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Pharmacognostic screening, physico-chemical and cytotoxic potential of *Sesuvium sesuvioides* (Fenzyl) Verdc.

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Abstract: *Sesuvium sesuvioides*(Fenzl) Verdc. (Aizoaceae) is commonly known as BarriUlwaiti and used in folklore remedies; i.e. arthritis, gout, epistaxis, hemorrhage, smallpox, chickenpox, cold and flu by the local practitioners in the Cholistan desert. In the current study, fresh and dried plant material was examined macroscopically and microscopically. Transverse sections of plant parts such as leaf, stem, root and flower were also examined. Physico-chemical and fluorescence analysis according to WHO recommendations for standardization of plant material were performed. Phytochemical screening maybe helpful in determining the secondary metabolites responsible for their biological activities. Mineral analysis (Na^+, K^+, Li^+, Ca^{2+}, Mg^{2+}, Cl^-, Zn^{2+}, Cu^{2+} and Fe^{2+}), total fat and crude proteins were estimated to evaluate the nutritional value of the plant. In *in-vitro* cytotoxic activity, n-hexane fraction (50µg) showed significant results against Human T-lymphoblastic Leukemia CCRF-CEM cell lines followed by methanol and chloroform fractions. This study will be worthwhile for the correct identification and for observing any type of adulteration. This observation will be helpful for differentiating this species from closely related species of the same genus or family.

Keywords: *Sesuvium sesuvioides*, pharmacognostic features, microscopic, physico-chemical, cytotoxicity.

INTRODUCTION

The Cholistan desert of Pakistan is host to a number of the salt-tolerant plants (Halophytes) which span the total area of the Bahawalpur region. Halophytes have succulent properties that lack the ability to secrete salts. This increases the salt concentration along with rising in water contents and becomes more succulent during their development. Halophytes acquire abiotic compounds from the soil and amalgamate with them to produce various biologically active compounds possessing potent pharmacological activities (Flowers and Colmer, 2015). Therefore, halophytes have great potential for food products, medicine, chemicals, forage and for the production of biomass for renewable energy (El Shaer and Attia-Ismail, 2015). Few halophyte species are used as food, vegetable or salad such as *Atriplex balimus, Haloxylon salicornicum, Sesuvium portulacastrum, Chenopodium album, Salicornia europaea, Portulaca oleracea* and *Suaeda maritime* (Joshi *et al.*, 2018). Species used for fodder are *Alhagi maurorum, Salsola imbricata, Suaeda fruticosa* and *kochia scoparia* (Joshi *et al.*, 2018). Seed bearing halophytes such as *Suaeda moquinii, Salicornia bigelovii, Salvadora persica, Kochia scoparia, Haloxylon stocksii* and *Chenopodium glaucum* are used for high quality edible oil and fat (Centofanti and Bañuelos, 2019; Joshi *et al.*, 2018). Halophytes have great medicinal importance; their various species have been used in different ailments. *Sesuvium sesuvioides, Achyranthes aspera, Capparis decidua*, *Solanum surattense* and *Citrullus colocynthis* are used in cold, flu, cough, bronchitis and asthma. (Fatima *et al.*, 2019; Qasim *et al.*, 2011; Qureshi and Bhatti, 2008). *Atriplex stocksii, Trianthema triquetra and Cymbopogon jawarancusa* are used in fever (Qureshi *et al.*, 2009; Qasim *et al.*, 2011; Fatima *et al.*, 2019). *Suaeda fruticosa, Capparis spinosa* and *Portulaca oleracea* have potential as anti-hyperlipidemic agent (Mohammed, 2020; Mollica *et al.*, 2017; Nazeam *et al.*, 2018). *Alhagi maurorum, Amaranthus virdis, Chenopodium album, Citrullus colocynthis* and *Digera muricata* are used in gastrointestinal diseases such as laxative and constipation (Qureshi and Bhatti, 2008; Kapoor *et al.*, 2020). *Chenopodium album, Tamarix dioica, Tamarix, indica, Crithmum maritimum, Fagonia indica* and *Portulaca oleracea* are used in skin related diseases such as wound healing, itching and inflammation (Bahramsoltani *et al.*, 2020; Petropoulos *et al.*, 2018). *Alhagi maurorum, Capparis decidua*, *Amaranthus virdis, Tribulus terrestris* and *Salvadora oleoides* are used in *urino-genitary* disorders such as kidney stones, spermatorrhoea and aphrodisiac (Shafi *et al.*, 2001; Husain *et al.*, 2008; Qasim *et al.*, 2011; Jeph and Khan, 2020). One of the succulent halophytes, *Sesuvium sesuvioides* is a short-lived perennial herb, located mostly in saline patches and inter-dunal clayey flats of Cholistan desert in Pakistan (Khan *et al.*, 2004). It is worldwide distributed in tropical and subtropical regions of Africa, Egypt, Sudan, India and W. Pakistan (Kew, 2015; Sukhorukov *et al.*, 2017). *Sesuvium sesuvioides* is used as folk medicine in the treatment of arthritis, gout and epistaxis (Ahmad *et al.*, 2014) by local

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people. Its stem and preferably roots, when mixed with water after stamped, are used for hemorrhage, chicken pox, smallpox, measles and nose bleeding (Rehman *et al.*, 2015; Burkill, 1994). It is also used in cough, flu and cold (Fatima *et al.*, 2019). It is mixed with pot herbs and boiled to make it soft and tasty (Neuwinger, 2000). It is used as fodder for goats and pigs (Rodin, 1985). *S. sesuvioides*is also used in the treatment of thyroid dysfunction, inflammation, fever, ulcer and diabetes by local practitioners in the desert areas of Cholistan. Recently anti-inflammatory, analgesic and antipyretic potential of *S.sesuvioides*have been reported scientifically (Sajid-Ur-Rehman *et al.*, 2021). In this research work, pharmacognostic features, phytochemical, physico-chemical characteristics and cytotoxic potential of *S. sesuvioides* were assessed first time.

MATERIALS AND METHODS

Plant material

The whole plant (Leaves, stems, roots and flowers) freshly grown was collected from the Rohi area of Cholistan desert, Bahawalpur Pakistan during the months of February, March 2019. The plant was identified and authenticated by a taxonomist, Cholistan Institute of Desert Studies, Bahawalpur with Voucher number CIDS/ IUB-0206/08 for further reference. It was shade dried over filter paper for forty days, pulverized by an electrical grinder and sieved through mesh No.60. Then its dried powder was kept in airtight container. The fresh plant was used for macroscopic evaluation.

Solvents and chemicals

All chemicals and solvents used during the study were of analytical grade (Merk, Sigma and B.D.H) and purchased from the local market.

Extraction and fractionation

The powdered plant material was extracted with 70% methanol (B.D.H) of analytical grade by successive maceration process. The crude filtrate was first passed through the muslin cloth then fine filtration was done by using Whatman Grade-1 filter paper. The methanol extract was concentrated to dryness under reduced pressure (-760mm Hg) and controlled temperature using a rotary evaporator (Buchi Rotavapor R-200). A dark green thick mass so obtained was placed in an oven to dry completely (Memmert Beschichung Loading Model 100-800). The methanol extract was further fractioned using successive solvent extraction methods with different polarity-based solvents such as n-hexane, chloroform and n-butanol. After fractionation, samples were concentrated to dryness under reduced pressure using a rotary evaporator and stored in air tight container in a refrigerator, until used for analysis.

Macroscopic evaluation

Macroscopic evaluation of fresh plant material was performed on leaf, stem, root and flower part and its color, shape, odor, taste and size was observed according to the previously described method (Brain and Turner, 1975; Younus *et al.*, 2019).

Microscopic evaluation

Microscopic evaluation of dried powder was carried out by using a binocular microscope at both low (eye piece= 10x and objective =5x) and high power (eye piece= 18x and objective =10x and 40x) respectively. According to the procedure, a small amount of powder was placed on the glass slide and mixed with two drops of mounting media (chloral hydrate 10% solution and glycerin 50% solution) thoroughly with the help of a fine needle and then a glass coverslip was put on the slide. Its microscopic structures were observed and compared with the standard work of Youngken,1950 (Youngken, 1950). Photographs of plant cellular structures were taken using a digital camera (Sony DSCWX 200 digital). Before section cutting, fresh plant parts were washed with water and placed in the solution of ethanol:formalin:acetic acid (85:10:5). All plant parts were put into paraffin wax for infiltration considered as internal embedding. These embedded tissues were placed into the mould and hot paraffin was poured into the surrounding to make paraffin wax blocks. These paraffin tissue blocks were cut with a microtome to get thin slices (6 microns) and placed on a glass slide with egg albumin adhesive. These slides were examined under a binocular microscope (Chaffey, 2000).

Preliminary phytochemical screening

Preliminary qualitative phytochemical analysis of the crude extract of the plant was carried out by using the standard method, to detect the presence of secondary metabolites such as alkaloids, glycosides, saponins, tannins, terpenes, flavonoids, phenols, fixed oil and sugars (Goveas and Abraham, 2014; Aldhebiani and Mufarah, 2017).

Physico-chemical analysis

Physico-chemical tests such as pH, moisture contents, total ash values, water soluble ash value, acid insoluble ash value, extractive values and swelling index were performed according to WHO guidelines on quality control standard methods for medicinal plants (Organization, 1998). Total fat and crude protein of the plant were also estimated (Datta *et al.*, 2019).

Mineral analysis of the plant

Macro minerals such as Na^{+}, K^{+}, Li^{+}, Ca^{2+}, Mg^{2+}, Cl^{-} and micro minerals Zn^{2+}, Cu^{2+}, and Fe^{2+} were evaluated. Sodium, potassium and lithium were estimated according to the method of Jenkins (Jenkins *et al.*, 1977). 2.54g of NaCl/L, 1.91g of KCl/L and 6.07g of LiCl/L in double distilled water were used as the reference solutions. The concentration of the test solution was calculated from standard curve between the concentration and flame emission value. The result of calcium and magnesium were evaluated with standard salt of EDTA by using Murexide and Erichrome Black T indicator. Zinc, copper and iron were determined by using Atomic absorption Spectrophotometry. Different standard solutions were used to obtain the standard curves for analysis of the test solutions. Finally, the result was recorded according to the method of Sawhney and Singh (Sawhney and Singh, 2000). The simple precipitation titration method was used to calculate the amount of chloride. All results were calculated in mg/100g of dried plant powder.

Fluorescence analysis

Dried powder of aerial parts of the plant was subjected to the fluorescence analysis after treating with water, hydrochloric acid, H_2SO_4, HNO_3, acetic acid, benzene, ammonia, hexane, chloroform, methanol, acetone and bromine water using ordinary and ultraviolet light (254 and 366nm wavelength). This analysis was carried out according to the standard procedure (Khandelwal, 2008).

Cytotoxic potential

Human T-lymphoblastic leukemia CCRF-CEM cells and breast cancer MDA-MB-231 cells were bred in RPMI 1640 medium (Gibco®, Invitrogen, Darmstadt, Germany), supplied with 2 mM L-glutamine (Sigma), 10% heat-inactivated fetal bovine serum (FBS, PAA Laboratories, Pasching, Austria) and 1% Pen/Strep. All cells were incubated at 5% humidified CO_2 at 37 C in a Heraeus HERAcell 240 breeder (Thermo Fisher Scientific Inc., Vienna, Austria) and splitted when the confluence reached 90% at the ratio of 1:5 every two days or 1:10 every three days.

Cell number: The number of cells was determined by CASY® cell counter (Innovatis, Reutlingen, Germany).

For cell counting using the CASY® counter, 25µl (for CCRFCEM) or 50µl (MDA-MB-231) of a cell suspension was diluted with 10ml CASY® ton solution and analyzed. The cells were only used for cytotoxic assays when the vitality reached over 90%.

Viability assay (XTT assay): Tetrazolium salt is widely used in histochemical localization studies and cell biology assays as a detection reagent. XTT (sodium 3-[1-(phenylaminocarbonyl)-3,4tetrazolium]-bis (4methoxy-6-nitro) benzene sulfonic acid hydrate), a second generation of tetrazolium salt derivative, is a colorless or pale yellow compound that turns into brightly orange when it is reduced to form a water-soluble formazan derivative by mitochondrial oxidoreductases, released by viable cells.

Cell proliferation kit II (XTT) was purchased from Roche Diagnostics (Mannheim, Germany), Cat. No. 11465015001. The assay was performed as previously described (Damianakos *et al.*, 2012). The suspension (100µl) of 5000 cells of MDA-MB-231 was seeded into every well of 96-well plates in 24 hours before adding the tested compounds. In case of CCRF-CEM, aliquots (100 µl) of 10000 cells were seeded and the compounds of different concentrations were added immediately. All cells were incubated with the substances for 72 hours before 50 µl of XTT solution was added to each well. This solution consisting of XTT labeling reagent and an electron coupling reagent was freshly prepared in a ratio of 50:1 before adding to the wells. Vinblastine (Sigma-Aldrich®, U.S.A) served as a positive control and all compounds were dissolved in DMSO 10%, the final concentration of DMSO in the wells was kept at 0.5% which exhibited no toxicity for the cells. The absorbances were measured after 1.5-hour incubation for the adherent cell lines, and 4 h incubation for the non-adherent cells, using a Hidex Sense Microplate Reader (Hidex®, Finland).

RESULTS

Macroscopic evaluation

The plant is a short-lived perennial herb forming patches up to 1.2 m in diameter and 35 cm in height (fig.1A). Leaves are 6-15 mm long, 2.5-6 mm broad, petiolate, sub-opposite or alternate, dark green in color, fleshy and succulent; its taste is salty and odor is herbaceous, slight aromatic (fig.1B). Its stem is usually rough with slight warty outgrowths when fresh (fig.1C). Bracts lanceolate and0.9mm long.Flowers solitary or 2-3, sessile, 10mm long, up to 15mm in diameter.Tepals are narrowly triangular, usually bright pink in color (fig.1D). Stamens 5-7, ovary locular and superior, stigma 5, seeds 2-10, black, shiny, reniform and 0.8-1mm long, slightly depressed from the center, hilum sub-central and longitudinally ridged (fig.1E) (Kanwal *et al.*, 2009).

Powdered microscopy

Fine powder of different parts of the plant including leaf, stem, root and flower were mounted in different media like chloral hydrate and glycerin for microscopic evaluation. The observed features of the leaf revealed the presence of epidermal cells with stomata, vessel vein, fiber and pitted vessel shown in fig. 2 (A, B, C & D). Microscopic features of stem showed the presence of parenchyma cells, pitted vessels, fiber and spiral vessel shown in fig. 3(A, B, C & D). Powdered study of root powder showed the presence of parenchyma cells, fiber, pitted vessels and epidermal cells are shown in fig. 4(A, B, C & D). Similarly in flower, parenchyma cells, vessels, testa of seed coat and epidermal cells were observed shown in fig. 5(A, B, C & D).

Transverse section of plant parts

The transverse section of leaf showed the upper epidermis along with sub-stomatal chamber followed by spongy mesophylls, vascular bundles which are abundantly present near the lower epidermis (fig. 6). In TS of stem, there is a cuticle layer attached with cortex cells followed by epidermal layer, xylem, phloem and pith cells were present in the center (fig. 7). The TS of roots showed the presence of epidermis with cortex layer, large cells of meta-xylem, small cells of proto-xylem, phloem, cambium, and pith cells (fig. 8). Similarly in TS of flower, epidermal cells, various vascular bundles, anther and pollen sac and stigma cell in the center were observed (fig. 9).

Preliminary phytochemical analysis

The resultof phytochemical screening for the presence of glycosides, saponins, tannins, terpenes, flavonoids, phenols, fixed oils and sugars are shown in table 1.

Fluorescence analysis

The result of fluorescence analysis of the plant material with different solvents and reagents are shown in table 2.

Mineral analysis

Results of quantitative mineral analysis of *S. sesuvioides* (dried powder) by using different methods are shown in table 3.

Physico-chemical analysis

Results of various physic-chemical parameters are shown in table 4.

Effect of Plant extract at cell lines cytotoxicity

Result of plant crude extract and its fractions against Human T-lymphoblastic leukemia CCRF-CEM cells and breast cancer MDA-MB-231 cells showed that plant extract and its fractions did not show a remarkable result against MDA-MB cells when compared with standard drug (fig. 10); while n-hexane fraction at 50µg concentration presented significant result against Human T-lymphoblastic leukemia CCRF-CEM cells (fig. 11) followed by methanol extract and n-butanol fraction.

DISCUSSION

Pharmacognostic studies, physico-chemical analysis including ash values, extractive values in different solvents and phytochemical parameters were used to standardize the *Sesuvium sesuvioides* first time. Due to the high demand of medicinal plants or natural products, herbal materials are easily adulterated with low quality plant materials. So an organoleptic and microscopic examination is the first step towards establishing the correct identification and degree of purity of the plant materials (Organization, 1999). The study of the anatomical features may help to establish the botanical identity among the different species of the plant family (Metcalfe and Chalk, 1950). In this current study, microscopic evaluation of the powdered plant showed the presence of various histological features such as epidermal cells with stomata, vessels of different types, fibers, vascular bundles and pith. The structure of xylem and phloem indicates that the plant is flowering dicots (Angiosperm). Transverse section of dicot stem is characterized by open vascular bundles with cambium. These anatomical features may also be helpful for the right identification of the plant. Fluorescence phenomenon is an important tool for determining the purity and quality of the plant material. Different constituents present in the plant powdered sample exhibited fluorescent colors at day light and U.V. light with various inorganic or organic chemical reagents or some may be converted into fluorescent derivatives. It gives idea about the nature of the constituents (Alam and Saqib, 2015). The physico-chemical analysis of the plant material helps to determine its quality and purity such as ash value which gives the idea about the contamination of soil or sand. The pH of the plant powder was noted about 5.9, indicating the more acidic compounds or salts in the plant material. Water soluble ash indicates the amount of inorganic matter in the plant sample, while acid insoluble ash gives the idea about the presence of silica in the plant. High extractive value of the methanol extract gives idea about the presence of hydrophobic components. The methanol soluble extract indicates the presence of polar compounds such as glycosides, phenols, tannins, flavonoids and steroids; while water soluble extract shows the presence of sugars, acids and inorganic compounds. Moisture content was found 2.67% that indicates the stability of the crude drug for preventing from microbial contamination or chemical degradation. Swelling index is measured due to the presence of mucilage and it was in the range of 1.1ml indicating the lack of mucilage. Result of preliminary phytochemical screening shows the presence of various bioactive components which are very important to determine the quality of drug and to detect the therapeutic efficacy that comprises the health benefits. The presence of tannins, phenols, and saponins gives clue about the anti-inflammatory and analgesic properties of the plant (Komakech *et al.*, 2019), while flavonoids, glycosides and steroids may be effective against cardio, hepato and nephrotoxicity (Soni and Singh, 2019). The amount of fat and crude protein indicates the nutrition importance of the plant. Minerals play an important role for different enzymatic functions as cofactor, and are biologically important. These are also helpful for the metabolism and active growth of the plants. High intake of Ca^{2+}, K^{+} and Mg^{2+} abridge the risk of stroke and osteoporosis (Staszowska-Karkut and Materska, 2020). Result of cytotoxicity against Human T-lymphoblastic leukemia CCRF-CEM cells and breast cancer MDA-MB-231 cells shows that the plant crude extract and fractions do not possess remarkable result against MDA-MB cells when compared with vinblastine. n-hexane fraction at 50µg conc. presents significant result against CCRF-CEM cells, followed by methanol extract and n-butanol fraction that might be due to presence of unknown novel compounds which need to be explored.

Fig. 1(A): *Sesuvium sesuvioides*

Fig1. (B): Fresh leaf

Fig. 1 (C): Stem

Fig. 1 (D): Flower

Fig. 1 (E): Seeds

Fig. 1:(A) *Sesuviumsesuvioides* in its natural environment (B) Fresh leaf (C) Stem (D) Flower (E) Seeds

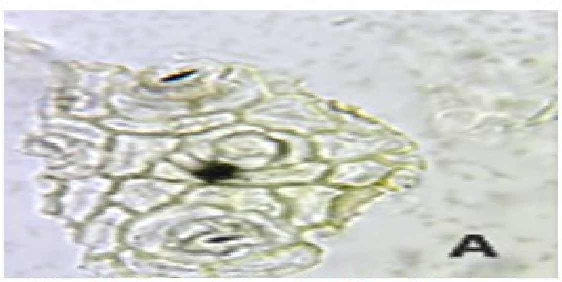

Fig. 2 (A): Epidermal cells with stomata

Fig. 2 (B): Pitted vessels

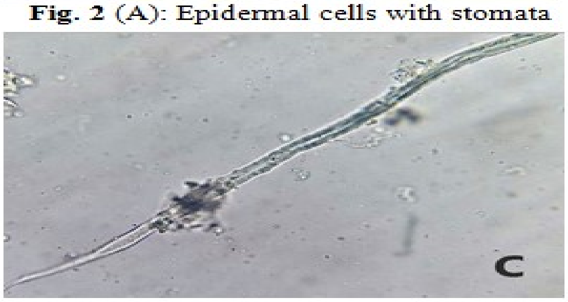

Fig. 2 (C): Fiber

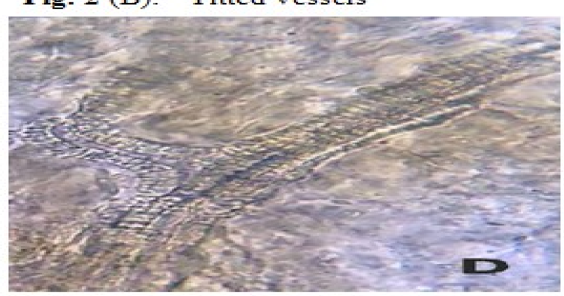

Fig. 2 (D): Vessel vein

Fig. 2: Microscopy of Powdered Leaf; (A) Epidermal cells with stomata (B) Pitted vessels (C) Fiber (D) Vessel vein

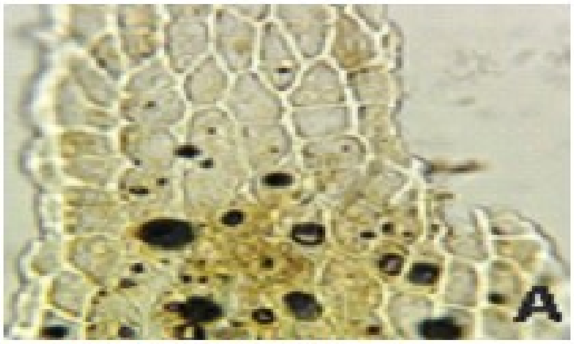

Fig. 3 (A): Parenchyma cells

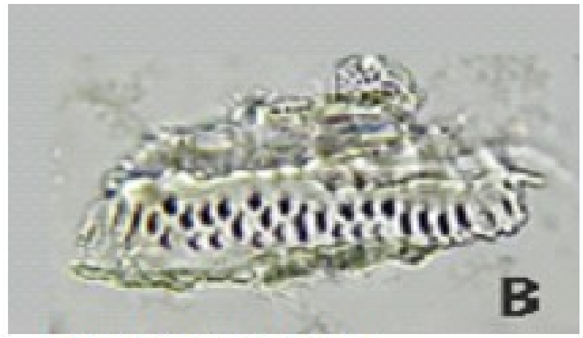

Fig. 3 (B): Pitted vessel

Fig. 3 (C): Fiber

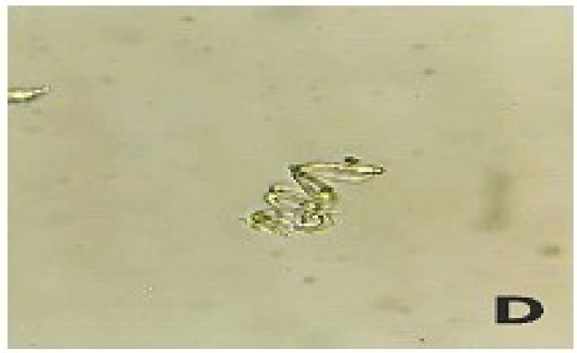

Fig. 3 (D): Spiral vessel

Fig 3:Microscopy of Powdered Stem; (A)Parenchyma cells (B) Pitted vessel (C) Fiber (D) Spiral vessel

Fig. 4 (A): Parenchyma cells

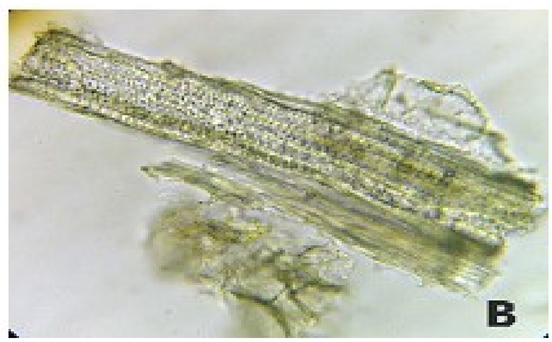

Fig. 4 (B): Vessels

Fig 4 (C): Fiber

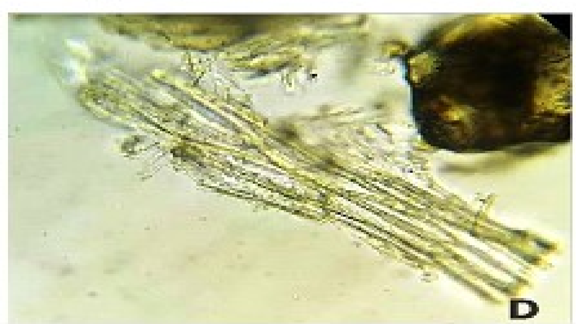

Fig 4(D): Epidermal cells

Fig. 4: Microscopy of Powdered Root; (A) Parenchyma cells (B) Vessels (C) Fiber (D) Epidermal cells

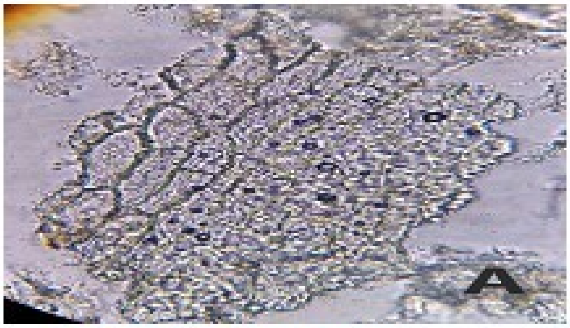

Fig. 5 (A): Epidermal cells

Fig. 5 (B): Vessels

Fig. 5 (C): Seed coat

Fig. 5 (D): Parenchyma cells

Fig. 5: Microscopy of Powdered Flower; (A) Epidermal cells (B) Vessels (C) Seed coat (D) Parenchyma cells

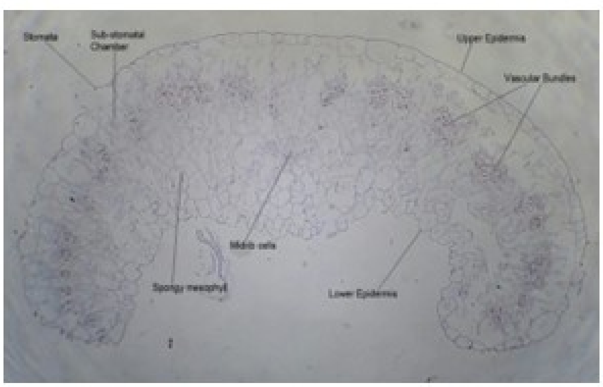

Fig. 6: Transverse section of leaf

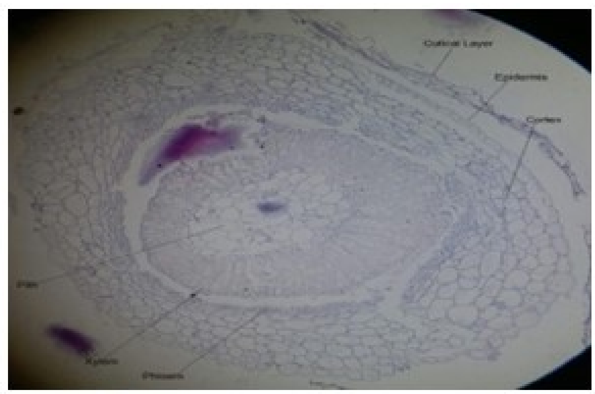

Fig. 7: Transverse section of stem

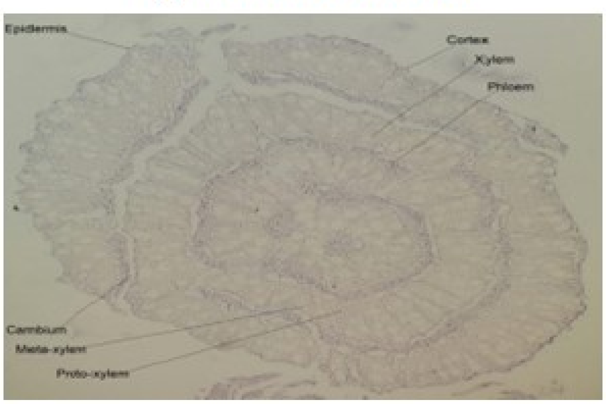

Fig. 8: Transverse section of root

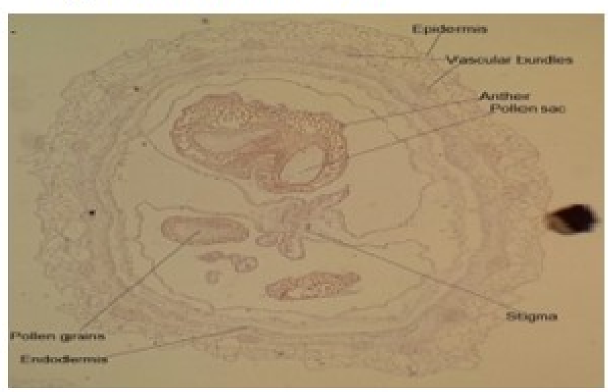

Fig. 9: Transverse section of flower

Table 1: Phytochemical analysis

Tests	Observation	Inference
	Alkaloids	
Hager's test	No Yellow colored precipitates	Alkaloids are absent
Wagner's test	No Reddish brown precipitates	Alkaloids are absent
Mayer's test	No Cream colored precipitates	Alkaloids are absent
	Glycosides	
Borntrager's test	Red or pink color	Anthraquinone glycoside absent
Keller-Killiani test	Brown ring appeared at the junction	Cardiac glycoside Present
	Tannins	
Gelatin test	White precipitates	Tannins are present
	Flavonoids	
Alkaline reagent test	Dark yellow coloration	Flavonoids present
	Saponins	
Froth test	Froth formation occur	Saponins present
	Phenols	
$FeCl_3$ Test	Blackish color	Phenolic contents present
	Carbohydrates	
Fehling solution test	Brick red precipitates on boiling	Carbohydrates present
Molisch test	Voilet ring appeared at the junction	Carbohydrates present
	Terpenes	
Leibermann-Burchard's test	Violet ring at the junction	Terpenes present
	Fats or fixed oils	
Spot test	Permanent stain on paper	fixed oils present

Table 2: Fluorescence analysis of the plant powder

Treatment	Day light	254nm	366nm
Dry Powder	Light yellowish brown	Light brown	light brown
Powder + water	Golden Yellow	Yellowish green	Pale yellow
Powder + HCl	Golden Yellow	Yellowish brown	Yellowish brown
Powder + H_2SO_4	Brown	Dark brown	Brown
Powder + HNO_3	Sharp golden yellow	Light brown	Yellowish brown
Powder + Benzene	Yellow	Yellowish green	Yellowish pink
Powder + Ammonia	Yellowish green	Yellowish green	Light Yellowish green
Powder + Acetic acid	Light brown	Brown	Light brown
Powder + Methanol	Light yellow	Light Yellowish green	Light Yellowish pink
Powder + Chloroform	Yellow	Light Yellowish green	Light Yellowish pink
Powder + Hexane	Pale Yellow	Light yellow	soft yellow
Powder + bromine	Brownish yellow	Brownish yellow	Brownish yellow

Table 3:Mineral analysis in mg/100g of dry powder of *S. sesuvioides*

Na^+	K^+	Li^+	Ca^{2+}	Mg^{2+}	Cl^-	Zn^{2+}	Cu^{2+}	Fe^{2+}
10.20	9.25	8.2	0.76	0.44	1.75	87.1	0.923	35.6

Table 4:Physico-Chemical analysis

pH	Moisture contents	Total fat	Crude protein	Swelling index	Ash value	Water soluble Ash value	Acid insoluble ash value
5.9	2.67%	2.60%	8.75%	1.1ml	25.50%	15.5%	0.9%
Water extractive value		Methanol extractive value		Chloroform extractive value		Hexane extractive value	
47%		23.5%		18.6%		3.6%	

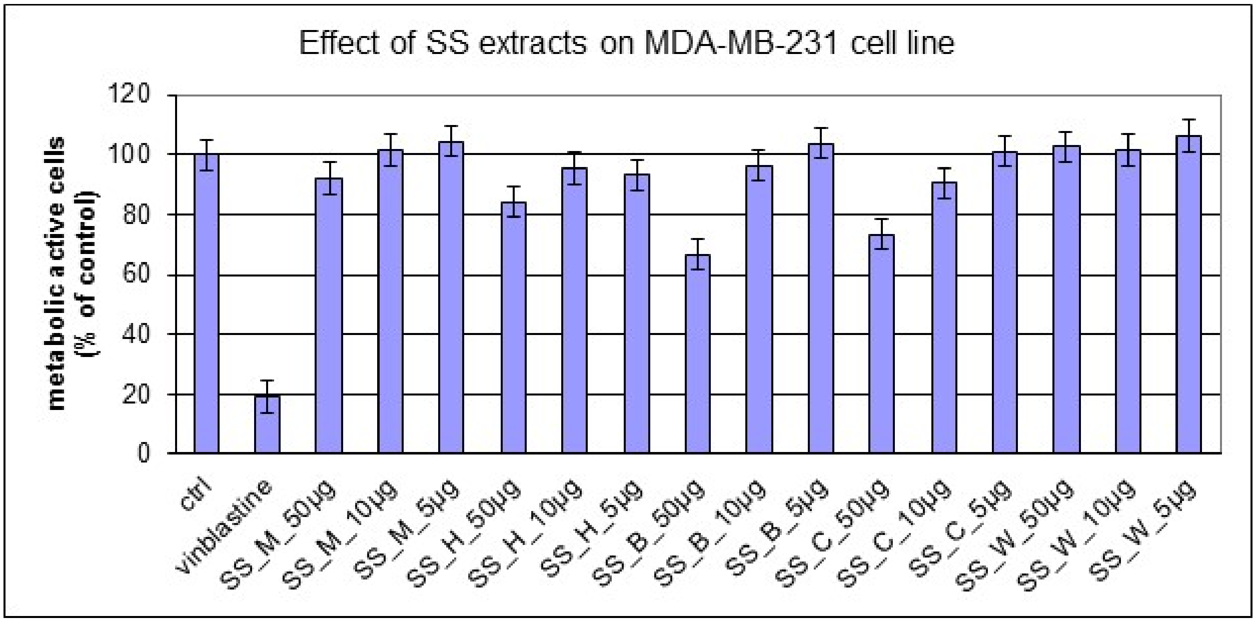

Fig. 10:Effect of plant extract and fractions on MDA-MB cells

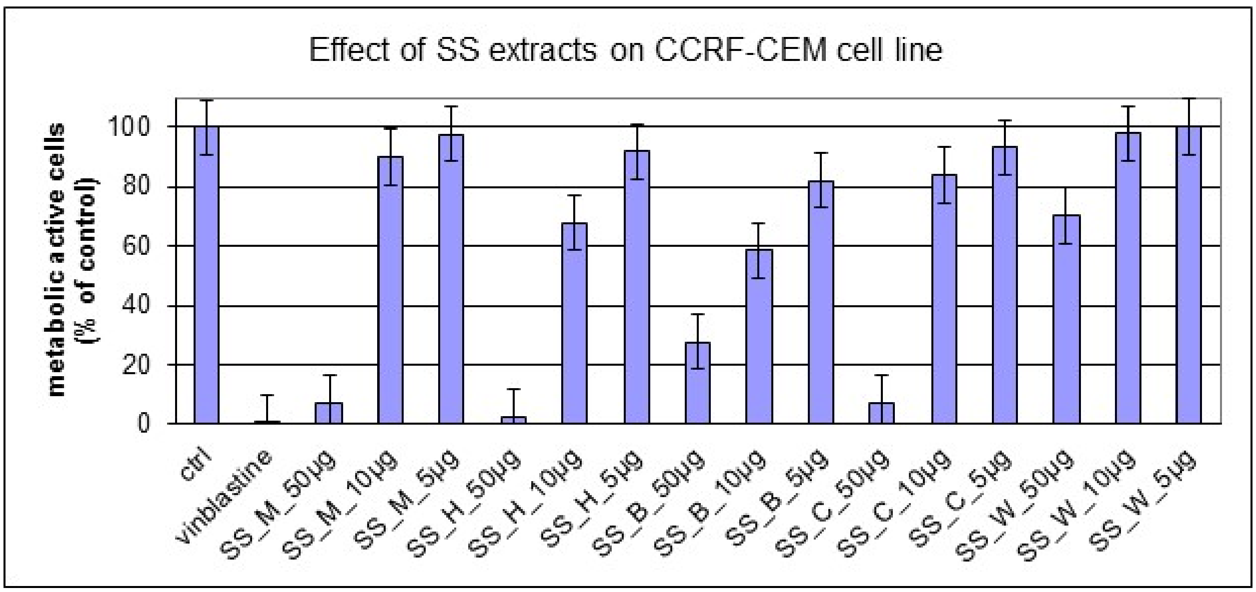

Fig. 11: Effect of plant extract and fractions on CCRF-CEM cells

CONCLUSION

Standardization and pharmacognostic evaluation of this plant has not been reported in the literature. Pharmacognostic screening provides key information for the authentication and identifies the adulteration of crude drug. In this research work, pharmacognostic parameters are reported first time. They are useful for the identification of the plant and are also helpful in differentiating this specie from other species of the same genus and family. Mineral analysis and nutritional value of the plant gives the idea about the palatability for the human and livestock and for the development of crude drug formulation to be utilized as a possible therapeutic agent for treating various ailments. Results of cytotoxicity in cell lines give the idea about the potential of plant against Human T-lymphoblastic leukemia.

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