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Quality control parameters of *Rakta Karpasa* flower (*Gossypium arboreum* Linn.)

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Abstract

Gossypium arboreum Linn., commonly known as *Rakta Karpasa*, is widely used in *Ayurveda* for the treatment of diseases and for the processing of various formulations of *Rasashastra*. However, preliminary pharmacognostical parameters are not available for this particular species. In present study, transverse section of fresh flower showed presence of stelate trichomes in epidermis, collenchymatous hypodermis, cortex with rosette crystals. The physicochemical parameters like, pH of Rakta Karpas Flower (RKF) was not more than 6.67, the loss on drying was not more than 11.64 % w/w, the alcohol soluble extractive was not more than 49.01 % w/w. In HPTLC profile at 254 nm frequency, 3 peaks were observed at max R_f, 93.94, 2.65, 3.41 and subsequent end R_f were 95.38, 1.55, 3.06.

Key-Words: *Rakta Karpasa*, *Gossypium arboreum* Linn, HPTLC

Introduction

Rakta Karpasa[1,2] i.e *Gossypium arboreum* Linn., belonging to family Malvaceae, has synonyms *Karpasa*, *Tundikeri*, *Samudranta*, *Vanyakarpasa*, is a medium sized annual herb, often with mucilaginous sap. native to South America, particularly its north-western parts, it is also cultivated in India. The root is branched, with tap root system. The stem is erect, branched, young portion often covered with trichomes. Leaf is simple, alternate, often palmetly lobed, lobes 3 to 5 palmetly veined, stipulated petiolated, entire margine, veination reticulate and multicosted divergent, veins purple in colour. The plant has inflorescence which is axillary, solitary in the leaf axis. Few actions observed by the specific part are, the root of *Gossypium arboreum* Linn. has emmenagogue, oxytocic, abortifacient, parturient, lactagogue whereas the seed and leaf are Antidysenteric[3]. Only seeds are galactogogue, pectoral, and febrifuge. The seed oil is used externally for clearing spots and freckles from the skin. The seed contains 26.2 to 27.9% protein; 1, 22 to 2.42 free gossypol. The leaf possesses the hypotensive and antirheumatic property. Flower is used in hypochondriasis and bronchial inflammations. The plant is also termed to be potent antidiabetic and possesses wound healing property[4]. Due to lack of quality control parameters for flowers of this medicinal plant, it becomes necessary to lay the same.

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Material and methods

The fresh flowers of *Rakta Karpasa* (*Gossypium arboreum* Linn.) were collected from AVSS Ayurveda Mahavidyalaya, Herbal Garden, Bijapur, Karnataka. For the microscopic evaluation of the (*Gossypium arboreum* Linn.) flower, powder slides were separately prepared by using distilled water for detecting various constituents.

For establishing quality control standards of flower, organoleptic characters like taste, colour etc, powder microscopy, histochemical tests, macroscopic evaluation, microscopic assessment, powder microscopy and qualitative tests for various functional groups and physicochemical parameters according to standard protocols of Ayurvedic Pharmacopeia of India.

Results and Discussion

Macroscopic characters: Flowers are bractiatate with epicalyxes, complete, bisexual, actinomorphic, hypogynous, pentamerous and purple in colour. Epicalyx is outside the calyx, several bracteoles often form a calyx like whorl called epicalyx. Epicalyx consists of three bracteoles and are fused, bloched with purple pigments. Calyx has five sepals which are basally connate and valvate. Corolla has five petals which are free, basally adnate to the terminal column, usually twisted and pinkish purple in colour. Corolla has five petals, centrally bloched with magenta colour, the androcium has numerous stamens, monadelphous, anthers one celled reiniform (kidney shaped)

dehisenced longitudinal, filaments fused to form a terminal column around the ovary. Gynoecium consists of a compound pistil with many carpals, ovary is superior with numerous ovules in each locule on axil placentation style one and branched about as many as carples. Stigma as many as carples and capitate. Seeds are endospermic with curved embryo and scanty endosperm. (Fig. 1 and 2)

Microscopic characters: In the flower, transverse section of pedicel is almost circular in outline and shows epidermis with thick cuticle bearing glandular, simple, multicellular, stelate trichomes. Underneath this lies two to three collenchymatous hypodermis loaded with tannin. Cortex is parenchymatous embedded with rosette crystals of calcium oxalate, followed by pericyclic reagion contain cells filled with tannin. Discontinuous ring of wedge shape xylem vessels capped with phloem tissue. Centrally located pith contains pitted parenchyma at places and whole section is embedded with rosette crystals of calcium oxalate. (Fig. 3 to 8)

Powder microscopy of flower shows fragment of anther with filament, epidermis, pollen tetrads. Mature and immature pollen grains with poly protuberance, fragments of gynoecia, fragments of ovule with hilum and rosette crystals, fragments of ovule with chalaza, fragment of ovary with micropyle and egg apparatus, fragment of epidermis and hypodermis with tannin in sectional view from pedicel, beadded parenchyma, fragments of different trichome viz. simple, unicellular, multicellular, stelate, prismatic crystals of calcium oxalate. (Fig. 9 to 11)

On organoleptic evaluation of various sensory parameters of flower, taste was observed to be pungent, astringent, colour was pink with violet predominance, the flower was odourless and texture appeared as fine.

While observing the physicochemical characters, pH[5] of RKF was not more than 6.67, the loss on drying[6] was not more than 11.64 % w/w, ash value[7] was not more than 9.71 % w/w, the acid insoluble ash[8] was not more than 1.89 % w/w, water soluble extractive[9] was not more than 4.63 and the alcohol soluble extractive[10] was not more than 49.01 % w/w.

While analyzing the flower for qualitative analysis[11, 12], alkaloids, glycosides, starch, saponin, carbohydrates and sterol were absent, whereas, phenols, proteins, flavanoids and tannin were present.

The same extract was examined for high performance thin layer chromatography[13] profile of at 254 nm frequency, using the solvent system of Choroform: Methenol in the ratio of 9:1. The developed plate was observed under 254 and 366 nm (Fig. 10, 11). 10% Ferric Chloride was used as derivatization for visualization. At 254 nm frequency, 3 peaks were observed at max R_f, 93.94, 2.65, 3.41 and subsequent end R_f were 95.38, 1.55 and 3.06 % of Hight covered were 4302.0, 70.1 and 138.2 also at 366nm frequency two picks were observed at max. R_f 96.20, 0.4 and subsequent end R_f 94.37 and 5.63 % height covered were 4429.6 and 404.9. (Fig. 12 and 13)

TS of flower shows presence of stelate trichomes in epidermis, followed by collenchymatous hypodermis, cortex with rosette crystals; centrally located pith containing pitted parenchyma. Powdered microscopy showed characteristic features like, anther with filament, epidermis, pollen tetrads, mature and immature pollen grains with poly protuberance, fragments of gynaecium, fragments of ovule with hilum and rosette crystals, fragments of ovule, fragment of ovary, fragment of epidermis and hypodermis, beaded parenchyma, fragments of different trichome viz. simple, unicellular, multicellular, stelate, prismatic crystals. Other physico-chemical characters and HPTLC profile can be considered as a preliminary quality control data for this particular species.

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Table 1: Physicochemical parameters of RKF sample

Parameters	Observation
pH value	6.67
Loss on drying	11.64
Ash value (%w/w)	9.71
Acid insoluble ash (%w/w)	1.89
Water soluble extract (%w/w)	4.63
Alcohol soluble extract (%w/w)	49.01

Table 2: Qualitative test for various functional groups

Tests	RKF
Alkaloids	-ve
Glycosides	-ve
Starch	-ve
Saponin	-ve
Carbohydrates	-ve
Sterol/Steroid	-ve
Tannin	+ve
Flavanoids	+ve
Phenols	+ve
Proteins	+ve

+ve =present, -ve=absent

Table 3: HPTLC Profile of RKF at 254 nm

254 nm			
Peak	**Max R_f**	**End R_f**	**Height %**
1	93.94	95.38	4302.0
2	2.65	1.55	70.1
3	3.41	3.06	138.2

Table 4: HPTLC Profile of RKF at 366 nm

366 nm			
Peak	**Max R_f**	**End R_f**	**Area %**
1	96.20	94.37	4429.6
2	0.4	5.63	404.9

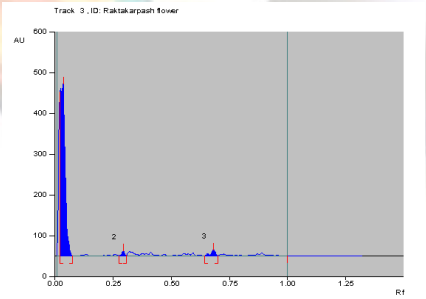

Fig. 12: HPTLC densitogram of flower extract visualized at 254 nm

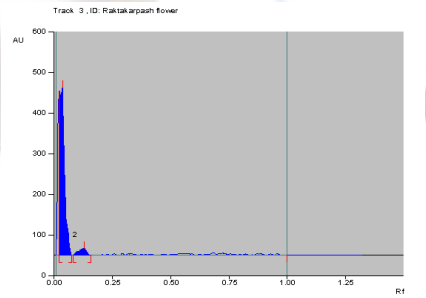

Fig. 13: HPTLC densitogram of flower extract visualized at 366 nm

Fig. 1: Flower in natural habitat

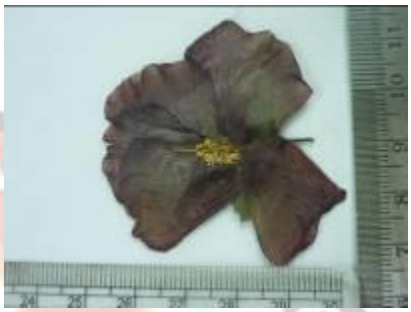

Fig.2: measurements of dried flower (about 5cm x 5cm)

Fig. 3: TS of anther with filament, epidermis, pollen tetrads

Fig. 4: TS of pedicel

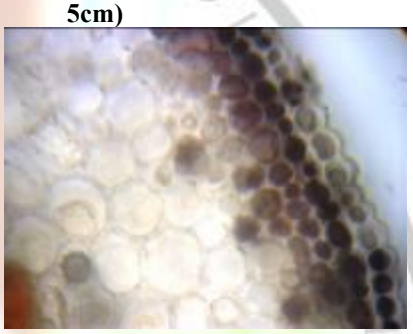

Fig. 5: Epidermis & Hypodermis of Rakta Karpasa flower pedicel

Fig. 6: TS of Gynaecium

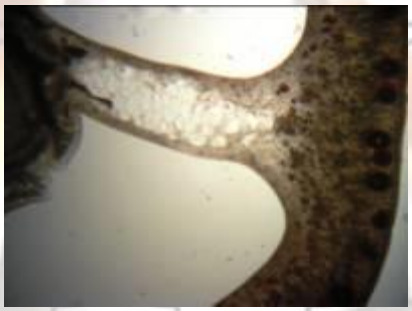

Fig. 7: TS of ovule with chalaza

Fig. 8: TS of ovary with micropyle and egg apparatus

Fig. 9: Lignified multi branched trichome

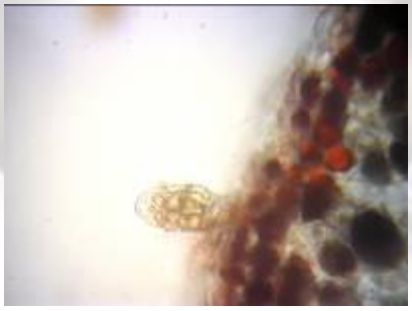

Fig. 10: Glandular trichome

Fig. 11: Unmatured & matured pollen grains