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Research Article

Hypoglycemic and Analgesic effects of Methanolic Extracts of *Sonchus arvensis* from Nepal

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ABSTRACT
Sonchus arvensis, a perennial sowthistle, has been least explored in Nepal. Although, several uses like anti inflammatory, sedative, antioxidant and kidney stone eradicating properties has been identified till date, study on hypoglycaemic and analgesic activity is not done till date. Therefore, the plant was collected from Kathmandu; aerial parts of the plant were dried, crushed, and extracted using a Soxhlet apparatus. The methanolic extract was concentrated for studying hypoglycemic and analgesic effects. Hypoglycemic effect in rats showed significant reduction in both normal and glucose loaded rats in a dose-dependent fashion. Similarly, the analgesic effect study using hot plate and chemical writhing method showed significant analgesic effect in dose-dependent manner. Thus, it is concluded that the plant possess strong phyto-chemicals having hypoglycemic and analgesic properties.

Key words: Sonchus, hypoglycemic, analgesic, chemical writhing, extraction

INTRODUCTION

Traditional medicine plays a great potential in the primary health care[1]. Despite the use of herbal medicines over many centuries, only a relatively small number of plant species has been studied for possible medical applications. Safety and efficacy data are available for even smaller number of plants, their extracts and active ingredients and preparations containing them[2]. Sonchus arvensis (Dudhe Jhar in Nepali) is available in range ranging from 1000m to 4100 m in height. It is herbaceous perennial, with milky sap and creeping roots that produce new shoots, to 1.8 m tall. Sonchus arvensis can grow in light (sandy), medium (loamy) and heavy (clay) soils and prefers acid, neutral and basic (alkaline) soils[3]. This plant being noxious, is highly competitive, persistent, and can rapidly colonize new sites by vegetative reproduction[3]. Sonchus arvensis, a traditional and unexplored plant, was selected for the present work in order to develop scientific data for its hypoglycemic and analgesic properties so that it could be scaled for further investigation on its metabolites or chemical constituents responsible for those properties.

MATERIALS AND METHODS

Sample Preparation

Samples of the plant were collected from Nagarjun Hill, Kathmandu, Nepal. The aerial parts of the plant were dried, crushed, and extracted using a Soxhlet apparatus. Twenty grams of the powdered material was extracted with 200 ml volumes of petroleum ether, diethyl ether, methanol, and water, each in a stepwise manner. The extracts were concentrated and stored until used for experiments.

Hypoglcyemic study of methanolic extract in rats with Glucose loading

In this method, 12 hr fasted, healthy adult rats (170g-250g wt.) were divided into 3 groups of 4 animals each. Blood glucose level was measured using Omnitest® EZ Glucometer. Here, group 1 served as control group (glucose group; 3gm/kg body weight) that received 5 ml of water, group 2 as standard, which received the standard drug Glipizide (1mg/kg) dissolved in 5 ml water, group 3 (Test) received methanol extract of 250 mg/kg dissolved in 5 ml of water. Initially blood glucose level was noted, then each rat of Group 1, 2 and 3 were given respective samples intraperitoneally. 30 minutes after the treatment 5 ml of glucose (3 gm/kg) was given orally through a feeding tube to the each animal. Blood was drawn from the tail vein of animals at an interval of 30 minutes and the percentage induced glycemia was estimated[4].

Hypoglcyemic study of methanolic extract in rats without Glucose loading

In this method, the procedure was same as mentioned above except no glucose loading.

Analgesic activity of methanolic extract on mice

Hot plate method: Each mouse was weighed and divided into 5 groups of 3 mice in each. The basal reaction time was taken by observing hand paw licking or jump response in animals when placed on the hot plate maintained at constant temperature of 55°. Normally animals showed such response in 5 to 6 seconds. A cut off period of 15

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Table 1: Hypoglycemic effect of methanolic extract of *S. arvensis* in glucose loaded rats

Group	Dose (mg/kg; po)	No.of animals used (n)	Before treatment (o mins)	Blood glucose level (mg/dl) ± S.E. After treatment at			% Induced Glycemia at 2 hour
				30 mins	60 mins	2 hours	
Control (Glucose)	-	3	81.6667± 4.17665	112.54± 3.1498	126.28± 2.5491	140.6667 ±5.23874	72.24
Standard (Glipizide)	1	3	78.0000± 2.08167	87±2.281	92±1.842	60±3.492	23.07
Methanol Extract	250	3	72.3393± 2.33	119.167±2.641	101.21393± 1.943	93±3.28	

Table 2: Hypoglycemic effect of methanol extract of *S.arvensis* in normal rats

Group	Dose (mg/kg; po)	No.of animals used (n)	Before treatment (o mins)	Blood glucose level (mg/dl) ± S.E. After treatment at			% Induced Glycemia at 1 hr
				30 mins	60 mins	2 hours	
Control	-	3	106.33± 1.85	108.12± 1.459	94± 8.54	97.12±1.16	11.59
Standard (Glipizide)	1	3	117± 1	98±1.295	95±2.33	96±1.17	17.9
Methanol Extract	250	3	76.67± 10.39	74.12± 1.194	39.67± 5.23	47.66±1.297	48.25

Table 3. Aalgesic activity of methanolic extract of S. arvens*is in mice by Hot plate method*

Treatment	Dose (mg/kg; ip)	No of animals used (n)	% of reaction time
Control	-	3	.00± 9.82
M. Extract	62.5	3	55±10.4
M. Extract	125	3	86.11± 32.03
M. Extract	500	3	96.67±17.63
Standard (aspirin)	25	3	31.67±9.27
Standard (aspirin)	100	3	78.33±11.66

Table 4: Analgesic activity of methanolic extract of *S. arvensis* in mice by Chemical writhing method

Treatment	Dose (mg/kg; ip)	No of animals used (n)	Mean stretching episode±S.E.	% protection (n)
Control	-	3	84.33± 9.82	-
M. Extract	62.5	3	54.67±5.03	35.14
M. Extract	125	3	41± 2.64	51.38
M. Extract	500	3	17±1.15	79.84
Standard(aspirin)	25	3	17.33±18.19	79.44
Standard(aspirin)	100	3	13.33±1.76	84.15

second was taken to avoid damage to the paw. After taking the initial reading (response time in seconds), first group was given intraperitoneally 62.5 mg/kg body weight of methanol extracts made in normal saline. The second and third group received IP 125 mg/kg and 500 mg/kg of the methanol extracts respectively. Then another group was given IP 25 mg/kg and 100 mg/kg body weight of aspirin made in normal saline. The control group was given normal saline only and after 30 minutes of the treatment, the response time was noted for each mouse from all the groups. A cut off time of 15 seconds was followed to avoid any thermal injury t

$$\% \text{ Protection} = \frac{\text{Reaction time of final} - \text{Reaction time of initial}}{\text{Reaction time of initial}}$$

Chemical writhing method: For carrying out writhing test, mice were divided in to 5 groups of 3 mice each. The first group was given acetic acid (0.6% w/v, 1ml /100 g body weight) as a control group, which produces within 3 to 10 minutes a writhing or stretching syndrome characterized by a wave of contractions of the abdominal musculature followed by extension of the hind limbs. These were taken as reaction to chemically induced pain. The second and third group was given I.P. 25mg/kg and 100mg/kg body weight of aspirin and remaining three groups were given 62.5mg/kg, 125mg/kg and 500mg/kg of methanol extract of Sonchous arvensis made in distilled water respectively. After 30 minutes, acetic acid (1ml /100 g body weight of 0.6% acetic acid) was given intraperitoneally to the second, third, fourth and fifth groups of mice. After injection total numbering of stretching episodes shown by each mouse within 20 minutes was recorded. The percentage protection

of stretching episode by the extract and standard reference (Aspirin 25mg/kg and 100mg/kg) was calculated[4].

RESULTS AND DISCUSSION

Hypoglcemic effect of methanolic extract in Rats with glucose loading

The extract showed significant reduction of plasma glucose level in dose dependent manner with compared to control. Both extract and standard drug (Glipizide) exhibited maximum hypoglycemic effect at 120 mins. The hypoglycemic effect of methanol extract at 250mg/kg p.o. was comparable to standard drug (Glipizide) at 1mg/kg p.o.

Hypoglcemic effect of methanolic extract in Rats without glucose loading

The extract showed significant hypoglycemic effect in dose dependent manner. The extract and standard (Glipizide) exhibited maximum hypoglycemic effect at 60 mins after treatment. The extract at 250mg/kg p.o. was found comparable to standard drug (Glipizide) at 1mg/kg p.o. The results are tabulated below:

Effect of methanolic extracts of S. arvensis on Analgesic activity in mice

Both the hot plate and chemical writhing experiment showed significant analgesic activity in dose dependent manner.

CONCLUSION

The research carried out in this study showed that the plant exhibits significant hypoglycemic and analgesic activity. It may, therefore, be concluded, that the plant contains constituents which have those properties which may be helpful in generating lead molecules for the development of new and novel analgesic and antidiabetic agents. This study, in addition, may assist in the establishment of a scientific database for the plant. Since, this is only a preliminary study and a more detailed study is still needed to characterize the compounds for further pharmacological investigation.

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