

## RESEARCH ARTICLE

**Anti-inflammatory and Antimicrobial Property of *Dioscorea deltoidea* L from Nepal**

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Received 07 May 2014; Revised 05 Aug 2014; Accepted 19 Aug 2014

**ABSTRACT**

The methanolic extracts of *Dioscorea deltoidea* Wall ex Griseb was tested for the antimicrobial property in four pathogenic bacteria *Staphylococcus aureus*, *Salmonella typhi*, *Escherichia coli* and *Pseudomonas aeruginosa*, and a fungal stain of *Candida albicans*. Anti-inflammatory property was evaluated in Wister rats. *In-vitro* antimicrobial activity was performed by well diffusion method to while Carrageenan induced inflammation was used to evaluate the anti-inflammatory activity. The extracts exhibited a dose-dependent organism selective antimicrobial action. The 5% and 10% extract showed significant activity against *S. aureus* and *E. coli* but these concentrations did not shown any activity against *S. typhi* and *P. aeruginosa*. Similarly, Anti-inflammatory property in carrageenan induced inflamed rat was found considerable at 3 h of extract administrated. The results from the preliminary phytochemical screening showed the presence of alkaloids, flavonoids, tannins, glycosides, amino acids, carbohydrates and terpenoids.

**Key words:** *Dioscorea deltoidea*, Anti-inflammatory activity, *In-vitro* antimicrobial activity.

**INTRODUCTION**

*Dioscorea deltoidea* Wall.ex Griseb. belongs to the family of dioscoreaceae which is commonly known as Bhyakur in Nepal. *Dioscorea* species mainly consists of starch, with some saponins, lipids, vitamins and minerals. It is also used to alleviate constipation<sup>[1,2]</sup>. Tubers are used as a food product and also used for the treatment of different diseases such as digestive disorder, diarrhea, irritability, abdominal pain, wounds burns, chronic liver pain and anemia<sup>[3]</sup>. The roots of most members of this genus contain diosgenin. This compound is widely used in modern medicine in order to manufacture progesterone and other steroid drugs. These are used as contraceptives and in the treatment of various disorders of the genitry organs as well as in a host of other diseases such as asthma and arthritis<sup>[4]</sup>.

Inflammation is one common and major cause of sufferings now and every time past. The drugs that are available are known as NSAID, act by inhibiting the function of prostaglandin. It is part of the complex biological response of vascular tissues to harmful stimuli, such as

pathogens, damaged cells, or irritants<sup>[5]</sup>. The classical signs of acute inflammation are pain, heat, redness, swelling, and loss of function. Therefore, there is a need to develop alternative antimicrobial agents for the treatment of infectious diseases from medicinal plants. Recent study showed that some of the selected medicinal plants from Nepal and India significant analgesic and anti-inflammatory activities with the relation to their phytochemical compositions<sup>[6,7]</sup>. In the past few years, our team has conducted the several researches on Nepalese medicinal plants against human pathogenic microorganisms<sup>[8-14]</sup>. Therefore, it is always matter of interest to search a new Nepali plant for pharmacological properties with different aspect. The literate survey shows that there exists a research gap pertaining to specific study on antimicrobial and anti-inflammatory activity of *Dioscorea deltoidea* Wall.ex Griseb. from Nepal. Therefore, this is a first attempt to evaluate the antimicrobial and activities of *Dioscorea deltoidea* Wall.ex Griseb. from eastern Nepal.

**MATERIALS AND METHODS**

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### Plant material

The rhizomes of *Dioscorea deltoidea* Wall.ex Griseb. were collected from Terhathum District of Eastern Nepal in June, 2014. The plant was authenticated by Rajendra Gyawali, Assistant professor of Kathmandu University, where a voucher, specimen number, has been deposited for future reference. The samples were air-dried at room temperature, powdered, rhizomes were extracted in methanol by using Soxhlets apparatus and methanol was evaporated by using water bath.

### Phytochemical screening

The phytochemical screening of methanol extract was done to identify the main groups of chemical constituents present in methanol extract of *Dioscorea deltoidea* Wall.ex Griseb. their color reaction [15].

### Test organism

Bacterial stain of *Staphylococcus aureus*, *Salmonella typhi*, *Escherichia coli* and *Pseudomonas aeruginosa* and fungal stain of *Candida albicans* were obtained by Department of Microbiology, National Medicines Laboratory (NML), Kathmandu, Nepal. The microorganisms were kept under refrigeration (4°C) until use. Experiments were conducted as per the procedure given in literature [16,17].

### Antimicrobial activity

Different concentrations of the methanolic extract were prepared in distilled water and 50µl of the extract at different concentrations was loaded on sterile filter paper discs measuring 6mm in diameter, so that the concentration of the extract on each disc was 5% and 10% respectively. The agar diffusion method was used, 24% transmittance bacteria culture solution was added in SCDA and Mackonkey agar, and fungal culture solution was added in SDA at 40-50°C. The culture solution of bacteria and fungi used was 4ml for 350 ml media. Then it was mixed and about 25 ml of media was poured into petric plates. Then it was kept about one hour. The 50µl sample, standard solution were kept in bores which were prepared by sterilized borer. It was allowed to diffuse about one and half hours and were incubated at 37°C for 24 hours. Wile SDA were incubated at 25°C for 24-48 hrs. After incubation, the zone of inhibition was measured. Standard antibiotic reference of ciprofloxacin and Ketacoazole was used as positive control for bacteria and fungi respectively. The reference standards were obtained from National Medicines Laboratory, Nepal.

### Anti-inflammatory Test

Study was carried out by using standard published methods; and carrageenan induced paw edema was used for anti-inflammatory activity [18]. The Wistar rats were used for the study. They were divided into 3 groups of 6 animals each group with either sex. To carried out test, Group 1<sup>st</sup> keep as the standard, group 2<sup>nd</sup> as the extract test and group 3<sup>rd</sup> as control. The marking was fixed in each right paw of each group rat. Then, initial reading of each group right paw was taken with the help of plathesmmometer (Medicaid PM-707 Delhi, E-16/17 Sector 8, Rohini, Delhi-110085). The three groups of rats were injected with 0.1ml (1%) carrageenan in the right hind paw of each rat under the sub-planter region respectively. Test group were administered the extract (200mg/kg) by intraperitoneal route 1 hour before the carrageenan injection. The control groups administered the dimethyl sulphoxide (DMSO), while Diclofenac 100mg /kg was used as reference for positive control. Then, the reading of the right paw was taken at 1 h and 3 h intervals.

## RESULTS AND DISCUSSION

### Antimicrobial properties

The pattern of inhibition was seen against bacteria at a particular concentration in selective manner. At higher concentrations, the extract also showed good inhibitions. The 5% and 10% methanolic extract of *Dioscorea deltoidea* Wall.ex Griseb. showed significant activity against *S. aureus* and *E. coli* but this concentration does not show activity against *S. typhi* and *P. aeruginosa*. It has greater antibacterial activity against *S. aureus* than *E. coli*. Similar type of result has been reported from alcoholic extract of Indian originated *Dioscorea deltoidea* Wall.ex Griseb. and shown remarkable effect on *S. aureus* and *E. coli* [19].

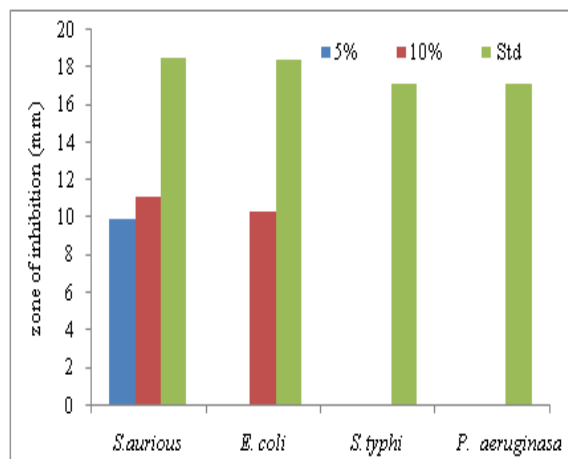
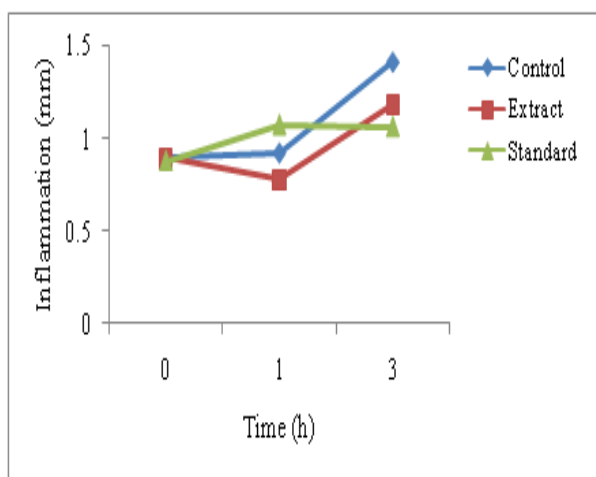


Figure 1: Antimicrobial activity of methanolic extract of *Dioscorea deltoidea* Wall.ex Griseb. in comparison to Ciprofloxacin

These concentrations have also shown slight effect on *Candida albicans* which was 9.03 at 10 % concentration and standard was Ketoconazole (18.30mm). This result is also agree with previous findings on same fungal stain <sup>[19]</sup>.

### Anti inflammatory properties

Extracts showed the dose dependent anti-inflammatory property and was not as potent as standard drug Diclofenac. The maximum percentage of inhibition was found by extract at 3 h interval of extract administration (200mg/kg), which was satisfactory than control. This data shows that the positive response of methanolic extract at 3 h interval of administration extract in carrageenan induced inflammation in the rats.



**Figure 2: Anti-inflammatory activity of methanolic extract of *Dioscorea deltoidea* Wall.ex Griseb. in comparison to Diclofenac**

The results from the preliminary phytochemical screening of the methanolic extract studies showed the presence of alkaloids, flavonoids, tannins, glycosides, amino acids, carbohydrates and terpenoids.

The study concluded that the *Dioscorea deltoidea* Wall.ex Griseb. is rich in carbohydrates, amino acids, flavonoids, glycosides, tannins, alkaloids and terpenoids. The methanolic extract of *Dioscorea deltoidea* Wall.ex Griseb. showed that potent antibacterial and anti fungal activity at 5% and 10% concentration of sample against *S. aureus* and *E. coli*. property of methanolic extract is good at 3 h interval of administration extract of *Dioscorea deltoidea* Wall.ex Griseb. in carrageenan induced inflammation in the rats.

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