



Received on 20 November, 2016; received in revised form, 09 January, 2017; accepted, 014 January, 2017; published 01 June, 2017

MACROSCOPIC AND MICROSCOPIC EVALUATION OF *ABRUS PRECATORIUS* L. (GUNJA), SEEDS

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Keywords:

Abrus precatorius, Macroscopy, Microscopy, Quality, Purity

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ABSTRACT: The excessive exploitation of medicinal plants during recent years raises the issues regarding their quality, safety and efficacy. In this respect, there has been a rapid increase in the standardization of medicinal plants with therapeutic potential. In spite of the new techniques, identification and evaluation of plant drugs pharmacognostic study is more cheap and reliable. *Abrus precatorius* L. of family Fabaceae is native to India and is locally known as Rati. It is widely employed in traditional medicinal systems. The present investigation deals with the macroscopic and microscopic evaluation of the seeds of this species to record the parameters of diagnostic value. Macroscopic studies comprised of shape, size, taste, colour, odour etc. Microscopic studies were done by using trinocular microscope. Anatomy of the seed was studied by taking transverse sections. Such information will be used for further therapeutical and pharmacological evaluation of the species and will also help in maintaining the quality and purity of sample. Moreover, the study would also serve as a valuable tool in drug identification and in ensuring quality formulations.

INTRODUCTION: India has a rich heritage of valuable medicinal plants belonging to different families. These plants form the backbone of the traditional system of medicine as these are subjected to formulate useful medicines in different traditional systems like Ayurveda, Unani, Siddha and Chinese system of medicine. Despite the availability of modern medicine, the indigenous or traditional medicine retained their status and gained importance in the field of medicine during recent times particularly in developing countries for cultural and historic reasons.

However, the excessive exploitation of medicinal plants raises the issues regarding their quality, safety and efficacy. Herbal medicines face various problems on the practical field regarding botanical identification, adulteration, diversified attributes etc. As the crude drugs forms the basis for the manufacture of wide range of valuable medicinal preparations for human use, the development of pharmacognostical research has become obligatory to acquire therapeutically effective medicine prepared from legitimate drug material ^{1, 2, 3, 4}. Such studies focused on taking out the diagnostic qualities will facilitate the identification and standardization of different botanical species of plant origin ⁵.

In ancient times the authentication of plants or plant parts depended on the well experienced collector's knowledge with the organoleptic parameters of the plant such as colour, odour and

QUICK RESPONSE CODE	DOI: 10.13040/IJPSR.0975-8232.8(6).2631-35
	Article can be accessed online on: www.ijpsr.com
DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.8(6).2631-35	

texture. But now, this technique of evaluation turned out to be less reliable as the sources of medicinal plants broadened and adulteration became more complicated. There is need of development of reliable, easy, cheap, quality and convenient methods for authentication for the proper identification and standardization of medicinal plants especially toxic plants in addition to the organoleptic methods. Microscopy technique is very helpful to achieve the goal of standardization of the medicinal plant preparations and also to enhance the authentication methods of medicinal plants⁶.

A thorough macroscopic and microscopic investigation was performed on the *Abrus precatorius* L. seeds. Macroscopic study is a technique of qualitative assessment which is based on the study of morphological and sensory profiles of the plant material. This technique is helpful to distinguish the desired plant species or plant part and morphologically similar, yet distinguishable species that could occur as possible adulterants. On the other hand, microscopic examination uses the light microscope to analyze the different characteristics of a particular plant sample and thus helps in identification of the organized drugs by their known histological characters and also for confirming the structural details of the herbal drugs^{5,6}.

Abrus precatorius L. of family Fabaceae is a slender, perennial, twining vine bearing characteristic red seeds with black mark at the base. It is native to India, but now found in all tropical and sub-tropical regions throughout the world^{7,8,9}. It is called as Rati in Hindi and Shangir in Kashmiri¹⁰. The plant, from the ancient times has been used as medicine in India, China as well as in other old cultures¹¹. The plant is popular for its seeds, which are toxic due to the presence of a proteinaceous substance abrin¹².

The main phyto-constituents of the seeds are carbohydrates, proteins, steroids triterpenoids, aminoacids, alkaloids, flavonoids and isoflavonoids¹³. Seeds of the plant are very beautiful and are thus used in jewellery also. These are used to cure worm infections, painful swellings, tuberculosis and possess potent anti-microbial and insecticidal

properties. Powdered seeds are taken as oral contraceptives in various African tribes and hot water extract of the seeds is taken orally for curing malaria. Seeds are said to be emetic, tonic, purgative, aphrodisiac, anti-ophthalmic and anti-phlogistic. These are also used in veterinary medicine for the treatment of fractures^{11, 14}. However there is very minute pharmacognostical report on the macroscopic and microscopic parameters that are required for the quality control of the seeds crude drug. The current study therefore, attempts to report the necessary macroscopic and microscopic standards of seeds of *Abrus precatorius* L., which will help to identify the drug.

MATERIAL AND METHODS:

Sample collection and authentication: Plant material was obtained from the local market of Bhopal, Madhya Pradesh. The sample was authenticated for its botanical identity by Dr. Zia-Ul-Hassan; HOD of the Department of Botany Saifia Science College, Bhopal and voucher specimen No. 520/Bot/Saifia/2015 was deposited there for future reference. The seeds were cleaned and washed with distilled water in order to remove the impurities and were shade dried. These cleaned seeds were then used for the macroscopic and microscopic purposes. All the chemicals and reagents used in this study were of analytic grade. Precision rotary microtome (Scientech, SE-191) was used for sectioning of the specimen.

Macroscopical studies: The seeds of *Abrus precatorius* L. were subjected to macro-morphological studies which comprised of shape, size, taste, fracture, colour and odour. Such parameters were assessed as per standard methods¹⁵.

Microscopic studies and powder analysis: The seeds after soaking in water for two days were fixed in FAE (1:1:18) (formalin-5ml + Acetic acid-5ml + 70% ethylalcohol-90 ml) for 48-72 hours. Following the processes of dehydration, clearing and infiltration, microtome slides (transverse sections) of the specimen were prepared, stained and observed under light microscope. For powder microscopy, the shade dried mature seeds were grinded into fine powder with the help of electric

grinder. The fine powder was then subjected to microscopic examination as per the standard methods. The powdered drug was evaluated as such and also by treating separately with different reagents like phloroglucinol, concentrated hydrochloric acid, diluted hydrochloric acid, glycerine, iodine solution, safranin, water, sudan and methylene blue for determining different microscopic features. All the preparations were observed under Olympus CH20iBIMF microscope (Trinocular with camera attachment). Photomicrographs in both the cases were taken using SONY digital camera Model No. DSC-350^{16, 17}.

RESULT AND DISCUSSION: The quality control parameters of the seeds of *Abrus precatorius* L. studies were established with the help of macro-morphological and microscopic studies. Determination of the sensory, macroscopic and microscopic characteristics is the first step of establishing the identity and the purity of the medicinal plant materials before further test are undertaken as per the norms of World Health Organization. Macroscopic examination of the drugs refers to various characters like shape, size, colour, odour, taste and special features, like touch, texture etc^{1, 18}. Microscopic inspection of herbal materials is indispensable for the identification of broken or powdered materials. Microscopic characters determine the histological characters of the seed and can serve as diagnostic parameters¹⁹.

Macroscopical evaluation: The seeds of *Abrus precatorius* L. are found to be very distinctive, bright scarlet red in colour with a large black spot at hilum which is sunken and elliptical. These are solid, ovoid-ellipsoid-globose shaped with smooth surface, 5-7 mm long and 4-5 mm wide. These have bitter taste with characteristic odour (Fig. 1).



FIG. 1: MATURE SEEDS OF *ABRUS PRECATORIUS* L.

Microscopical evaluation:

Transverse section: Transverse section of seed is almost circular in outline. Transverse section of seed shows outer testa differentiated in epidermis and endodermis. Epidermis comprises the large portion of the testa and is made of haphazardly arranged radially elongated palisade like cells. Inner thin portion of the testa is comprised of collapsed cells forming a hyaline layer. Endodermis is composed of large thick-walled isodiametric parenchyma cell on inner side and small thin walled cells on outer side. Cotyledons are made of broad radially elongated parenchymatous mesophyll cells. Starch grains are abundant in it (Fig. 2).

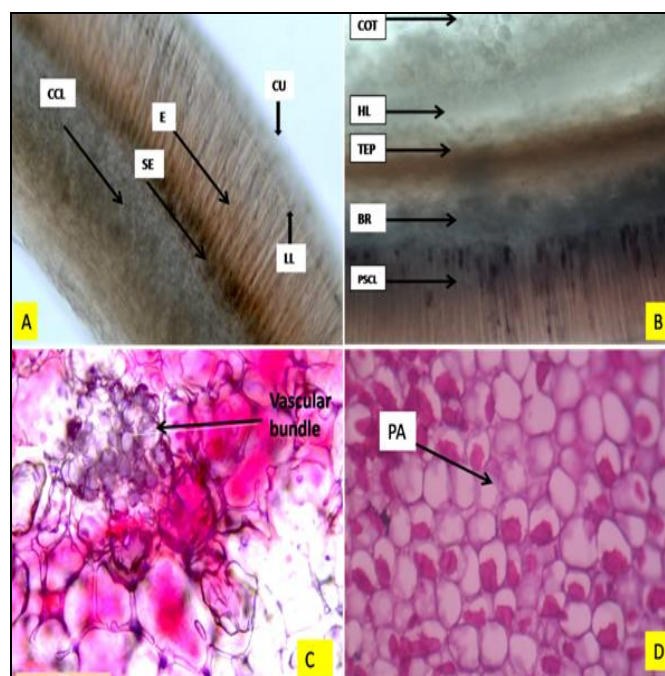


FIG. 2: A: T. S CELLULAR OF TESTA SHOWING EPIDERMIS (E), SUB-EPIDERMIS (SE) AND COLLAPSED CELL LAYER (CCL); B: T. S CELLULAR OF SEED SHOWING PALISADE LIKE SCLEREIDS OF EPIDERMIS (PSCL), BEARER CELLS (BR), TANGENTIALLY ELONGATED PARENCHYMATOUS TESTA CELLS (TEP), HYALINE LAYER (HL) AND COTYLEDON (COT); C: T. S CELLULAR OF SEED SHOWING VASCULAR BUNDLE; D: T.S CELLULAR OF SEED SHOWING PARENCHYMATOUS COTYLEDONS (PA).

Seed powder: Diagnostic characters of the seed powder showed cotyledonary cells with aleurone grains, group of bearer cells with parenchyma, fragments of hyaline layer and group of palisade like cells of testa (Fig. 3).

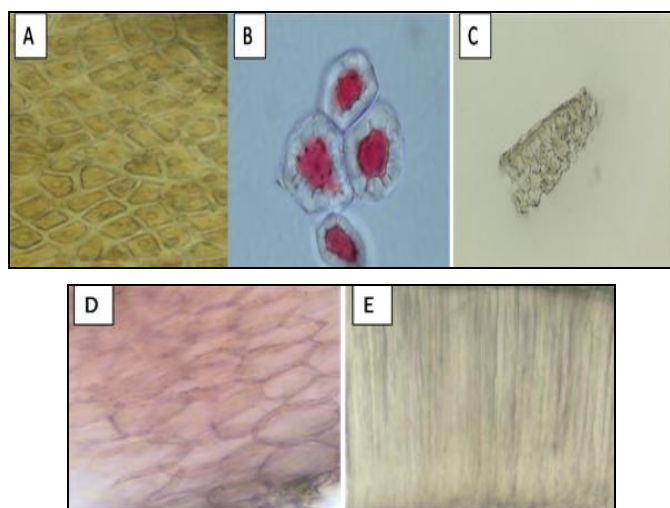


FIG. 3: A, B: COTYLEDONARY CELLS WITH ALEURONE GRAINS; C: GROUP OF BEARER CELLS WITH PARENCHYMA; D: FRAGMENTS OF HYALINE LAYER; E: GROUP OF PALISADE LIKE CELLS OF TESTA.

CONCLUSION: The macroscopic and microscopic studies of the seeds of *Abrus precatorius* L. were carried out with the aim of bringing out diagnostic characters that will play a great role in the primary identification and proper authentication of the botanical species of the plant drug. This will be helpful to establish particular standards and help to minimize the adulteration of preparations obtained from *Abrus precatorius* L. seed. Macroscopic and microscopic characteristics of the *Abrus precatorius* L. seeds will act as a useful source of information to establish the identity and to determine the quality and purity of the plant material in future studies. Such a study, although, cannot provide a complete evaluation profile of the herbal drug, still it can provide supporting evidence. This study is thus a substantial step and when combined with other analytical parameters can be used to obtain complete evidence for standardization and to ascertain them as drugs.

In conclusion, for identification and evaluation of medicinal plants by pharmacognostical studies, macroscopic and microscopic methods are the cheap, reliable and simplest methods to start with establishing the correct identification of the source material.

ACKNOWLEDGEMENT: The authors thank the referee for many perceptive comments that led to improvement of the work.

CONFLICT OF INTEREST: The authors declare that there is no conflict of interest regarding the publication of this paper.

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How to cite this article:

Tabasum S, Khare S and Jain K: Macroscopic and microscopic evaluation of *Abrus precatorius* L. (Gunja), seeds. Int J Pharm Sci Res 2017; 8(6): 2631-35. doi: 10.13040/IJPSR.0975-8232.8(6).2631-35.

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