Quality control constraint of *Guizotia abyssinica* Cass, source of medicinally useful edible oil seeds

Bani Shashikala, Mallya Suma V, Prabhu Suchitra

**ABSTRACT**

**INTRODUCTION**

*Guizotia abyssinica* Cass. brachydebranch erect, stout stem, commonly known as Ramtil or Niger seed. Seeds are the rich source of oil with high nutritional index. Traditionally the seed powder is used as remedy for cough, oil in cases of rheumatism. Apart from this the seeds are also used for different dishes like chutney, condiments etc. Hence a study has been designed to document pharmacognostic, physicochemical & phytochemical data on above drug. **Materials and Methods:** Matured seeds were collected, authenticated and used for the study. Macro-microscopy, physicochemical, phytochemical standards and HPTLC marked using proper protocol. **Results:** Seeds are achene, obovoid and narrowly long like a needle, black with white to yellow scars on the top. Microscopic study shown the presence of epidermis and endodermis filled with alliferone grains and oil globules. Physico-chemical standards mark the purity of the drug. Alkaloid, Steroid, Carbohydrate, Terpenoid & Coumarins were detected as secondary metabolites. HPTLC revealed prominent spots with Rf values 0.54, 0.58, & 0.70 under short UV and 0.45 & 0.82 under long UV. **Conclusion:** Pharmacognostic values depicted in this paper are a measure of its quality standards.

**Keywords:** *Guizotia abyssinica* Cass, Ramtil, Pharmacognostic, Phytochemical, HPTLC

**MATERIALS AND METHODS**

**Materials**

Matured seeds of *Guizotia abyssinica* Cass. (Ramtil) were collected from Gadag district, cleaned properly with other foreign matters like stem pieces, husks, taxonomically named, using floras, sample deposited at SDM centre for Research in Ayurveda and Allied sciences, Voucher specimen No. 17032101.

**Macroscopy**

Outer features of samples were documented using Canon IXUS digital camera. The Macroscopic features were studied using taxonomy text books. Organoleptic characters marked as per standard guidelines.

**Correspondence:**

Bani Shashikala, PhD Scholar, Sri Dharmasthala Manjunatheshwara (SDM) College of Ayurveda, Kuthpady, Udupi, Karnataka, India

Email: sumamallya@gmail.com
Microscopy

Plant samples soaked in FAA (Formalin-5ml + Acetic acid-5ml + 70% Ethyl alcohol-90ml) solution for more than 48 hours. The seed samples were cut into thin transverse section using a blade and sections were stained with saffranine. Then these were mounted on slides visualized under microscope, photographed using Zeiss AXIO trinocular microscope attached with Zeiss AxioCam camera under bright field light. Magnifications of the figures are indicated by the scale-bars [3].

Powder microscopy

One gram of test drug powder was sieved through 80 pore size mesh. A pinch of powder was mounted on a slide with a drop of glycerine water. Slide visualized under microscope, particular cell features marked and recorded.

Physicochemical study:

Seed sample shade dried, powdered properly and loss on drying at 105°C, total Ash, acid insoluble ash, water soluble ash, alcohol soluble extractive & water-soluble extractive were carried out as per standard methodology [3].

Phytochemical study

Alcoholic extract of seed powder was screened for the presence of various phytochemical constituents as per standard operative procedures and results recorded [4].

HPTLC

1g of Guizotia abyssinica seed powder was extracted with 10 ml of alcohol. 4, 8 and 12µl of the above extract applied on a pre-coated silica gel F254 on aluminum plates to a band width of 7 mm using Linomat 5 TLC applicator. This particular plate was developed in Toluene: Ethyl acetate (9.0: 1.0). Then developed plates were visualized in short UV, long UV, and then derivatised with vanillin sulphuric acid observed under white light and scanned under UV 254nm, 366nm and 620nm. Rf, colour of the spots and densitometric scan of this experiment were recorded.

RESULTS

Macroscopy

Guizotia abyssinica Cass. seed is an achene, club-shaped, obovoid and narrowly long like a needle, whitish yellow mark on the top as well as base with a hard testa. It appears glossy and shiny with characteristic odour. The embryo is white. (Figure 1 & Table 1).

| Sr. no | Parameters | Characters observed |
|--------|------------|---------------------|
| 1.     | Colour     | Light brown to black |
| 2.     | Shape      | Club shaped, obovoid, needle like |
| 3.     | Appearance | Glossy & shining    |
| 4.     | Seed weight| 2.52mg              |

Figure 2: TS of Guizotia abyssinica Cass.
**Fig 2a.** TS of seed *Guizotia abyssinica* Cass.

AG – aleurone grains; Cot – cotyledon; E – epidermis; En – endosperm; OC – Oil cells; Pa – lignified parenchyma; PL – pigment layer; SC – stone cells; Scl – sclereids; T – testa.

**Fig 2c.** T.S of seed of *Guizotia abyssinica* enlarged view without staining

**Powder microscopy**

Seed powder has shown following characters such as sclerenchyma fibres, bundle of fibres, sclerenchyma with pigments, stone cells and pitted sclerenchyma cells. (Figure 3)
Physico-chemical standards

Loss on drying was 8.42%, total ash 3.98%, acid insoluble ash 0.2%, water soluble ash 0.60%, alcohol soluble extractive 26.94% and water-soluble extractive was 9.4% w/w respectively. (Table 2)

| Parameter                        | Results n = 3 | % w/w |
|----------------------------------|---------------|-------|
| Loss on drying                   | 8.42          |       |
| Total Ash                        | 3.98          |       |
| Acid Insoluble Ash               | 0.2           |       |
| Water soluble Ash                | 0.60          |       |
| Alcohol soluble extractive value | 26.94         |       |
| Water soluble extractive value   | 9.4           |       |

Table 2: Physico-chemical standards of *Guizotia abyssinica* Cass.

Phytochemical study

Alcoholic extract of the test drug has shown the presence of Alkaloid, Steroid, Carbohydrate, Terpenoid & Coumarins. (Table 3)

| Test          | Inference |
|---------------|-----------|
| Alkaloid      | +         |
| Steroid       | +         |
| Carbohydrate  | +         |
| Tannin        | -         |
| Flavanoids    | -         |
| Saponins      | -         |
| Terpenoid     | +         |
| Coumarins     | +         |
| Phenols       | -         |
| Carboxylic acid| -       |
| Amino acids   | -         |
| Resin         | +         |
| Quinone       | -         |

Table 3: Phytochemical constituents of *Guizotia abyssinica* Cass.

HPTLC

HPTLC of alcoholic extract revealed the prominent spots with Rf values 0.54, 0.58, & 0.70 under short UV, 0.45& 0.82 under long UV with selective mobile phase. (Figure 4, 5. Table 3)

| Test                     | Inference |
|--------------------------|-----------|
| track 1- Guizotia abyssinica – 4µl |          |
| track 2- Guizotia abyssinica – 8µl |          |
| track 3- Guizotia abyssinica– 12µl |          |

Solvent system – Toluene: Ethyl Acetate: (9:1)

Figure 4. HPTLC photo documentation of ethanolic extract of *Guizotia abyssinica* Cass.

| Test                      | Inference |
|---------------------------|-----------|
| Short UV  | Long UV  | Post derivatisation |
| -          | -        | 0.34 (D. purple)    |
| -          | 0.45 (F. blue) | 0.44 (D. purple) |
| 0.54 (L. green) | -        | 0.54 (L. purple)    |
| 0.58 (L. green) | -        | -                   |
| -          | 0.60 (L. purple) | -                   |
| -          | 0.63 (L. purple) | -                   |
| 0.70 (L. green) | -        | 0.71 (L. purple)    |
| -          | 0.75 (L. purple) | -                   |
| -          | 0.79 (L. purple) | -                   |
| -          | 0.82 (F. blue)  | -                   |

*F – Fluorescent; L – Light; D – Dark
Fig 5a: At 254nm

Track 3. ID: Guizotia abyssinica

| Peak | Start Position | Start Height | Max Position | Max Height | Max % | End Position | End Height | Area | Area % |
|------|----------------|--------------|--------------|------------|-------|--------------|------------|------|--------|
| 1    | 0.00 Rf        | 25.0 AU      | 0.03 Rf      | 522.3 AU   | 35.62 %| 0.08 Rf      | 13.6 AU    | 1054.7 AU | 24.88 %|
| 2    | 0.23 Rf        | 4.7 AU       | 0.29 Rf      | 15.5 AU    | 1.65 % | 0.30 Rf      | 13.9 AU    | 452.2 AU  | 1.12 %  |
| 3    | 0.31 Rf        | 15.7 AU      | 0.39 Rf      | 82.6 AU    | 5.63 % | 0.41 Rf      | 1.3 AU     | 2264.6 AU | 5.65 %  |
| 4    | 0.44 Rf        | 2.3 AU       | 0.50 Rf      | 189.5 AU   | 12.93 %| 0.54 Rf      | 9.2 AU     | 3860.3 AU | 9.55 %  |
| 5    | 0.56 Rf        | 4.8 AU       | 0.61 Rf      | 96.8 AU    | 6.60 % | 0.64 Rf      | 50.8 AU    | 2364.6 AU | 5.70 %  |
| 6    | 0.64 Rf        | 52.1 AU      | 0.67 Rf      | 161.4 AU   | 11.61 %| 0.73 Rf      | 0.0 AU     | 5232.1 AU | 13.18 % |
| 7    | 0.74 Rf        | 2.9 AU       | 0.76 Rf      | 14.4 AU    | 0.98 % | 0.76 Rf      | 13.4 AU    | 177.0 AU  | 0.44 %  |
| 8    | 0.77 Rf        | 12.8 AU      | 0.79 Rf      | 31.8 AU    | 2.17 % | 0.81 Rf      | 24.9 AU    | 567.5 AU  | 1.40 %  |
| 9    | 0.81 Rf        | 25.0 AU      | 0.84 Rf      | 90.4 AU    | 6.17 % | 0.88 Rf      | 0.7 AU     | 2318.2 AU | 5.73 %  |
| 10   | 0.88 Rf        | 11.0 AU      | 0.94 Rf      | 281.5 AU   | 17.83 %| 0.99 Rf      | 57.7 AU    | 13096.8 AU | 32.39 % |

Fig 5b: At 366nm

Track 3. ID: Guizotia abyssinica

| Peak | Start Position | Start Height | Max Position | Max Height | Max % | End Position | End Height | Area | Area % |
|------|----------------|--------------|--------------|------------|-------|--------------|------------|------|--------|
| 1    | 0.00 Rf        | 16.8 AU      | 0.02 Rf      | 736.2 AU   | 74.68 %| 0.06 Rf      | 0.0 AU     | 7383.0 AU | 52.92 %|
| 2    | 0.43 Rf        | 1.6 AU       | 0.51 Rf      | 94.7 AU    | 9.60 % | 0.56 Rf      | 0.1 AU     | 2556.5 AU | 17.16 %|
| 3    | 0.83 Rf        | 0.1 AU       | 0.87 Rf      | 84.7 AU    | 8.59 % | 0.89 Rf      | 73.0 AU    | 2026.8 AU | 13.60 %|
| 4    | 0.89 Rf        | 73.4 AU      | 0.90 Rf      | 76.2 AU    | 7.73 % | 0.99 Rf      | 3.3 AU     | 2431.3 AU | 16.32 %|
DISCUSSION

*Guizotia abyssinica* Cass the source of oil seeds, which grows in drier regions of India, and possessing many precious nutrients. The cold pressed oil is also used as substitute for different cooking oils. Wide therapeutic and edible utility of this less studied seed oil is need of an hour to document pharmacognostic standards.

*Guizotia abyssinica* Cass. is an achene, of club-shaped, obovoid and narrowly long like a needle, black with white to yellow scars on the top. On naked eye observation the seeds appear glossy and shiny with characteristic odour. Transverse section of the seed revealed two integuments, outer & inner. Outer integument consists of well developed, thin, shining, single layered polygonal and tabular celled epidermis with full of mucilage and 2 to 3 layered sub-epidermis, brown with thick walled parenchyma. Inner integument comprises of single layered sclereenchymatous layer reddish brown, with longitudinally or radially elongated, compactly arranged lignified stone cells. These cells beside being thick walled are pitted and show a very small lumen, collapsed parenchymatous cells & dark brown or chocolate brown in colour. Thin endosperm which surrounds the cotyledons is the feature of TS. The cells of endosperm and cotyledons are parenchymatous, colorless, polyhedral, somewhat thick walled containing aleurone grains and abundant oil globules.

Physicochemical parameters of a drug indicate chemical nature, physical impurities due to contamination as well as the solubility in different extractive media. Alcohol soluble extractive value, represent their solubility in respective media along with chemical nature. 26.94% w/w &9.4% w/w were extractive values of test drug obtained in alcohol and water respectively, which show its solubility in alcoholic media. Test drug show the presence of carbohydrate, alkaloid, steroid, terpenoids, coumarins & resin. HPTLC profile exposed the prominent spots with Rf values 0.54, 0.58, & 0.70 under short UV, 0.45& 0.82 under long UV with selective mobile phase.

CONCLUSION

*Guizotia abyssinica*. Cass is an edible oil seed with therapeutic utility, studied pharmacognostically. As authenticity is the first parameter in any drug research, results presented in this paper will be beneficial to carry out further researches.

Acknowledgement

Authors are obliged to President, Dr. D. Veerendra Heggade, SDM Educational Society for constant support in research activities. Authors are indebted to Dr. G Srinivasa Acharya, Principal SDM Udupi and Dr. B. Ravishankar, Former Research Director, SDM Centre for Research in Ayurveda and Allied Sciences, Udupi for Guidance and support.

REFERENCES

1. Kirtikar KR. & Basu BD.  Indian medicinal plants. volII, Dehradun; International Book distributors; 2006, P.1369
2. Mulata Gelata, Rodomiro Ortiz, The importance of *Guizotia abyssinica* (niger) for sustainable food security in Ethiopia: Genetic Resources and crop evolution June 2013; 60(5):1763-70
3. Anonymous. The wealth of India, A dictionary of Indian raw materials & industrial products Vol-IV.  Newdelhi: Council of scientific & industrial research: 2009, P.270- 275
4. Khare CP, Indian medicinal Plants an illustrated dictionary, Springer: 2007, P. 297
5. Nadakarni KM., Indian Material Medica Vol-I, Dehradun; International book Distributor: 2006, P.395
6. Dwivedi Sumeet, and Kohli Seema Folk-lore uses of *Guizotia abyssinica* (L.F) Cass. Among tribal and rural people of Madhya Pradesh, IJPTP. 2012; 3(4):434-437.
7. Wallis TE. Textbook of Pharmacognosy. New Delhi: CBS Publisher and Distributors: 1985, P.527

HOW TO CITE THIS ARTICLE

Shashikala B, Mallya Suma V, Suchitra P. Quality control constraint of *Guizotia abyssinica* Cass, source of medicinally useful edible oil seeds. J Phytopharmacol 2018; 7(5):431-436.