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Research Article

Preliminary Phytochemical Screening and Invitro Antioxidant and Antidiabetic Activity of Aerial Part of Dipsacus inermis W.

Samreen Maqbool*, Nahida Tabassum

Department of Pharmaceutical Sciences (Pharmacology Division), University of Kashmir 190006.

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ABSTRACT

Diabetes mellitus is a chronic disease marked by reduced insulin secretion, impaired insulin action and elevated blood glucose levels, which can cause severe health complications. The plants with medicinal properties play an increasingly important role in food and pharmaceutical industry for their function on disease prevention and treatment. In present study hexane and aqueous extracts of the aerial parts of Dipsacus inermis was evaluated for their antioxidant and antidiabetic activity. Phytochemical screening was done using different laboratory protocols. Antioxidant activities of different extracts were evaluated by DPPH, ABTS scavenging assay and ferric reducing antioxidant power. Invitro antidiabetic activity was determined by in-vitro α-amylase and α-glucosidase inhibition assay. Phytochemical screening showed the presence of phenols, alkaloids, terpenoids etc. In vitro antioxidant activity revealed low IC50 values in scavenging assays thereby indicating the antioxidant potential of the extracts however aqueous extract was found to have more antioxidant potential. In-vitro antidiabetic studies revealed low IC50 values in α-amylase and α-glucosidase assays thereby indicating antidiabetic potential of the extracts however aqueous extract was found to have more antidiabetic potential. It can be concluded that aerial parts of Dipsacus inermis possess antidiabetic and antioxidant potential.

INTRODUCTION

Diabetes mellitus (DM) is a deadly disease characterized by decreased organ responsiveness to released insulin and reduced insulin production, which can be acquired or inherited. Such a deficiency can cause elevated blood glucose levels, which can damage blood vessels and neurons, among other body systems1. By 2030, there will be over 366 million diabetic patients worldwide, up from 171 million in 2000, according to World Health Organization (W.H.O.) projections2. Plants continue to play a significant role in the management of diabetes in

***Corresponding Author:** Samreen Maqbool
Address: *Department of Pharmaceutical Sciences (Pharmacology Division), University of Kashmir 190006.*
Email ✉: samreen.phscscholar@kashmiruniversity.net
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underdeveloped countries, where the majority of the population lacks access to modern medicines and has limited financial resource3. Herbal plants play an important part in medicine because of their innate medicinal effectiveness. Diabetes mellitus and its consequences brought on by the formation of advanced glycation end products are being treated with plant-based medications despite the advances in contemporary medicine. In developed countries, there is a growing interest in alternative diabetes treatment options, such as plant-based drugs, due to the adverse effects of insulin and oral hypoglycemic drugs4. According to WHO recommendations, the use of plant-derived hypoglycemic treatments within traditional medicinal practices holds significant importance5. These therapies which have ability to improve pancreatic tissue function by either increasing insulin production or decreasing intestinal glucose absorption accounts for their anti-hyperglycemic effects. β-cell protection and reduced glucose fluctuation are achieved by the use of herbal medicines. Plants usually include secondary metabolites that contribute to their pharmacological properties, such as phenolics, flavonoids, glycosides, coumarins, saponins, terpenoids, alkaloids, and others, all of which have great therapeutic potential6. Antioxidants, which are found in plants, are also known to have therapeutic potential for a number of illnesses. Furthermore, recent research has demonstrated that plants react remarkably to stresses brought on by a combination of antagonistic abiotic variables as opposed to those induced by a single one.



Fig 1: Picture of whole plant of Dipsacus inermis Wall. taken from the collection site

Dipsacus innermis (Family : Dipsacaceae) belongs to the genus Dipsacus, which has between 28 and 33 species. It is known in Kashmiri as Wopal haakh or Wopal Hak. It has been used in the traditional medicine of the Kashmir Himalayas for stomachic and carminative qualities and is used to treat colds, fevers, coughs, sore throats, general exhaustion, and body aches[7]. It has been reported to possesses anti-inflammatory[7], antibacterial [8], antioxidant properties[7] etc.

MATERIALS AND METHODS

Whole plant of *Dipsacus innermis* (DI) was collected from Gulmarg area of Kashmir, India in August 2022. The plant was authenticated at the Centre for Biodiversity and Taxonomy (CBT) University of Kashmir by Akhtar H Malik Jr. Scientist with voucher specimen number of 9644-KASH. In the present study aerial part of this plant was used. The aerial part was dried in shade for 7 days and then coarsely powdered. The material was then hermetically sealed in a plastic bag and stored at room temperature tilt the preparation of the extract. For the present study hexane and aqueous extract of the aerial part was used.

Preparation of plant extract

The hexane and aqueous extract was prepared by cold maceration. The powdered material (1kg) was placed in the maceration bottle and solvent hexane was added till the whole material was dipped in the solvent. The maceration was continued for 72hrs. It was then filtered and concentrated to dryness using a rotary evaporator. The residue was transferred to a previously weighed Petri dish an again allowed to dry at room temperature till a semi solid mass is obtained. The process was repeated for preparing the aqueous extract of the aerial part. The %age yield was calculated for both hexane and aqueous extract (w/w of dry plant material). The dried extract was kept in the labeled sample bottle and stored in the refrigerator for further use. The two extracts, were evaluated for phytochemical screening, invitro antioxidant and antidiabetic activity using the established methods.

Chemicals and reagents

Hexane, Gallic acid, Dragendroff's reagent, Wagner's reagent, Benedicts reagents, Fehlings solution A& B, Sulfuric acid, HCL, Ninhydrin reagent, NaOH solution, Glacial acetic acid, Rutin, Quercetin, , 2,2-azino-bis (3-ethylbenzothiazoline)-6-sulfonic acid (ABTS), 1,1-diphenyl-2-picryl-hydrazyl (DPPH), ferric chloride, potassium ferricyanide, porcine pancreatic α-amylase, rat intestinal α-glucosidase, and p-nitrophenyl-a-D-glucopyranoside (pNPG). Starch, dinitrosalicylic acid (DNS), and acarbose. All other chemicals and reagents used were of analytical grade.

Phytochemical analysis

Chemical tests for the screening and identification of secondary metabolites present in the extracts of *Dipsacus innermis* were carried for flavonoids, alkaloids, cardiac glycosides, steroids phenols terpenoids, saponins, tannins, and anthraquinones, using standard procedures[9].

Assessment of total phenolic content

The method described by Soobrattee MA et al.2005[10], was used to quantify the phenolic content of the two extracts. A 1 mL aliquot of the extract was combined with 4 mL (75 g/L) of sodium carbonate and 5 mL of Folin–Ciocalteu reagent, which had been previously diluted with water 1:10 v/v. For color development, the tubes were vortexed for 15 seconds and allowed to stand at 40°C for 30 minutes. Spectrophotometer was used to measure absorbance at 765 nm. Extracts at a final concentration of 1 mg/mL were assessed. The standard used was gallic acid. Using the formula derived from a gallic acid calibration curve, the total phenolic content was reported in terms of mg/g gallic acid equivalent[10].

Determination of total flavonoids

Total flavonoids were determined using the method of Kumar V et al.2018[11]. 2 mL of distilled water was added to 0.5 mL of the sample and standard (1 mg/mL), followed by 0.15 mL of 5% NaNO2, and the mixture was kept at 25°C for 5–6 minutes. After adding 0.15 mL of 10% AlCl3, the mixture was left to stand for an additional six minutes. Following the addition of 1 milliliter of 4% NaOH and 5 milliliters of distilled water, the reaction liquid was vortexed for 15 minutes, and a color shift was noted. The spectrophotometer was used to measure the absorbance at 420 nm. Total flavonoid contents were calculated as ascorbic acid (mg/g) equivalent using the equation obtained from a calibration curve of ascorbic acid[11].

In-vitro Antioxidant activity

Hexane and aqueous extracts of *Dipsacus inermis* aerial part was evaluated for antioxidant potential using the following method:

- DPPH radical scavenging assay

- ABTS radical scavenging assay
- Ferric reducing antioxidant assay

DPPH Free Radical Scavenging Assay

The Soler Rivas method[12] was used to assess the in-vitro radical scavenging activity of hexane and aqueous extract of the aerial parts. 3 ml of control (an equivalent quantity of methanol) and test solutions at various concentrations (20, 40, 60, 80, and 100 µg/ml) were placed in separate test tubes with 1 ml of a 0.1 mM solution of DDPH in methanol. A UV-visible spectrophotometer was used to detect the absorbance at 517 nm thirty minutes later. The following formula was used to determine the % capacity to scavenge the DPPH radical:

% DPPH scavenged = {(Ac - At)/Ac} x 100

Where Ac = the absorbance of the control and

At = the absorbance of the test sample.

The IC50 value was obtained by linear regression analysis of the dose response curve plotted using % inhibition versus concentration. The ascorbic acid was taken as a reference standard [12] .

ABTS+ radical- scavenging activity (ABTS-RSA)

The scavenging of the ABTS free radical (2,2-azino-bis (3-ethyl benzothiazoline-6-sulfonic acid)) was done by an established method[13]. ABTS radical cation (ABTS•+), by mixing a 7 mM ABTS solution with a 2.45 mM potassium persulphate solution in an equal amount and allowing them to react for 12 to 16 hours in the dark this approach creates a blue-green chromogen,. The blue-green resulting solution was diluted with methanol before to the experiment in order to achieve an initial absorbance of 0.702±0.001 at 734 nm. The antioxidant effects were observed by combining 1 ml of ABTS solution with 00–50 µl of test samples to make 1 ml. The absorbance was measured at 734 nm after 5–7 minutes. The decrease in absorbance was caused by the ABTS radical cation's hydrogen-donating availability, which caused the color of ABTS•+ radical cation to change to colorless ABTS[13]. The following formula was used to calculate the percentage of ABTS•+ radicals' capacity to scavenge free radicals at various concentrations:

FRSA (%) = [(Absorbance of control - Absorbance of test)/ Absorbance of control] ×100

The IC50 value was obtained by linear regression analysis of the dose response curve plotted using % inhibition versus concentration. The Quercetin was taken as a reference standard.

Ferric reducing antioxidant power

The antioxidant power of ferric reduction was assessed using the method of Benzie and strain 1996[14]. A solution of 1% potassium ferricyanide [K3Fe(CN)6] and 2.5 mL of 0.2 M sodium phosphate buffer (pH 6.6) were mixed with varying amounts of *Dipsacus innermis* extract (10–50 µg/mL). Using a vortex shaker, the reaction mixture was thoroughly vortexed before being incubated for 20 minutes at 50°C. After the mixture had been incubated, 2.5 mL of 10% trichloroacetic acid was added, and it was centrifuged for 10 minutes at 3,000 rpm. 0.5 mL of 0.1% ferric chloride and 2.5 mL of deionized water were combined with the supernatant (2.5 mL). Using a UV Spectrophotometer, the colored solution was measured at 700 nm in relation to the blank using a standard. Ascorbic acid served as the reference standard in this case, and the samples reducing powers were comparable to that of the reference standard [14].

In-vitro antidiabetic activity

The in-vitro antidiabetic activity of the two extracts was evaluated using the methods:

- α-amylase inhibition assay
- α-glucosidase assay

α-amylase inhibition assay

For this experiment, the protocol created by earlier researchers was used[15]. 1.5 ml each of the α -amylase enzyme (1%) prepared in phosphate buffer (6.8 pH), and 1.5 ml of each extract of hexane and aqueous separately at different strengths and acarbose (100–400 g/ml) as standard antidiabetic drug, were mixed together. The mixture was incubated for 20 minutes at room temperature before 2 milliliters of a 1% starch solution was added. The aforementioned mixture was incubated for 30 minutes at 37 °C. After that 1.5 milliliters of the 3,5-dinitro salicylic acid reagent was then added to the mixture. The mixture was immersed in a bath of hot water for five minutes. A UV-visible spectrophotometer was used to measure the absorbance at 540 nm. Following the completion of three duplicates of each experiment, the average was determined [15] .

Finally, the percentage inhibition of α-amylase inhibition was calculated as:

%inhibition=A0-A1/A0×100where

A0 = The absorbance of control.

A1 = The absorbance of the test or standard.

α-glucosidase inhibition assay

Using the Vennila and Pavithra (2015) method [16], the inhibitory activity was evaluated by mixing several concentrations of the sample (100–500 µg/ml) with 1 ml of starch solution (2% w/v maltose) in 0.2 M tris buffer (pH 8). The reaction mixture was incubated at 37 °C for 10 minutes. The reaction was initiated by adding 1 ml of alpha-glucosidase enzyme (1 U/ml), and it was then incubated for 40 minutes at 35 °C. The reaction was then stopped by adding 2 cc of 6 N HCl. At 540 nm, a spectrophotometer was used to quantify the color's intensity based on the earlier method of Vennila and Pavithra, 2015 with modification [16].

The percentage inhibition was calculated as:

Percent inhibition=Absorbance of control-Absorbance of sample/ Absorbance of control×100 IC50 values for each test technique were computed. The inhibitory concentration (IC50) value is the quantity of inhibitor required to reduce a substance's effect by 50% under test conditions. The IC50 values were obtained from the mean inhibitory values and plotted as a function of the percent inhibition vs the log inhibitor concentration.

Statistical analysis

The data obtained will be expressed as Mean ± standard deviation (SD) and all experimental analyses were carried out in triplicate.

RESULT AND DISCUSSION

Phytochemical screening

Preliminary phytochemical screening of *Dipsacus inermis* aerial part hexane and aqueous extract showed that the plant is rich in various active ingredients (secondary plant metabolites). The result of the phytochemical screening revealed strong to moderate presence of alkaloids, phenolics, tannins, cardiac glycosides, terpenes, saponins, in hexane extract **(Table 1)** and alkaloids, tannins, flavonoids, phenols, carbohydrates, glycosides, saponins in the aqueous

extract of the plant *Dipsacus inermis* aerial part respectively **(Table 1)**

Table 1: Phytochemicals present in the hexane and aqueous extract of aerial part *Dipsacus inermis*

Test	Extract of Aerial parts of *Dipsacus inermis*	
	Hexane	Aqueous
Alkaloids		
Dragendroff's/ Kraut's	+	+
Wagners test	+	+
Carbohydrates		
Fehling's test		+
Benedict's test	_	+
Molish's test	_	+
Flavonoids		
Alkaline reagent test	+	+
Shinoda's test	_	+
Saponins		
Foam test	**+**	**+**
Phenols		
Iodine test	+	+
Ferric chloride test	+	+
Terpenoids	-	+
Proteins	-	-
Tannins	+	+
Glycosides		
Keller Killani test	+	++
Phytosterols	-	++
Coumarins	+	+
Anthraquinones	-	-

Total Phenolic Content

Total phenolic content was found to be 66.08 and 98.25 (mg GAE/g dry extract) for hexane aqueous extract of aerial part of *Dipsacus inermis* respectively **(Table 2).** Total flavonoid content was found to be 45.9 (RE) mg/g of dry extract for hexane extract and 25.4 (RE)mg/g of dry extract for aqueous extract of *Dipsacus inermis* aerial part respectively **(Table 2)**

Table 2: Total phenolic and flavonoid content in hexane and aqueous extracts of aerial part of Dipsacus *inermis*

Extract	Total Phenolic Content		Total Flavonoid Content	
	Concentration µg/ml	mg/g of GAE of dried extract of *Dipascus inermis*	Concentration µg/ml	mg/g of Rutin of dried extract of *Dipascus inermis*
Hexane	30ug/ml	66.12±0.064	60ug/ml	25.63±0.251
Aqueous	30ug/ml	98.15±0.218	60ug/ml	49.5±0.5

Values are expressed as mean ± SD, n=3

In-vitro Antioxidant Activity

The in-vitro antioxidant activity was evaluated using different methods

DPPH radical scavenging assay, ABTS radical Scavenging assay, Ferric reducing antioxidant power

DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay

DPPH radical scavenging potential of Dipsacus inermis aerial part hexane and aqueous extract at different concentrations investigated in the present study was determined together with standard antioxidant (ascorbic acid). Dipsacus inermis (hexane and aqueous extract) showed significant scavenging effect on DPPH free radical in concentration dependent manner. When compared with standard antioxidant used in the experiment, the extracts showed relatively lower DPPH free radical scavenging potential (Fig 2).

Table 3: IC50 value of standard and aqueous and hexane extract of aerial part of Dipsacus inermis

Sample	IC50 µg/ml
Ascorbic acid	2.227 ±0.063
Aqueous extract	22.54 ±0.426
Hexane extract	121.89±0.1050

Values are expressed as mean ± SD, n=3

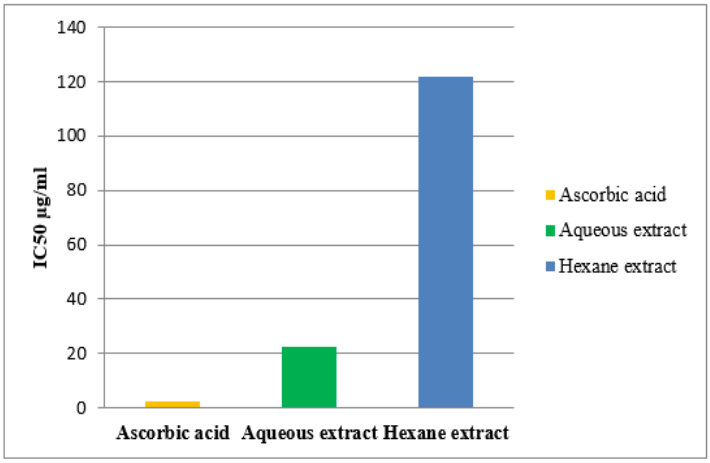


Fig 2: Effect of hexane and aqueous extracts of aerial part of Dipsacus inermis on DPPH radical scavenging activity (IC50 µg/ml) using Ascorbic acid as standard

ABTS Free Radical Scavenging

ABTS radical scavenging potential of Dipsacus inermis aerial part hexane and aqueous extract at different concentrations investigated in the present study was determined together with standard antioxidant (Quercetin) at the same concentrations. Dipsacus inermis (hexane and aqueous extract) showed significant scavenging effect on ABTS free radical in concentration dependent manner. When compared with standard antioxidant used in the experiment, the extracts showed relatively lower ABTS free radical scavenging potential (Fig 6).

Table 4: IC50 of standard nad aqueous and hexane extract of aerial part of Dipsacus inermis

Sample	IC50 value
Quercetin	5.13±0.0071
Aqueous	93.6±0.104
Hexane	200.8±0.064

Values are expressed as mean ± SD, n=3

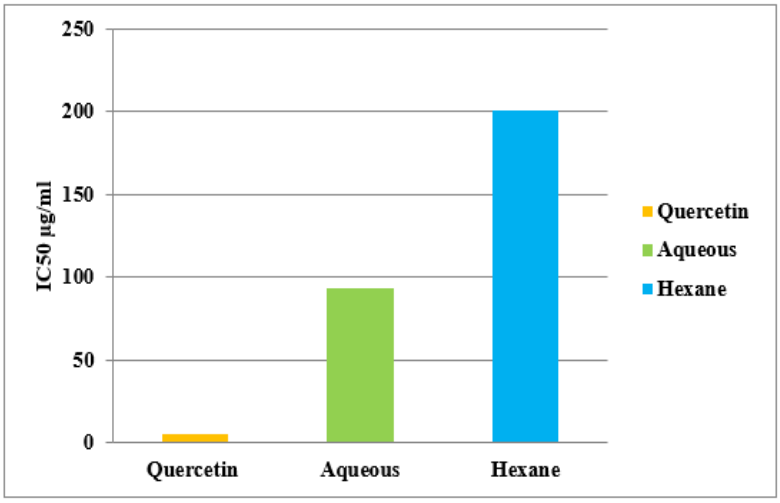


Fig 3: Effect of hexane and aqueous extracts of aerial part of *Dipsacus inermis* on ABTS radical scavenging activity (IC50µg/ml) using Quercetin as standard

Ferric Reducing Antioxidant Assay

The ferric reducing antioxidant power was determined in both the extracts of plant *Dipsacus inermis* against standard ascorbic acid **(Fig 4).** It was seen with the increase in the concentration of the extract the reducing power activity increased **(Fig 4)**

Table 5: Ferric reducing antioxidant power of hexane and aqueous extract of aerial part of *Dipsacus inermis*

Sample	Concentration	Absorbance
Hexane	10	0.01647±0.0001
	20	0.0364± 0.0002
	30	0.0761 ±0.0001
	40	0.09387± 00006
	50	0.1083± 0.00006
	60	0.1343 ±0.0001
Aqueous	10	0.0456± 0.0001
	20	0.1353±0.00006
	30	0.2203±0.00026
	40	0.2601±0.0001
	50	0.3780± 0.00006
	60	0.4241±0.0001

Values are expressed as mean ± SD, n=3

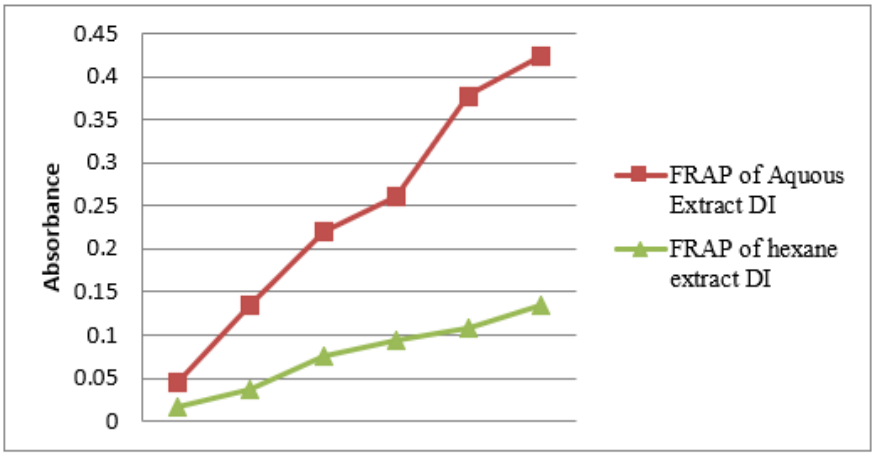


Fig 4: Effect of hexane and aqueous extracts of aerial part of Dipsacus inermis on ferric reducing antioxidant power (FRAP) using Ascorbic acid as standard

In-vitro Antidiabetic Activity: Different methods were used to evaluate the in-vitro antidiabetic activity like in-vitro α-amylase inhibition, in-vitro α- gulcosidase inhibition.

α-amylase Inhibition Assay

α-amylase inhibition assay of Dipsacus inermis aerial part hexane and aqueous extract at different concentrations was investigated in the present study together with standard acarbose. The IC50 values of the extracts compared to the standard are given in the Table 6.

α-gulcosidase Inhibitory Activity:

α-glucosidase inhibition assay of Dipsacus inermis aerial part hexane and aqueous extract at different concentrations was investigated in the present study together with standard acarbose. The IC50 values of the extracts compared to the standard are given in the Table 6.

Table 6: Effect of hexane and aqueous extracts of aerial part of Dipsacus inermis on α-amylase (IC50 µg/ml) and α-glucosidase (IC50 µg/ml) inhibitory activity using acarbose as standard.

Sample	α- Amylase activity IC50 value (µg/ml)	α-glucosidase activity IC50 value (µg/ml)
Acarbose	18.76 ± 0.022	7.9±0.012

Aqueous DI	190.4 ± 0.079	149.7±0.034
Hexane DI	916.4 ± 0.041	385.4±0.042

Values are expressed as mean ± SD, n=3

DISCUSSION

Diabetes significantly impacts the well-being, quality of life, and lifespan of patients, while also placing a substantial burden on healthcare systems. From the past many years people are shifting towards the natural products isolated from many plant sources used for prevention and treatment of various diseases like heart diseases, high blood pressure and diabetes. Around the world 800 medicinal plants are known to have antidiabetic activity, and 450 of these have been proven to have anti-diabetic properties. Out of these, 109 plants have been fully understood mechanisms for treating diabetes[18]. In the present study *Dipsacus inermis* aerial part was being evaluated for the invitro antioxidant and antidiabetic activities. Around 11 genera and 290 species have been reported for Dipsacus. *Dipsacus asper*[19] and asperoides has been reported to posses antidaibetic activity[20]. But no data is available for antidiabetic potential of *Dipsacus inermis***.** The present study indicated the presence of different phytoconstituents like phenol, terpenoids, alkaloids and flavonoids in the aerial parts which may be responsible for the anti diabetic activity. These constituents have been demonstrated to have antidaibaetic activity [21].The phytochemical analysis of hexane and aqueous extracts of *Dipsacus inermis* aerial part revealed the presence of several phytochemicals: saponins, phenolics, flavonoids, tannins, alkaloids, triterpenes, and glycosides. The extracts showed good DPPH, ABTS radical scavenging and ferric reducing antioxidant power. The extracts showed the inhibition of α- amylase and α- glucosidase there by pointing towards their antidiabetic potential.

CONCLUSION

It can be concluded from the study that hexane and aqueous extract of aerial parts of *Dipsacus inermis* possesses antidaibetic potential however aqueous extract was found to be more effective because of the lower IC50 values seen in radical scavenging antioxidant assays and more inhibition of α-amylase and α-glucosidase.

Abbreviations Used

ABTS	2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)
CBT	Centre for biodiversity and taxonomy
DI	*Dipsacus inermis*
DM	Diabetes mellitus
DNS	Dinitrosalicylic acid
DPPH	2,2-diphenyl-1-picrylhydrazyl
FRAP	Ferric reducing antioxidant power
HCL	Hydrochloric acid
IC 50	Half maximal inhibitory concentration
pNPG	p-nitrophenyl-a-D-glucopyranoside
RSA	Radical scavenging activity
SD	Standard deviation
WHO	World Health Organization

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REFERENCES

1. Das S. K, Samanta L, Thatoi H. In vitro antidiabetic and antioxidant potentials of leaf and stem bark extracts of a mangrove plant, Xylocarpus granatum. Journal of Herbs, Spices & Medicinal Plants. 2016; 22(2): 105-117.

2. World Health Organization, 2024.
3. Singh VP, Bali A, Singh N, Jaggi AS. Advanced glycation end products and diabetic complications. Korean J Physiol Pharmacol. 2014 Feb;18(1):1-14.
4. Poongunran, J., Perera, H. K. I., Fernando, W. I. T., Jayasinghe, L. and Sivakanesan, R. α-Glucosidase and α-Amylase Inhibitory Activities of Nine Sri Lankan Antidiabetic Plants".Journal of Pharmaceutical Research International, (2015) 7(5), pp. 365–374.
5. Geethalakshmi R and Sarada DVL. α-amylase inhibitory activity of Trianthema decandra L. Journal of biotechnology and biochemistry.6(3)2010,pp. 369-376.
6. Chelladurai GRM and Chinnachamy C. Alpha amylase and Alpha glucosidase inhibitory effects of aqueous stem extract of Salacia oblonga and its GC-MS analysis. Braz. J. Pharm. Sci. 201854 (01).
7. Hassan S, Sajjad N, Khan SU, Gupta S, Bhat MA, Ali R, Ahmad Z, Ganie SA, Hamid R. Dipsacus inermis Wall. modulates inflammation by inhibiting NF-κB pathway: An in vitro and in vivo study.Journal of Ethnopharmacology. Volume 254.2020.
8. Wani I, Manzoor N, Singh K, Pal A. Invitro phytochemical and antimicrobial activity of Dipsacus inermis in Kashmir Valley. International Journal of Science and Research. Volume 6 Issue 3, March 2017.
9. Shaikh JR, MK Patil. Qualitative tests for preliminary phytochemical screening: An overview. Int J Chem Stud 2020;8(2):603-608.
10. Soobrattee MA, Neergheen VS, Luximon-Ramma A, Aruoma OI, Bahorun T. Phenolics as potential antioxidant therapeutic agents: mechanism and actions. Mutat Res. 2005 Nov 11;579(1-2):200-13.
11. Kumar, V., Suman, U., Rubal, Yadav, S.K. Flavonoid Secondary Metabolite: Biosynthesis and Role in Growth and Development in Plants. In: Yadav, S., Kumar, V., Singh, S. (eds) Recent Trends and Techniques in Plant Metabolic Engineering. Springer, Singapore(2018).
12. Soler-Rivas C, Espin JC, Wichers HJ. Characterization of the Total Free Radical Scavenger Capacity of Vegetable Oils and Oil Fractions Using 2,2-Diphenyl-1-picrylhydrazyl Radical. Journal of Agriculture and food chemistry. 2000, 48(3),.
13. Meena H.; Pandey H.K.; Pandey P.; Arya M.C. & Ahmed Z. Evaluation of antioxidant activity of two important memory enhancing medicinal plants Baccopa monnieri and Centella asiatica. Indian J. Pharmacol., 2012, 44, 114-7.
14. Benzie IF, Strain JJ. The ferric reducing ability of plasma (FRAP) as a measure of "antioxidant power": the FRAP assay. Anal Biochem. 1996 Jul 15;239(1):70-6.
15. Pant G, Sai J, Babasaheb S, Reddy P, Mudaliar S. In vitro α-amylase and α-Glucosidase inhibitor activity of Abutilon indicum leaves. Asian Journal of Pharmaceutical and Clinical Research. 2013;6,22-24,.
16. Ramachandran S, Rajasekaran A, Adhirajan N. In Vivo and In Vitro Antidiabetic Activity of Terminalia paniculata Bark: An Evaluation of Possible Phytoconstituents and Mechanisms for Blood Glucose Control in Diabetes. ISRN Pharmacol. 2013 Jul 14.
17. Vennila V and Pavithra V. In-vitro alpha amylase and alpha glucosidase inhibitory activity of various solvent extracts of Hybanthus enneaspermus linn. World journal of pharmacy and pharmaceutical sciences. 2015 4(4),.
18. Babar A, Jadhav V and Gole V. A review of medicinal plants with potential antidiabetic effect. Journal of Medicinal Plants Studies 2025; 13(2): 275-282

19. Li T, Hua Q, Li N, Cui Y, Zhao M. Protective effect of a polysaccharide from Dipsacus asper Wall on streptozotocin (STZ)-induced diabetic nephropathy in rat.International Journal of Biological Macromolecules.Volume 133,2019,Pages 1194-1200.
20. Wang Z, Liu X, Whang W.Deciphering the anti-diabetic potential of Dipsacus asperoides root: Identification of active compounds and quality assessment.Journal of Agriculture and Food Research.Volume 18,2024,101375.
21. Firdous SM. Phytochemicals for treatment of diabetes. EXCLI J. 2014 ;13:451-3.

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