Modification Of Antidiabetic Activity of *Galega Officinalis* With Different Drugs

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Abstract: Diabetes mellitus (DM) is a multifactorial metabolic disorder due to damaged insulin emission, insulin activity or both. The sign of hyperglycemia implies that present treatment alternatives legitimately or by implication endeavor to standardize blood glucose levels. In the present study, the detection of phenolic compounds in aqueous-alcoholic extracts from aerial portion of goat's rue showed occurrence of forty-eight compounds, amongst which seven compounds were identified, named as ferulic acid, caffeic acid, quercetin, chicoric acid, rutin, hyperoside, and apigenin. The optimal extractant for the maximum extraction of the flavonoids' totality from goat's rue (Galega officinalis L.) herb has been determined and the fact that the highest yield of flavonoids (0.097%) was extracted with 50% alcoholic extract has been established. Experimental data, obtained within determination of micro elements of goat's rue (Galega officinalis L.) herb, confirmed the presence of manganese, copper and selenium, which are able to enhance the anti-diabetic effect of the medicinal plant material. The drawback of the present treatment choice is that they have symptoms, are costly and past the span of a great many people living in the creating scene.

Keywords: Diabetics, Metformin, Galega officinalis Linn, HPLC chromatogram

INTRODUCTION

Diabetes mellitus (DM) is a complicated metabolic condition necessitating continuous restorative consideration and multifactorial risk reduction procedures. The inability of hypoglycaemia to regulate the condition is demonstrated by damaged insulin emission, insulin activity, or both [1,2]. The sign of hyperglycaemia implies that present treatment alternatives legitimately or by implication endeavour to standardize blood glucose levels. The medicine likes insulin, sulfonylureas, biguanides and thiazolidinedione; and bariatric medical procedure for grown-ups with a weight file (BMI) > 35 kg/m^2 and type 2 DM (T2D) [3,4]. According to the International Diabetes Federation (IDF) reported that 537 million adults were suffering from DM in 2021 and this count is estimated to reach to 643 million by 2030 and 783 million by 2045. Due to the diabetics, 6.7 million people died in 2021[5]. The drawback of the present treatment choice is that they have symptoms, are costly and past the span of a great many people living in the creating scene.

Internationally, offers of natural meds are developing by about 10% yearly. Over 25% of our basic drugs contain probably a few mixes acquired from plants. In less created nations the World Health Organization appraises that 75-80% of the general population depend on plant-based prescriptions for essential medicinal services. The utilization of conventional medication has expanded in created nations likewise, essentially because of the disappointment of present-day prescription to give successful treatment to interminable sicknesses and development of multi sedate safe Bacteria and Parasites. The unfriendly impact of compound medications, addressing of the methodologies and presumptions of allopathic prescription, their expansion in expenses and more prominent free to data on conventional has likewise led to an increment in enthusiasm for elective treatment [6.7].

Plant concentrates have turned into a wellspring of expectation as a wide gathering of therapeutic plant arrangements are accessible that have been utilized throughout the hundreds of years only based on exact proof. Subsequently, it has turned out to be important to return to the restorative plant subordinate conventional prescription framework. From ebb and flow research reports, clearly separate from different plant parts are screened for properties like Anti-incendiary, Anti-microbial, Analgesic, Anti-gaining strength, hypoglycaemic, hypotensive and comparative impacts in creature models mirroring the illness conditions and their manifestations for which such plants are regularly utilized in society prescription [8-11]. In a couple of cases, endeavours are made to detach dynamic standards. It has been contended that the separation of dynamic standards isn't a basic condition for home grown medication and that it is ideal to decide proficiency and different impacts utilizing each plant arrangement the manner in which it is utilized as home grown cure. With one precedent we can say how research is blasting on therapeutic plants [12].

Metformin is dimethyl biguanide. It responds to the liver's decreased glucose output by increasing glucose uptake in peripheral tissues, primarily in the muscles. For a long time, metformin was misunderstood, ridiculed, and outlawed in many countries. However, it is now one of the world's most frequently prescribed pharmaceuticals. Metformin is widely regarded as the drug of choice for most T2D patients since it does not promote weight gain and only slightly impacts a few cardiovascular risk factors [13-16]. Metformin can be drawn legitimately from the utilization in medieval Europe of *Galega officinalis* Linn as home grown prescription. A solution of *G. officinalis* was said to weaken the exceptional pee going with the sickness that came to have the name of DM [17].

Galega officinalis Linn is a lasting herb which is 1m tall. This plant is generally found in the mild locales of the world, and regularly alluded to as goat's mourn. *G. officinalis* was utilized in the European old story's prescription for the treatment and the board of diabetes. The dynamic compound from the concentrate of *G. officinalis* was observed to be guanidine which showed

hypoglycaemic activity. Werner and Bell from Trinity College in Dublin, Ireland, are credited with creating the first combination of metformin in 1922 [18-21].

MATERIALS AND METHODS

Samples of rue goat tree dried, collected and identified by authors in the western regions of Ukraine during flowering (July-August 2018), were used in experimental studies.

The content of trace elements in the above-ground parts of *Galega officinalis L*. is largely determined by the atomic absorption spectrometry by electrical atomization (AAS / EA) by Zeeman post-complete microwave rear - which assists the digestion of plant material with continuous determination in a formal manner, according to the European Pharmacopoeia, of standard supplements, as described in our previous book.

To choose the right output, it is important to consider the chemical composition of the raw material, as well as to remove the appropriate biological group (BAS), as well as economic efficiency and safety. Flavonoid glycosides are known to be highly soluble in water or alcoholic compounds. When the BAS extraction was obtained from the goat's urine, the concentration of the raw material in the final product was 1:10. Based on the above item ethanol was used as an indicator in varying amounts from 20 to 96%. Exhaust processes are performed at room temperature. The output was obtained in the form of fractional maceration simultaneously for all exhibitions, and the output was compiled and sorted through filter paper.

Phenolic compounds have been identified in the form of high-performance liquid chromatography (HPLC). The Agilent 1200 liquid chromatograph with a chromatographic column XTerra C18 (4.6x250mm; 5µm particle size) was used to conduct research on the HPLC process.

To prepare the cell phase A use a solution of sodium dihydrogen phosphate monohydrate - 0.6 g/L, which is set to pH 2,5 and phosphoric acid; during the cell phase B - acetonitrile solution. Flow rate of 1.0 mL/min per eladi gradient; injection volume samples 100 µL; column temperature thermostat 25 °C. Detection of identical Diode members is performed at wavelength 330 nm. Detection was performed by comparing the storage time values of the peaks in the chromatogram of the solution being tested with the corresponding values of common substances (chlorogenic acid, caffeic acid, ferulic acid, rosmarinic acid, luteolin-7-glycoside, rutin, hyperoside, apigenin-7-glycoside, luteolin, quercitin, apigenin, kaempferol). All reagents and solution solutions comply with the requirements of the State Pharmacopoeia of Ukraine. Ordinary chromatograms, found within the probe, are shown in **fig. 1** and **2.** Limited estimates of total flavonoids in the surface of the goat's rue, expressed as rutin, are made in a spectrophotometric manner, using a complex aluminium structure in the centre. ethanolic additional spectra concentrations. Optical density and absorption are measured on the Carry-50 spectrophotometer.

Test solution: Apply 1.0 mL of tested ethanolic adhesive in a 25 mL measuring flask, add 5 ml of aluminium chloride reagent R to ethanol R, and adjust the volume with 70% ethanol.

Compensation fluid. Dilute 1.0 mL of the test solution to 25.0 mL with 70% ethanol.

Reference solution. 0.05 g (well-measured quantity) of a standard sample of rutin (Sigma) diluted with 50 ml of 70% ethanol during heating in a bath water, cooled and converted the solution volume with the same solvent to 100 mL. 5 mL of 5% aluminium chloride reagent R was added to 1 mL of the obtained solution and prepared with 70% ethanol in a measuring flask of 25 mL.

Compensation fluid. 1 mL of standard rutin sample solution was placed in a 25 mL measuring flask and adjusted volume by 70% ethanol. The quantity of the obtained solutions tested and the reference solution was measured by a spectrophotometer at a height of 410 nm in a cuvette with a 10 mm layer 30 min after adjustment. The content of total flavonoids (X) in the raw material, in percentage, expressed as rutin, is calculated as follows:

where: Ax - apparent density of the tested solution; A0 - apparent congestion of reference solution; m0 - weight of rutin, in mg.

RESULT

Identification of flavonoids and hydroxy cinnamic acids by the HPLC method was conducted in goat's rue (*Galega officinalis* L.) herb extracts. The technique allowed determining a qualitative composition of the analysed medicinal plant material. Totally the presence of 48 phenolic compounds was found. Seven substances were identified: caffeic acid, ferulic acid, chicoric acid, rutin, quercetin, hyperoside, andapigenin. Amongst the identified compounds rutin had the highest contents.

The effect of ethanol concentration on the degree of extraction of flavonoids was studied. It was based on determination of the yield of the total flavonoids by the method of differential spectrophotometry. The optimal range of values for the ethanol concentration for extraction of flavonoids was established as the result of the conducted research, it comprises 50-60%. The highest content of the total of flavonoids (0.0972%) was obtained applying 50% solution of ethanol. Therefore, for further research 50% alcoholic extract of the Goat's rue herb should be taken. Results of quantitative measurement of the flavonoids content in the Goat's rue (*Galega officinalis* L.) herb extract, expressed as rutin, are illustrated in the **Fig. 4.**

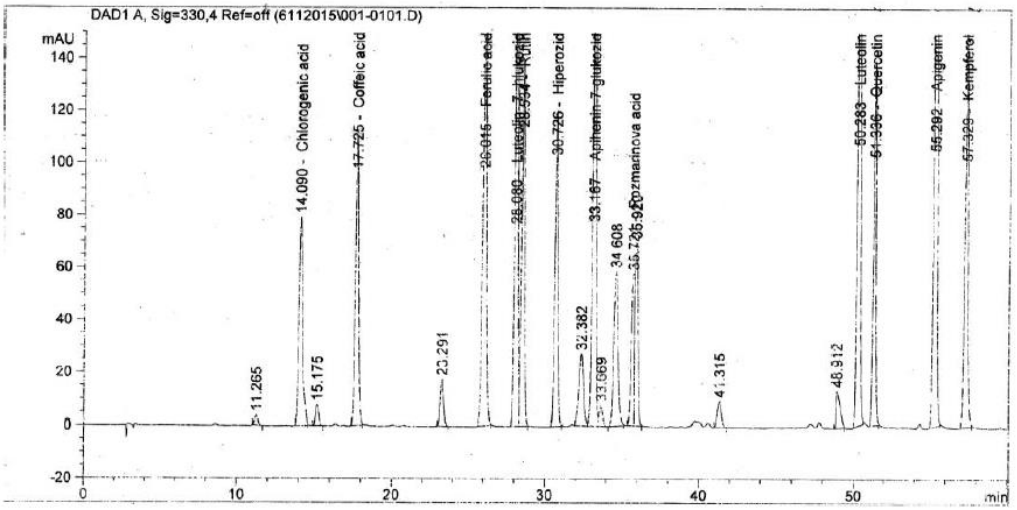

Fig 1: The typical HPLC chromatogram ofstandardsolutions' mixture of flavonoids and hydroxy cinnamic acids

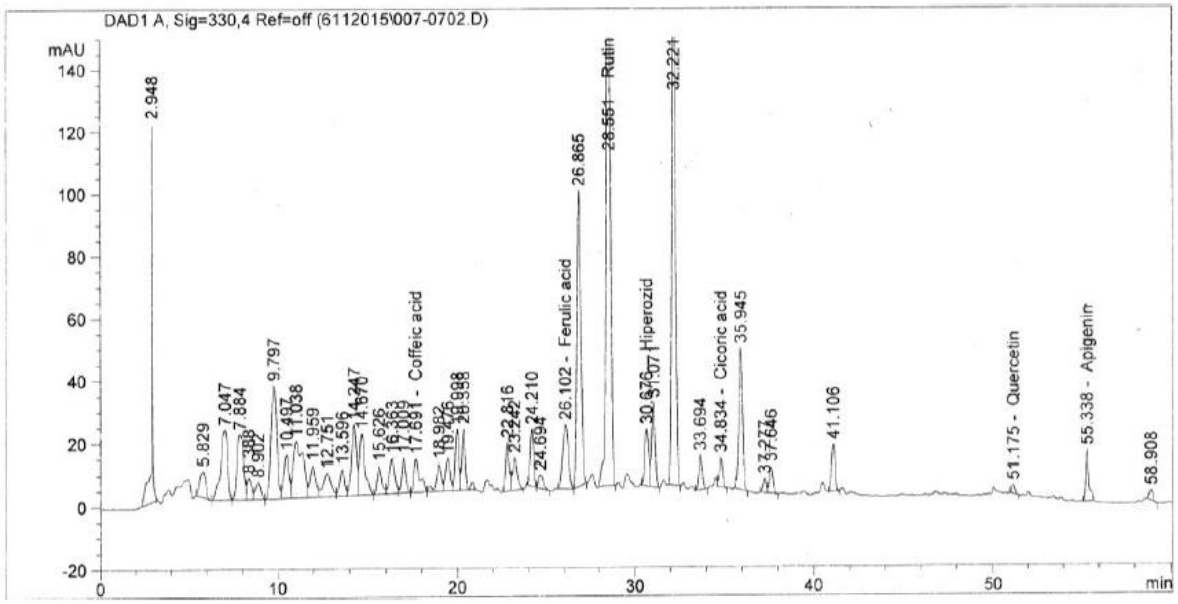

Fig 2: The typical HPLC chromatogram of 50% ethanolic extract of *Galega officinalis* L. herb, obtaining during detection of flavonoids and hydroxy cinnamic acids

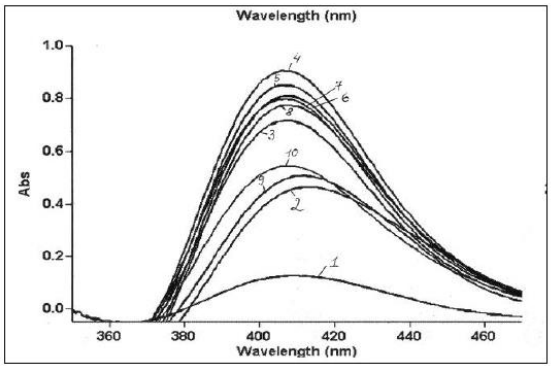

Fig 3: Differential electronic absorption spectra under conditions of quantitative measurement of flavonoids in the Goat's rue herb extracts of different concentration of ethanol: 1-20%; 2 -30%; 3-40%; 4-50%; 5-60%;6-70%; 7-80%; 8-90%; 9-96% ethanol; 10-rutin

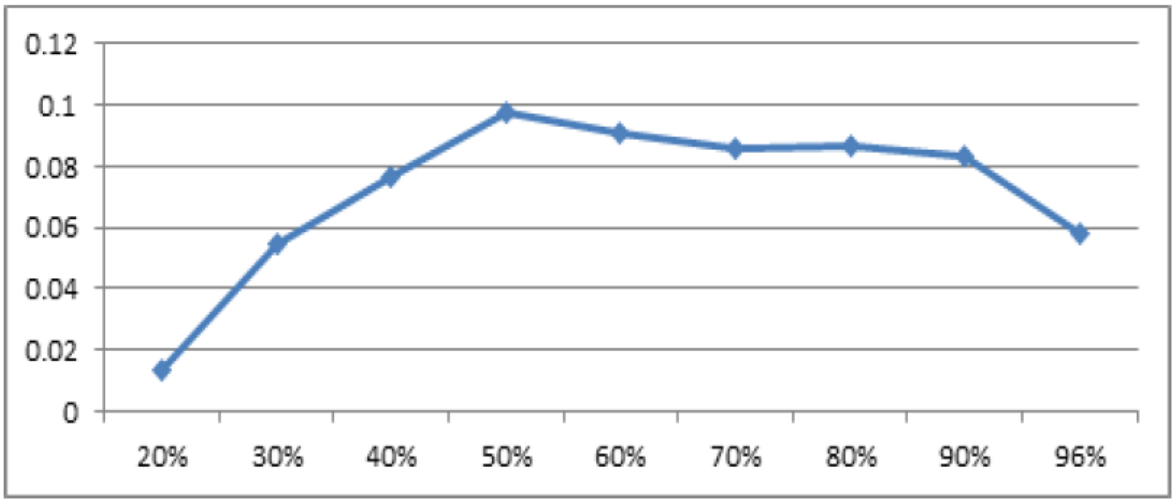

Fig 4: Diagram of dependence for total amount of flavonoids in obtained extracts of above-ground parts of *Galega officinalis* L. from ethanol concentration

As it is shown in the diagram (**Fig.4**), the highest content of flavonoids' totality was obtained using 50% ethanol as an extractant. Trace elements are being studied as possible active principles in hypoglycaemic plants. The mineral fraction of certain medicinal herbs from indigenous folk medicines exhibits higher glucose tolerance factor action than the organic fraction of the plants. The high concentrations of K, Ca, Cr, Mn, Cu, and Zn in several anti-diabetic medicinal plants have been made responsible for stimulation of insulin action. Deficiencies of copper can be an important factor in the development and evolution of chronic diseases such as cardio vascular dysfunction and diabetes. Manganese deficiency is associated with growth impairment, bone abnormalities, diabetic-like carbohydrate changes, in co-ordination, and increased susceptibility to convulsions.

For a more complete estimation of aerial parts of Goat's rue, the study of the contents of micro elements have been carried out in the current research by atomic absorption spectroscopy with electro thermal atomization (AAC/EA) on VARIANAA 240Z after mineralization in the microwave Milestone Start D. The found quantities of trace elements in the analysed samples were as follows: manganese–23.8µg/g, copper–14.2µg/g, selenium–0.27µg/g, lead–0.13µg/g, cadmium–0.013µg/g. The determined amounts of lead and cadmium in the investigated samples of above-ground parts of *Galega officinalis* L. comply with the requirements of the European Pharmacopoeia (Monograph 01/2012:1433 "Herbal Drugs): maximum 1.0ppm of cadmium and maximum 5.0ppm of lead, and therefore, might be considered as non-toxic natural source of the essential micro elements manganese, copper and selenium.

CONCLUSION

The development of modern methods for standardization of the extracts from *Galega officinalis* L. and obtained on its basis the standardized drugs of appropriate quality, which allow predicting the expected hypoglycaemic outcome, is highly relevant for the treatment of diabetes mellitus. The results of detection of phenolic compounds in aqueous-alcoholic extracts from aerial portion of goat's rue showed occurrence of 48 compounds, amongst which 7 compounds were identified, such as caffeic acid, ferulic acid, chicoric acid, rutin, quercetin, hyperoside, and apigenin. The optimal extractant for the maximum extraction of the flavonoids' totality from goat's rue (*Galega officinalis* L.) herb has been determined and the fact that the highest yield of flavonoids (0.097%) was extracted with 50% alcoholic extract has been established. Experimental data, obtained within determination of micro elements of goat's rue (*Galega officinalis* L.) herb, confirmed the presence of manganese, copper and selenium, which are able to enhance the anti-diabetic effect of the medicinal plant material.

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