Research Article

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PHARMACOGNOSTICAL STUDY OF KUTAKI (*PICRORHIZA KURROA* ROYLE EX. BENTH)

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Received on: 27/07/16 Revised on: 30/08/16 Accepted on: 17/09/16

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DOI: 10.7897/2277-4343.075215

ABSTRACT

Kutki has been used in the indigenous system of medicine since a long time. The authentic source of the drug is *Picrorhiza kurroa* Royle ex. Benth belonging to the family *Scrophulariaceae*. The plant is native of North-West Himalayas from Kashmir to Sikkim. Kutaki is considered to be a valuable bitter tonic and a favorite remedy in bilious dyspepsia accompanied with fever. It is antipyretic, anthelmintic, and slightly laxative and is useful in asthma, blood troubles, burning sensation, piles, inflammations, ringworm. This study is designed for various pharmacognostical standards which can help in ensuring the purity, safety and efficacy of this valuable medicinal plant. Different methods like macroscopic, microscopic and physiochemical techniques were used for identification and standardization of intact and powdered drug of rhizome of *Picrorhiza kurroa* Royle ex. Benth. Pharmacognostical study showed that rhizomes of *P. kurroa* are yellowish brown in colour with bitter taste. Transverse section showed cork, cork cambium, primary cortex and vascular tissue. Phloem, sieve cells and xylem vessels constitute the vascular tissue with pith cells in the centre. Lignin cells, metaderm, mucilage and proteins are found in powder microscopy of *P. kurroa*. Physiochemical analysis was found within range when compared with API. Different pharmacognostical features of *P. kurroa* revealed from this study will help in standardization of crude drug and preventing adulteration in the herbal raw drug market.

Keywords: *Picrorhiza kurroa* Royle ex. Benth, Pharmacognostic, Transverse section.

INTRODUCTION

Katuka is a hairy shrub, native to Himalayas, with perennial bitter woody rootstock clothed with persistent leaf bases.¹ Katuka consists of the dried rhizome with root of *Picrorhiza kurroa* Royle ex Benth belonging to family *Scrophulariaceae*.² This herb has spatula shaped 5-10cm long leaves. Flowers are small, bluish white, showy and are arranged in dense, terminal and cylindric spikes, and are pollinated by insects. Fruit capsule is 1.3 cm long.³ A fair large quantity of the drug is collected from various places in the north west and Sikkim Himalayas and exported regularly to the plains. The plant may be cultivated at higher altitudes in the Himalayas, it is also propagated by seeds and rhizomes.⁴ The plant is commonly found at an altitude of 3000-4500m and in Uttarakhand, populations are seen in Almora, Chamoli, Tehri, Pithoragarh and Uttarkashi.⁵ Rhizomes contain a brown resinous glucoside, picrorhizin and picrorhizetin. It also possess kutkin, apocynin, alpha-sitosterol.⁶ The rhizomes are bitter, tonic, acrid, cooling, laxative, carminative, digestive, stomachic, ant helminthic, anti inflammatory, cardio tonic, expectorant, anti pyretic, anti periodic, cholagogue and purgative in large doses. Rhizomes are useful in burning sensation, constipation, gastric disorders, dyspepsia, flatulence, colic, leukoderma, leprosy, skin diseases; diseases of spleen and liver including jaundice, anemia, hemorrhoids and general debility.⁷ In Unani system of medicine, rhizomes are used for curing ailments like epilepsy, paralysis and skin diseases. It possess emmenagogue, emetic, abortifacient properties, used an antidote for dog bite and improves eye-sight.⁸ Its action on the Liver is similar to but

milder than that of colocynth. It is a valuable anti periodic in low continued fevers and given to children in worms.⁹ Plant possess many important pharmacological activities like antimicrobial, hepato protective, antioxidant, anti-bacterial, antimutagenic and anti-cancer activities.¹⁰ Rhizomes of *P. kurroa* are commonly used for the preparation of many Ayurvedic formulations like Arogyavardhini gutika, Tiktaka ghrita, Sarvajvarahara lauha, Mahatiktaka ghrita etc.¹¹ *Picrorhiza kurroa* Royle ex. Benth. is commonly used either as an adulterant or substitute for *Gentiana kurroo*. Great confusion exists with regard to the identity of these drugs as the name Kutaki is employed in the vernacular to mean both of them. As *Picrorhiza kurroa* Royle ex. Benth is considered a valuable bitter tonic almost as efficacious as Gentian, there develops a need for the proper standardization of this drug so that the drug can be used on extensive scale in cases where bitters are indicated. Present study has been taken to investigate the organoleptic characters, microscopic study i.e. transverse section study and powder microscopy of rhizome of *Picrorhiza kurroa* Royle ex. Benth.

MATERIALS AND METHODS

Plant collection and Authentication

The fresh plant specimen was collected from hills of Tungnath region of District Rudraprayag, Uttarakhand. The plant material was taxonomically identified by Dr. C.P. Kuniyal, Incharge of Herbal Research and Development Institute, Mandal,

Gopeshwar, Chamoli, Uttarakhand under the reference letter No. 58/HRDI/Sample/2014-15.

Pharmognostical Studies

Macroscopic evaluation or Organoleptic study

Collected and authenticated rhizomes of *P. kurroa* were dried and various organoleptic characters viz., color, odor, taste, texture, fracture, and shape were studied.¹²⁻¹⁴ This study generally includes the tests that can be done by one's sensory organs and quality of drug can be inferred up to some extent.¹⁵

Microscopic evaluation

Freehand sections of rhizomes of *P. kurroa* were taken and stained using safranin. The sections were observed under compound microscope and photographs of different magnitude were taken. Powder microscopy was also performed using different stains like iodine stain, Methylene blue, safranin stain and eosin stain and the diagnostic characters like starch grains, lignin cells, mucilage and others were noted.¹²⁻¹⁴

Physiochemical Evaluation^{16,17}

Determination of Foreign matter

Genuine plant material was weighed by the electronic monopan balance and a thin layer of sample was spreaded on a white color sheet. By bull lens, the layer was examined for foreign matter. Foreign matter was separated and collected in to another paper. Plant material was recollected and weight again. Percentage of foreign matter in relation to the total quantity of plant material was calculated.

Determination of Moisture content (Loss on drying)

10 g of sample (variation within 0.01gm) was placed in a tared evaporating dish dried in oven at 105° for first 5 hours, and weighed. Drying & weighing was continued further at every one hour interval until constant weight was reached. The constant weight was noted so that two consecutive weighing after drying for 30 minutes and cooling for 30 minutes in a desiccators, show not more than 0.01 g difference. The loss in weight was noted and calculated as a percentage.

Determination of Total ash

The total ash method is designed to measure the total amount of material remaining after ignition. This include both physiological ash which derived from the plant tissue itself and non physiological ash which is the residue of the extraneous matter (e.g. sand and soil) adhering to plant surface. Silica Crucible was cleaned, dried well, labeled with glass pencils and then weighed to constant weight. 5 gm of powdered drug sample was put in the Silica crucible. The drug was spread evenly into a thin layer. This crucible was placed in a muffle furnace and ignited at a temperature of 450°C for about 6 hrs or more until the ash was totally free from Carbon. The crucible containing the ash was allowed to be cooled in desiccators and subsequently weighed to constant weight. The percentage of ash with reference to the air dried drug was calculated.

Estimation of Acid insoluble ash value

The total ash thus obtained was gently boiled for 5 minutes with 25 ml of dilute hydrochloric acid after covering the crucible with a watch glass. The cover glass was rinsed with 5 ml of distil water and rinsed water is collected in the crucible itself. The mixture is filtered in an ash less filter paper and washed with hot water 2-3 times. The ash less filter paper containing insoluble matter was properly folded, kept back in to the crucible and ignited to constant weight. The percentage of Acid-Insoluble Ash with reference to the air dried drug was calculated.

Estimation of Alcohol soluble extractive value

About 5 g of the coarsely powdered test sample was macerated with 100 ml of Ethanol in a closed conical flask for twenty-four hours, shaking frequently during first six hours and allowed to stand for next eighteen hours and then filtered rapidly, taking precautions against loss of solvent. About 10 ml of the filtrate was taken in a Petridish, and dried in oven at 105°, to constant weight and weighed. The percentage of alcohol-soluble extractive with reference to the air-dried drug was calculated.

Estimation of Water soluble extractive value

The whole above mentioned procedure was carried out using chloroform water instead of ethanol.

RESULTS

Macroscopic study

Macroscopic or organoleptic characters of rhizome of *P. kurroa* are as shown in Table 1 and Figure 1.

Microscopic study

Transverse section of rhizome

Transverse section of rhizome of *P. kurroa* as shown in Figure 2 clearly shows the presence of outer layer of tangentially elongated, suberised cells known as cork. Below the cork, cork cambium is present which consists of 1-2 layers collenchymatous cells without intercellular spaces. Cortex lies under cork cambium where primary cortex contains 8-10 layers of parenchyma cells with small intercellular spaces. Then, there is 2-3 layered parenchymatous cells known as Pericycle. Vascular tissue consists of bunch of phloem, sieve cells (parenchyma) compactly arranged, scattered xylem vessels (fibers) in between xylem parenchyma. In centre Pith cells are present. (Figure 2)

Powder microscopy of rhizome

Powder microscopy of rhizome of *P. kurroa* shows the presence of metaderm, mucilage, proteins and lignin cells but absence of starch grains. (Figure 3)

Physiochemical evaluation

The results of physiochemical parameters are summarized in Table 2.

Table 1: Organoleptic characters of *P. kurroa*

S. No.	Appearance	Rhizome of <i>P. Kurroa</i>
1.	Size	3 to 9 cm long and 0.7 to 0.9 cm thick.
2.	Shape	Externally yellowish brown in colour. Cylindrical, straight and very few are curved in shape. Bud scales are rarely seen. Roots are found to be attached with all rhizomes.
3.	Colour	Yellowish brown
4.	Odor	Pleasant
5.	Taste	Bitter
6.	Fracture	Short, with a thick and creamish peripheral cambium ring and diminished light brown central cambium ring.

Table 2: Physiochemical analysis of *P. kurroa*

S. No.	Parameters	Rhizome of <i>P. kurroa</i>	Standards as per API
1.	Foreign matter	1.142%	Not more than 2%
2.	Moisture content	12.95%	-
3.	Total Ash value	3.8%	Not more than 7%
4.	Acid insoluble ash	0.63%	Not more than 1%
5.	Alcohol soluble extractive value	22.42%	Not less than 10%
6.	Water soluble extractive value	42.63%	Not less than 20%

Fracture showing thick creamish peripheral cambium ring

Figure 1: Organoleptic features of Rhizome of *P. kurroa*

Figure 2: Transverse section of Rhizome of *P. kurroa*

Metaderm are present, starch grains are absent (Iodine stain) in Kutaki sample

Deep blue colour show mucilage (Methylene blue) in Kutaki sample

Red stain show lignin cells (Safranin stain) in Kutaki sample

Red colour show proteins (Eosin stain) in Kutaki sample

Figure 3: Powder microscopy of Rhizome of *P. kurroa*

DISCUSSION

For the establishment of identity, purity, safety and efficacy of herbal drugs, standardization is the need of the hour. Macroscopy, microscopy and physiochemical evaluation of *Picrorhiza kurroa* has been carried out in this study. Organoleptically, rhizomes of *P. kurroa* are externally brownish in color; cylindrical, straight or slightly curved in shape. Surface is found to be rough due to longitudinal wrinkles and taste is extremely bitter. Fracture is found to be short with a peripheral yellowish ring and brownish cambium ring in the centre. Transverse section microscopic study shows a layer of cork, cork cambium, 8-10 layers of primary cortex, 2-3 layers of Pericycle. Phloem, sieve cells and xylem vessels constitute the vascular tissue with pith cells in the centre. Lignin cells, metaderm, mucilage and proteins are found in powder microscopy of *P. kurroa*. Physiochemical analysis are done and compared with API in which all parameters are found to be within range. These studies will be helpful to pharmaceuticals for identification of raw drugs for drug standardization.

CONCLUSION

Kutaki has been used in the indigenous system of medicine since a long time. The authentic source of the drug is *Picrorhiza kurroa* Royle ex. Benth belonging to the family *Scrophulariaceae*. Kutaki is considered to be a valuable bitter tonic and a favourite remedy in bilious dyspepsia accompanied with fever. It is antipyretic, anthelmintic, and slightly laxative and is useful in asthma, blood troubles, burning sensation, piles, inflammations, ringworm. But some other species such as *Gentiana kurroo* Royle, *Helleborus niger* Linn., roots of *Picrorhiza scrophularia* are sold in drug market under the name kutaki or kuru. So, there is a need to standardize the authentic source of genuine drug by using different parameters. This paper is an attempt of the author to generate identity and purity standards for *P. kurroa* to prevent its adulteration in the herbal drug market.

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Cite this article as:

Amarendra Kumar Mall, Suresh Chaubey, Ramesh Chandra Tiwari, Gagandeep Kour. Pharmacognostical study of Kutaki (*Picrorhiza kurroa* Royle Ex. Benth). Int. J. Res. Ayurveda Pharm. Sep - Oct 2016;7(Suppl 4):36-40 <http://dx.doi.org/10.7897/2277-4343.075215>

Source of support: Nil, Conflict of interest: None Declared

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