International Journal of Pharmacy and Biological Sciences-IJPBS™ (2019) 9 (1): 531-540
Online ISSN: 2230-7605, Print ISSN: 2321-3272
Research Article | Biological Sciences | Open Access | MCI Approved
UGC Approved Journal

Determination of Physicochemical and Phytochemical Potential of *Sesamum Indicum* L. Seeds (Kunjad Sufaid)

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Received: 12 Oct 2018/ Accepted: 6 Nov 2018/ Published online: 01Jan 2019
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Abstract

Background: Proper identification and standardization is mandatory to ensure the therapeutic efficacy of herbal drugs used for health ailments. Physicochemical and Phytochemical standardization is considered a prerequisite for the assessment, of biological activity or determination of biological standards of the plant material. It provides the analytical characteristics which may prove to be useful in fixing the physicochemical standard for the Unani drugs. Unani Medicine possess a large number of drugs used in various diseases as mentioned by eminent Unani Physicians based on their own long-term experience. But, a doubt always remains regarding the standardization of Unani drugs. **Objective:** Therefore, the present study was aim to standardize and to assure the quality control check of an important Unani drug Kunjad safaid used for various infectious diseases. **Material and Methods:** The test drugs, Kunjad (*Sesamum indicum L.*) were procured from local market of Aligarh. Which includes parameters recommended by National Unani Pharmacopeia Committee, Qualitative analysis and chromatographic studies (TLC) were performed for proper identification and quality control these parameter include **Results:** Ash values, Total ash, (4.36%) acid insoluble ash, (3.23%) water soluble ash, (1.06%) Successive Extractive values in different solvent; petroleum ether (48.76%), diethyl ether (3.93%), chloroform (1.10%), ethyl acetate, (2.83%), acetone (0.70%), alcohol (1.80%), aqueous (4.96%), solubility in alcohol (32.0%) and water (8.26%), loss on drying (3.13%), pH at 1% (6.52), & 10% (5.91), bulk density (0.60%) and moisture content (5.0%). **Conclusion:** Preliminary phytochemical analysis of Sesamum seed showed presence of Alkaloid, steroids phenol and terpenoids carbohydrate and protein, which may be active compound, responsible for its wide activities.

Keywords
Standardization, Kunjad, TLC, Physicochemical, Phytochemical.

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INTRODUCTION

The herbal or natural drugs show significant variation in the chemical composition. This can be so drastic as to cause therapy failure or toxicity, so it can be appreciated that different samples of the same natural drug would rather commonly produce significantly different responses. So it is necessary to determine some crucial physicochemical characters of each sample before its pharmacological study to ensure that subsequent study would use same natural drugs. Therefore, along with the pharmacological study, the test drug was also subjected to a physicochemical study, the evaluation of their ash value, extractive value, and qualitative analysis is of great significance. Therefore, present study deals with physicochemical and phytochemical investigation of Kunjad Sufaid consists of dried seeds of *sesamum indicum* Linn. Syn. S. orientale Linn., S. luteum Retz., S. occidentalis[1]. It is commonly known as Til, sesame or benneseed, is cultivated through, out India, mainly for its seeds and oil, in India mainly grown in Mp, Up, Rajasthan, TN, and Maharashtra. This species is often found wild on road sides and waste land[2]. An erect annual plant more or less foetid and glandular, the plant is indigenous to tropical Africa and cultivated throughout the warmer parts of India[3, 4]. It (*Sesamum indicum*) is one of the oldest cultivated plants in the world, mainly grown for extraction of oil from seeds. And there are three varieties of sesamum seed are found: black, white, and red[5, 6]. The oil from sesame plant is an important ingredient in Unani remedies in India and is used in Chinese medicine to increase energy and prevent aging[7] due to the presence of bioactive components present in the seed including polyunsaturated fatty acids, phytosterols, tocopherols, vital minerals and unique class of phenylpropanoid compounds namely lignans such as sesamin, sesamol and sesamolin[8]. These phytochemicals provide defense mechanism against reactive oxygen species and increases keeping quality of oil by preventing oxidative rancidity[9, 10]. Sesame lignans have various pharmacological properties including, antioxidant activity[11, 12], antimicrobial activity[13] anti-proliferative activity[14] lowering cholesterol levels[15] increasing hepatic fatty acid oxidation enzymes[16] and show antihypertensive effects[17, 18]. Sesame seed have been used as a medicine since antiquity. They are considers to act as aphrodisiac, demulcent, lactogogue, emmenagogue, diuretic, and laxative[3, 19, 20], stringent, tonic[6]. Traditionally, sesame is used in the treatment of hemorrhoids, dysentery, constipation, cough, amenorrhea, dysmenorrhea and ulcer[3, 6, 19, 20]. According to Unani system it act as *Muqawwi-e- Bah, Mudirr-e-Laban*, *Mudirr-e-Haiz, Mohallil-e-Waram*[21, 22], *Musakkin-e-Alam*[23], *Musakkhin/* Temperative, *Musammin-e-Badan*[24], and used in *Amraz-e-Sadar wa Riya, Suaal-e-Yabis* and in *Amraz-e-Tasunnuj-e-Yabis*[6, 23]. Sesame is very effective in lowering cholesterol levels due to its lignans content. Sesame seeds serve to boost the immune system of the body due to its phytosterol content. It is also believed that Til can help in prevention of certain forms of cancers. Recently, the use of Unani drugs have been increased in various ailments due to the failure of modern medicine which could not provide effective treatment for chronic diseases, and adverse effect of chemical drugs, and their increasing cost. Moreover, greater public access to information on traditional medicine has increased interest in alternative treatments. Keeping in view of all these facts, the present study is being, carried out with following various parameters.

MATERIAL AND METHODS

The test drugs, Kunjad (*Sesamum indicum L.*) were procured from local market of Aligarh. And are properly identified according to the botanical, Unani and Ayurvedic literature and then confirmed in pharmacognosy section of department of Ilmul Advia. A herbarium sample of the test drugs were prepared and submitted to mawalid-e-salasa museum of the department after identification for further reference, Kunjad, voucher no, SC- 0183/15. The drug was cleaned from the earthy material, washed with double distilled water and dried at 45 °C in hot air oven to powdered in electrical grinder with slow and light movement to avoid sticking of the drug material with the grinder and there after the drug was passed through the sieve no. 80 to confirm its fineness and uniformity of particle size. Finally the powder was stored in air tight container for experimental study.

Physicochemical Studies

The Physicochemical study include the determination of extractive values of the test drug in

different solvents, alcohol and water soluble contents, moisture content, ash values, loss of weight on drying, bulk density and pH values.

Ash Value Determination

Total ash

About 2 to 3 gm accurately weighed powdered drug was incinerated in silica crucible (previously ignited and weighted) at a temperature not exceeding dull red heat (450°C) in muffle furnace until free from carbon. The crucible was cooled in dessicator and weighted. The percentage of total ash was calculated with reference to air dried drug[25, 26, 27].

Water soluble Ash

The ash was boiled with 25 ml of distilled water for 5 minutes. The insoluble matter was collected on ash less filter paper (Whatmann Filter paper No.42). It was washed with hot water and was incinerated along with filter paper in a previously weighted silica crucible at a temperature not exceeding 450°C to a constant weight. The weight of the insoluble matter was subtracted from the weight of total ash and the difference in weight helps in determining the weight of the water soluble ash. The percentage of the water soluble ash was determined with reference to the air dried drug[26, 27].

Acid Insoluble Ash

The ash was boiled with 25 ml of dilute Hydrochloric acid for 5 minutes. The insoluble matter was collected on ash less filter paper (Whatmann Filter paper No.42). It was washed with hot water and the insoluble matter was incinerated along with filter paper in a previously weighted silica crucible not exceeding 450°C to a constant weight. The percentage of the acid insoluble ash was determined with reference to the air dried drug[26, 27].

Moisture Content

The moisture content of the drug was determined by Toluene distillation method (Dean and Stark Method). 10 gm of test drugs was taken in the flask of toluene distillation apparatus and 75 ml of distilled toluene was added and heated for subsequently for 5 hours. The volume of the water collected in the receiver tube (graduated in ml) was noted and the percentage of moisture content was calculated[25, 26].

Loss of weight on drying

10 gm of powdered drug was taken, spread uniformly as a thin layer in a shallow petridish. It was heated at a regulated temperature of 105ºC, cooled in a desiccator and weighted. The process was repeated many times till two consecutive weights were found constant. Loss in weight was calculated with respect to initial weight in reference of percentage[25, 28].

Determination of pH value

Determination of pH was carried out by a synchronic digital pH meter (model no. 335) equipped with a combined electrode. The instrument was standardized by using buffer solution of 4.0, 7.0, and 9.20 to ascertain the accuracy of the instrument prior to the experiment.

The pH value of 1% aqueous solution

An accurately weighted 1 gm of drug was dissolved in distilled water and the volume was adjusted accurately to 100 ml in a conical flask and allowed to stand overnight. It was filtered and the pH of 1% solution was measured with pH meter at particular temperature until two successive reading agree within +0.02 unit[26, 27, 28].

The Ph value of 10% aqueous solution

An accurately weighted 10 gm of drug was dissolved in distilled water and the volume was adjusted accurately to 100 ml in a conical flask and allowed to stand overnight. It was filtered and the pH of 10 % solution was measured with PH meter at a particular temperature until two successive reading agree within +0.02 unit[26, 27, 28].

Bulk Density

The tapped density is an increased bulk density attained after mechanically tapping a graduated measuring cylinder or vessel containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped, and volume readings are taken until little further volume change is observed. The mechanical tapping is achieved by raising the cylinder and allowing to it drop, under its own mass, a specified distance by either of manually methods or with the help of Apparatus. The bulk and tapped density are expressed in gm/ml, here ml and cm^3 are equivalent volume[29].

$$\text{Bulk Density} = \frac{\text{Wieght of the Powder drug /gm}}{\text{Volume of Cylender in } cm^3 \text{ or ml}}$$

Determination of Extractive values

The extractive values of all the test drugs in different solvent viz. Petroleum ether, diethyl ether, chloroform, ethyl acetate acetone, ethanol, and distilled water were determined with the help of soxhlets apparatus (Successive method). The heat was applied for 6 hours on a heating mantle, after that it was evaporated on water bath till the weight become constant. The temperature of heating mantle and water bath was maintained according to

the solvent used for the extraction. The extracts were filtered and after evaporation of the solvents, the extractive values were determined and percentage of extract was calculated with reference to the air dried drug. The procedure was repeated for three times and the mean value for each extract was calculated[27, 28].

Water and Alcohol Soluble Contents

5 gm of the air dried powdered drug was taken with 100 ml of distilled water, in a glass stoppard conical flask for 24 hours. The mixture was carefully shaken frequently for 6 hours and then allowed standing for 18 hours. It was filtered and 25ml of filtrate was evaporated to dryness on a water bath. The residue was dried at 105°C to constant weight, cooled in desiccator for 30 minutes and weighed. The percentage of water soluble matter was calculated with reference to the amount of air dried drug. The percentage of alcohol soluble matter was determined as above by using alcohol in place of water[27].

Phytochemical Analysis

Qualitative Analysis

The qualitative analysis of different chemical constituents present in test drugs was carried out according to the scheme proposed by[30]. The powder of the test drugs was extracted with petroleum ether (BP, 60-80°C). The petroleum ether extract (I) was tested for phenols, alkaloids and sterols/terpenes. A part of this extract was saponified and this portion (II) was tested for fatty acids, whereas, un-saponified portion (III) was tested again, phenols, and sterols/terpenes for confirmation. The defatted mark was divided into two portions, one portion was extracted with hot water and the other with ethanol (70%). The aqueous (IV) and ethanolic (V) extracts were tested for alkaloids, flavonoids, saponins, sugars, and tannins. Aqueous extract was extracted with ether, and ether soluble portion (VI) was tested again for alkaloids, sterols/terpene, whereas water soluble portion (VII) was tested for glycosides. The water soluble portion again hydrolysed with 5% hydrochloric acid and extracted with chloroform. The aglycone portion (VIII) was tested for insoluble hydrochloride of alkaloids. Chloroform soluble portion (IX) was tested for alkaloids and sterols / terpenes, whereas, water soluble fraction (X) was tested for alkaloids. One part of this water soluble portion was basified with any alkali (ammonia) and extracted with immiscible solvent (ether). The solvent soluble part (XI) was again tested for alkaloids.

1. Test for alkaloids

A drop of Dragendroff's reagent in the extract was added. The brown precipitate shows the presence of alkaloids[25].

Hager' Test

Few drops of Hager's reagent were added in 1 ml of alcoholic test solution. The presence of yellow colour precipitate indicates the presence of alkaloids.

Wagner' Test

Few drop of Wagner' reagents were added in 1 ml of alcoholic test solution dissolved with 2 ml of dil. HCl. The presence of yellow brown colour precipitation indicates the presence of alkaloids[25].

2. Test for carbohydrate / sugars

I - Fehling's Test

In the aqueous extract, a mixture of equal parts of Fehling's solution A and B previously mixed was added and heated. A brick red precipitate of cuprous oxide indicates the presence of reducing sugars.

II - Molisch Test

In an aqueous solution, α-napthol was added. Afterwards, concentrated sulphuric acid was gently poured. A brown colour ring at the junction of two solutions indicates the presence of the sugar[25].

3. Test for Flavonoids

A piece of magnesium ribbon was added to the ethanolic extract of the test drug followed by drop wise addition of concentrated HC1. Colour ranging from orange pink to red is a confirmatory test for flavonoids[31].

4. Test for Glycosides

The test solution is to be filtered and sugar is removed by fermentation with baker's yeast. The acid is removed by precipitation with magnesium oxide or barium hydroxide. The remaining alcoholic extract contains the glycosides was subsequently detected by the following methods.

a. The hydrolysis of the solution is to be done with concentrated sulphuric acid and after the hydrolysis sugar is determined with the help of Fehling's solutions.

b. The Molisch's test is done for sugar using α-napthol and concentrated sulphuric acid[25].

5. Test for Tannin

Ferric chloride solution was added in the aqueous extract of the drug. A bluish black colour which disappeared on addition of dilute sulphuric acid followed by a yellowish brown precipitate shows the presence of tannin[25].

6. Test for protein

Million's reaction

To the test solution, Million's reagent was mixed and white coloured precipitate showed the presence of proteins.

Biurette's Reaction
In the hot test solution, 1 ml concentrated sodium hydroxide was added, followed by one drop of copper sulphate solution. A violet or red colour indicated the presence of proteins

Xanthoproteinic Reaction
In the test solution, concentrated nitric acid was added. A yellow precipitate appeared which dissolved in strong solution of ammonia and gave yellow colour, showing the presence of proteins[25].

7. Test for Starch
0.015 gm of Iodine and 0.015 gm of potassium Iodide was added in 5 ml of distilled water, 2 ml of iodine solution formed was added to 2 ml of aqueous test solution. The presence of blue colour indicates the presence of starch[30].

8. Test for Phenol
5-8 drops of 1% aqueous solution of lead acetate was added to aqueous or ethanolic test solution. The presence of yellow coloured precipitate indicates the presence of phenols[25].

9. Test for Sterol / Terpenes
Salkowski reaction In the test solution of chloroform, 2 ml concentrated sulphuric acid was mixed from the side of the test tube. The colour of the ring at the junction of the two layers was observed. A red colour ring indicates the presence of sterols / terpenes[25].

10. Test for Amino Acids
The ethanolic extract was mixed with ninhydrin solution (0.1% in acetone). After heating gently on water bath for few minutes, it gives a blue to red-violet colour that indicates the presence of amino acids.

11. Test for Resin
The test solution was gently heated and acetic anhydride was added in it. After cooling, one drop of sulphuric acid was mixed. A purplish red colour that rapidly changed to violet indicates the presence of resins[25].

Test for Saponins
(a) The defatted marc (0.5 gm) was boiled with water for 2 minutes in a test tube. After cooling, the mixture was vigorously shaken and then left for 3 minutes. The amount of honey comb frothing was classified as- no froth – negative; froth less than 1cm - weakly positive; froth greater than 1cm - highly positive; froth greater than 2 cm - strongly positive[30].
(b) The marc was boiled with water for 2 minutes. After cooling haemolysis test was performed. Haemolysis of blood indicated the presence of saponins[30].

(B) Fluorescence Analysis
(I). Fluorescence Analysis of powdered drugs
Fluorescence analysis of the powdered drugs were done for identification, the powdered drugs were treated with different chemicals and observed in day light and under ultra violet light. The changes in colour were noted.
(ii). Fluorescence Analysis of the successive extracts of the test drugs
Successive extracts of the test drugs viz. Petroleum ether, diethyl ether, chloroform, ethyl acetate, acetone, ethanol and aqueous extract were observed in day light and UV lights.

(C) Thin Layer Chromatography (TLC)
Thin Layer Chromatography of different extract was carried out on T.L.C. pre-coated aluminium plates (silica gel 60 of F_{254} layer thickness 0.25 mm) by taking petroleum ether: diethyl ether in 1:1 ratio and n-butanol: Acetic acid: Water in 5:1:4 ratio as the mobile phase. The Rf values of the spots were calculated by the following formula[25].

$$R_f \text{ value} = \frac{\text{Distance travelled by the spot}}{\text{Distance travelled by the solvent}}$$

RESULTS AND DISCUSSION
The physicochemical evaluation is an important parameter in detecting adulteration or improper handling of drug. The efficacy of drug mainly depends upon its physical and chemical properties, therefore, the determination of physicochemical characters and thereby the authenticity of drug is necessary before studying it for pharmacological activities. The techniques involved in the process of standardization encompass different parameter that together constitutes the profile of a drug. Determination of physicochemical properties also provides an index of purity and authenticity of the drug that in turn helps in quantifying the pharmacological effects and determination of the doses for various degrees of effects. Physicochemical study is also important because it helps in characterizing different constituents or group of constituents that frequently lead to establish the structure activity relationship and the likely mechanism of action of the drug. The percentage of different constituents also gives an idea of the

magnitude and intensity of the effect of the drug. Apart from the degradation in the quality of the drugs that occurs due to climate, soil and processing condition, adulteration too contributes to its variability. Thus, the physicochemical study of the drug is a crucial aspect of the research study. The present study determines a comprehensive range of physicochemical characters of the drug according to the parameters used in pharmacopeia which may serve as the standard for ensuring optimum efficacy and safety of various samples of the drug. Kunjad sufaid **(***Sesamum indicum* Linn.**)** has been in use since times immemorial to treat wide range of indications. Present study deals with physicochemical and phytochemical investigation of dried seed of Kunjad (*Sesamum indicum* Linn.) The physicochemical investigation of the certain medicinal plant will be helpful for evaluation of nutritive value and preparation of Unani drugs and medicine. Phytochemical screening help to reveal the chemical nature of the constituents of sesame (*Sesamum indicum* Linn.) extract. Phytochemical analysis of extract showed that it contains alkaloid, phenol, sterol and triterpenes, carbohydrate, glycoside, were found in the extract (Table-3). The extractive values are a parameter for detecting the adulteration in any drug. The amount of the extracts that the drugs yield in a solvent is often an approximate measure of the amount of a certain constituent present in the drug. Therefore, for establishing the standard of any drug the extractive values play a major role (Table-2). Ash value is the residue that remains after complete incineration of the drug. Ash value plays an important role in ascertaining the standard of a drug, because the dust, earthy and un-required matters are generally added for increasing the weight of a drug resulting in the higher ash percentage. Therefore, the ash value determination furnishes the basis of judging the identity and cleanliness of a drug and give information related to its adulteration with inorganic matter (Table-2). The percentage of solubility of powder drugs is also considered as an index of purity. Different percentage of alcohol varies with respect to soluble extractives, whereas, the drugs obtained from different source may produce different extractive values, extracted with the same concentration of alcohol (Table-2). Thin layer chromatography is one of the important techniques used for detecting the adulteration of the drugs. The various compounds present in the drug separate, depending on the affinity of mobile and stationary phases. The resolution of different kinds of chemical components is determined by using TLC and calculating the R_f values after detecting the spots in order to standardize the drug for its identity. If the drug is adulterated there might be appearance of the other compounds as adulterant, in turn may increase the number of spots. On the other hand the exhausted or deteriorated drugs may loose the components and the number of spots appeared might be less. R_f values of various spots appeared in different solvents system have been noted in day light, UV light and the treatment with iodine vapors, (Table-6).

Table – 1. Organoleptic characters of powdered Drugs

S. No.	Parameter	Kunjad
1.	**Colour**	White
2.	**Appearance**	Coarse
3.	**Odour**	Characteristic oily
4.	**Taste**	Sweet oily

TABLE- 2. Physicochemical study of Powder of *Moringa oleifera Lam*

S.NO	Parameters	Percentage (w/w)*
1.	**Ash value**	
	Total ash	4.36±0.008
	Acid insoluble ash	3.23±0.145
	Water soluble ash	1.06±0.006
2.	**Soluble Part**	
	Ethanol soluble	32.0±0.96
	Aqueous soluble	8.26±0.26
3.	**Successive Extractive Values**	
	Pet. Ether	48.76±0.05
	Di-ethyl ether	3.93±0.08
	Chloroform	1.10±0.05

S.NO	Parameters	Percentage (w/w)*
	Ethyl. Acetate	2.83±0.20
	Acetone	0.70±0.05
	Alcohol	1.80±0.10
	Aqueous	18.56±0.66
4.	**Moisture content**	5.0±0.57
5.	**Loss on Drying**	3.13±0.21
6.	**pH values**	
	1% water solution	6.52±0.10
	10% water solution	5.91±0.01
7.		
	Bulk density	0.6±0.00

***Note: Values are average of three experiments**

TABLE- 3. Preliminary Screening of major Phytochemicals of Sehjana (Moringa oleifera)

S.NO.	Chemical constituents	Tests/reagent	Inference
1.	Alkaloid	Dragendroff´s reagent	+
		Hager´s test	+
		Mayer´s reagent	+
2.	Carbohydrate	Molisch´s Test	+
		Fehling´s test	+
3.	Glycoside	NaOH Test	+
4.	Flavanoids	Mg ribbon and Dil. Hcl	-
5.	Tannin	Ferric chloride test	-
6.	Protein	Xanthoproteic test	+
		Biuret´s test	-
7.	Sterol/Terpenes	Salkowski reaction	+
8.	Amino acid	Ninhydrin solution	-
9.	Resins	Acetic Anhydride Test	-
10.	Phenol	Lead acetate Test	+
11.	Saponin	Frothing with $NaHCO_3$	-
12.	Starch	Iodine test	-

***Indications: „-" Absence and „+" presence of constituent.**

Table- 4. Fluorescence Analysis of Extraction of Kunjad (*Sesamum indicum linn*)

S.NO.	Extract	Day Light	UV Long	UV Short
1.	**Pet. Ether**	Light Brown	Dark Blue	Light Green
2.	**Di-ethyl ether**	Brown	Bluish	Dark Green
3.	**Chloroform**	Brown	Light Green	Green
4.	**Ethyl-Acetate**	Light Brown	Black	Light Green
5.	**Acetone**	Brown	Violet	Green
6.	**Alcohol**	Brown	Black	Green
7.	**Aqueous**	Dark Brown	Black	Dark Green

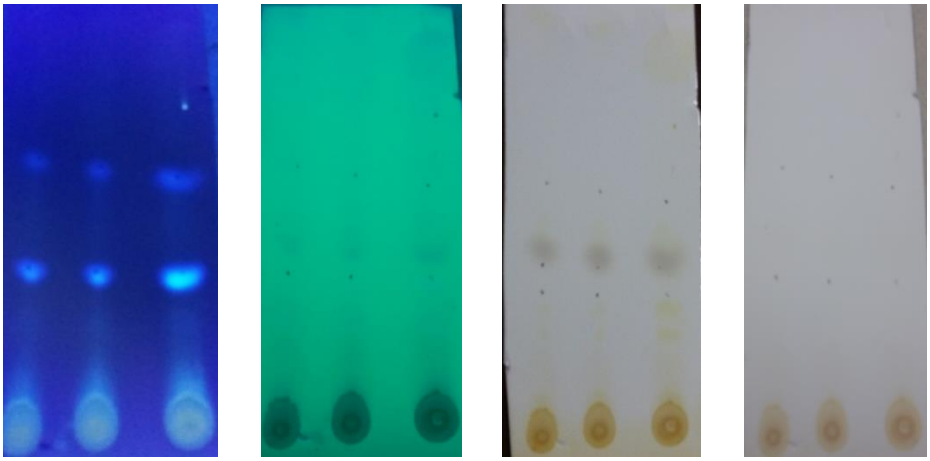
Table- 5. Fluorescence Analysis of Powder drug Kunjad (*Sesamum indicum linn*.) with different chemical reagents

S.NO.	Powdered drug + Chemical Reagent	Day Light	UV short	UV long
1.	Powdered drug + Conc. HNO_3	Light yellow	Light Green	Dark Green
2.	Powdered drug + Conc. HCl	Light pink	Light Brown	Black

S.NO.	Powdered drug + Chemical Reagent	Day Light	UV short	UV long
3.	Powdered drug + Conc. H_2SO_4	Dark Brown	Green	Dark Green
4.	Powdered drug + 2% Iodine solution	Dark Brown	Green	Black
5.	Powdered drug + Glacial Acetic Acid +HNO_3	Light yellow	Green	Dark Green
6.	Powdered drug + Glacial Acetic acid	White	Light Green	Black
7.	Powdered drug + NaOH (10%)	Light Brown	Green	Black
8.	Powdered drug + Dil. HNO_3	Orange	Green	Green
9.	Powdered drug + Dil. H_2SO_4	Brown	Light Green	Dark Green
10.	Powdered drug + Dil. HCl	Brown	Bluish Green	Black
11.	Powdered drug+ Dragendorff's	Golden	Bright Green	Black
12.	Powdered drug + Wagner's Reagent	Dark Brown	Dark Green	Black
13.	Powdered drug + Benedict's reagent	Greenish Blue	Light Blue	Black
14.	Powdered drug + Fehling reagent	Light Brown	Light Green	Black
15.	Powdered drug + KOH (10%) Methanol	White	Light Green	Black
16.	Powdered drug + $CuSO_4$ (5%)	Light Blue	Light Green	Black
17.	Powdered drug + Ninhydrin (2%) in Acetone	Brown	Green	Black
18.	Powdered drug + Picric Acid	Yellow	Dark Green	Dark yellow
19.	Powdered drug + Lead Acetate (5%)	Light Brown	Light Green	Black

Table-7. Thin Layer Chromatography of Petroleum ether extract of Kunjad

Treatment	Solvent System as petroleum ether : diethyl ether (2:1)	
	No of spots	Rf value and colour of spots
Day light	2	0.38 (dark), 0.58 (brown)
UV short	1	0.44 (green),
UV long	2	0.38 (Light blue), 0.58 (blue),
Iodine vapor	3	0.34 (yellow), 0.38 (yellow), 0.44 (brown), 0.58 (brown)



UV long | UV short | Iodine vapor | Day light

Figure 1. TLC of Petroleum ether Extract of Kunjad (*Sesamum indicum* Linn).

Plants of *Sesamum indicum* Lin.

Seeds of *Sesamum indicum* Lin.

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