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Antidiabetic Properties of Matricaria Recutita Extract in Alloxan-Induced Diabetic Rats

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Summary

Matricaria recutita, once it has been called as Marticaria chamomilla, Chamomilla recutita, and Chamomilum nobile family Asteraceae. Matricaria recutita shows different pharmacological activities like anti-inflammatory, anti- cancer, treatment of stress and depression, anti-allergic etc. The present study investigates the antidiabetic potential of Matricaria recutita extract in alloxan-induced diabetic rats. The effects of an ethanolic extract of Matricaria recutita on serum glucose, total cholesterol, triglycerides, plasma insulin and liver glycogen were examined in control and experimental groups. Matricaria recutita extract reduced the serum glucose concentration at 24, 48 and 72 hours. To verify the activity sub-chronically, the extract administered orally in the doses of 25, 50 and 100 mg/kg to diabetic rats for 30 days, that significantly reduced the level of glucose, total cholesterol and triglycerides with an increase in insulin and glycogen concentration to near normal levels in a dose-dependent manner. The results indicate that Matricaria recutita extract possess antidiabetic potential in alloxan-induced diabetic rats.

Keywords: Matricaria recutita, Antidiabetic activity, alloxan-induced diabetic rat.

Introduction

Matricaria recutita, once it has been called as Marticaria chamomilla, Chamomilla recutita, and Chamomilum nobile family Asteraceae and commonly it is known as German chamomile, Roman chamomile, English chamomile, Camomilla, and Flos Chamomile (1, 2) It mainly grows indigenously in Europe, NW. Asia, N. Africa, and cultivated in N. America and in many parts of the world (1, 3).This herb has been used as herbal remedies for thousands of years. One of the most commonly consumed single ingredient herbal tea is chamomile, prepared with dried flowers from Matricaria recutita. The composite flower is white in color with a yellowish orange center (1). Infusions and essential oils from fresh or dried flower heads have aromatic, flavoring and coloring properties. Both are used in a number of commercial products including soaps, detergents, perfumes, lotions, ointments, hair products, baked goods, confections, alcoholic beverages and herbal teas. Chamomile flowers contain 0.24- to 2.0 percent volatile oil that is blue in color (1, 3). Matricaria recutita is well known for its pharmaceutical properties including; anti-inflammatory (4, 5), immunomodulatory activity (6), arcaricadal property (7), anti-cancer activity (8), antipruritic effect (9), wound healing property (10-13), treatment of oral mucositis (14), intracanal irrigant (15), Treatment of infant botulism (16), treatment of gastrointestinal disorders (17), antimicrobial activity (18), antiulcer activity (19), treatment of stress and depression (20), anti-allergic activity (21), antisolar agent (22), inhibition of poliovirus replication (23), anxiolytic agent (24), Prevent osteoporosis (25). With regard to these properties,

this study was undertaken to evaluate the antidiabetic activity of ethanolic extract of Matricaria recutita, since up to now no pharmacological evaluation has been done on Matricaria recutita for its antidiabetic activity. This prompted us to pursue the activity and was examined for their efficacy and for determination of their possible mechanism of action.

Materials and Methods

Alloxan monohydrate was purchased from Sigma Chemical Company, St Louis, MO, USA. Gliclazide was procured from Dr. Ahmadi Lab, Zabol, Iran. All the other chemicals used were of analytical grade and were purchased from commercial sources. Matricaria recutita was collected during the month of April – June 2011 from Agricultural Research Institute, Zabol University, Zabol, Iran. About 1 kg of Matricaria recutita was chopped into small pieces, shade dried, coarsely powdered and exhaustively extracted with ethanol by cold percolation method. After 72 hours, the solvent was decanted and distilled-off over boiling water bath. Further concentrations were done under reduced pressure using rotary flash evaporator and finally dried in a desecrator. Adult male albino rats of Wistar strain weighing 150 - 200 g used for the study were obtained from Razi Institute, Mashhad, Iran. Animals were housed in polypropylene cages and maintained under standard conditions (12 h light and dark cycles, at 25±3º C and 35-60% humidity). Standard pelletized feed and tap water were provided ad libitum. In the present study, thirty six rats were used. Group I: contained six animals that served as control. The remaining 30 animals were given alloxan intra-peritoneally (120 mg/kg body weight) to induce hyperglycemia. After 72 hours, the hyperglycemic conditions in these animals were ensured from their blood glucose values which were above 250 mg/dl. Further they were segregated into five groups containing six animals each and were treated as follows.

Group II - Disease-control (alloxan 120 mg/kg i.p)
Group III - Diabetic + Glidazide (25 mg/kg of Body wt)
Group IV - Diabetic + M. recutita extract (25 mg/kg of Body wt)
Group V - Diabetic + M. recutita extract (50 mg/kg of Body wt)
Group VI - Diabetic + M. recutita extract (100 mg/kg of Body wt)

Serum glucose concentration was measured at 24, 48 and 72 hours from the blood samples. The doses was continued for 30 days and on day 31, the animals were sacrificed by cervical decapitation under mild anesthesia and the blood were collected in tubes with clot activators and heparin to get serum and plasma while the liver was removed immediately, washed with ice-cold saline and stored in deep freezer at -20ºC for glycogen estimation. Plasma insulin was estimated by ELISA method using Biotech-ELX-50, (U.S.), liver glycogen using UV visible spectrophotometer, Serum glucose, total cholesterol and triglycerides were estimated using Randox-*daytona* fully automated random axis analyzer (U.K.). Statistical evaluation of analytical data was done by Student's *t*-test using SPSS package. The values are expressed as the mean ± standard Deviation (S.D) and values with $P<0.01$, $P<0.001$, $P<0.05$ were considered significant.

Results

Table 1 shows the effect of M. recutita extract on serum glucose level in hyperglycemic animals. The level of glucose in animals treated with gliclazide and M. recutita extract (25 mg/kg) for 24, 48 and 72 hours showed a decrease in the level of glucose. In 50 and 100 mg/kg dose, the level of glucose further decreased with 24, 48 and 72 hours, the decrease was drastic in 72 hours.

On observing the response with 100 mg/kg dose for 72 hours, the level of glucose was found near to the control value, thereby indicating the anti diabetic potential of M. recutita. Table 2 illustrates the effect of M. recutita extract for a sub-chronic period of 30 days. The diabetic control rats (Group II) showed a significant increase in glucose, total cholesterol and Triglycerides levels, while plasma insulin and liver glycogen were reduced drastically when compared to the control animals. On treatment with standard drug gliclazide, all the parameters found to attain near normal values. The animals treated with M. recutita extract in different doses (25, 50 and 100 mg/kg) showed dose-dependent decrease in levels of glucose, total cholesterol and triglycerides while increase in plasma insulin and liver glycogen were obtained when compared to the disease-control group.

Table 1: Effect of Matricaria recutita extract on the serum glucose (mg/dl) levels in hyperglycemic rats for 24, 48 and 72 hours.

Treatment (mg/kg)	24 hours	48 hours	72 hours
Group I	114.00 ± 4.89	114.00 ± 5.11	114.00 ± 5.23
Group II	610.54 ± 9.74a***	627.34 ± 8.54a***	636.65 ± 8.98a***
Group III	563.45 ± 8.72b***	435.76 ± 9.51b***	311.23 ± 8.96b***
Group IV	577.32 ± 8.13bNS	389.98 ± 8.92b***	252.72 ± 10.32b***
Group V	436.86 ± 10.83b***	263.23 ± 9.47b***	193.67 ± 8.76b***
Group VI	348.87 ± 9.04b***	176.76 ± 9.87b***	119.11 ± 9.34b***

Values represent mean ± S.D. (n = 6). *P< 0.05, **P<0.01, ***P<0.001 when compared to control animals; NS: Non-significant.

Table 2: Anti diabetic effect of Matricaria recutita extract treated in alloxan-induced rats for 30 days.

Treatment (mg/kg)	Serum glucose (mg/dl)	Plasma insulin (µU/L)	Liver glycogen (mg/gm tissue)	Total cholesterol (mg/dl)	Triglycerides (mg/dl)
Group I	114.00±5.35	14.03±1.93	57.84±2.75	63.11±3.24	66.35±3.49
Group II	493.43±9.32a***	7.86±2.85a***	13.00±2.33a***	112.28±2.63a***	111.87±3.27b***
Group III	107.54±6.86b***	12.14± 1.91b***	27.23±3.31b***	61.23±2.17b***	73.76±3.12b***
Group IV	111.28± 6.74b***	11.45±2.07b***	49.11±3.61b***	71.21±2.85b***	77.71±3.21b***
Group V	98.65±5.32b***	12.03±2.34b***	56.19± 2.75b***	61.83±3.11b***	63.19±3.17b***
Group VI	90.87±6.80b***	15.17±2.13b***	59.27±3.09b***	54.18±3.09b***	56.24±3.64b***

Values represent mean ± S.D. (n = 6). *P< 0.05, **P<0.01, ***P<0.001 when compared to control animals; NS: Non-significant

Discussion

The results of antidiabetic study clearly showed that Matricaria recutita extract produced a significant hypoglycemic action. At 25 mg/kg dose, the activity of Matricaria recutita extract in lowering the serum glucose and promoting glycogen storage was found to be higher than the standard drug. The possible mechanism for this action might be due to the inhibition of the enzyme glycogen phosphorylase, an enzyme that catalyzes the process of glycogenolysis thereby inhibiting glucagon which on feedback inhibition favours the production of insulin as reported by Liu (26). This might be the cause for drastic depletion of glucose and lipid parameters such as total cholesterol and triglyceride in hyperglycemic condition. Further studies are necessary to determine the exact nature of the active principles and mechanism of action of Matricaria recutita extract. From this study we can conclude that Matricaria recutita extract has beneficial effects on blood glucose and lipid abnormalities. It has the potential to impart therapeutic effect in diabetes.

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