Phytochemical Extraction & Antimicrobial activity of the Leaves of Solanum nigrum

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***Abstract*—The leaves of *Solanum nigrum* evaluate the anti-microbial activity. It has wide range of medicinal & pharmacological application. The plant has been reported to have anti-inflammatory, anti-microbial, anti-bacterial, anti-fungal, anti-diabetic and anti-cancerous properties. It contains several secondary metabolite products like flavonoids, tannins, phenolic compounds, saponins, terpinoids etc. The microorganism *E. coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* were used for the antimicrobial activity. The anti-microbial activity was determined by the disc diffusion method and minimum inhibitory concentration.**

***Index Terms*—Antimicrobial, Phytochemical, Disc diffusion method.**

I. INTRODUCTION

Solanum nigrum play a significant role in the field of ethno medicine. *Solanum nigrum* plant leaves have been used as medicinal herb for many years. It is widely used in Ayurveda, Unani and Siddha medicines as home remedy for various diseases in Indian traditional system. *Solanum nigrum* polysaccharide inhibits tumor growth. It is an important herbal medicine which is generally used in mosquito larvicidal activities against culex quinquefasciatus. It also helpful in dysentery, stomach pain and fever.

The plant juice is used on ulcers & skin disease. Traditionally the fruit of *Solanum nigrum* plant was used to treat asthama, excessive thirst and tuberculosis. The other part of plant like leaf, root, stem & flower is widely used in ethno medicine. The whole part of plant contains a large no. of phytoconstituents like flavonoids, terpinoids, tannins, saponins, alkaloids and phenolic compounds. Plant Solanum nigrum belong to family Solanaceae. This family consists of 90 genera. It is an annual herbaceous plant of 10-60 cm high with a green plant. *Solanum nigrum* leafs are important aspects of medicinal plant resource. Solanum nigrum elaborate a wide spectrum medicinal property such as anticancer, antioxidant, antimiocrobial properties.

II. MATERIALS AND METHODS

Collection of plant material

The fresh leaves of Solanum nigrum plants were collected from botanical garden Faculty of science Banaras Hindu University, Varanasi, India. The fresh leaves were washed 3-4 times with running tap water, to remove soil and unwanted dust particles. Then the leaves were shaded, dried, and stored in air tight bottles.

Soxhlet extraction:

The dried coarse powder of Solanum nigrum leaves was placed inside a thimble made from thick filter paper, which is loaded into the main chamber of the soxhlet extractor. This extractor was placed on to a distillation flask containing the methanol solvent. The soxhlet was then equipped with a condenser and the solvent was heated to reflux. The warm solvent vapor travels up a distillation arm and flood into the chamber of thimble. When the chamber is almost full, it gives automatically emptied by a siphon side arm back down to the distillation flask. This cycle may be allowed to repeat many times so that the desired compound gets concentrated in the distillation flask. The solvent extracts are filtered, concentrated under reduced pressure (30+_10) in a rotary evaporator at 30 C-60 C to a syrupy consistency and finally dried in vacuum desiccators and then submitted to lyophilisation in order to remove the solvent completely to produce powdered form of extracts. Lyophilization removes the water and stabilizes the extract so that it can retain

satisfactory pharmacological activity during long term storage. The weight of the dried mass is recorded and used for experimental studies. The yield was 5.9% with respect to dry starting material with characteristic odor & greasy consistency.

Phytochemical Analysis:

The phytochemical analysis of Solanum nigrum leaf extract revealed the presence of secondary metabolites such as alkaloid, cardiac glycosides, flavonoids, saponins, tannins, terpinoids and phenolic compound according to phytochemical methods accounted by Evanse (2002), and Sofwora (1993).

Antimicrobial Activity:

Bacterial culture of Escherichia coli, Pseudomonas aeruginosa and Staphylococus aureus obtained from the cultures collection center, Department of Botany and Biotechnology University of Banaras Hindu University (BHU), India were used for antimicrobial test organisms. The bacteria were maintained on nutrient broth (LB) at 37^0C.

III. RESULTS

Pharmacological activity of the leaves of *Solanum nigrum*

Qualitative and Quantitative analysis of the phytochemicals of the leaves of Solanum nigrum

Qualitative and quantitative analysis of the leaves of Solanum nigrum revealed the presence of phenols, saponins, tannins and terpins. Quantitative estimations of bioactive constituents are summarized in table. The presence of these phytochemicals in the leaves of Solanum nigrum makes it medically and therapeutically important.

Bioactive constituents	Presence	Quantity in gram%(w/w)
Carbohydrate	+	0.26 ±0.12
Alkaloids	+	1.14±0.17
Steroids	+	1.18±0.14
Saponins	+	2.23±0.89
Tannins	+	1.07±0.11
Flavonoids	+	1.19±0.18
Phenols	+	1.27±0.20
Lipids	+	1.31±0.14
Proteins	+	1.37±0.64

Table no.1: Qualitative and Quantitative analysis of the leaves of *Solanum nigrum*

Antimicrobial Activity of the leaves of Solanum nigrum

Tetracycline showed the maximum inhibition zone against *Staphylococcus aureus* than *Escherichia coli* and *Pseudomonas aeruginosa*. The result from the disc diffusion method, followed by measurement of minimum inhibitory concentration (MIC). In table2, *Solanum nigrum* with the smallest inhibition zone against *Escherichia coli*, *Pseudomonas aeruginosa* (+ve) and show maximum inhibition zone against Staphylococus aureus (10.3mm) by providing dose of 30mg/ml of crude drug and again increases concentration then maximum inhibition zone against *Pseudomonas aeruginosa* (10.7mm) then *Escherichia coli*, *Staphylococcus aureus* by providing dose of 120 mg/ml. In table 2, antibiotic Streptomycine showed the maximum inhibition zone against Staphylococcus aureus. Methanolic extract of leaves of Solanum nigrum were tested against gram +ve & gram –ve bacteria. Tetracyclin and Streptomycine used as a positive reference for bacteria and distilled water use as a negative control.

Group	Zone of inhibition (In mm)		
	E. Coli	*S. aureus*	*P. aeruginosa*
Control	00.00	00.00	00.00
Tetracyclin	10.1±0.31	12.1±0.35	9.4±0.46
SN30	8.2±0.38	10.1±0.43	9.7±0.36
SN60	7.5±0.48	10.3±0.49	7.5±0.30
SN120	8.1±0.32	9.5±0.62	10.7±0.48

Table no.2: Antimicrobial activity of the leaves of *Solanum nigrum* against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* by using Tetracytclin as a positive control.

Group	Zone of inhibition		
	E. coli	*S. aureus*	*P. aeruginosa*
Control	00.00	00.00	00.00
Streptomycin	7.2±0.41	8.2±0.46	7.1±0.28
SN30	8.2±047	5.1±0.30	7.6±0.35
SN60	9.1±0.64	7.3±0.38	9.2±0.56
SN120	6.1±0.32	7.8±0.3.	5.5±0.03

Table no.3: Antimicrobial activity of the leaves of *Solanum nigrum* against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* by using Streptomycin as a positive control.

IV. DISCUSSION

The antibacterial activity of the methanolic extract from *Solanum nigrum* leaves against pathogenic microorganism. Methanolic extract of leaves of *Solanum nigrum* shows good antibacterial activity *Staphylococcus aerues*, *Pseudomonas aeruginosa* and *Escherichia coli*. In the leaf of *Solanum nigrum* showed broad spectrum antimicrobial activity +ve bacteria *Staphylococcus aerueus* and gram –ve bacteria *Escherichia coli*, *Pseudomonos aeruginosa*. In our result, we found that crude drug of Solanum nigrum leaves are show more antimicrobial activity compare to tetracycline and streptomycin. The leaf extract of *Solanum nigrum* contain many secondary metabolites which are responsible for inhibition to growth of microorganisms. The present study was focused on the determination of minimum inhibitory concentration (MIC) of leaf extract Solanum nigrum, which may play an important role in the modern drug discovery program.

The secondary metabolites such as tannins, flavonoids, alkaloids, saponin which show medicinal activity. Tannins are water soluble polyphenol. Tannins are also known as antimicrobial agent. Tannins have been reported to prevent the development of microorganism by precipitation microbial protein and making nutritional protein unavailable for them (O.A. Sodipo, M.A. Akanjl, F.B Kolawole).

The presence of above said phytochemical constituents could account for much medicinal properties of both species for the treatment of various disease such as treatment disease such as cough, liver problem, stomach, skin disease, jaundice etc (Pronob gogoi and M. Islam, V.Ravi, T.S.M Saleem, S. S Patel,R.C.Srivastava).

V. CONCLUSION

Solanum nigrum is most important medicinal plant. The methanolic extract of Solanum nigrum leaves have different degree of antibacterial activity. It is concluded the leaf extract of Solanum nigrum mildly potent as antibacterial agent. Therefore, we would leave extract Solanum nigrum serve as a potential source of industrial drug useful in some bacterial infection.

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