eISSN - 2348-0173
Vol-2 / Issue-3 - May - June - 2014

www.ijaam.org

INTERNATIONAL JOURNAL OF AYURVEDA & ALTERNATIVE MEDICINE

Bi-Monthly Peer Reviewed International Journal

VOL 2 ISSUE 3 (2014) | INTERNATIONAL JOURNAL OF AYURVEDA & ALTERNATIVE MEDICINE | eISSN 2348-0173

RESEARCH ARTICLE eISSN 2348- 0173

PHARMACOGNOSTICAL EVALUATION OF *APAMARGA* (*Achyranthes aspera* Linn.)

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Article Received on	-	21st May 2014
Article Revised on	-	25th June 2014
Article Accepted on	-	27th June 2014

VOL 2 ISSUE 3 (2014) | INTERNATIONAL JOURNAL OF AYURVEDA & ALTERNATIVE MEDICINE | eISSN 2348-0173

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QR Code IJAAM

ABSTRACT:
Apamarga (*Achyranthes aspera* Linn.) is a well known herb useful in different diseases. In detail pharmacognostical profile of this plant is not found. Considering this, it has been attempted to evaluate detailed pharmacognostical profile of *Achyranthes aspera* Linn. Whole plant was collected in the month of November 2012; shade dried; pulverized; sieved through 80 mesh and preserved in an airtight glass container. Pharmacognostical evaluation shows xylem composed of tracheids, fibers and parenchyma in transverse section of root, parenchymatous cells contain rosettees of calcium oxalate crystals in transverse section of stem, simple worty trichome and annular vessels in powder of leaf, transverse section of seed contains parenchyma cells greatly consisting oil globules, aleuron grains, some of the cells filled with yellow brown content and also prismatic crystals of calcium oxalate. The current work appears to be the first of its kind and can be considered as reference standard for future studies.

Key Words: *Apamarga*, Root, Stem, Leaf, *Tandula*, *Achyranthes aspera*

INTRODUCTION

Knowledge of herbs has been handed down from generation to generations for thousands of years.[1] Herbal drugs constitute a major part in all traditional systems of medicines. Plants above all other agents have been used for medicine from time immemorial because they have fitted the immediate personal need, easily accessible and inexpensive.[2] According to the WHO more than 80 % of the world's population relies on traditional herbal medicine for their primary health care.[3] World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species.[4] Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants.[5] In recent time there has been a marked shift towards herbal cures because of the pronounced cumulative and irreversible reactions of modern drugs. However, due to over population, urbanization and continuous exploitation of these herbal reserves, the natural resources along with their related traditional knowledge are depleting day by day.[6]

Achyranthes aspera Linn (Amaranthaceae) is an important medicinal herb found as a weed throughout India. Though almost all of its parts are used in traditional systems of medicines; seeds, roots and shoot are the most important parts which are used medicinally. Till date, pharmacognostical profile of different parts of *Apamarga* is not found reported. Considering this, it is attempted to evaluated pharmacognosy of individual parts of *Apamarga*.

MATERIALS AND METHODS

Collection: Fresh *Apamarga* (*Achyranthes aspera* L.) was collected in the month of November 2012 as per collection standards. The plant specimen was authenticated by the Pharmacocgnosist. All parts of *Apamarga* like Leaf, Stem, Root, Flower, Fruit and Seed were separated; shade dried; pulverized; sieved through 80 sieves and preserved in an airtight glass container.

Morphology: The collected raw material of plant was identified and authentified by studying their characters systematically as per the methods described in the textbooks of pharmacognosy. The specimen was observed as such with naked eye.[7]

Macroscopic and microscopic evaluation: Thin free hand transverse sections of fresh parts of *A.aspera* taken by maceration method.[8] For identification of various contents, they were treated with phloroglucinol and hydrochloric acid.[9] Photomicrographs were taken by using canon digital camera attached to Carl Zeiss Trinocular microscope.

Organoleptic characters: Colour, taste, odour and powder nature were recorded by sensory characters.[10]

Powder Microscopy: Small quantity of powder studied first with distilled water then stained with phlorolucinol and Conc. Hcl Microphotographs were taken.[11]

RESULTS AND DISCUSSION

Root

Macroscopy: Cylindrical tap root, slightly ribbed, 0.1-1.0cm in the thickness, gradually tapering, rough due to presence of some root scars, secondary and tertiary root present, yellowish brown; odour, not distinct.

Transverse section of Root: Transverse section of root showed single layered epidermis, followed by 6-19 layered, rectangular, tangentially, elongated, thin-walled cork cells, followed by 5-6 successive alternating more or less concentric rings of secondary vascular tissue and the conjunctive parenchyma. Arcas or patches of phloem and conjunctive parenchymatous tissues were much smaller and hence appear embedded in the xylem mass in the stem while these were longer and form alternate and concentric rings with the xylem. Xylem composed of tracheids, fibers and parenchyma; vessels with both simple and bordered pits. Pith was absent.

Powder microscopy: Organoleptic characters of Root powder was showed in table no 1.
Microscopic characters of root powder showed cork in transverse view, cork in surface view, prismatic crystals of calcium oxalate, fragment of border pitted vessels, prism along with oil globules, fibres passing through medullary rays, simple fibres, border pitted vessels and yellow brownish content (Tannins).

Stem

Macroscopy: 0.3-0.5cm in cut pieces, yellowish brown, erect, branched, cylindrical, hairy, solid, and hollow when dry.

Transverse section of Stem: Stem showed 6-10 prominent ridges which diminish downward up to the base where it becomes cylindrical. The epidermis was single layered externally with a thick cuticle. The cortex was composed of 6-10 layers of parenchymatous cells; many of them contain rosettees of calcium oxalate crystals. Vascular bundles lie facing reach ridges capped by pericyclic fibers, transverse section of mature stem shows lignified, thin-walled cork cells; pericycle a discontinuous ring of lignified fibers; vascular tissues show anomalous secondary having 4-6 incomplete rings of xylem and phloem. The central part of the stem was occupied by pith in which two medullary bundles were found either separate throughout or fused in some cases.

Powder microscopy: Organoleptic characters of Stem powder was showed in table no 1.
Microscopic characters of stem powder showed rossate crystals, annular vessels, fragment of border pitted vessels, septed fibres, fragment of parenchyma cells, short warty trichomes along with starch grain, short warty trichoms along with hilum, border pitted vessels and cork in surface view.

Leaf

Macroscopy: Leaves simple, subsessile, exstipulate, opposite, decussate, wavy margin, obovate, slightly acuminates and pubescent due to the present of thick coat of long simple hairs.

Transverse section of Leaf:

Petiole: Transverse Section of petiole Showed crescent-shaped outline, having ground tissues consisting of thin-walled, parenchymatous cells containing rosettee crystals of calcium oxalate; 4-5 vascular bundle situated in mid region.

Midrib: Transverse section of leaf throw mid rib showed a single layered epidermis, on both surfaces; epidermis followed by 4-5 layered Collenchyma cells on upper side and 2-3 layered on lower side; ground tissue consisting of thin walled, parenchymatous cells had number of vascular bundles; each vascular bundle shows below the xylem vessels, thin layers of cambium, followed by phloem and a pericycle represented by 2-3 layers of thick-walled, non-lignified cells; rosettee crystals of calcium oxalate found scattered in ground tissues.

Lamina: Showed single layered, tangentially elongated epidermis cells covered with thick cuticle having covering trichomes which were similar to those of stem found on both surface; mesophyll differentiated into palisade and spongy parenchyma; palisade 2-4 layered of thick parenchyma larger, slightly elongated in upper, while smaller and rectangular in lower surface; spongy parenchyma 3-5 layers thick, more or less isodiametric parenchymatous cells; idioblast containing oxalate distributed in palisade and spongy parenchyma cells; stomata anisocytic and anomocytic in both surface.

Powder microscopy: Organoleptic characters of Leaf powder was showed in table no 1.
Microscopic characters of leaf powder showed rosette crystals, prismatic crystals, simple warty trichome, fragment of annular vessels, yellow brownish content (Tannins), trichomes with lumen, trichomes without lumen, stomata anomocytic, lignified fibres and Epidermal cells.

Flower

Macroscopy: Inflorescence - dense axillay and terminal spikes, spiny flowers, bracteates; Bract - scaly, membranous, scarious; bracteoles - membranous. Flower bisexual, actinomorphic, pentamerous, hypogynous and very small. Perianth – 5 membranous green to pink lanceolate, fimbricate. Stamens - five filament, long; anthers - dorsi fixed. Gynoecium - monocarpellary syncarpous, superior, unilocular with basal placentation style1; stigma - capitate. Fruit article seeds with cured embryo and mealy endosperm.[12]

Transverse section of Flower:

Perianth: Transverse section of perianth showed somewhat compressed and boat shaped measures about 0.3-0.4 mm. Outer layer covered with cells compactly arranged barrel shaped epidermal cells without inter cellular spaces; lower side cells filled with yellow brownish content (may be tannin). The ground tissue was divided into upper loosely arranged barrel shaped parenchyma cells and lower part consist compactly arranged parenchyma cells with chlorophyll pigments and many rosettee crystals of calcium oxalate crystals. On either side of the edges compactly arranged collenchymas cells give the mechanical support for the ground tissue. Vascular bundles were open and collaterally distributed at the lower side; the ground tissue was made-up off few xylem elements and phloem.[12]

Androecium: Squashed androecium shows many papillose cells with prismatic and rosettee crystals of calcium oxalate, fibres, stomata and spiral vessels, multi cellular glandular trichomes, oil globules and numerous, rounded, polyhedral pollen grains. Each pollen grain consist two layers, extine and intine. Extine was somewhat cutinized, which often provide with spinous outgrowths. Intine was thin and delicate. Cells of the filament were parenchymatous and longitudinally arranged, covered with many multicellular trichomes.[12]

Gynoecium: It was monocarpellary syncarpous; Ovary superior, mace in shape. Style tubular, Colour simple reddish. Section composed of parenchyma cells, prismatic crystals of calcium oxalate, oil globules, vascular strands and many polyhedral pollen grains adhering on the walls of the tube. Stigma - with many pappillose, measures about 0.4 mm, cells filled with nectar and tannin content.[12]

Powder microscopy: Organoleptic characters of Flower powder was showed in table no 1.

Microscopic characters of flower powder showed Prismatic crystals of calcium oxalate, Starch grains, Oil globules and many polyhedral pollen grains.[12]

Fruit

Macroscopy: An indehiscent dry utricle enclosed within persistence, perianth, and bracteoles. Minute egg shaped, shining and brownish green in colour. Ovule - single chambered, monocarpellary with basal placentation, outer most cells reddish and cup shaped with some oil globules. Inner single layered stone cells lead into loosely arranged parenchyma cells. Cotyledons - two rich in starch grains; Embryo – very minute.[12]

Transverse section of Fruit: Transverse section of the fruit showed that the outer most Pericarp made up off single layered epidermal cells with thick cuticle and some cells leads in to multicellular glandular trichomes. The Pericarp followed by testa, perisperm, inner endosperm cotyledons and the radical.

Powder Microscopy: Organoleptic characters of Fruit powder was showed in table no 1.

Microscopic characters of fruit powder showed Prismatic crystals of calcium oxalate, Oil globules, Epidermal cells, Multi cellular glandular trichomes, tannin content, simple and compound starch grain and spiral vessels.[12]

Seed

Macroscopy: Sub-cylindric, truncate at the apex, round at the base, endospermic, brown.

Transverse section of Seed: Transverse section of seed shows outer most single layered Testa consists rectangular shaped compactly arranged parenchyma cells. Perisperm cells loosly arranged somewhat elongated parenchyma cells greatly consisting oil globules, aloerone grains, some of the cells filled with yellow brown content and also prismatic crystals of calcium oxalate. Endospem made up off compactly arranged parenchyma cells loaded by starch grains and oil globules. Cotyledons two consisting parenchyma cells rich with starch grains.

Powder Microscopy: Organoleptic characters of Seed powder was showed in table no 1.

Microscopic characters of seed powder showed prismatic crystals, oil globules, endosperm cells along with aleurone grains, Fragment of endosperm cells along with aleurone grains, fibres with luman, Endocarp cells, epidermal cells with oil globules, yellow brown contant may be tannins.

Panchanga (Whole plant)
Powder Microscopy: Organoleptic characters of Panchanga (Whole plant) powder was showed in table no 1.
Microscopic characters of *Panchang* (Whole plant) powder showed covering trichome, glandular trichome, calcium oxalate crystals of the stem, vessels of the roots showing bordered pits, pitted vessels of the stem, tracheid of the stem with simple pits, Prismatic and Rosettee crystals, Simple fibres, Lignified fibres, Yellow brownish content (tannins), Oil globules, Annular vessels, Short warty trichoms along with starch grain, Stomata anomocytic, Epidermal cells, Polyhedral pollan grains and Spiral vessels.

DISCUSION

Plant identified *Achyranthes aspera Linn.* Belongs to Amaranthaceae family is herb from all over the waste places of India. Stem angular, ribbed, simple or branched from the base, leaves thick ovate – elliptic or obovate – rounded, flowers greenish white, numerous in axillary or terminal spikes, seeds subcylindric, truncate at the apex, rounded at the base, reddish brown.

Transverse section of root showed that 5-6 successive alternating more or less concentric rings of secondary vascular tissue and the conjunctive parenchyma, vessels with both simple and bordered pits were specific characters of the Amaranthaceae specially *Apamarga* Distinctive characters cork in transverse and surface view, prismatic crystals of calcium oxalate, fragment of border pitted vessels, fibres passing through medullary rays and border pitted vessel were identified.

Transverse section of stem showed that lignified, thin-walled cork cells; pericycle a discontinuous ring of lignified fibers; vascular tissues show anomalous secondary having 4-6 incomplete rings of xylem and phloem were important characters observed in the stem. Distinctive characters, rossate crystals, annular vessels, fragment of border pitted vessels, short warty trichoms were identified.

Transverse section of leaf throw mid rib showed a single layered epidermis, on both surfaces; epidermis followed by 4-5 layered Collenchyma cells on upper side and 2-3 layered on lower side; leaves idioblast containing oxalate distributed in palisade and spongy parenchyma cells; stomata anisocytic and anomocytic in both surface. Important character of leaf powder showed rosettee crystals, prismatic crystals, simple warty trichome, fragment of annular vessels, yellow brownish contants were observed.

Transverse section of perienth showed outer layer covered with cells compactly arranged barrel shaped epidermal cells without inter cellular spaces; lower side cells filled with yellow brownish content, Squashed androecium showed many papillae cells with prismatic and rosettee crystals of calcium oxalate, stomata and numerous, rounded, polyhedral pollen grains, gynoecium showed many polyhedral pollen grains adhering on the walls of the tube. Stigma - with many pappillose. Important characters of flower powder showed Prismatic crystals of calcium oxalate, Starch grains, Oil globules and many polyhedral pollen grains.
Transverse section of the fruit showed that the outer most Pericarp made up off single layered epidermal cells with thick cuticle and some cells leads in to multicellular glandular trichomes. Distinctive characters of fruit powder showed Prismatic crystals of calcium oxalate, Oil globules, Epidermal cells, Multi cellular glandular trichomes, Simple and compound starch grain and Spiral vessels.

Transverse section of seed showed outer most single layered Testa consists rectangular shaped compactly arranged parenchyma cells, perisperm cells loosly arranged somewhat elongated parenchyma cells, endospem made up off compactly arranged parenchyma cells loaded by starch grains and oil globules. Important characters of Seed powder showed Endosperm cells along with aleurone grains, Fragment of endosperm cells along with aleurone grains, Fibres with lumen, fragments of Endocarp cells.

Microscopic characters of *Panchang* (whole plant) powder showed glandular trichome, , bordered pitted vessels, Prismatic and Rossate crystals of calcium oxalate, Lignified fibres, Oil globules, Short warty trichoms along with starch grain, Stomata anomocytic, Polyhedral pollan grains and Spiral vessels.

CONCLUSION

Pharmacognostical study of *A. aspera* Linn. provide specific parameters that will be useful in the individual characteristics and also as well as whole powder adulterant in identification and authentication of the drug. Prismatic and Rosettee crystals, Simple fibres, Lignified fibres, Pollen grain this helps in further research on flowers and seeds.

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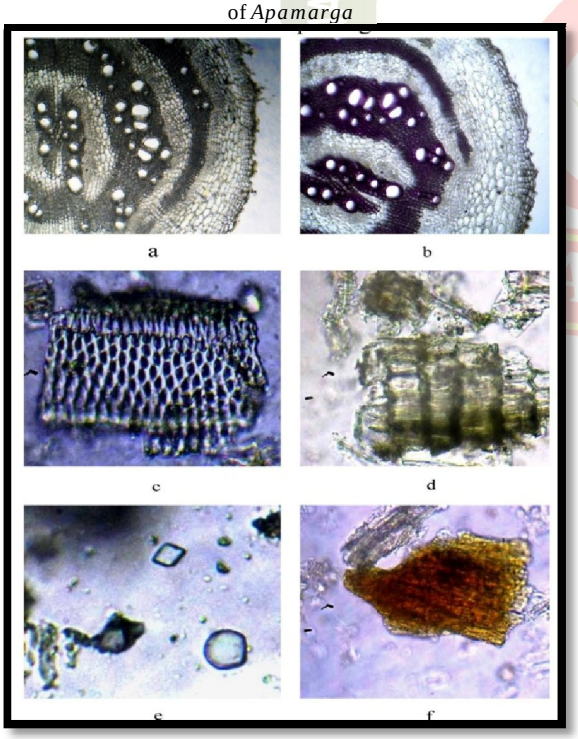
Table 1 Contains Organoleptic characters of powder of each parts and whole plant of *Apamarga*.

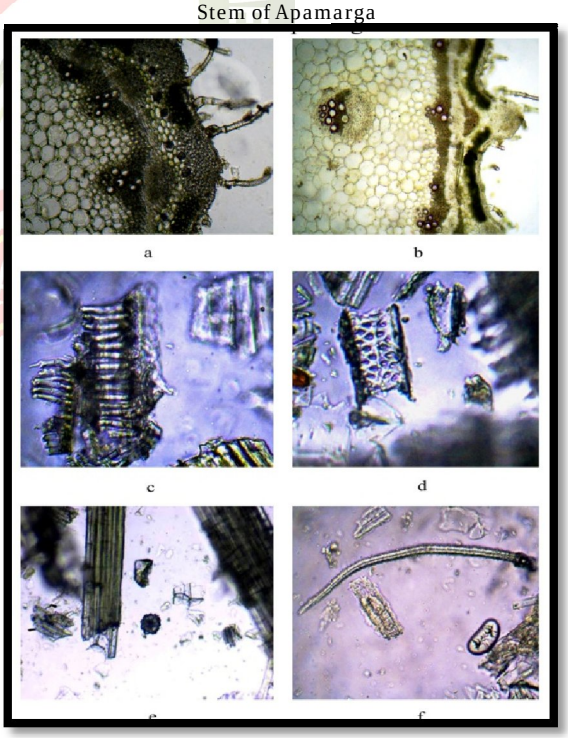
Parts	Colour	Odour	Touch	Taste
Stem	Creemish white	NIL	Coarse	NIL
Root	Creemish white	Astringent	Coarse	Light *Kashaya*
Leaf	Dark green	Astringent	Coarse	*Kashaya*
Flower	Whitish yellow	Specific	Coarse	Astringent
Fruit	Whitish yellow	Specific	Coarse	Astringent
Seed	Whitish yellow	Specific	Coarse	Astringent
Whole plant	Creemish yellow	Astringent	Course	*Kashaya*

Figure 1 Transverse section and Powder Microscopy of Root of *Apamarga*



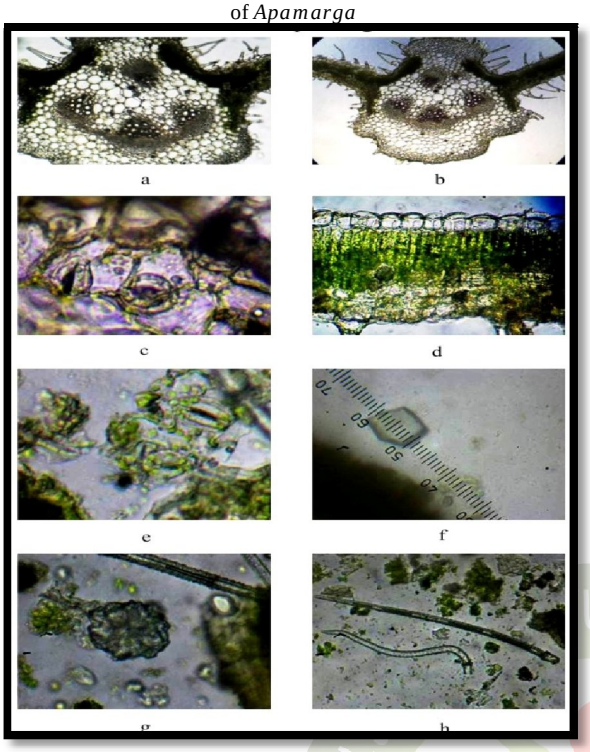
a- Transverse section of unstained Root; b- Transverse section of stained Root ; c- Border pitted vessels; d- Cork in surface view
e- Prismatic crystals with starch grain; f - Tannin content

Figure 2 Transverse Section and Powder Microscopy of Stem of Apamarga



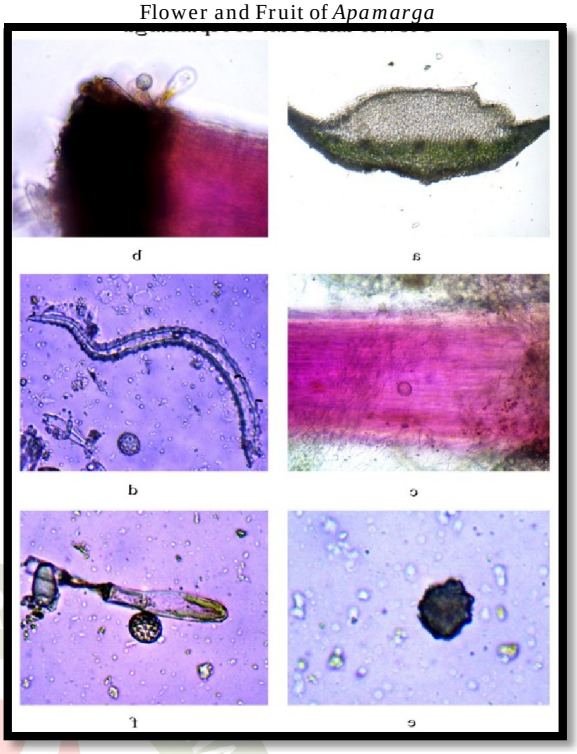
a- Transverse section of unstained stem; b- Transverse section of stained stem; c- Annular vessels; d- Border pitted vessels; e- Rosette and prismatic crystals with septet fibers; f- Warty trichoms with starch grain with hylum

Figure 3 Transverse Section and Powder Microscopy of Leaf of *Apamarga*



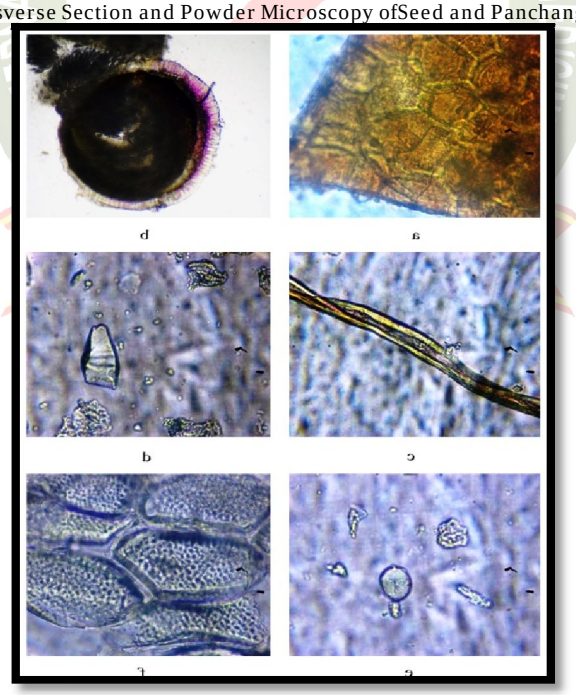
a- Transverse section of unstained Leaf; b- Transverse section of stained Leaf; c- Anomocytic stomata; d- Spongy parenchyma along with rosette crystals; e- Anomocytic stomata; f- Prismatic crystals; g- Rossat Crystals; h- warty trichoms with starch grain with hilum

Figure 4 Transverse Section and Powder Microscopy of Flower and Fruit of *Apamarga*



a- Transverse section of perienth; b- Gynoecium along with pollen grain; c- Style with p0llen grain; d- Fibers; e- Rosette Crystals; f- Pollen grain, Grandular trichoms with prismatic crystals

Figure 5 Transverse Section and Powder Microscopy ofSeed and Panchang of *Apamarga*



a- Epicarp cells**; b-** Fibers with white luman; c- Transverse section of Seed; d- Prismatic crystal; e- Starch grain; f - Pitted Paranchyma

CITE THIS ARTICLE AS –	
Hasmukh R Jadav et.al, Pharmacognostical Evaluation of Apamarga (Achyranthes aspera Linn.)Int. J. Ayu. Alt. Med., 2014; 2(3):53-59	
Source of Support – Nil	Conflict of Interest – None Declared

INTERNATIONAL JOURNAL OF AYURVEDA & ALTERNATIVE MEDICINE
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