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Comparative Pharmacognostical & Phytochemical Study of *Kodrava (Paspalum scrobiculatum)* & *Mandua (Eleusine coracana)*

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ABSTRACT

Reference of *Kodrava* (Kodo millets) and *Mandua* (Eleusine coracana) can be well traced in different *Samhitas*. *Acharya Charaka* described *Kodrava*, where it was indicated in disorders of *Kapha* and *Pitta*.[1] In Nighantus, *Kodrava* and *Mandua* (Finger millets) both mentioned as *Laghu, Swadu, Katu Vipaka, Lekhniya, Ruksha, Vatapittaprakopaka.*[2] Many plants have been described in *Ayurveda* in them *Ahara* holds greater medical importance, this study is an attempt to compare the Pharmacognostical and Phytochemical evaluation between the *Kodrava* and *Mandua*, as here the peoples of Uttarakhand called *Kodo* (*Kodrava*) and *Mandua* are same and shopkeepers also knows *Kodo* in the name of *Mandua* only. So, on the basis of their Pharmacognostical and Phytochemicals profiles., one can differentiate both the drugs. The Macroscopy and Microscopy of seeds of both the plants were studied as per standard procedures. The powders of both the drug's seeds used in the experimental study to ascertain its *Rasa* by dilution method. Both the parts shows the same *Rasa* i.e., *Madhura* and *Kashaya, Virya Sheet* and almost same morphological and microscopical characters like Aleurone layer with Starch grains and oil droplets was present. Embryo can be seen clearly in both the drugs. The dissimilar character in both the drugs was Epithelial cells with Air space and thick walled Endosperm cells present in EC but not in PS. Hence it is concluded that both drugs are different with same family Poaceae.

Key words: *Kodrava, Paspalum scrobiculatum (PS)., Mandua, Eleusine coracana (EC).*

INTRODUCTION

Ayurveda is the ancient science and Medicinal plants are backbone of *Ayurvedic* System of Medicine with number of plants being used for distinguished purposes. *Dravyas* is divided into two parts on the basis of utility, *Ahara Dravya* and *Aushadha Dravya*,[3] and both plays an important role in the management of any disease. *Acharya Charaka* said that for all the successful management of the diseases it is essential to select proper medicine.[4] But it is possible only after proper identification of the drug. Many of those plants were already described in various *Samhitas* and *Nighantus*, *Kodrava* has described as Binding faeces and urine, increasing *Vata,* scraping (reducing fat), easily digestible, Astringent, Eliminating poison (toxicants), Mitigating *Pitta* and *Kapha,* alleviating *Raktapitta,* cold in touch, *Grahi,* Sweet, Dry *(Ruksha),* cold.[5] The properties of *Madhoolika* has been given as mitigating *Kapha* and *Pitta,* Unctuous, Aphrodisiac, Cold, Astringent, Easily digestible, Reducing urine, Binding faeces. Synonyms that has given *Madhuli.*[5] Here the aim of the study is to compare the pharmacognostical and phytochemical evaluation between the *Kodrava* and *Mandua* as here the peoples

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of Uttarakhand called *Kodo* and *Mandua* are same and shopkeepers also knows *Kodo* (*Kodrava*) in the name of *Mandua* only.

Materials and Methods

Both the plant was identified taxonomically following details mentioned in various Flora during March-April and it was labelled for collection of material.[6,7] *Mandua* was collected from Dehradun, Uttarakhand Fig.1.1, 1.2 and *Kodrava* collected from Jhansi, UP. Fig.2.1, 2.2.

Fig.1.1: EC seeds

Fig.1.2: EC powder

Fig.2.1: PS Seeds

Fig. 2.2: PS without husk

The seeds of the collected plants were sun-dried for physicochemical and chemical analysis and anatomical works. Organoleptic characters were assessed using dried plants. The transverse sections were done taken using free-hand sectioning methods. Fluorescent microscope and photomicrography camera (Dewinter Optical Inc.) were used observation of characters and photomicrographs. Physicochemical analysis was done as per methods mention in *Ayurvedic Pharmacopoeia of India* and Quality Control Methods for Medicinal Plant Materials published by World Health Organization.[8,9] Preliminary phytochemical analysis was done for hydro-alcoholic extracts.[10,11] Quantitative assessments were done total carbohydrate, total protein, total lipid, dietary fibers, sodium, potassium and calcium. Anthrone method was used determination of total carbohydrate using UV-Visible spectrophotometer (Systronics 106).[12] Quantity of protein was assessed using micro Kjeldahl method followed by conversion factor.[13] Total lipids were quantified as per method given in *Ayurvedic Pharmacopoeia of India.*[14] Sodium, potassium and calcium were quantified using flame photometer (Sytronics 128). The thin layer chromatography was done using silica plate and solvent chloroform and methanol in ration 90:10. Long UV wavelength was used for taking photograph. Quantitative assessment foe Heavy metals were done for component plant drugs. Estimation of Mercury was examined by Seamen's Volumetric Method, Arsenic by Kjeldahl Method, Lead and Cadmium was detected by EDTA Method.

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Observations and Results

***Kodrava* (PS)** *Kodo* millets, *Paspalum scrobiculatum* Linn. (Fam. Poaceae) consists of dehusked and well-matured caryopsis of an annual grass 60 to 90 cm tall, cultivated in the plains of India for its grains; newly gathered grains with husks are poisonous; husks are removed prior to use or powdering.

Fig. 3.1

Fig. 3.2

Grain oval to rounded in shape, plano-convex and up to about 4 mm in length; `pericarp brown, adherent to seeds, can be removed by rubbing; as seen under hand lens, on the convex side of caryopsis, there is one central line, and on the plane surface, three lines; inside pericarp is a shiny brown seed; seeds possess three prominent ridges on the convex side and in between these ridges, fine striations are present; plane side of the seed shows finely striated oval central depression, apical side pointed.Fig.3.1, Fig. 3.2

***Mandua* (EC)** Finger millet is a utricle which is spherical and about 1.5 mm in diameter. The membranous pericarp of finger millet was loosely associated with the seed at maturity. We can clearly see the basic structures i.e., Embryo, Micropyle, Hilum, Chalaza. This is a seed with Lateral depression. Fig.4.1, Fig, 4.2.

Fig. 4.1

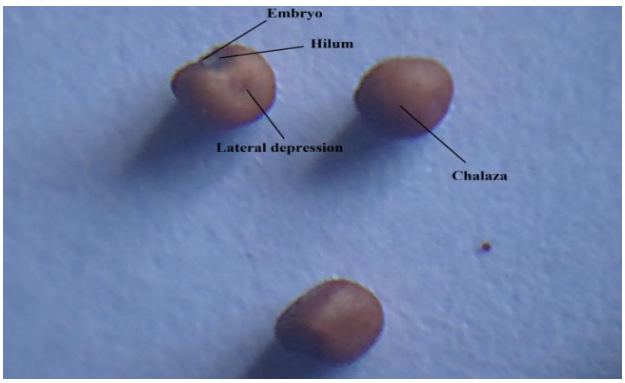

Fig. 4.2

The comparative microscopic characters between PS and EC as shows in figures (Figure numbers: 5.1 - 5.6 and 6.1 - 6.6 respectively and Table no. 1.

Microscopic Structure of PS

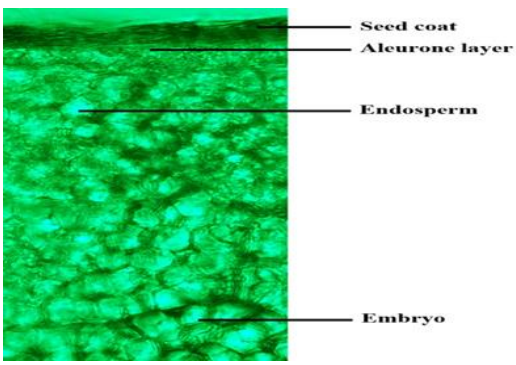

Fig. 5.1: Outline T.S

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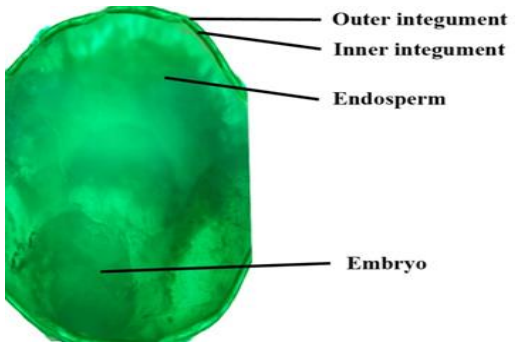

Fig.5.2: Outline T.S

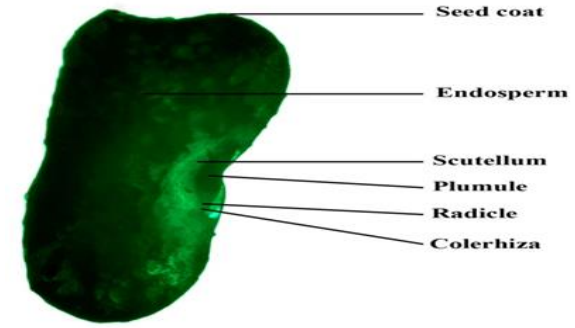

Fig.5.3: Outline L.S.

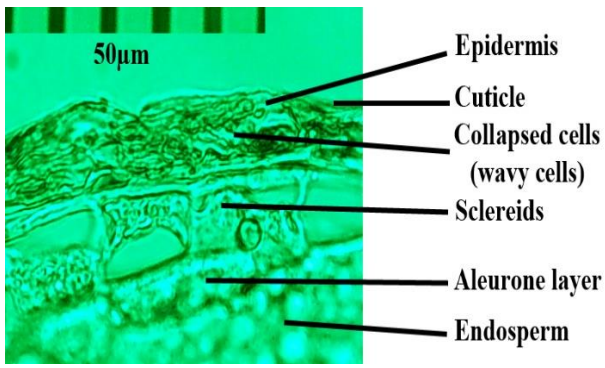

Fig.5.4: Pericarp to Endosperm

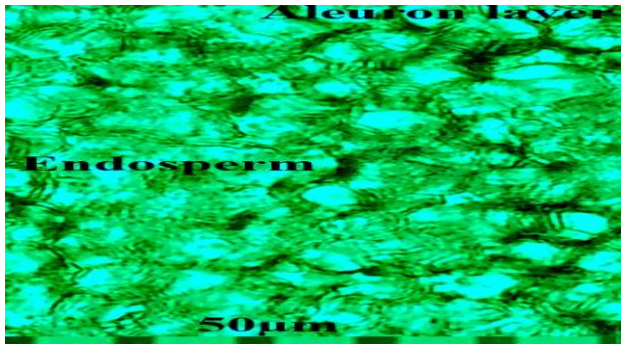

Fig. 5.5: Aleuron layer & Endosperm

Powder Microscopy of PS

We can see powder under microscope with brown, fine, free flowing; Simple & Compound starch grains of various shapes and sizes which are isolated or in groups.

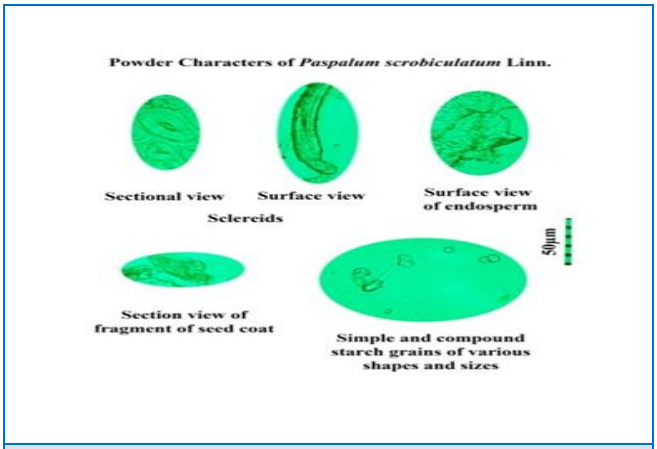

Fig. 5.6: Powder microscopy of PS.

Microscopy Structures of EC: (Fig.no.6.1-6.6)

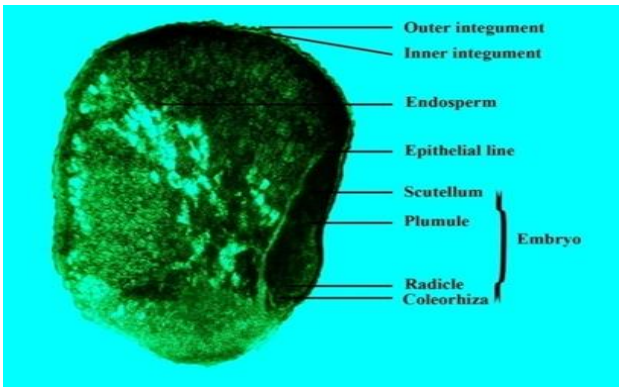

Fig.6.1: Outline T.S.

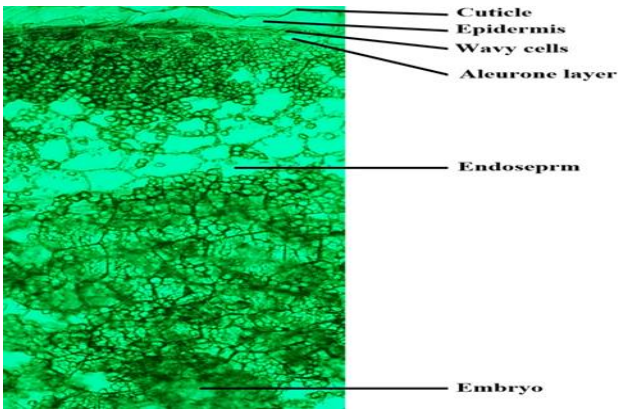

Fig. 6.2: Outline T.S.

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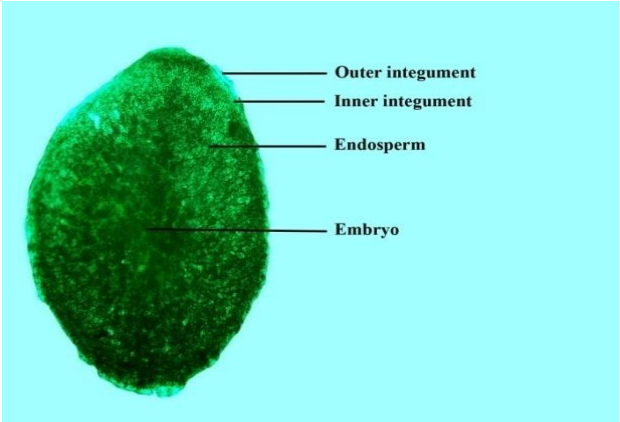

Fig. 6.3: Outline T.S. integuments

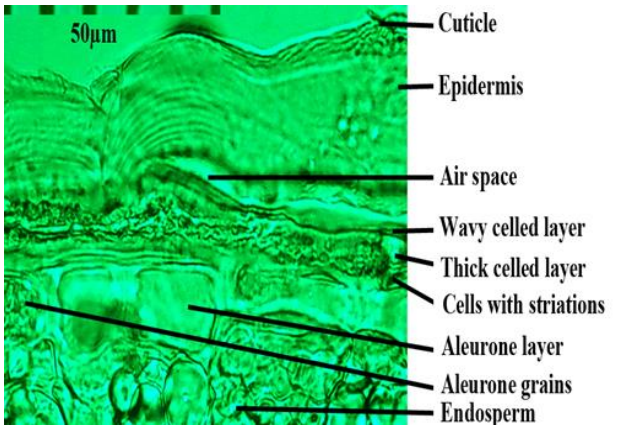

Fig. 6.4: Pericarp to Endosperm

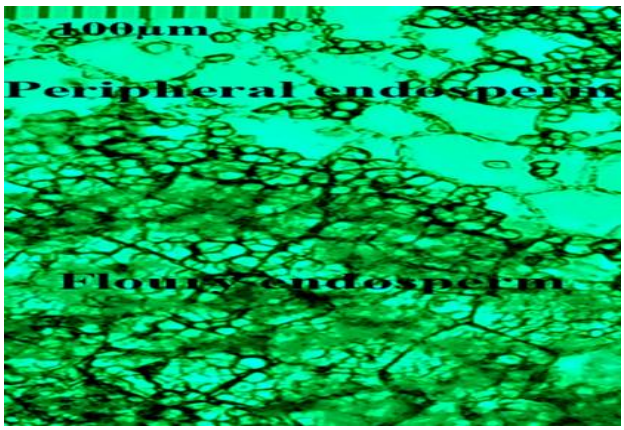

Fig. 6.5: Peripheral Endosperm

Powder Microscopy EC

In powder microscopy, we can see the surface view of endosperm with surface view of embryo. Sectional view of Seed coat and Simple & Compound starch grains of different shapes and sizes.

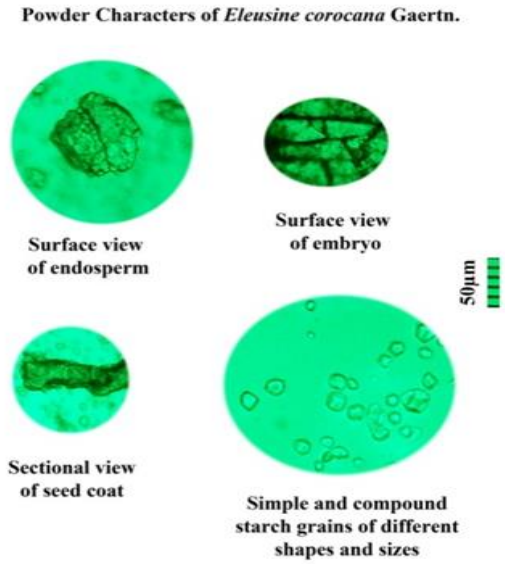

Fig. 6.6: Powder Microscopy of EC

Table 1: Comparative Pharmacognostical Study

Characters	PS	EC
Epidermis with Cuticle	+	+
Pericarp	+ with 6-10 layers	-
Lumen	+	-
Testa	Not well defined	-
Scutellum	+	+
Layers of cells	Irregular in shape	Cells with Striations
Air space	-	+
Oil droplets	+	+
Aleurone layer with grains	+	+
Endosperm cells	Thin walled	Thick walled
Embryo	+	+
Sclereids	+	-

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Integuments	+	+

The dissimilar characters were air space between the cells present in EC and Sclereids present in PS. Endosperm present in both the seeds but thick walled in EC and thin walled in PS. The Outline of T.S. shows same characters like Scutellum, Integuments, Embryo.

Phytochemical tests

In physical evaluation, moisture content, total ash, acid insoluble ash and extractive values viz., alcohol and water soluble extractive values were determined. The ash value represents the inorganic salts present in the drug. Phytochemical tests for constituents such as tannin, mucilage etc., was done and powdered drugs were performed as per standard procedures.

Table 2: Physiochemical Parameters

Physiochemical Parameters %(w/w)	PS	EC
Loss on Drying at 110°C	7.75%	8.50%
Total Ash	8.51%	7.15%
Water Insoluble Ash	3.21%	2.25%
Acid insoluble ash	2.10%	1.85%
Water soluble ash	3.21%	2.25%
Water soluble extractives	7.25%	7.81%
Alcohol soluble extractives	8.10%	8.44%
pH (10 % of aqueous solution)	4.88 ±0.10	5.31 ± 0.10

Preliminary phytochemical screening

The Methanol and water extractive was used to carry out the preliminary screening. The extract was further subjected for the presence of various constituents such as alkaloids, tannins, phenols and for Flavonoids. Quantitative estimations of total Nutrition were done. High performance thin layer chromatography was carried out for spectral comparison of both the sample. (Tables 3-6)

Table 3: Qualitative tests

Chemical Constituents	PS	EC
Carbohydrate	Present	Present
Glycoside	Present	Present
Protein & Free amino acid	Present	Present
Alkaloids	**Absent**	Present
Flavonoids	Present	Present
Saponins	Present	Present
Steroids	Present	Present
Triterpenoides	Present	Present
Phenolic compounds	Present	Present

Table 4: Quantitative Tests

Chemical Constituents	PS	EC
Carbohydrate	51.25%	66.55%
Protein	8.12%	6.75%
Lipid	1.21%	1.15%
Iron (mg/100gm)	1.05±0.75	2.75±1.65
Potassium (mg/100gm)	1005±22.55	1446.65±26.05
Calcium (mg/100gm)	34.45±8.25	244.45±18.45
Sodium (mg/100gm)	152.25±12.45	235.15±12.48
Heavy metals		
Mercury	0.3145 (mg/kg)	0.2835 (mg/kg)
Lead	0.2535 (mg/kg)	0.4312(mg/kg)
Arsenic	0.2835 (mg/kg)	0.2422 (mg/kg)

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Cadmium	0.0755 (mg/kg)	0.0674 (mg/kg)

Table 5: Thin Layer Chromatography

Solvent System : Chloroform: Acetic Acid: MeOH: Water:: 6:3.2:1.2:0.8

Spraying Agent : Anisaldehyde Sulphuric Acid

Eleusine corocana

	Before Spray		After Spray	
Rf values	**Colour under visible light**	**Colour under Long UV**	**Colour under visible light**	**Colour under Long UV**
0.29	-	Pale yellow	-	Brick red
0.41	-	Pale lemon yellow	-	-
0.51	-	Pale fluorescent Blue	-	Fluorescent pale yellow
0.62	-	Blue	-	Blue
0.82	-	Fluorescent Blue	Mud brown	Fluorescent blue

Paspalum scrobiculatum

	Before Spray		After Spray	
Rf values	**Colour under visible light**	**Colour under Long UV**	**Colour under visible light**	**Colour under Long UV**
0.28	-	Pale yellow	-	Pale orange
0.39	-	Pale Blue	-	Pale Blue
0.52	-	Pale Blue	-	Pale Blue
0.58	-	Pale green	-	Pale Flourescent Yellow
0.62	-	Pale Fluorescent Blue	-	Pale Yellow
0.83	-	Blue	Mud Brown	Creamish-Yellow

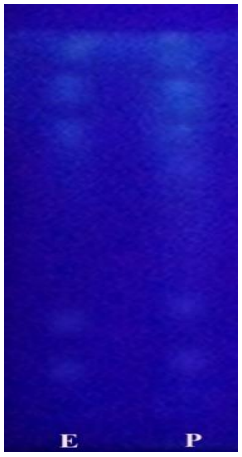

Fig. 7.1: Before spray (Long UV)

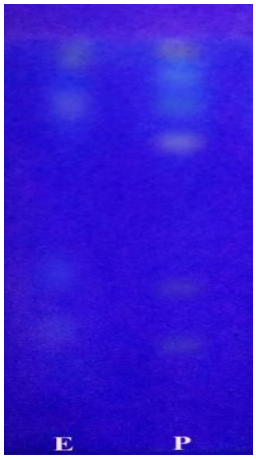

Fig.7.2: After spray (Long UV)

Fig.7.3: Before spray (Visible light)

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Fig. 7.4: After spray (Visible light)

Table 6: Fluorescent tests

	EC		PS	
Materials	**Colour under visible light**	**Colour under Long UV**	**Colour under visible light**	**Colour under Long UV**
Sample	Creamish - White	Mud Brown	Mud Brown	Fluorescent Creamish - Yellow
Sample + Water	Creamish – milky White	Mud Brown	Creamish - White	Yellow
Sample + MeOH	White	Bright Fluorescent White	Pale Yellow	Fluorescent Yellowish - Green
Sample + 10% NaOH	Pale Yellow	Yellowish Brown	Pale Green	Pale Yellow
Sample + 10% HCl	Pale Pink	Brown	Pale Brown	Brown
Sample + 10% HNO_3	Pale Yellow	Brown	Pale Brown	Mud Brown
Sample + 10% H_2SO_4	Pale Yellow	Dark Brown	Pale Brown	Mud Brown
Sample + 10% NH_3	Pale Greenish Yellow	Pale Fluorescent White	Pale Green	Creamish - Yellow

Comparative Phytochemical results

This study has been carried out for chemical compounds such as carbohydrates, proteins and lipids that are utilised as food by man and also for a multiple of compounds like Glycosides, Alkaloids, Volatile oils, Tannins, etc., that exert a physiological and therapeutic effect. The nutritional compounds are present in both seeds like carbohydrate, proteins, lipids, Calcium, Sodium, Potassium, Iron but with different Quantitative estimations, as protein is found better in *Kodrava* (PS) while carbohydrate found more in *Mandua* (EC) others has very small Quantitative differences.

Discussion

Foreign organic matter was 0.45% & loss on drying was 7.75% w/w for *Kodrava* and for *Mandua* Foreign organic matter was 0.20% and loss on drying was 8.50%. The ash value is the indicator of the presence of inorganic & earthy matter in the plant. The Percentage of total ash of *Kodrava* was 8.51% and of *Mandua* was 7.51%. The acid insoluble content indicates the presence of siliceous matter. It is 2.10% for *Kodrava* and *Mandua* 1.85% the Percentage of water soluble ash is 3.21% for *Kodrava* and for *Mandua* 2.25%. Both the plants have subjected to qualitative examination to find out the presence of micro-nutrients & heavy metal constituents. It is found that calcium, (essential for nucleic acid, phospholipids & ATP) Sodium, Potassium, Iron was present in both the plants. Qualitative analysis of inorganic matter showed the presence of carbohydrate, protein, glycoside, Triterpinoides, Flavonoids, Phenolic compounds & Saponin in both the drugs but Alkaloid, only present in *Kodrava.* The course powder of the plants was subjected to cold extraction. The alcohol & water extractive value of *Kodrava* was found to be 8.10% and 7.25% respectively and of *Mandua* was 8.44% and 7,81% respectively. TLC of the methanolic extract of *Kodrava,* R_f value 0.29, 0.41, 0.51, 0.62, 0.82 and of *Mandua* R_f value 0.28. 039, 0.52, 0.62, 0.83.

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Conclusion

Kodrava and Mandua, both are the different drugs with different Pharmacognostical and Phytochemical properties. Some resemblance can be seen as both are seeds, Phytochemical evidence shows 0.29-0.28, 0.41-0.39, 0.37, 0.51-0.52, 0.62-0.62, 0.83-0.82 R_f values similarity with help of spectral comparisons, The quantitative estimation shows that Carbohydrate content is little more in EC. On the other hand Sodium, Potassium, Calcium, Iron was quite more in EC. It can be concluded that EC is more nutritious than PS but Protein was little more in PS. This study is helpful in identification. It further requires scientific evaluation at molecular level, marker compounds and some more pharmacological evidence for establishment.

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