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Antibacterial and Phytochemicals attributes of *Solanumsurrattense* Burm. (Solanaceae)

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Abstract: In this study, acetone, ethanol and water extracts of four parts (root, stem, leaf and fruit) of Solanum surrattenseBurm (Solanaceae) were studied for antimicrobial activity by well diffusion method against three human pathogenic bacterial spp. Klebsielia pneumonia, Escherichia coli and Staphylococcus aureus. The results found the zone of inhibition against K. pneumonia, E. coli and S. aureus between 10±2.00 - 18±2.52, 7±1.15 - 19±1.15 and 6±0.00 - 16±2.00 mm respectively. The results of phytochemical as antioxidant, total flavonoid, Flavonols, reducing power and tannin between the 3.99±0.16 - 12.29±0.05, 0.36±0.01-1.40±0.17, 0.08±0.01-0.88±0.09, 0.41±0.09-2.19±0.13 and 0.15±0.01-0.88±0.01 mg/ml were observed from under study plant.

Keywords Phytochemicals Solanum SurrattenseBurm (Solanaceae)

1. INTRODUCTION

Many bacteria are mostly found on the human body (Sender *et al.,* 2016),which may cause skin diseases like; carbuncles, cellulitis, impetigo and gradually produce severe diseases (Dryden, 2010). Some bacterial strains produce drug resistance which cause major problems in clinical treatment (Pukumpuang *et al.*, 2012). Moreover our body is exposed to a large number of foreign chemicals (Kumari *et al.,* 2003), which are mostly man made and we are fail to metabolize their negative effects on our health properly due to the generation of free radicals (Sagwan *et al.*, 2011). Free radicals are also generated during normal metabolism of aerobic cells (Carmen and Florin 2009; Ghaseme *et al* 2009; Li *et al* 2009; Hunang *et al.*, 2005; Zaporozhets *et al.*, 2004; Odukoya *et al.*, 2007 and Sagwan *et al.*, 2011). Free radicals are highly unstable and strongly react with biomolecules causing for numerous processes, structural modification, abnormal function, cell or tissue damage (cell tumor) and coronary heart diseases (Sagwan *et al.*, 2011 and Pukumpuang *et al.*, 2012).

Anti-oxidants are important chemicals that can delay or inhibit and prevention of different human diseases by terminating, initiating and propagation chain reaction. Ascorbic acid, Vitamin E and phenolic compounds are powerful anti-oxidants have ability to reduce the oxidative damage related with many diseases like, cancer, cardio-vascular diseases, diabetes, arthritis, immune deficiency diseases and aging (Pietta *et al.*, 1998; Lea *et al* 2000 and Middleton *et al.*, 2000). These antioxidants cannot be produced by human body, thus must be taken through diets especially leafy vegetables, seeds and fruits. The aim of present study to investigate the Phytochemicals and anti-bacterial and anti-oxidant activities of 20% Aqueous and solvents extracts of traditionally medicinal plant *S.surrattense* Burm belongs to family Solanaceae.

2. MATERIALS AND METHODS

Sample collection

The plant material was collected from Jamshoro and its adjacent area and washed under tap water to remove dust and debris. The plant parts (Root, Stem, Leaf and Fruit) were dried in shade for 3-4 weeks at room temperature, pulverized to fine powder with the help of grinder.

Preparation of 20% extract

20 grams of dried plant powder was taken in pestle mortar and added little quantity of glass powder with few ml of organic solvent / water, crushed till made paste and centrifuged at 6000rpm for 15 minutes. The supernatant was filtered through suction pump. The procedure was repeated twice. The final volume of supernatant was made up to 100 ml and stored at 4°C for further investigation (Naqvi *et.al.*, 2011).

Determination of antioxidant activity:

The antioxidant activity was measured by (Prieto *et al.*, 1999) method, using Vitamin E as standard. The 0.2 ml of test samples mixed with 2ml of reagents (0.6M Sulphuric acid, 28mM Sodium Phosphate and 4mM Ammonium molyb date), incubated in the water bath at 95°C for 90minutes. The samples were cooled at room temperature and the absorbance was measured at 695 nm.

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Determination of total phenolic

Total phenolic contents were determined from extracts of *S. surrattense* by (Yasoubi *et al*., 2007) method with slight modifications, using Gallic acid as standard. The 0.2 ml of test samples were added with 1ml of Folin-ciocalteu (ten-fold), after 2-5 minutes add 0.8 ml of 7.5% Na_2CO_3, thoroughly mixed and incubated for 30 minutes at room temperature. The absorbance was measured at 765 nm.

Determination of total flavonoid

The total flavonoid contents were estimated by (Kim *et al*, 2003) method and calculated using Quercetin as standard. The 0.1ml of test sample was mixed with 0.3ml of 5% sodium nitrate, after 5 minutes 0.3 ml of 10% aluminum chloride, 2ml of 1M sodium hydroxide were added and final volume was raised up to 10ml with distilled water. The absorbance was measured at 510 nm against the reagent blank.

Determination of total flavonol contents;

The 1ml of test sample was mixed with 2ml of 5% aluminum chloride (prepared in ethanol) then 3ml of 5% sodium acetate was added, the mixture was mixed thoroughly, vortex for few minutes and incubated for 1 hour at room temperature. The absorbance was read at 440 nm and calculated byQuercetin standard curve by (Kumaran and Karunakaran, 2007) method.

Determination of reducing power;

The reducing power activity was measured by (Oyaizu, 1986) method, using ascorbic acid as standard. The 1ml of test sample was mixed with 2.5ml of 0.2M phosphate buffer (pH 6.6), 2.5 ml of 1% potassium ferricyanide and incubated at 50^{o}C for 20 minutes. The 2.5ml of 10% trichloroacetic acid was added to terminate the reaction then the samples were centrifuged at 3000 rpm for 20 minutes. The 2.5 ml of upper layer was taken in clean test tube mixed with 2.5 ml distilled water and 0.5 ml of 0.1% ferric chloride mixed thoroughly. The absorbance was noted at 700 nm.

Determination of tannin contents;

0.1ml of test sample was added with 7.5 ml of distilled water, 0.5 ml of FolinCiocalteu (1:1 v/v), mixed thoroughly then 1ml of 35% sodium carbonate was added and final volume was made up to 10 ml. The mixture was shaken well, kept at room temperature for 30 minutes and read the absorbance at 510 nm by (Tamilselvi *et al*. 2012) method. The concentration of tannin was calculated from under investigated plant extracts using gallic acid standard curve.

Antibacterial activity:

The pure culture of *Staphylococcus aureus*, *Klebsielia pneumonia* and *Escherichia coli* were obtained from ISRA University Hospital Pathology Laboratory, Hyderabad, Sindh, Pakistan. The antibacterial activity was tested from the 20% solvents and water extracts of different parts of *S. surrattense* by well diffusion method (Rajrana, 2015) 30µl of plant extracts were applied in each well against the under study bacterial species. The commercial antibiotic disc 30µg of ciprofloxacin, gentamycin, penicillin etc. were used as positive control. The Petri dishes were incubated at 37°C for 24h. The zones of inhibition were measured in millimeters (mm) formed around the wells. All the experiments were performed in triplicate.

Table-1: Anti-bacterial activity of *Solanum surrattense* zone of inhibition in mm.

	K. pneumonia		
	Acetone	**Ethanol**	**Water**
Root	Nil	Nil	11±1.15
Stem	10±2.00	Nil	11±1.15
Leaf	18±2.52	18±2.52	12±2.52
Fruit	Nil	10±2.00	12±2.52
	E. coli		
Root	7±1.15	14±1.73	Nil
Stem	9±1.15	9±1.15	Nil
Leaf	19±1.15	16±0.58	15±3.00
Fruit	14±1.73	14±1.73	15±0.58
	S. aureus		
Root	7±0.58	0±0.00	6±0.00
Stem	8±0.58	0±0.00	6±0.58
Leaf	8±0.58	13±1.73	8±0.58
Fruit	8±0.58	14±1.00	9±1.15

3. RESULT AND DISCUSSION

The *Solanum surrattense*is known as yellow berried night shade belongs to family Solanaceae, commonly found on waste places open areas and road sides in India and Pakistan. The local people use the fruits and other parts of this plant as folk medicine in different infections (Abbas *et al*, 2014). In literature several workers investigated phytochemical, antioxidantand antibacterial activities from different medicinal plants such as *Tinosporacordifolia*, *Withaniasomnifera*, *Centellaasiatica*,*Azadiractaindica*,*Solanum surrattense*; *Datura metel*, *Solanum xanthocarpum*,and *S. nigrum* (Shahriar *et al*., 2013); (Muruhan *et al*., 2013); (Radha *et al*., 2014;Sangeetha *et al*., 2014) .(Afolayan, 2016)

In this study the highest antioxidant was observed in leaf acetone, ethanol and water extracts 10.26±0.38, 12.29±0.05 and 10.81±0.53 mg/ml respectively **(Fig.1).** The flavonoids were observed in stem and fruit water extracts 1.40±0.17 and 1.02±0.11 mg/ml respectively as shown in **(Fig. 2-3).** The maximum values of phenolic contents were observed in leaf and fruit acetone and water extracts 0.92±0.04, 0.97±0.03, 0.71±0.03 and 0.95±0.01 mg/ml respectively as shown in **(Fig.2).** The

0.61±0.01 mg/ml flavonol was noted in leaf ethanol extract as shown in **(Fig.4).** (Abrar *et al*., 2013) estimated reducing power in *Withaniasomnifera*. Our study reveals that acetone extracts of root, stem, leaf and fruit maximum range reducing power and tannin, 1.23±0.08, 1.85±0.08, 2.13±0.13 and 1.79±0.28 mg/ml respectively as shown in **(Fig.5)** and 0.78±0.02, 0.79±0.02, 0.88±0.01 and 0.83±0.01 mg/ml respectively as shown in **(Fig.6).**

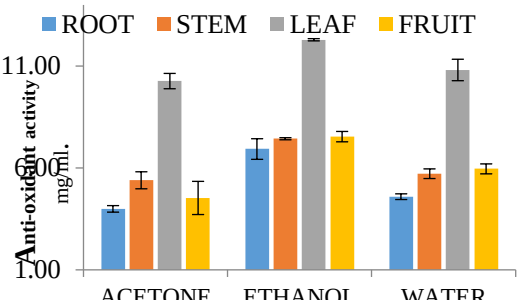

Fig.1 Total Antioxidant activity of 20% solvents of different parts of *S.surrattense*.

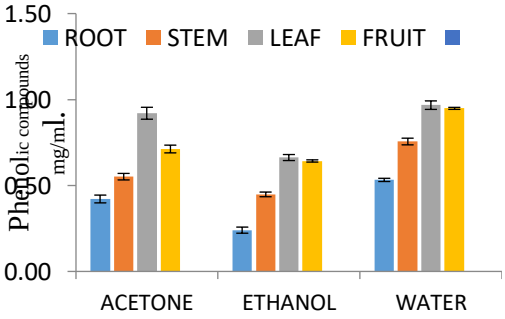

Fig.2 Total Phenolic contents of 20% solvents of different parts of *S.surrattense*.

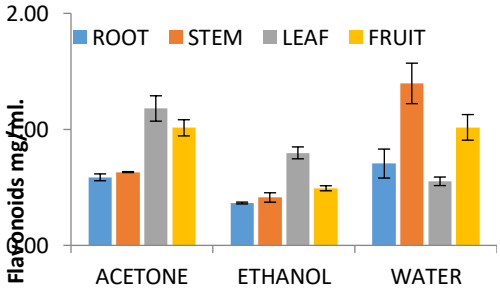

Fig. 3. Total Flavonoids of 20% solvents of different parts of *S.surrattense*.

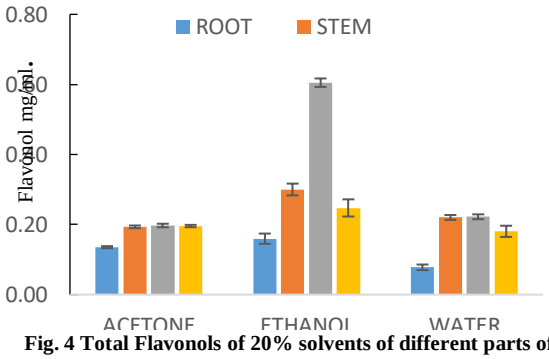

Fig. 4 Total Flavonols of 20% solvents of different parts of *S.surrattense*.

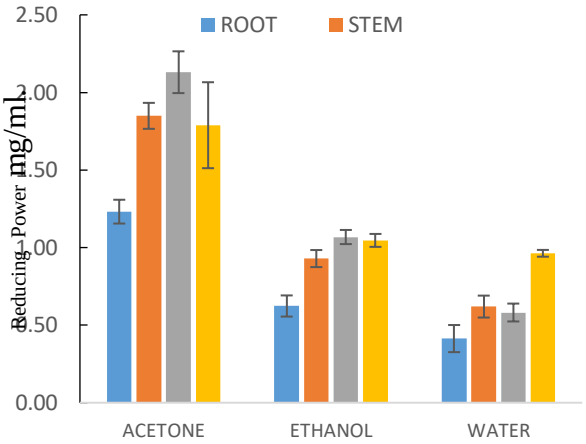

Fig. 5. Reducing Power of 20% solvents of different parts of *S.surrattense*.

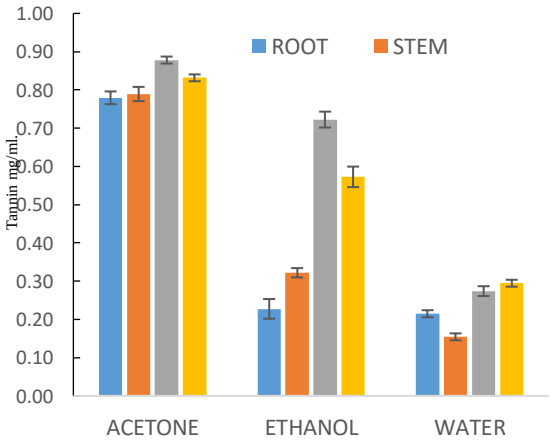

Fig. 6 Tannin of 20% solvents of different parts of *S.surrattense*.

The uppermost range of inhibition against *K. pneumonia* was observed in leaf acetone and ethanol extracts 18±2.52 mm and leaf and fruit water extracts showed 12±2.52 mm zone of inhibition as shown in Table 1. Deshmukh *et al*., (2015) observed 19 mm zone of inhibition in *Datura stramonium* leaf extract, Alam *et al.,* 2012 observed 19 mm in leaf ethanol extract of *W. somnifera,* Saranraj *et al*., (2011) 16mm in *Datura metel* leaf ethanol extract, Shahid *et al*., (2013), observed 20 mm in fruit ethanol extract of *W.coagulanse,* Abbas *et al.*, 2014 found no efficacy of fruit different solvents against *K. pneumonia* of *S.nigrum* and *S.surrattense*.

The top range of inhibition against *E. coli* was observed in leaf acetone, ethanol and water extracts 19±1.15 mm, 16±.58 and 15±3.00 mm respectively as shown in Table 1.The similar results were observed by Alam *et al*., (2012) in leaf ethanol extract of *W.somnifera* 28mm, Saranraj *et al*., (2011) observed 26mm in *Datura metel* leaf ethanol extract, Shahid *et al*., (2013), observed 22mm in fruit extract of *W.coagulanse*. Abbas *et al*.,(2014) observed 8mm and 16mm in fruit acetone and water extracts of *S.njgrum* and 9mm and 18 mm in *S. surrattense* respectively.

The utmost range of inhibition against *S. aureus* was observed in leaf and fruit ethanol extracts 13±1.73 and 14±1.00 mm as shown in Table No 1.Saranraj *et al*., (2011) observed 9mm in *Datura metel* leaf ethanol extract, Shahid *et al*., (2013), observed 18mm in fruit extract of *Withaniacoagulanse*. Abbas *et al*., (2014) observed 8mm and 14mm in fruit acetone and water extracts of *Solanum njgrum* and *Solanum surrattense* respectively.

4. CONCLUSIONS

This study concluded that *Solanum surrattense* is a source of phytochemicals potent against pathogenic microorganisms. These findings suggested that *S. surrattense*could be a potential source of natural antioxidant having great importance as therapeutic agent and preventing oxidative stress related degenerative diseases.

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