990; Wang et al., 1991; Okugawa et al., 1995; Angers et al., 1996; Divivedi et al., 1997; Rastogi et al., 1998; Chouhan.1999; Sabinsa 2000; Singh et al., 2004; Joshi et al., 2005; Chatterjee et al., 2005; Kant et al., 2005; Tahir et al., 2007; Robinson et al., 2008; Shah and Seth. 2010; Mohan et al., 2010; Rehman et al., 2011; Javed et al., 2012; Sarkar et al., 2012; Bohuguna et al., 2012, 2013; Andola et al., 2013). As well as another authenticated reference has reported in a research survey or references (Ved et al., 2003; Venkatachalam et al., 2006; Burdock et al., 2008; Warnke at al., 2009; Kareparamban et al., 2010; Nulu et al., 2010; Srivastava et al., 2010; Mandalar et al., 2010; Shah et al., 2013; Sharma et al., 2013;) for identification and conformity of extensive authenticated selective and reported plant species were confirmed and identified with the help of standard ethnobotanical flora, species, family as well as these reported active phytochemical constituents of rare and costly raw medicinal plants of India.

**GMP Rules & Act in Schedules-T for ASU Drugs:** In according to Indian Drugs and Cosmetics Act and drug regulatory affair aspect for ASU. Drugs as per The Drugs and Cosmetics Rules, 1945, The Drugs and Cosmetics (tenth amendment) Rules, 2003 for mandatory controlling rules of Misbrand, Adulterated or Substituted, Spurious drugs use in any Herbal or polyherbal ASU. Forme single and formulated compound, coded, sashtra ousheedhi, preparatory, patent herbal medicines under mention respectively as follows:

**TABLE 1:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Section</th>
<th>Criteria of GMP Rules &amp; Act under Schedules-T for ASU. Drugs</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misbranded drugs</td>
<td>33E</td>
<td>ASU drugs are deemed to be misbranded</td>
<td>2</td>
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<td></td>
<td></td>
<td>• If colored or coated to conceal the damage or made appear better than therapeutic value.</td>
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<td>• If it is not labeled in a prescribed manner.</td>
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<td>• If label or container is accompanying drug bears any false claim or misleading.</td>
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<tr>
<td>Adulterated drugs</td>
<td>33E</td>
<td>ASU drugs are deemed to be adulterated</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>• If it consists filthy, or decomposed material.</td>
<td></td>
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<td>• If prepared, packed or stored under unsanitary conditions.</td>
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<td>• If its container contains any poisonous or deleterious substance.</td>
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<td>• Colour other than one which is prescribed.</td>
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<td>• Harmful or toxic substance.</td>
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<td></td>
<td></td>
<td>• If any substance mixed to reduce its quality or strength.</td>
<td></td>
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<tr>
<td>Spurious drugs</td>
<td>33EEA</td>
<td>ASU drugs are deemed to be Spurious</td>
<td>2</td>
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<td></td>
<td></td>
<td>• If it is sold or offered under another name.</td>
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<td></td>
<td></td>
<td>• If it is an imitation or substitute for another drug.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• If the label or container bears the name of an individual or company which is factious.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If it has been substituted by other drugs.</td>
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</tr>
</tbody>
</table>

In the challenging task of Drug controlling and Drug regularity affairs and pharmacovigilance authority on the aspects for used Misbrand, Adulterated or Substituted, Spurious drugs in ASU. herbal products that are a major punishable offense which has Government or private industrialist or pharmacy manufacturer blindly used malpractice of Misbrand, Adulterated or Substituted, Spurious drugs as intestinally or unintentionally in our various type of ASU. Herbal products hence finally effected and suffer ignescents national peoples due to their continues using and without having any medicinal values, Quality and Efficacy as well as decrease the product shelf life. Resulted in their showing the adverse and side effect to humankind.

**Types of Adulterants Presence in Endangered and costly herbal raw drugs:** Drugs are generally adulterated or substituted with substandard, inferior, or artificial drugs.

**Using Substandard Commercial Varieties:** Adulterants resemble the original crude drug morphologically, chemically, therapeutically but
are substandard in nature and cheaper. This is the most common type of adulteration 13, 21-22, 24.

Using Superficially Similar Inferior Drugs: Inferior drugs may or may not have any chemical or therapeutic value. They resemble only morphologically, so due to its resemblance they are used as adulterants 13, 21-22, 24.

Using Artificially Manufactured Substance: The drug is adulterated with the substance which has been prepared artificially. The artificially manufactured substance resembles the original drug. This method is followed by costlier drugs 13, 21-22, 24.

Using Exhausted Drug: The same drug is admixed, but that drug is devoid of the medicinally active substance as it has been extracted already. Mainly volatile oil containing drugs like clove, coriander, fennel, caraway are adulterated by this method. As it is devoid of color and taste due to extraction, natural color and taste are manipulated with additives 13, 21-22, 24.

Using Synthetic Chemicals to Enhance Natural Character: Synthetic chemicals are used to enhance the natural character of the exhausted drug. Examples: citral is added to citrus oils like lemon and orange oils 13, 21-22, 24.

Presence of Vegetative Matter of the Same Plant: Some miniature plants growing along with the medicinal plants are added due to their color, odor, and constituents 13, 21-22, 24.

Harmful Adulterants: Some are harmful materials as the adulterant are collected from market waste materials and admixed with the drug. It is done for liquid drugs 13, 21-22, 24.

Adulteration of Powders: The drugs which are in the form of powders are frequently adulterated. Examples: dextrin is added in ipecacuanha, exhausted ginger in ginger, red and white sandalwood powders in red and white capsicum powders and powdered bark adulterated with brick powder 13, 21-22, 24.

Reason of Adulteration of Endangered and Costly Herbal Raw Drugs: Confusion in Vernacular Names: Lack of Knowledge about the Authentic Source: Nagakesar is one of the important drugs in Ayurveda. The authentic source is Mesua ferrea. However, market samples are adulterated with flowers of Calophyllum inophyllum. Though the authentic plant is available in plenty throughout the Western Ghats and parts of Himachal or J&K State, Himalayas valleys, suppliers are unaware of it. There may also be some restrictions in forest collection. Due to these reasons, C. inophyllum (which is in the plains) is sold as Nagakesar. Authentic flowers can be easily identified by the presence of two-celled ovary whereas, in case of spurious flowers, they are single-celled 13, 21-22, 24.

The Similarity in Morphology: Mucuna pruriens is adulterated with other similar Papilionaceae seeds having similarity in morphology. M. utilis (sold as white variety) and M. deeringiana (sold as wider variety) are popular adulterants. Apart from this M. cochinchinensis, Canavalia virosa and C. ensiformis are also sold in Indian markets. Authentic seeds are up to 1 cm in length with a shining mosaic pattern of black and brown color on their surface. M. deeringiana and M. utilis are bigger (1.5-2 cm) in size. While M. deeringiana is dull black and M. utilis is white or buff-colored 13, 21-22, 24.

Lack of Authentic Plant: Hypericum perforatum is cultivated and sold in European markets. In India, availability of this species is very limited. However, the abundant Indo-Nepal species H. patulum sold in the name of H. perforatum. The market sample is a whole plant with flowers, and it is easy to identify them taxonomically. Anatomically, transverse section of H. perforatum stem has compressed thin phloem, hollow pith, and absence of calcium oxalate crystals. Whereas H. patulum has broader phloem, partially hollow pith and presence of calcium oxalate crystals 13, 21-22, 24.

The Similarity in Color: It is well known that with time, drug materials get changed to or substituted with other plant species. ‘Ratanjot’ is a recent day example. According to the suppliers and non-timer forest product (NTFP.) contractors, in the past, roots of Ventilago madraspatana were collected from the Western Ghats, as the only source of ‘Ratanjot’. However, that has not been practiced now. It is known that Arnebia euchroma var euchroma is the present source. The similarity is in yielding a red dye, A. Euchroma substitutes V.
madraspatana. Recently V. madraspatana is not found in the market. Whatever is available in the market, in the name of Ratanjot is originated from A. euchroma 13, 21-22, 24.

Careless Collections: Some of the herbal adulterations are due to the carelessness of herbal collectors and suppliers. Parmelia perlata is used in Ayurveda, Unani, and Siddha. It is also used as grocery. Market samples showed it to be admixed with other species (P. perforata and P. cirrhata). Sometimes, Usnea sp. is also mixed with them. Authentic plants can be identified by their thallus nature 13, 21-22, 24.

Unknown Reasons: ‘Vidari’ is another example of an unknown authentic plant. It is an important Ayurvedic plant used extensively. Its authentic source is Pueraria tuberosa, and its substitute is Ipomeoa digitata. However, market samples are not derived from these two. It is interesting to know that an endangered gymnosperm Cynca circinalis is sold in plenty as Vidari. The adulterated materials originated from Kerala, India. Though, both the authentic plant and its substitute are available in plenty throughout India, how C. circinalis became a major source for this drug is unknown. P. tuberosa can be easily identified by the presence of papery flake like tubers and I. digitata by the presence of its concentric rings of vascular bundles and their adulterant C. circinalis by its leaf scars and absence of vessel elements. 13, 21-22, 24.

Need for Substitution and Adulteration: Guggulu (Exudate), Commiphora wightii (Arn.) Bhand and Commiphora mukul is substituted and adulterated by Babul, Kikar (Exudate), Acacia nilatica L. wild and Myrrha gond or myrrh gum, (Exudate), Commiphora myrrha, Hing or Hinguda (Exudate) (Ferula foetida regal) and (Ferula narthex boiss) is substituted and adulterated by Kikar or Babul Gond, Hashab (Exudate), (Gum accasia or Acacia senegal), and Shittim Gond, Talha, Karaya (Exudate), (Acacia seyal) 7, 21-22, 24, 26, 51-54, 83. Uncertain identity of the drug: For the herb Lakshmana different species such as Artila quinquefolia, Ipomea sepiaria etc. are considered. Cost of the drug: Rumi Mastagi (Exudate), (Pistacia lentiscus Linn) is substituted and adulterated by Salai guggul or Gum olibanum (Exudate), (Frankincense indica), Kumkuma or Keser, KumKum, Zafran, (Crocus sativus Linn.) Styles and Stigmas of aerial parts of flowers are substituted and adulterated by Kusumbha or Kusum, (Carthamus tinctorius) Styles and Stigmas of aerial parts of flowers, Rakta Chandana, Sandal Surkh, (Hard wood powder), (Pterocarpus santalinus Linn.) is substituted and adulterated by Red Capsicum, Lal shimla mirch, (Fruit powder), (Capsicum annuum Linn., Capsicum baccatum Linn. and Capsicum frutescens Linn.) as such Sveta Chandana, Sandal Safed, (Hardwood powder), (Pterocarpus santalinus Linn.) is substituted and adulterated by White Capsicum, Safed shimla mirch, (Fruit powder), (Capsicum annuum Linn.) largely used in Ayurvedic and Unani compound formulation being costly herb 7, 21-22, 24-26, 55-58, 63, 83.

Non-Availability of the Drug: Substitution and adulteration for Ashtvarga part (a group of 8 crude drugs - Riddhi or Vriddhi, Kakoli, Kshirakakoli, Jibhaka, Rsabhaka, Meda and Meha meda). These endanger and rare drugs are found in high altitude reason 2000 to above 4500-meter height Himachal and Himalaya northan reason of high altitude dense valleys.

Riddhi (Tubers), (Habenaria intermedia D. Don) is substituted by Varahikand (Tubers), (Dioscorea bulbifera) or Chiriya Musali (Tubers), (Asparagus filicinus Buch. Ham. ex. D. Don), Vriddhi (Tubers), (Habenaria edgeworthii Hook. f. ex. collet) is substituted by Varahikand (Tubers), (Dioscorea bulbifera) or Salam Panja (Tubers), (Dactylorhiza hatagirea (D. Don) Soo) or Maha bala, (Sida acuta Burm. f.), Kakoli (Rhizomes and Buells), (Roseea purpurrea Smith) is substituted by Ashwagandha, Asrol, Asgandh Nagori (root), (Withania somnifera Dunal) or Kali Musali (root), (Corculigo orchiods Gaerth), Kshirakakoli (Pseudobulbs), (Fritillaria roylei Hook) and (Lilium polyphyllum D. Don) is substituted by Ashwagandha, Asrol, Asgandh Nagori (root), (Withania somnifera Dunal) or Safed Musali (root), (Chlorophyrtum arundinaceum Boker) Jeevak (Pseudobulbs), (Creipipium acuminatum (D. Don.) Szlach.) is substituted by Varahik and (Tubers), (Dioscorea bulbifera) or Safed behman (Centauarea behen Linn.) or Guruch (Tinospera cordifolia (wild)), Rishbhak (Pseudobulbs), (Malaxis muscifera (Lindl.) Kuntze), is substituted by Varahikand (Tubers), (Dioscorea bulbifera) or Lal
behmen, (Centaurium roxburghii (D. Don) Drue.), Meda (Rhizomes and roots), (Polygonatum verticillatum Linn. Allioni) is substituted by Satavari (root bulbs), (Asparagus racemosus willd) Royle) or Salam mishri (root), (Eulophia campestris wall.), Maha meda (Rhizomes and roots), (Polygonatum cirrhifolium (wall.) Royal) and (Polygonatum Verticillatum Alloi) is substituted by Satavari (root bulbs), (Asparagus racemosus willd) Royle) or Shakakul mishri (root bulbs), (Polygonatum multiflorum (Lin.) All.) or Prasarani, (root bulbs), (Paederia foetida Linn.) are largely used in Ayurvedic compound formulation being endangers and rare herbal singal drugs as an Ashtvarga part like manufacturing of Avelah (Semi soiled form) Chaymenprash formulated composition ingredients 

Types of Substitution Presence in Endangered and Costly Herbal Raw Drugs: Using different drug, Substitution of the Species Belonging to the Same Family and Using different species., using different parts of the plant and Due to the same in action.

TABLE 2: ADULTERATED AND SUBSTITUTE PARTS USED IN ENDANGERED, COSTLY HERBAL DRUGS OF INDIA

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Original Endanger and costly Raw Drugs</th>
<th>Substitute Used</th>
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<tbody>
<tr>
<td>1</td>
<td>Vatsnabh (Dried Root), 7, 21-22, 24, 26, 33-33, 83-84 (Aconitum Chasmanthum stapf ex. Haimes)</td>
<td>Mohri or Vatsnabh substitute, (Aconitum ferox wall)</td>
</tr>
<tr>
<td>2</td>
<td>Ativisha, (root), 7, 21-22, 24, 26, 34-35, 83-84 (Aconitum heterophyllum)</td>
<td>Mustaka (root), (Cyperus rotundus)</td>
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<tr>
<td>No.</td>
<td>Description</td>
<td>Images</td>
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<td>-----</td>
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<td>3</td>
<td>Kutki, (rhizome) 7, 21-22, 24, 26, 36-38, 83-84 (Picrorhiza kurroa royle ex)</td>
<td><img src="image1" alt="Image" /> <img src="image2" alt="Image" /></td>
</tr>
<tr>
<td>4</td>
<td>Kuth or Kustha, (root) 7, 21-22, 24, 26, 39-49, 83-84 (Saussurea lappa)</td>
<td><img src="image3" alt="Image" /> <img src="image4" alt="Image" /></td>
</tr>
<tr>
<td>5</td>
<td>Puskar mool, (root) 7, 21-22, 24, 26, 41, 83-84 Inula racemosa</td>
<td><img src="image5" alt="Image" /> <img src="image6" alt="Image" /></td>
</tr>
<tr>
<td>6</td>
<td>Jatamansi (root) 7, 21-24, 26, 44-45, 83-84 (Nardostachys Jatamansi D C)</td>
<td><img src="image7" alt="Image" /> <img src="image8" alt="Image" /></td>
</tr>
<tr>
<td>7</td>
<td>Guggulu (Exudate) 7, 21-22, 26, 40-50, 83 Commiphora wightii (Arn.) Bhand and Commiphora mukul</td>
<td><img src="image9" alt="Image" /> <img src="image10" alt="Image" /></td>
</tr>
</tbody>
</table>

**Notes:**
- Kutki is also known as Kuth or Kout (root) (Saussurea castus).
- Puskar mool is also known as Kuth or Kout (root) (Saussurea castus).
- Jatamansi is also known as Bhootkeshi (root) (Selinum vaginatum).
- Guggulu is also known as Babul, Kikar (Exudate), Commiphora wightii (Arn.) Bhand.
- Commiphora mukul is also known as Myrrha gond or myrrh gum, (Exudate), Commiphora myrrha.
<table>
<thead>
<tr>
<th>Page</th>
<th>Description</th>
</tr>
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</table>
| 8    | **Hing or Hingu** (Exudate), 7, 21-22, 24, 26, 51-54, 83-84  
     (Ferula foetida regal) and  
     (Ferula narthex boiss)  |

| 9    | **Rumi Mastagi**, (Exudate), 7, 21-22, 24, 26, 55-58, 83  
     (*Pistacia lentiscus* Linn)  |

| 10   | **Riddhi**, (Tubers), 7, 21-22, 26, 29, 39, 83-84  
     (*Hobenaria intermedia* D. Don)  |

|  | **a-** Kikar or Babul Gond, Hashab (Exudate),  
     (Gum Accasia or Acacia senegal)  |
|  | **c-** Shittim Gond, Talha, Karaya (Exudate),  
     (Acacia seyal)  |
|  | **a-** Salai guggul or Gum olibanum (Exudate),  
     (Frankincense indica)  |
|  | **a-** Varahikand (Tubers),  
     (*Dioscorea bulbifera*)  |
|  | **b-** Chiriya Musali (Tubers),  
     (*Asparagus filicinus* Buch. Ham. ex. D. Don)  |
Vriddhi, (Tubers), 7, 21-22, 26, 29, 59, 83-84
(Habenaria edgeworthii Hook. f. ex. Collett)

a- Varahikand (Tubers), (Dioscorea bulbifera)
b- Salam Panja (Tubers), (Dactylorhiza hatagirea (D. Don) Soo)
c- Maha bala, (Sida acuta Burm. f.)

Kakoli, (Rhizomes and Bulbs), 7, 21-22, 26, 29, 60-83
(Roseea purpurea Smith)

a- Ashwagandha, Asrol, Asgandh Nagori (root), (Withania somnifera Dunal)
b- Kali Musali (root), (Corculigo orchiods Gaerth)
Kshirakakoli, (Pseudobulbs), (Fritillaria roylei Hook) and (Lilium polyphyllum D. Don)

Jeevak, (Pseudobulbs), (Crepipium acuminatum (D. Don.) Szlach.)

a- Ashwagandha, Asrol, Asgandh Nagori (root), (Withania somnifera Dunal)

b- Safed Musali (root), (Chlorophytum arundinaceum Boker)

c- Varahikand (Tubers), (Dioscorea bulbifera)

d- Safed behman (Centaurea behen Linn.)

e- Guruchi (Tinospera cordifolia (willd))
15  **Rishbhak**, (Pseudobulbs), 7, 21-22, 26, 29, 83-84
( *Malaxis muscifera* (Lindl.)Kuntze)

16  **Meda**, (Rhizomes and roots), 7, 21-22, 26, 29, 83-84
( *Polygonatum verticillatum* (Linn.) Allioni)

17  **Maha meda**, (Rhizomes and roots), 7, 21-22, 26, 29, 83-84
( *Polygonatum cirrhifolium* (wall.) Royal) and
( *Polygonatum Vertecillatum* Alloi)

a- **Varahikand** (Tubers),
( *Dioscorea bulbifera*)

Lal behmen ( *Centaurium roxburghi* (D. Don) Drue.)

a- **Satavari** (root bulbs), ( *Asparagus racemosus* willd)
Royle)

b- **Salam mishri** (root), ( *Eulophia campestris* wall.)

c- **Prasaran**, (root bulbs),
( *Paederia foetida* Linn.)
18. **Rakta Chandana or Sandal Surkh**, (Hard wood powder), 7, 21-22, 24, 63-64, 66-72, 83
   (*Pterocarpus santalinus* Linn.)

19. **Sveta Chandana or Sandal Safed**, (Hard wood powder), 7, 21-22, 24, 65-72, 83
   (*Pterocarpus santalinus* Linn.)

- **Red Capsicum, Lal shimla mirch**, (Fruit powder),
  (*Capsicum annuum* Linn., *Capsicum baccatum* Linn. and
  *Capsicum frutescens* Linn.)

- **White Capsicum, Safed shimla mirch**, (Fruit powder),
  (*Capsicum annuum* Linn.)
TABLE 3: ACTIVE PHYTOCHEMICAL CONSTITUENTS OF ENDANGERED, COSTLY ASU. HERBAL DRUGS OF INDIA

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Local name and Botanical name</th>
<th>Family and Part used</th>
<th>Investigated and reported Active phytochemical constituents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ativisha, (Aconitum heterophyllum)</td>
<td>Ranunculaceae, (Dried tuber)</td>
<td>Aconitum heterophyllum - Aconive alkaloid contained - 0.16% to 0.27%, Atisine alkaloid - 0.19 % to 0.35%</td>
</tr>
<tr>
<td>3</td>
<td>Kutki, (Picrorhiza kurroa royle ex)</td>
<td>Serophulariaceae, (Dried rhizome)</td>
<td>Kuthoside, Glycoside - Picroside, Andrasis &amp; Apocynine, Active Iridoid glycoside contained - Picrotin - 1.50% to 3.10% , Picrotoxin – 0.83 to 1.70%</td>
</tr>
<tr>
<td>4</td>
<td>Kuth or Kusha, (Saussurea lappa)</td>
<td>Compositeae, (Astenacea), (Dried root)</td>
<td>Hexadectarinol-2.5%-5%, Dehydrocostus lactone 16.7%, Elemol-5.84%,γ-costol-1.80% , Valerenol-4.29% and terpin-4-ol-1.60%, Sesquiopiperene, β-cyclocostunoulide, Dihydroconstunolide and Dehydro constus lactone</td>
</tr>
<tr>
<td>5</td>
<td>Puskar mool, (Inda racemosa)</td>
<td>Compositeae, (Astenacea), (Dried root)</td>
<td>Trinosesquiopiperene, Lactones, Alanto- lactone, Isolaaloiolantolactone essential oil</td>
</tr>
<tr>
<td>6</td>
<td>Chirata, (Swertia chirata Buch. Ham.)</td>
<td>Gentianaceae, (Whole plants)</td>
<td>Seco-iridoid glycoside, Enico-flovin, Gontia -mine &amp; Gentioiucrine triterpenoid alkaloid, Lupeol, Triterpene alcohol, Swertianone &amp; Swertanol Triterpenoid,Swertainain Xan-thone, β-sitosterol-3-β-D-glucoside sterol</td>
</tr>
<tr>
<td>7</td>
<td>Jatamansi, (Nardostachys Jatamansi DC)</td>
<td>Valerianaceae, (Dried rhizomes)</td>
<td>Sesquiterpene acid,Nardin and Coumarins, Pyranocoumarin, Volatile oil % - 0.5% to 2.5%</td>
</tr>
<tr>
<td>8</td>
<td>Guggulu or Guggul</td>
<td>Buresaceae, (Exudate, natural resin)</td>
<td>Lignons,Lipids,Diterpins and Steroids,Z-Guggulsteroneder and E-Guggulsterone, Querce -tin palmitic and stearic acids, Compesterol, Cholesterol,β-sitosterol,α-Spinosterol(seed oil),Comphorene, polymycyne and caryaphy -lence (essential oil)etc.,Total % of Guggul -sterones - 0.75 to 2.35%,Volatile oil 1.0 to 5.0%</td>
</tr>
<tr>
<td>9</td>
<td>Hing or Hingu, (Ferula foetida regal) and (Ferula narthex boiss)</td>
<td>Umbelliferae, (Exudate, natural resin)</td>
<td>Resin- 40 to 65%,Gum - 20 to 25%,Volatile oil - 4 to 20%,Sesquiopiperene, Assafoetidinol A &amp; B, Umbellifene, Fesolol, Azulene,α-pinene, α-terpineol, α-Zulene, Vanillin, Ferulic acid, Dialylsulfdide, Diallyl sulfphide , Luteolin Resin, Volatile oil, α-bicycliperpenoid, Triterpene and Fatty acid compound- Oleacanie acid, Moronic acid, 242-mascanalicenic acid, 242-iso- mascanalicenic acid, Triucallol, Dammarradiene, 28-naroleon-12-en-3-one, Oleonolic aldehyde</td>
</tr>
<tr>
<td>10</td>
<td>Rumi Mastagi or Mastagi (Resin), (Exudate), (Pistacia lentiscus Linn)</td>
<td>Anacardiacaeae, (Exudate, natural resin)</td>
<td>Resin contained Starch and Minerals with bitter Substances, Also reported Taxol compound</td>
</tr>
<tr>
<td>11</td>
<td>Riddhi, (Hobenaria intermedia D. Don )</td>
<td>Orchidaceae, (Tuber)</td>
<td>Dried Tuber contained Starch and Minerals with bitter Substances, Also reported active Phenolic compounds</td>
</tr>
<tr>
<td>12</td>
<td>Vridhi, (Habenaria edgeworthii Hook. f. ex. collett )</td>
<td>Orchidaceae, (Tuber)</td>
<td>Dried Tuber contained Starch and Minerals with bitter Substances, Also reported active Phenolic compounds</td>
</tr>
<tr>
<td>13</td>
<td>Kakoli, (Rosea purpurea Smith)</td>
<td>Zingiberaceae, (Rhizome and Tuberous root)</td>
<td>Dried Rhizome and tuberous root contained Flavonoids, Alkaloids, Tannins, Saponin. Glycoside and also reported active Phenolic compounds</td>
</tr>
<tr>
<td>14</td>
<td>Kshirakakoli, (Fritillaria roylei) and (Lilium polyphyllum D. Don)</td>
<td>Liliaceae, (Pseudobulp),</td>
<td>Dried pseudobulp contained Linalool and α-terpineol, β-sitosterol-3-glyceryl-2-linoleil-3-linoleate, Glyceryl-1-n-octadec-9-enoyl-2-n-decomoyl-3-n-decanoate and Glyceryl-1-octadec-9-enoyl-2-octadec-9, 12-dienoyl-3-tetra cosonate and alkaloids Kashimrine (imperialine), peimine, Pemisine,</td>
</tr>
</tbody>
</table>
RESULT AND DISCUSSION: In the challenging task of Drug controlling and Drug regularity affairs and pharmacovigilance aspects for used Misbrand, Adulterated or Substituted, Spurious drugs in ASU. Herbal products that are a major offense which is Government or private industrialist or pharmacy manufacturer have used Misbrand blindly, Adulterated or Substituted, Spurious drugs as intestinally or unintentionally in our various type of ASU.

Herbal products hence finally effected and suffer our ignecents national peoples due to continue using and no medicinal values of its result of their adverse and side effect to mankind. It is found out focus point on the aspects of conclusive view or scientific observation that all adulterations are intentional malpractice as stated in many authenticated literature. With our technical expertise experienced observation and investigation. It’s communicated that the ASU herbal drugs are adulterated unintentionally also. Suppliers and cultivators, vendors, are illiterate and not aware of their spurious as well as the collection of substitute, adulterations supply. Major reasons are named confusion, non-availability, and lack of knowledge about the authentic plant.

Even scientific community and traditional physicians (Hakeems and Vads from production ends) which has attached or debuted in production sites are unaware of it and consumed intestinally or unintentionally using as an organoleptic test (Panchiyanderia parikshen) malpractice in large scale levels for manufacturing and formulation Herbal Pharmaceuticals and Pharmacies of Government and Private organization. Resulted effectually suffer ignecents national peoples due to their continues using and without having any medicinal values, Quality and Efficacy as well as decrease product shelf life. Now today’s demand herbal drug industries follow, high-quality standards using modern techniques and instruments such as Auto-UPLC, HPTLC, GC-MS., C13 and H1 NMR Chromatography and Spectroscopy techniques, etc. to maintained and monitored their
standard quality and determine sophisticated extracts, separated and fractionated, isolated investigation drugs research data’s conclusively investigate purity percentage of active ingredients, and developed extensive authenticated standard data’s of active phytochemical constituents in consumed formulated classical as well as patent, proprietary ASU.

Herbal products and our expertise devotion to improving day to day products Quality and Efficacy, shelf life. The future research and development require of the Pharmacognostic and Phytochemical analysis, cross-check of active phytochemical constituents concentration as the aspects of evolution medicinal potency, purity, safety of the final finished goods products as well as pharmacovigilance aspects with complies evolution of it’s medicinal values, potency, purity, product stability for the detect and investigate changes, decay of active phytochemical constituents by using their references standards. in the resulted follow-ups requirements provide or issue rule and act, time to time update and modify guideline should be follows by Drug Quality control, Quality assurance guideline of Indian Government authority AYUSH., WHO-GMP approval certified drug authority, Food Drug regularity authority (FDA.) and Director Drug Controlling and Regularity authority (DCRA.), World Health Organization (WHO) authorities for effectively redressal complaints and control of using adulteration, substitution, spurious drugs in ASU herbal products

World Health Organization, in its publication on quality standards for medicinal plant materials. Recommends rejecting any batch of raw material, which has more than 5% of any other plant part of the same plant (e.g., stem in leaf drugs), even though they derived from the authentic plant. Based on these standards, adulteration, whether intentional or unintentional should be rejected. Also, suppliers and traders should be educated about the authentic sources. As the resulted conclusion and existing scientific observation, it’s also must be need to considering high ethno botanical as well as industrial, commercial values and the endangered status of the species for conservation and sustainable utilization of critically endangered, rare costly species having preserve of high medicinal values of active phytochemical constituents, and defiantly very important should be need equally identified, climatically cultivated, officially protected for harvesting and conservation of high altitude region based growing endangered, rare species of northern region of Himachal Pradesh, Jammu & Kashmir and Uttarakhand state, northern Himalayas region.

CONCLUSION: As the scientific ethnobotanical and innovated demand of protecting critically endangered, rare and costly medicinal plant species. It should be a very important need to using cell culture techniques development, propagation, and conservation, cultivation, motivate forming and growing of these endangered, rare species. Also need to be tested and standardized, developed authenticated reference standard, increase and protect for large scale farming, conservation, cultivation and sustainable utilization in climatically low temperature, high altitude growing endangered medicinal species that’s a today needful demand for the aspect of preserve our cultural health care heritage and traditional, folk medicinal sashtra oushadhee therapy developed, served as well as provide traditional and alternative original medicinal plant-based standard quality ASU. Products to our stream nation.

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CONFLICT OF INTEREST: Nil

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C analysis of essential...Santalum album...U...al of...A...K...C...imicrobial Agents Chemother Journal...lwood. Zhagguo Zhong Yao Za Zhi...G...riculture Food...International Journal of Pharmaceutical...Playstore)...This article can be downloaded to...Sagar,...active phytochemical co...How to cite this article:...© 2013...66...63...62...61...60...59...58...57...55...52...50...49...48...47...46...45...44...43...42...41...40...39...38...37...36...35...34...33...32...31...30...29...28...27...26...25...24...23...22...21...20...19...18...17...16...15...14...13...12...11...10...9...8...7...6...5...4...3...2...1...E-ISSN: 0975-8232; P-ISSN: 2320-5148

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