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Phytochemical Screening and Antimicrobial Potential Analysis of Methanolic Extracts of Ten Days Mature *Triticum aestivum* Linn. (Whole Plants)

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ABSTRACT

Triticum aestivum Linn. is a common wheat plant which have been used as traditional herbal medicine and is highly valued for its therapeutic and nutritional properties. In the present study we intended to screen possible chemical groups and the antimicrobial potential of methanolic extracts of ten days mature whole plants of *T. aestivum* Linn. Phytochemical analysis was done by different qualitative chemical tests and antimicrobial potential was ascertained by disc diffusion method. The phytochemical analysis of the crude extract executed the presence of alkaloids, carbohydrates, glycosides, saponins, glycosides, steroids, tannins, flavonoids, terpenoids and phenols. Broad spectrum antimicrobial activity was revealed by the crude extracts at the concentration of 400 µg/disc. Ciprofloxacin was used as standard antibiotic to compare with that of the results. In order to isolate and characterize the antimicrobial active constituents responsible for the antimicrobial potential, further work especially bioassay-guided fractionation may be confessed.

Keywords: *Triticum aestivum* Linn., Phytochemical analysis, Antimicrobial potential, Ciprofloxacin

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INTRODUCTION

Among the plant kingdom many species of plants with decent medicinal value yet to be pursued. A big number of plants are constantly being screened because of their feasible medicinal value.[1] Poor and marginalized people get affordable means of health care from medicinal plants. Different parts of medicinal plants including; stems, barks, leaves, flowers and underground parts are frequently used for traditional medicines. Medicinal plants are used by the traditional medical practitioners from primitive time for treatment and in disease-treating formulations.[2] The major constituents of indigenous medicines are present in medicinal plants. Microorganisms has become the major causes of fatality and impediment in immune compromised patients and are also responsible for various infectious diseases throughout the world, especially in developing countries.[3] Several infections caused by microorganisms including; GIT infections, metabolism related infections, urinary tract infection, skin infections and surgical wound infections. The advancing of resistance of microbes against antibiotics by contentious use of antibiotics has become a robust issue within the recent years.[4-9] Unfortunately the treatment of infectious diseases throughout the world are continually being difficult due to antibiotic resistance, which also offers great challenges for medical practitioners and pharmaceutical industry.[10] Due to advent of drug resistance, many of our presently used antibiotics have become less reactive against a wide range of microorganisms. Furthermore, many unavoidable side effects are arisen by newly revealed drugs. So the exploration of antibacterial agents by the analysis of medicinal plants will be a beneficent task in generating new way of treatment.[11-12]

Due to lack of scientific data to support the native information, utilization of plants as natural antioxidants and within the treatment of diseases caused by pathogenic infection has been limited.[13] It is a well-known outcome that, natural products provide almost all of the antibacterial agents which have high degree of antibacterial potential.[14] So the analysis of natural products are extremely needed in order to pursue new antibacterial agents to fight against these condition.[15-16] That is why our present study was commenced.

Triticum aestivum Linn. is commonly known as common wheatgrass belonging to the family Poaceae (Gramineae) and have high chlorophyll content about 70% of its chemical constituents. Wheatgrass is highly valued because of its therapeutic and nutritional properties which has been used as traditional herbal medicine.[17] The therapeutic qualities of *Triticum aestivum* have been imposed to its rich nutritional content, including chlorophyll, vitamins

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(A, C, and E), minerals (calcium and magnesium), bioflavonoids, iron, and 17 amino acids, 8 of which are essential.[18] To support the use of *T. aestivum* Linn. a very little clinical data exists. The goal of the present study was to assess the antibacterial and antifungal potentials of crude methanolic extracts of ten days mature *T. aestivum* Linn. (whole plants).

MATERIALS AND METHODS

Drugs and chemicals

Analytical grade's chemicals and reagents were used in the present study. Methanol (99.5%), was procured from Sigma-Aldrich (Hamburg, Germany), which was used for extraction. Standard drug Ciprofloxacin was collected from Beximco Pharmaceuticals limited, Tongi, Bangladesh. Other reagents and materials required during culture preparation and for continuation of this full experiment were provided from the laboratory of Atish Dipankar University of Science and Technology, Dhaka-1213, Bangladesh.

Plant materials

Ten days mature whole plants of *Triticum aestivum* Linn. was collected during August, 2017 from different regions of Barisal, Bangladesh. The plant was proved by an expert of Bangladesh National Herbarium Institute, Mirpur, Dhaka, Bangladesh.

Preparation of plant extract

After collection of ten days mature whole plants of *T. aestivum* were properly washed with water. Then the collected plant materials were sliced, dried, and crushed. About 500 g of the crushed materials were soaked in 1.5 L of methanol at room temperature for 14 days. Filter cloth and Whatman filter paper no. 1 (Sargent, Welch, USA) was used to filter the solution and the filtrate was concentrated by a rotary evaporator (RE-52AA). A brown granular was executed and designated as crude methanolic extracts.

Phytochemical evaluation

Preliminary measurable phytochemical analysis of freshly prepared methanolic extracts of ten days mature *T. aestivum* Linn. (whole plants) was performed for the detection of phytochemicals such as alkaloids, carbohydrates, proteins, glycosides, phytosterols, tannins, saponins, flavonoids, phenols, gums, mucilages, fats and fixed oils using the following standard methods.[19-21]

Antibacterial and antifungal activity test

Test Organisms

Three strains of Gram-positive bacteria (*Staphylococcus aureus, Bacillus subtilis, Bacillus cereus*), three strains of Gram-negative bacteria (*Salmonella typhi, E. coli, Pseudomonas aeruginosa*) and three strains of fungi (*Aspergillus niger, Candida albicans, Microsporum canis*) were used to evaluate the antimicrobial potential. The organisms were collected from the Department of Microbiology, Chittagong Veterinary and Animal Sciences University, Bangladesh as pure cultures.

Disc Diffusion Assay (DDA)

The widely acceptable method for the evaluation of antimicrobial potential is disc diffusion method.[22] In the following method, a concentration gradient was created by diffusing an antibiotic from a reliable source through the nutrient agar. The test bacteria was seeded on nutrient agar medium at dried, sterilized filter paper discs (6 mm diameter, HI-Media, China) containing the known amounts of test samples (400µg/disc). Standard antibiotic of ciprofloxacin (5µg/disc) and blank discs were used as positive and negative control. These plates were reserved for 24 hours at low temperature (4°C) for the maximum diffusion of the test materials to the surrounding media. To allow optimum growth of the o rganisms, the plates were then incubated for 24 hours at 37°C. Microbial growth in plates were inhibited by the test materials containing antimicrobial property and thereby a distinct, clear zone was yielded; defined as zone of inhibition. By measuring the zone of inhibition, the antimicrobial activity of the test sample was determined.[23]

RESULTS

Phytochemical screening

Methanolic extracts of ten days mature *T. aestivum* Linn. (whole plants) is rich in carbohydrates, alkaloids, proteins, glycosides, phenols, tannins, flavonoids, saponins and steroids which were determined by different qualitative chemical tests. In order to discovery and identification of chemical constituents, the results of various chemical tests are summarized in Table 1.

Antimicrobial activity

Antimicrobial activity of sample extract was tested against six bacteria and three fungi at concentrations of 400µg/disc. Ciprofloxacin (5µg/disc) was used as standard antibiotic disc for the comparison. The result of antimicrobial activity is represented in Table 2. The crude extract exhibited highest activity against gram negative bacteria and moderate activity against both gram positive bacteria and fungi.

Table 1 **Phytochemical screening of methanol extracts of ten days mature *T. aestivum* Linn**

Sl. No	Group of phytoconstituents	Result
1.	Carbohydrates	+
2.	Proteins	+
3.	Alkaloids	+
4.	Flavonoids	+
5.	Tannins	+
6.	Phenols	+
7.	Saponins	+
8.	Glycosides	+
9.	Steroids	+
10.	Terpenoids	+

Here, + = presence, - = absence

Table 2 **Antimicrobial activity of the crude sample of ten days mature *Triticum aestivum* Linn**

Test Organisms		Crude sample (400µg/disc)		Ciprofloxacin (5µg/disc)
		Zone of inhibition	Relative % of inhibition	
Gram Positive (+ve) Bacteria	*Staphylococcus aureus*	10 mm	29%	34 mm
	Bacillus subtilis	16 mm	44%	36 mm
	Bacillus cereus	14 mm	44%	32 mm
Gram Negative (-ve) Bacteria	*Salmonella typhi*	12 mm	56%	22 mm
	E. coli	19 mm	63%	30 mm
	Pseudomonas aeruginosa	14 mm	54%	26 mm
Fungi	*Aspergillus niger*	2 cm	40%	5 cm
	Candida albicans	2.5 cm	42%	6 cm
	Microsporum canis	1.5 cm	38%	4 cm

DISCUSSION

Medicinal plants have been used globally to serve people for a long time. Herbal and medicinal plants are used by 80% of the world population in treating various ailments because such plants possess different types of phytochemicals which show a variety of pharmacological effects in human body.[24,25] From the previous studies it is clear that, phytoconstituents evaluation on most of the medicinal plants executed the presence of several phytochemicals like alkaloids, flavonoids, carbohydrates, tannins, phenol, terpenes, fats and fixed oils. Several biological actions including antimicrobial potentials are resulted because of these phytochemicals.[25] Cell wall synthesis of microorganisms is inhibited by antibacterial agents and thus showing their potentiality against microorganisms,[26,27] they causes depletion of energy by accumulating in bacterial plasma membrane.[28] Antibacterial agents changes the structure and function of key cellular constituents through interfering in the permeability of cell membrane, resulting in mutation, cell damage, and finally leads to death.[29] The methanolic extract of this plant appeared the presence of alkaloids, which may be responsible for antimicrobial potentials.[30] Due to presence of tannins and flavonoids, many parts of ten days mature *T. aestivum* Linn. possess antibacterial properties.[31,32] A large amount of aromatic compounds are synthesized by this plant among which phenols or their oxygen substituted derivatives are ascendant.[33] Protection against pathogens are provided by these compounds.[26] Since various phytoconstituents such as tannins, saponin, flavonoids, and alkaloids are present in the present study, which singly or in combination show the potential defense mechanism against pathogens.[30] Plants play a vital role in the development of antimicrobial agents because they are available, cost effective, and important resources of potentially useful structures;[30] therefore the preliminary step towards this goal is in-vitro antimicrobial potential screening. According to the consequence of the present study, it can be summarized that the methanolic extract of ten days mature *T. aestivum* Linn. (whole plant) reflects broad-spectrum antimicrobial potentials. Therefore, scientifically to better understand the mechanism of such actions more studies may be expressed.

CONCLUSION

From the above study, it can be spontaneously stated that the methanolic extract of ten day's mature *T. aestivum* Linn. (whole plant) is a cardinal source of therapeutic agents having broad-spectrum antimicrobial potentials.

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CONFLICT OF INTEREST

All authors have none to declare.

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