EVALUATION OF PHYTOCHEMICAL SCREENING, ANTIOXIDANT POTENTIAL AND FT-IR ANALYSIS FROM *SENNA SURATTENSIS* FLOWER EXTRACT

Heeralal Singh[1], and Rohit Kumar Bargah[2*]

Abstract

Objective: To study physicochemical, qualitative and quantitative estimation of phytochemicals, determination of total phenol and flavonoid content, antioxidant activity and FT-IR spectral analysis in floral parts of *Senna surattensis*.

Methods: The solvents ethanol, and aqueous are used for extraction of *Senna surattensis* plant parts. Phytochemical screening of plant parts was carried out in both the solvents. Determination of total phenol content was carried out using Folin - Ciocalteau method and total flavonoid content using Aluminium chloride spectrophotometric method. Antioxidant activity of methanolic extract of plant samples were evaluated with DPPH standard method. The FT-IR is a very useful technique for identifying the functional groups present in the mixture.

Results: The result revealed the presence of flavonoids, saponins, tannins, Steroidal glycosides, Triterpenoids, Anthraquinone, Reducing Sugar, Phenolic compound, steroids in ethanol and aqueous extract but tannins. alkaloids were absent in aqueous extract. Total phenol content was expressed in mg of Gallic Acid Equivalent (GAE) per g of dry weight. In results it was found that ethanol extract shows highest phenol content 267.20 mg/g in flowers. The content of flavonoids was expressed in mg of Quercetin Equivalent (QE) per g of dry weight. It was evaluated that total flavonoid content found highest in flowers 113.35 mg/g in ethanol extract**.** IC_{50} for standard ascorbic acid was found to be 51.36 µg/ml and for ethanol and aqueous extract flower was found to be 66.83 µg/ml and 92.73 µg/ml respectively. The DPPH radical scavenging activity of *Senna surattensis* was evaluated and compared with ascorbic acid. The presence inhibition of flowers extract was calculated at various concentration (50,100,150,200,250 etc.) as well as standard ascorbic acid. The highest scavenging activity of ethanolic and aqueous extract were 161.9±0.27 % and 138.2±0.58 % at concentration of 250 µg/ml. The FT-IR spectrum *Senna surattensis* showed the presence of alkane (C-H), methylene (C-H), (O-H) stretch, (C-N) stretch, (C-O) group, (N-H) stretch, p-directing benzene ring, alkyl halide (C-Cl), and aromatic amine compounds. FT-IR analysis of ethanol flower and aqueous extracts of *Senna surattensis* confirmed the presence of phenols, alcohols, carboxylic acid, amide, aldehydes, ketones, alkanes, alkenes, aromatics, amines and alkyl halides which show major peaks.

Conclusion: The results obtained from the preliminary standardization of *Senna surattensis* are very helpful in the determination of the quality and purity of the crude drug. The refurbished findings of *Senna surattensis* are promising, and further research is important to identify the bioactive compounds, thereby developing nutritional supplements and medications through therapeutic compound isolation.

Keyword: *Senna surattensis, Phytochemical Screening, Total phenolic, Total flavonoids, Antioxidant activity FT-IR Spectral, Pharmacological activity, Flavonoids, Steroids.*

[1]Research scholar, Department of Chemistry, Govt. S.P.M. College –Sitapur, Surguja (C.G.) INDIA 497111, Mob No-88187218744, Email: heeradr11@gmail.com

[2*]Assistant Professor, Department of Chemistry, Govt. S.P.M. College Sitapur Surguja (C.G.) India, 497111, Mob. No. 9755387988, Email: rohitbargah1978@gmail.com

[*]**Corresponding Author:-** Dr. Rohit Kumar Bargah,

*****Assistant Professor, Department of Chemistry, Govt .S.P.M. College Sitapur Surguja (C.G.) India, 497111, Email: rohitbargah1978@gmail.com

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1. INTRODUCTION

Medicinal plants are widely used for curing different diseases since ancient time. Medicinal powers in plants are an old idea. A small percentage of plants are used by human as food, even more are used for medicinal purposes. Medicinal plants are an important part of the medicine background. Most of the populations in the world depend on herbal medicine for their health care needs [1-2]. The plant kingdom represents a rich store of traditional medicines and organic compounds that may lead to development of new agents that are considered as important drugs in one or more countries in the world. Unlike current drugs which are single active components that effect a specific pathway, medicinal plants may work in a way that depends on a synergetic effect [3].

According to World Health Organization, medicinal plants are the best source to obtain a variety of newer herbal drugs. Medicinal plants are the local heritage with global importance and they are eco-friendly. Biologically active compounds from natural sources have always been a great interest for scientists working on infectious diseases [4-6]. In addition, the use of medicinal plants in medical synthesis becomes well-liked due to toxicity and side effects of synthetic drugs. Thus, medicinal plants play an important role in the enlargement of new healing agents [7].

Phytochemicals in fruits, vegetables, spices and traditional herbal have been found to play protecting roles against human diseases [8]. Crude or fractionated extracts and sometimes individual plant compounds are used for antibacterial, anti-inflammatory, antioxidant activities [9-10]. A medicinal plant is any plant which contains substances those reveal therapeutic effects or which contain substances those can be used as precursors for semi-synthetic drugs. These non-nutrient substances present in plants are known as phytochemicals and serve as protecting agents in the plants from microbial infections or pest infestations [11] .

Senna surattensis Burm.f. (Caesalpinaceae) is commonly known as Glaucos cassia. It is a small tree or large shrub, distributed throughout India. Bark and leaves are useful in diabetes and gonorrhoea [12], aerial parts are used to treat diabetes [13]. The plant is known for its use in diabetes, gonorrhoea and blennorrhoea . The beads made from wood are hanged in neck to cure jaundice [14]. The plant found to contain anthraquinone, flavonol glycosides, chrysophanol, physcion, kaemferide and quercetin [15-17]. Senna surattensis is about 8–10-meter hight, evergreen shrubs, found throughout India, tropical Asia and Australia. The leaves are long linear, acute, curved in shape. The flower is yellow in color and shorter than the leaves [18]. Phytochemical study of stem of Senna surattensis has been indicated the presence of chrysophenol, physcion, stearic acid, β-sitosterol and β-D glucoside [19]. In folk medicine, bark and leaves of Senna surattensis are used for the treatment of diabetes and gonorrhea. The leaves are used for blennorrhagia [18]. Bark and leaves are used in diabetes and gonorrhea in folk medicine. This plant is also a good pollution tolerant and reduces chemical pollutants from atmosphere.

Since natural antioxidants which are found in plants are mainly in the form of phenolic compounds, such as flavonoids, phenolic acids, tocopherols [20]. The reported great free radical scavenging activity of flower extracts of *Senns surattensis* perhaps is also due to liberal amount of flavonoids and phenolic components. These phytoconstituents compounds shows anti oxidative property in several physiological activity of living system by scavenging of free radicals, chelation of metal ions, such as iron and copper and inhibition of enzymes responsible for free radical generation [21]. In the present study, the most abundant extraction of antioxidants from flower of *Senna surattensis* provided by ethanolic flower extract though high scavenging activity of flower extracts exhibited from plant extract.

The therapeutic properties of medicinal plants are may be the result of the presence of various secondary metabolites such as alkaloids, flavonoids, cardio glycosides, phenols, saponins, steroids, etc [22]. Thus, the preliminary screening test is mandatory to determine the bioactive principles which subsequently leads to the discovery and development of drugs [23]. The presence of alkaloids and saponins in the flower extract, the biological function of alkaloids and their derivatives are very important and are used in analgesic, antispasmodic and bactericidal activities [24]. Saponins have properties of precipitating and coagulating red blood cells, and they also have cholesterol binding properties, formation of foams in aqueous solutions and haemolytic activity [25], and traditionally Saponins have been extensively used as detergents and molluscicide, in addition to their industrial applications as foaming and surface-active agents they also have beneficial health effects [26]. Plant steroids are known in facilitating cardio tonic activities and used in nutrition, cosmetics and herbal medicine.

Reactive oxygen species (ROS) such as O_2, H_2O_2 and OH• are highly toxic to cells. Cellular antioxidant enzymes and the free radical

scavengers normally protect a cell from toxic effects of the ROS. Free radicals are known to play an important role in origin of life and biological evolution implicating their beneficial effects on the organism. The cytotoxic effect of free radicals is deleterious to mammalian cells and mediates the pathogenesis of many chronic diseases, but it is responsible for killing of pathogens by activated macrophages in the immune system. Antioxidants fight against free radicals by protecting us from various diseases and scavenge of reactive oxygen radicals or protect the antioxidant defense mechanism. Reactive oxygen species (ROS) are capable of damaging biological macromolecules such as DNA, carbohydrates and proteins. ROS is a collective term, which includes not only oxygen radicals (O_2 and OH.) but also some non-radical derivatives of oxygen like H_2O_2, HOCl, and ozone (O_3). If human disease is believed to be due to the imbalance between oxidative stress and antioxidant defense, it is possible to limit oxidative tissue damage and hence prevent disease progression by antioxidant defense supplements. In addition, antioxidant activity may be regarded as a fundamental property important for life [27].

Extensive pharmacological studies on *Senna surattensis* leaves and vegetative parts exhibited anti-inflammatory, Hepatoprotective activity, anti - diabetic, anti-microbial activity, immune modifying potentials and anti-oxidant activities [28-31] were studied. Hence, the present study was performed based on the phytochemical screening, total phenol, flavonoids, antioxidant activity, and FT-IR Spectral analysis of flower extract of *Senna surattensis*.

2. MATERIALS AND METHODS

2.1 Collection of Plant Material

The flower of plants Senna surattensis was authentified by Prof. Rijwan Ulla, Department of Botany, Rajeev Gandhi Govt. Autonomous Post Graduate College Ambikapur, Surguja, Chhattisgarh, India. They were collected from different areas of Mainpat forest districts of Surguja, India. Collected materials was washed in running tap water, rinsed properly in distilled water and then subjected to drying at room temperature for about 5 days in open air. This air-dried material was grind into powdered and stored under refrigeration until their further utilization

2.2 Preparation of Plant Extracts

Dry powder of plant parts was percolated in a soxhlet apparatus with solvents such as ethanol and aqueous . The filtrates were evaporated to get concentrated residue. This residue treated as experimental drug for the present study. The extract was stored at 4oC until assay was completed. [32-33]

2.3 Preliminary Physicochemical Characteristics:

Air dried flowers were used for quantitative determination of proximate analysis e.g. loss on drying, total ash, acid insoluble ash, alcohol soluble extractive values. These physicochemical studies were done according to standard procedure of Indian Pharmacopoeia and WHO guidelines [34-37].

2.4 Phytochemical Qualitative Analysis

The plant extracts and methanolic and ethanolic aqueous solutions were assessed for the existence of the phytochemical analysis by using the following standard methods [38–45].

(1) Test for Tannins

10 ml of bromine water was added to the 0.5 g aqueous extract. Decolouration of bromine water showed the presence of tannins.

(2) Test for Saponins

5.0 ml of distilled water was mixed with aqueous crude plant extract in a test tube and it was mixed vigorously. The frothing was mixed with few drops of olive oil and mixed vigorously and the foam appearance showed the presence of saponins.

(3) Tests for Flavonoids

***(i) Shinoda Test*:** Pieces of magnesium ribbon and HCl concentrated were mixed with aqueous crude plant extract after few minutes and pink color showed the presence of flavonoid.

***(ii) Alkaline Reagent Test*:** 2 ml of 2.0% NaOH mixture was mixed with aqueous plant crude extract; concentrated yellow color was produced, which became colorless when we added 2 drops of diluted acid to mixture. This result showed the presence of flavonoids.

(4) Tests for Steroidal Glycosides

(i) Liebermann's Test: We added 2.0 ml of acetic acid and 2 ml of chloroform with whole aqueous plant crude extract. The mixture was then cooled and we added H_2SO_4 concentrated. Green color showed the entity of aglycone, steroidal part of glycosides.

***(ii) Keller-Kiliani Test*:** A solution of glacial acetic acid (4.0 ml) with 1 drop of 2.0% $FeCl_3$ mixture was mixed with the 10 ml aqueous plant extract and 1 ml H_2SO_4 concentrated. A brown ring

formed between the layers which showed the entity of cardiac steroidal glycosides.

***(iii) Salkowski's Test*:** We added 2 ml H_2SO_4 concentrated to the whole aqueous plant crude extract. A reddish-brown color formed which indicated the presence of steroidal aglycone part of the glycoside.

(5) Test for Terpenoids

2.0 ml of chloroform was added with the 5 ml aqueous plant extract and evaporated on the water path and then boiled with 3 ml of H_2SO_4 concentrated. A grey color formed which showed the entity of terpenoids.

(6) Test for Anthraquinones

10 ml of benzene was added in 6 g of the *Senna* powder sample in a conical flask and soaked for 10 minutes and then filtered. Further 10 ml of 10% ammonia solution was added to the filtrate and shaken vigorously for 30 seconds and pink, violet, or red color indicated the presence of anthraquinones in the ammonia phase.

(7) Test for Steroids

2 ml of chloroform and concentrated H_2SO_4 were added with the 5 ml aqueous plant crude extract. In the lower chloroform layer red color appeared that indicated the presence of steroids.

(8) Test for Alkaloids

A known quantity of the extract, 0.1 mg was added to 6ml of dilute hydrochloric acid and boiled, after boiling, it was cooled and filtered. The filtrate was divided into three portions and subjected to the following tests.

(i) To the first portion, 2 drops of Dragendorff's reagent were added. The formation of a red precipitate indicated the presence of alkaloids.
(ii) To the second portion, 2 drops of Meyer's reagent were added. A creamy white precipitate indicated the presence of alkaloids.
(iii) To the third portion, 2 drops of Wagner's reagent were added. A reddish-brown precipitate indicated the presence of alkaloids.

(9) Test for Phenolic Compound

The test sample 0.1 g was added to 10 ml of distilled water. The solution was heated in a boiling water bath for 3 min and filtered. A 2 ml aliquot of the filtrate was placed in each of 3 test tubes. The filtrate in one of the test tubes was diluted with distilled water in the ratio 1:4. A blue or greenish colour indicated the presence of phenolic compound.

(10) Test for Reducing Sugar

5 ml of a mixture of equal parts of Fehling's solution A and B was added to 5 ml of extract and then heated in a water bath for 5 min. Brick red precipitate showed the presence of reducing sugar.

2.5 Quantitative Phytochemical Screening

The quantitative phytochemical screening was performed by determining total phenolic content (TPC) and total flavonoid content (TFC) of the extracts [46]. The TPC and TFC of the extracts were expressed as milligrams of gallic acid equivalent per gram (mg GAE/g) of extracts and milligrams quercetin equivalent per gram (mg QE/g) of extracts, respectively [47].

2.5.1 Determination of Total Phenolic Content

Folin–Ciocalteu reagent was used for the determination of total polyphenolic content. 0.5 ml of each extract (5 mg/ml), Folin–Ciocalteu reagent (5 ml, 1:10 v/v diluted with distilled water) and aqueous sodium carbonate (4 ml, 1 M) solution were mixed together. The mixture was allowed to stand in the dark for 15 min at room temperature, and the absorbance at 765 nm was measured with the help of ultraviolet (UV-visible) spectrophotometer. Then, the total polyphenolic content was determined in terms of mg GAE/g of dry weight of the extract with the help of a calibration curve prepared with a series of gallic acid standards (10-80 μg/ml) [48].

2.5.2 Determination of Total Flavonoid Content

0.5 ml of each extract (50 mg/ml) was separately mixed with 1.5 ml methanol and 0.1 ml aluminium trichloride (10%). Then, 0.1 ml of 1 M potassium acetate and 2.8 ml distilled water was added into each test tube. Then, absorbance at 415 nm was measured after it was allowed to stand in the dark for 30 min using a UV-visible spectrophotometer. Finally, a calibration curve was prepared with a series of quercetin standards (10-50 μg/ml) and the total flavonoid compound concentration was determined in terms of mg QE/g of the extract [49].

2.6 Antioxidant Activity

Method used for antioxidant activity was DPPH free radical scavenging assay [50].

2.6.1 DPPH Free Radical Scavenging Assay

DPPH (1, 1-diphenyl-2- picrylhydrazyl (a, a-diphenyl-bpicrylhydrazyl) radical scavenging analysis was performed according to the reported method with slight modifications. Briefly, 1 mg/ml solutions of compounds and ascorbic acid were prepared by dissolving them into DMSO (Dimethyl sulfoxide). 50, 100, 150, 200, and 250 µL of each was added separately to 10.0 mL amber color volumetric flasks containing 2.0 ml of 0.01mM DPPH (prepared in ethanol). The final volume was made up to 3.0 ml and allowed to stand for 30 minutes in the dark and after 30 min absorbance was checked at 517 nm by using UV-visible spectrophotometer. Pure DPPH solution (0.01mM) was used as a control and ethanol was as a blank. The decrease of in absorbance equates the DPPH radical scavenging capacity. The above process was repeated three times for ascorbic acid and compounds/ samples. The radical scavenging ability was calculated
according to the formula:

Radical scavenging activity =

$$(A_0 - A_T / A_0) \times 100$$

Where, A_0 is the absorbance of pure DPPH solution (0.01mM), and A_T is the absorbance of (DPPH) and compounds / samples.

2.6.2. Hydrogen peroxide scavenging activity

Solution of hydrogen peroxide (40Mm) was prepared in phosphate buffer pH 7.4 and its concentration was determined by measuring the absorbance at 560nm using UV spectrophotometer. 0.1mg/ml of the extract was added to hydrogen peroxide solution and absorbance measured at 560nm using UV spectrophotometer against a blank solution containing phosphate buffer without hydrogen peroxide. Ascorbic acid was used as standard [51]. The percentage of hydrogen peroxide scavenging by the extract and standard compound was calculated using the given formula:

Percentage scavenged [H_2O_2] =

$$1 - \text{Abs (standard)} / \text{Abs (control)} \times 100$$

Where, Abs control was the absorbance of the control (without extract) at 560nm; Abs sample was the absorbance in the presence of the extract at 560nm.

2.7 Fourier Transform Infrared Spectrophotometer (FT-IR)

Fourier Transform Infrared Spectrophotometer (FT-IR) is perhaps the most powerful tool for identifying the types of chemical bonds/functional groups present in the phytochemicals. The wavelength of light absorbed is salient feature of the chemical bond as can be seen in the annotated spectrum. By interpreting the infrared absorption spectrum, the chemical bonds in a compound can be determined. Dried powder of the plant extracts of Senna surattensis was used for FT-IR analysis. 10 mg of the dried extract powder was encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample discs. The powdered sample of each extracts was loaded in FT-IR spectroscope (Shimadzu, Japan), with a Scan range from 400 to 4000 cm^{-1} with a resolution of 4 cm^{-1}[52].

Table: FT-IR bond and functional group

S.N.	frequency, cm^{-1}	Bond and functional group
1	3853-3985	O–H stretch, free hydroxyl, alcohols, phenols
2	3340-3200	O–H stretch, H–bonded alcohols, phenols
3	2904-3000	C-H stretching Alkane
4	2347-2260	C≡N stretch nitriles
5	1697-1745	C=O stretch, Carbonyl compounds ketones(C=O)
6	1600-1564	C–C stretch (in–ring) aromatics
7	1445-1412	C–H bend alkanes
8	1335-1250	C–N stretch aromatic amines
9	1231-1020	Alkyl amine
10	835-805	C–H -Aromatic compound
11	800-753	C–Cl stretch, alkyl halides

3. RESULTS AND DISCUSSION

Physiochemical parameters of the flower of *Senna surattensis* are tabulated in Table 1. Different extracts of the powdered flower were prepared for the study of extractive values. Percentage of extractive values was calculated with reference to the air-dried drug. The results are shown in Table 1. Deterioration time of the plant material depends upon the amount of water present in plant material. If the water content is high, the plant material can

be easily deteriorated due to fungus. The loss on drying at 105 °C in flower was found to be 10.1%. Total ash value of plant material indicated the amount of minerals and earthy materials attached to the plant material.

Physiochemical parameters of the flower of *Senna surattensis* are tabulated in Table 1.

Table 1: Physicochemical analysis of flower *Senna surattensis*

S.N	Parameters	Results (%w/w)
1	Total Ash	6.25
2	Acid insoluble Ash	1.70
3	Water -soluble Ash	3.59
4	Water soluble extractive value	9.63
5	Alcohol soluble extractive value	13.82
6	Loss on Drying	7.30

Senna surattensis flower ethanol extract has the highest solubility of phytochemicals when extracted with alcohol than aqueous extracts tested. Analytical results showed the results are in agreement with Senna surattensis flower extracts total ash 6.25, acid insoluble 1.70, water-soluble ash 3.59, water- soluble extractive value 9.63, alcohol soluble extractive value 13.82 and loss of drying (moisture of contents) 7.30.

The results given in table 2 show that the total phenol content and total flavonoid of *Senna surattensis* flowers are ethanolic 475.94± 0.27, 345.20± 0.45 and aqueous extract 465.22± 0.18, 315.75± 0.20 respectively.

Table 2 : Result of quantification studies *Senna surattensis* flower

S.N.	Extract	Test Parameter	Results(mg/g) (±SEM)
1.	Ethanol	Total phenolic Total Flavonoids	475.94± 0.27 465.22± 0.18
2.	Aqueous	Total phenolic Total Flavonoids	345.20± 0.45 315.75± 0.20

The study of the chemical constituents and the active principles of the medicinal plants have acquired a lot of importance all over the world. The present study includes the phytochemical screening of the plants Senna surattensis. The qualitative chemical tests for the ethanolic extracts were performed. The investigation showed that Senna surattensis contains, flavonoids, saponins, tannins, Steroidal glycosides, Triterpenoids, Anthraquinone, Reducing Sugar, Phenolic compound, steroids present in ethanol and aqueous extract but tannins, alkaloids were absent in aqueous extract.

Table 3: Phytochemical Screening of *Senna Surattensis* flower ethanolic and aqueous extract

S.N	Phytochemicals	Ethanolic Extract	Aqueous Extract
1	Flavonoid	+	+
2	Saponins	+	+
3	Tannins	+	-
4	Steroidal Glycoside	+	+
5	Triterpenoids	+	+
6	Anthraquinones	+	+
7	Reducing Sugar	+	+
8	Alkaloid	+	-
9	Steroids	+	+
10	Phenolic compound	+	+

(+): Presence, (-): Absent

DPPH scavenging activity of *Senna surattensis* flower extracts against DPPH radical were determined and the results are shown in table (4,5,6). DPPH scavenging activity has been used by various researchers as a rapid, easy and reliable parameter for screening the in vitro antioxidant activity of plant extracts. DPPH is a stable free radical and accepts an electron to become a stable diamagnetic molecule. The absorption maximum of a stable DPPH radical in methanol was at 517nm. IC_{50} for standard ascorbic acid was found to be 51.36 µg/ml and for ethanol and aqueous extract flower was found to be 66.83 µg/ml and 92.73 µg/ml, respectively. In order to study the effects of these compounds on biological system more studies are needed as these compounds might be responsible for use of this plant in different diseases [53]. The DPPH radical scavenging activity of *Senna surattensis* was evaluated and compared with ascorbic acid. The presence inhibition of flowers extract was calculated at various concentration (50,100,150,200,250 etc.) as well as standard ascorbic acid. The highest scavenging activity of ethanolic and aqueous extract were 161.9±0.27 % and 138.2±0.58 % at concentration of 250 µg/ml.

Table 4: Free radical scavenging capacity of Ascorbic acid

Concentration (µg/ml)	**DPPH Scavenging %**
	Ethanol Extract
50	51.2±0.36
100	86.7±0.27
150	129.8±0.98
200	167.1±0.24
250	212.3±0.76
IC_{50}	51.36

Values are mean ± SEM of three determinations

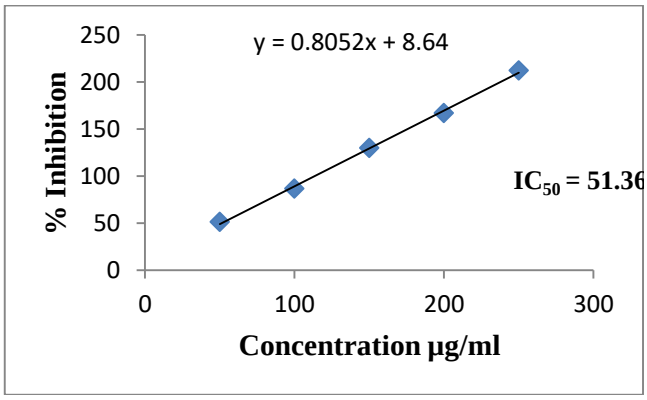


Table 5: Free radical scavenging capacity of ethanol extract of *Senna Surattensis*

Concentration (µg/ml)	**DPPH Scavenging %**
	Ethanol Extract
50	39.2±0.79
100	72.1±0.36
150	98.6±0.57
200	132.7±0.23
250	161.9±0.27
IC_{50}	66.83

Values are mean ± SEM of three determinations

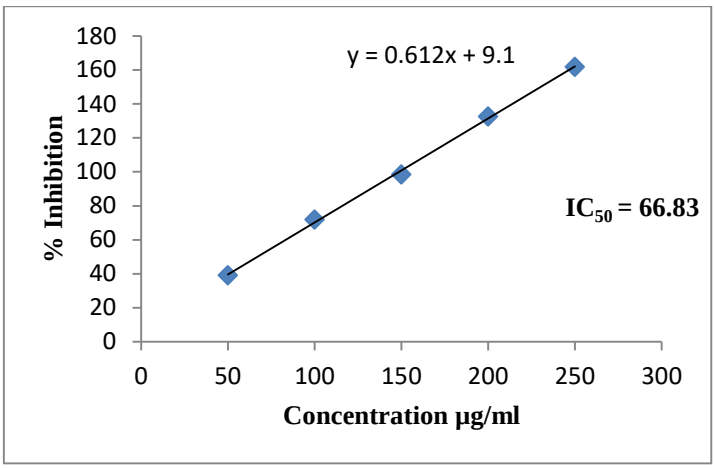
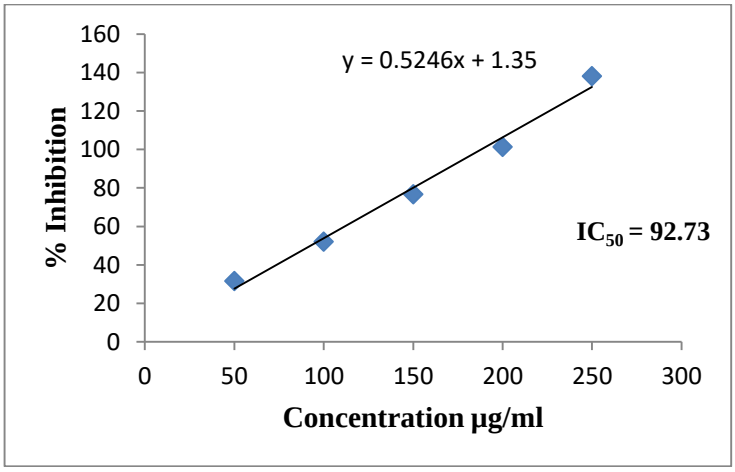


Table 6: Free radical scavenging capacity of aqueous extract of *Senna Surattensis*

Concentration (µg/ml)	DPPH Scavenging % Aqueous Extract
50	31.7±0.47
100	52.1±0.36
150	76.8±0.92
200	101.4±0.37
250	138.2±0.58
IC_{50}	92.73

Values are mean ± SEM of three determinations



Hydrogen peroxide Scavenging antioxidant activity of ethanolic and aqueous flower extract as shown in table no. 7, and 8. IC_{50} for standard ascorbic acid was found to be 51.36 µg/ml and for ethanol and aqueous extract flower was found to be 53.85 µg/ml and 69.11 µg/ml, respectively. The highest scavenging activity of ethanolic and aqueous extract were 226.1±0.35% and 198.2±0.43 % at concentration of 250 µg/ml.

Table 7: H_2O_2 scavenging capacity of ethanol extract of *Senna Surattensis* (flower)

Concentration (µg/ml)	H_2O_2 Scavenging % Ethanol Extract
50	52.7±0.45
100	84.1±0.71
150	132.4±0.83
200	188.7±0.29
250	226.1±0.35
IC_{50}	53.85

Values are mean ± SEM of three determinations

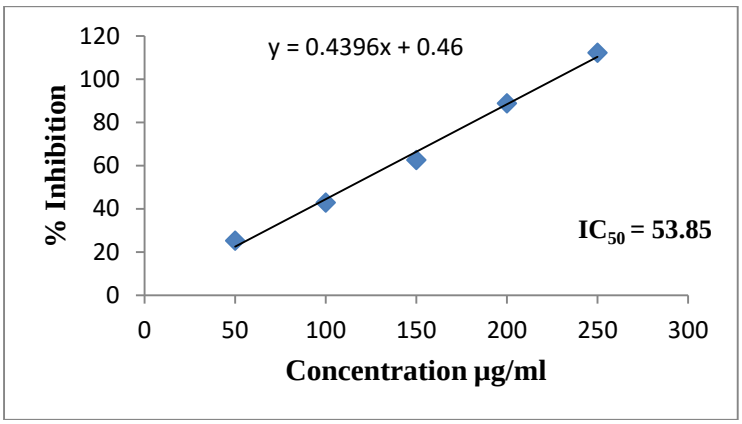
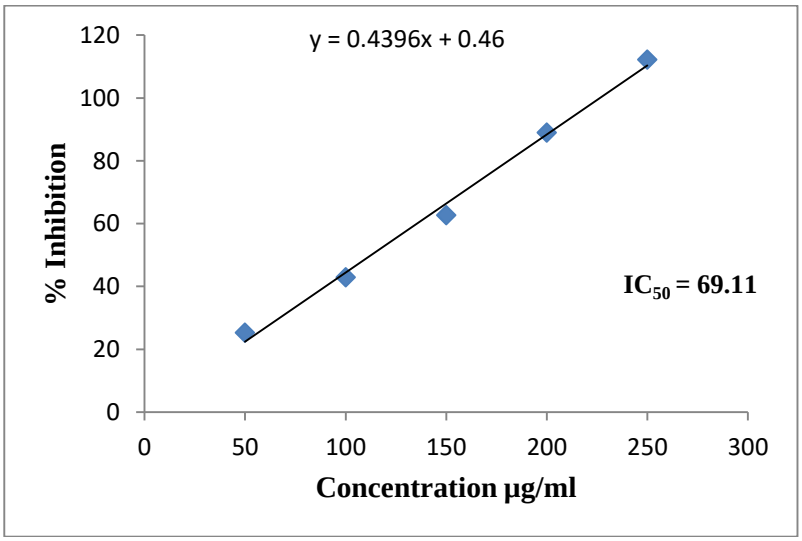


Table 8: H_2O_2 scavenging capacity of aqueous extract of *Senna Surattensis* (flower)

Concentration (µg/ml)	H_2O_2 Scavenging % Aqueous Extract
50	43.9±0.46
100	71.4±0.38
150	102.4±0.52
200	135.8±0.09
250	198.2±0.43
IC_{50}	69.11

Values are mean ± SEM of three determinations



FT-IR study Table -8 shows the functional groups of the organic and inorganic compounds of the plant extract. The FTIR methods was performed on a spectrophotometer system, which was used to detect the characteristics peak values and their functional group [54 -55]. Infra spectrum shows beak area 3853-3985 (O–H stretch, free hydroxyl, phenols and 3340 -3200 cm^{-1} is presence of OH groups. The peak area at 2904-3000 cm^{-1} vibration C-H stretching alkane. The beak area at 2347 cm^{-1} shows C≡N stretch nitriles. A strong stretching vibration at 1745 cm^{-1} and 1697 cm-1 shows the presence of carbonyl(C=O) groups. The beak at 1600-1564 cm^{-1} C–C stretch (in–ring) aromatics and 1445cm^{-1} shows C–H bend alkanes. The beak area a 1335 cm^{-1} shows C–N stretch aromatic amines. The beak at 1231 cm^{-1} shows Alkyl amine. group. 835cm^{-1} beak shows C-H out plane bending. The beak areas 753cm^{-1}, shows halogen compounds like C-Cl, compounds. FT-IR analysis of methanol flower and aqueous extracts of Senna surattensis confirmed the presence of phenols, alcohols, carboxylic acid, amide, aldehydes, ketones, alkanes, alkenes, aromatics, amines and alkyl halides which show major peaks.

Table 8: FT-IR spectrum of ethanolic and aqueous extract of *Senna surattensis*

Extract	Peak Value (cm^{-1})	Functional Group
Ethanolic Extract	859.32	Aromatic compound
	1071.50	O-H Bending group
	1209.42	Alkyl Ketone
	1314.54	C-H Bending
	1613.52	C=C-group
	1718.65	C=O Carbonyl group
	2100.57	C-N group
	2350.36	C-H Stretching
	2923.25	C-H stretching
	3301.31	O-H group
	3855.87	O-H Stretching
	3906.02	O-H stretching(medium)
	3933.99	O-H stretching(sharp)
Aqueous Extract	910.44	C-H Bending
	1048.36	O-H Bending group
	1403.27	C-H stretching
	1604.84	C=C-group
	2355.19	N-H/C-O stretching
	2809.44	C-H stretching
	2887.56	C-H stretching
	3259.84	O-H group
	3852.01	O-H Stretching
	3995.71	O-H stretching(sharp)

Spectral differences are the objective reflection of componential differences. By using FT-IR spectrum, we can confirm the functional constituent's presence in the given parts and extract, identify the medicinal materials from the adulterate and even evaluate the qualities of medicinal materials The results of the present study coincided with the previous observations observed by various plant biologist and taxonomist many researchers applied the FT-IR spectrum as a tool for distinguishing closely associated plants.

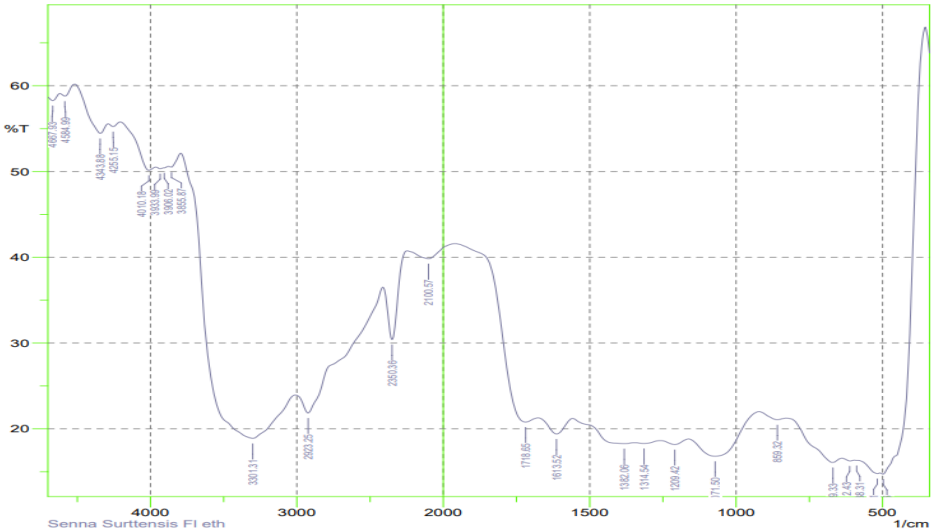


Fig1 : Shows the FT-IR frequency range of ethanolic Senna surattensis flower

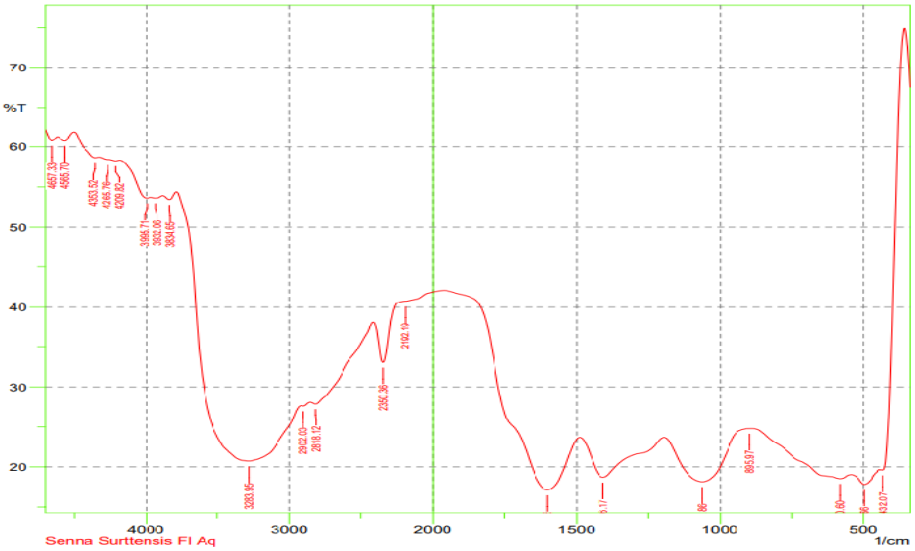


Fig 2 : Shows the FT-IR frequency range of aqueous *Senna surattensis* flower.

4. CONCLUSION

The present study revealed that flower extract of *Senna surattensis* was rich in phytochemical constituents and high levels of total phenolic and flavonoids compounds. The flower extract of *Senna surattensis* also possessed strong antioxidant potential and was thus capable of inhibiting, quenching free radicals to terminate the radical chain reaction. The results indicate that the plant material may become an important source of natural drug compounds with health protective potential and natural antioxidants of significant impact on the status of human health. Therefore, traditional medicine practice is recommended strongly for this plant and further study should be carried out to isolate, purify, and characterize the active constituents responsible for the bioactivity study and disease prevention.

5. Conflict of Interest: The authors have no conflict of interest.

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