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Antioxidant and Antibacterial activity of Leaves and Flowers of *Datura metel* of Kodaikanal Region of TamilNadu

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Abstract

Chloroform extract of leaves and flowers of *Datura metel* was assessed for phytochemical components, antioxidant and antimicrobial activity. The preliminary phytochemical investigation was done for both leaves and flowers revealed that contained alkaloids, terpenoids, phenolic compound, tannins, saponin and glycoside. In addition to this, inhibitory effects on six pathogenic organisms of *Klebsiella pneumoniae*, *Salmonella typhi*, *Shigella flexneri*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *Escherichia coli* were performed. The results showed that leaves extract exhibited the highest inhibitory activity against *S. typhi* (25mm), followed by *S. flexneri* (21mm) and the least activity against *K. pneumoniae* (16mm), E. coli (15mm) at the concentration of 100µg whereas flowers extract showed *S. typhi* (20mm), followed by *S. flexneri* (19 mm) and the least activity against *K. pneumoniae* (13mm), *E. coli* (9mm). The leaves extract revealed the highest reducing power and H_2O_2 activity than flowers.

Keywords: *Datura metel*, Phytochemicals, Antibacterial activity, Antioxidant activity

Contents

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1. Introduction

Medicinal plants play a significant role in health care services since ancient days. *Datura metel* L. of Solanaceae family is a sub-glabrous shrubby herb found to exist throughout the world [1]. Plants are rich in a variety of secondary metabolites such as tannins, terpenoids, alkaloids, flavonoids, phenols, steroids, glycosides and volatile oils. It is used in traditional medicine as a treatment for asthma, chronic bronchitis, chronic pain, seizures and coma. It is required to make out the phytochemical components of plants. The leaves of *D. metel* were used in anesthetic, antispasmodic [2]. In recent years, drug resistance to human pathogenic bacteria has been commonly reported[3]. Plant secondary metabolites have chemical diversity includes many compounds vitamins, nutrients, antioxidants, anticarcinogens with medicinal value [4]. Antibiotic resistance that develops from prolonged usage of certain drugs has led to continuous efforts in searching for metabolites that possess antimicrobial activities. Medicinal plants are

used for the ailment of several microbial and non-microbial originated diseases due to their valuable effects in health care [5]. Plants possibly will constitute a reservoir of new antimicrobial substances to be revealed. Free radicals are known to be the cause of various chronic and degenerative diseases, together with aging, coronary heart disease, inflammation, cancer and others [6]. Plants which are rich in antioxidants such as vitamins and phenolic compounds are believed to be effective in preventing these diseases through reducing oxidative stress and inhibiting lipid peroxidation in biological systems [7]. Recent studies also indicated that therapeutic benefits of certain crude drugs of plant origins were derived from their antioxidant activities. In this study, we have carried out the preliminary study of antibacterial and antioxidant activity of *D. metel* leaves and flowers of Kodaikanal region.

2. Materials and Method

2.1 Collection of plant materials

Leaves and flowers of *D. metel* were collected randomly from local area of Kodaikanal, TamilNadu. The plant materials were washed, shade dried and then powdered using the blender and stored in air tight bottles.

2.2 Chloroform Extraction

10 g of the plant powder was soaked separately into 100 ml of chloroform for 72 h with stirring at 24 h interval. The mixture was then filtered using Whatmann No 1. filter paper. The filtrates were then concentrated under vacuum at 40°C and the concentrated extracts stored at 4ºC until use.

2.3 Phytochemical analysis

Phytochemical analysis of flower and leaves were used to test for the presence of saponins, tannins, alkaloids, flavonoids and glycosides in the test samples [8].

2.4 Antibacterial Activity

The antibacterial activity of chloroform extracts were tested in disc diffusion method [9]. Muller Hinton agar medium was inoculated with 100µl of test organism's suspension. The discs containing the plant extract sample (25, 50, 75 and 100 µg/ml) were placed on the agar medium seeded with tested microorganisms. The plates were then incubated at 25°C for 24 h. Zone of inhibition was determined by measuring the diameter in millimeter.

2.5 Reducing power Assay

The reducing power was determined for extracts of leaves and flowers of *D.* metel [10]. Reaction was carried out in a mixture containing 2.5 M of sample (0.1–0.5 mg/mL), 2.5 ml of 0.1 M sodium phosphate buffer (pH 6.6) and 2.5 ml of $K_3Fe(CN)_6$ (1%, w/v) by incubating at 50°C for 20 min. After addition of 2.5 ml trichloroacetic acid (10%, w/v), the mixture was centrifuged at 5000g for 10 min. The upper layer (5 ml) was mixed with 0.5 ml of fresh $FeCl_3$ (0.1%, w/v), and the absorbance at 700 nm was measured against a blank. Vitamin C was used as the positive control.

2.6 H_2O_2 scavenging Assay

H_2O_2 scavenging activity was determined of *D. metel* of leaves and flowers [11]. The mixture containing 1 ml of sample (0.1–0.5 mg/mL), 2.4 ml of phosphate buffer (0.1 M, pH 7.4) and 0.6 ml of H_2O_2 solution (40 mM) was shaken vigorously and incubated at room temperature for 10 min. Then, the absorbance of the reaction mixture was determined at 230 nm.

3. Results and Discussion

The phytochemical analysis of *D. metel* leaves have an active compounds like alkaloids, terpenoids, tannins and phenolic compound, carbohydrate, glycoside, cardiac glycoside where as flower contains alkaloids, terpenoids, tannins and phenolic compound [12] which were shown in (Table 1). It therefore suggests that constituents of the plant extracts could serve as a source of drugs useful in the chemotherapy of some microbial infections. The study has shown that the chloroform extracts of *D. metel* leaves and flowers possessed antimicrobial properties against six microbes. The extracts exhibited significant zone of inhibition against the selected strains of microorganisms, such as *S. typhi, S. flexneri, P. aeruginosa, P.mirabilis, K. pneumoniae* and *E. coli*. Leaves showed better zone of inhibition than flowers which showed lesser zone of inhibition[13].

Extract has lowest zone of inhibition against *E. coli* and *K. pneumoniae*, it may need different solvent extraction to have greater activity against these pathogens. Various studies have shown that natural antioxidants are able to reduce DNA damage, mutagenesis, carcinogenesis and inhibit pathogenic bacteria growth. These events are often associated with the termination of free radical propagation in biological systems[14]. Thus, the antioxidant capacity of crude drugs is used as a parameter for evaluating medicinal bioactive components. In this study, we examined the antioxidant activities of leaves and flowers extracts, of *D. metal* and compared them to vitamin C. Results showed that leaves extract possessed antioxidant activity, which is 2 fold stronger than flowers extracts (Figs. 1-2)[15]. The phytochemicals like phenolic acids, flavonoids and terpenoids scavenge the free radicals activity thus inhibiting the oxidative mechanisms that lead to form of various diseases.

Table 1. Phytochemical components of *D. metel* leaves and flowers extract

Test organisms	***D. metel* (Leaves)**	***D. metel*(Flowers)**
Alkaloids	+	+
Flavonoids	_	_
Terpenoids	+	_
Phenol	+	+
Tannins	+	+
Anthraquinone	_	_
Saponin	_	-
Carbohydrate	+	+
Carotenoid	_	_
Glycoside	+	_
Cardiac glycoside	+	_

Table 2. Antimicrobial activity of Chloroform extracts of *D.metel* leaves and flowers

Organisms	**(Zone of Inhibition in mm)**							
	Leaves				**Flowers**			
	25µg	**50µg**	**75µg**	**100µg**	**25µg**	**50µg**	**75µg**	**100µg**
E. coli	6	12	14	15	5	6	8	9
K. pneumonia	9	13	15	16	8	10	11	13
P. aeruginosa	9	11	20	21	9	11	15	17
P. mirablis	8	14	16	19	6	12	14	16
S. flexneri	7	10	17	24	8	13	17	19
S. typhi	8	15	21	25	7	17	16	20

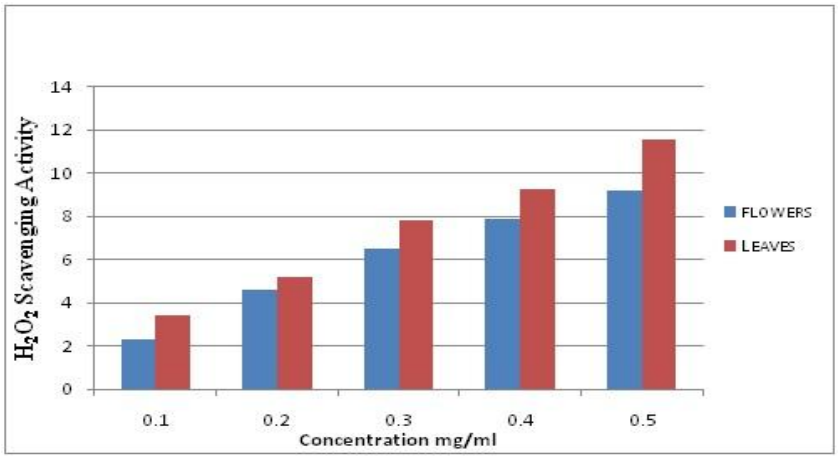

Figure 1: H_2O_2 scavenging assay of leaves and flowers of *D.metel*

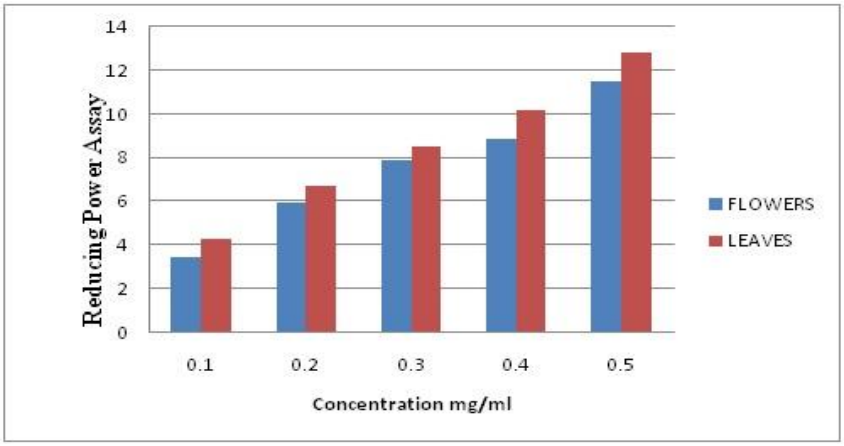

Figure 2: Reducing power assay of leaves and flowers of *D. metel*

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