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Isolation and Identification of Antidiabetic Agent from Vechellia Nilotica

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Abstract: -
Diabetes is increasingly affecting a growing number of patients and seriously reducing their quality of life. Use of conventional drugs in diabetes management is expensive, thus, unaffordable to most patients. Furthermore most of these conventional drugs are associated with undesirable side effects. Incorporation of herbal medicine into conventional healthcare system may significantly improve the overall healthcare system. Evaluation of efficacy and safety by scientific method is necessary to validate herbal medicine utilization, in most cases even where efficacy of the plants has been established the standard dosage required to bring about healing is not clear. This study was designed to designed to evaluate the antidiabetic potential of aqueous leaf extracts of Acacia nilotica in alloxan induced diabetic mice. The intraperitoneal route of herbal extract administration was found to be more effective than the oral route. Further, qualitative and quantitative phytochemical screening of aqueous leaf extracts of A. nilotica indicated the presence of phenols, alkaloids, flavonoids, tannins and saponins. However, cardiac glycosides and phylobatanins were not detected.

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I. Introduction :-

Diabetic mellitus is ranked seventh among the leading causes of death and third when its fatal complications are taken into account. Within the human body the pancreas controls blood glucose by producing and releasing the hormones insulin and glucagon, which stabilize blood glucose within the physiological range of 70-120 mg/dl. DM is characterized by a dysfunction of the pancreas, often in combination with reduced insulin sensitivity. Orthodox treatment of diabetes mellitus includes modification of lifestyle, such as diet and exercise and the use of insulin or oral hypoglycemic drugs. Pharmacologic agents target increased insulin secretion, decreased hepatic glucose production and increased sensitivity to insulin . Traditional medicines (TM), are widely used in Africa, including diabetes management because of the high cost associated with orthodox medicines, inadequate health facilities and health care professionals, coupled with inadequate training of health workers. Acacia nilotica is a shrub with an umbrella shaped crown with low branches, which are often scattered. Acacia nilotica is multipurpose nitrogen fixing tree legume that is widespread in Africa and Asia, and occurs in Australia. It is a complex species with nine subspecies, of which six are native to the African tropics and three others are native to the Indian subcontinent. It occurs from sea level to over 2000 m and can withstand extremes of temperature (>50°C) and air dryness but is frost sensitive when young.

Chemical used :-
Acetone, Methanol, Silica gel, Ethanol, Hexane, Chloroform, Buffer solution, HCL buffer

Aqueous Leaf Extracts of Acacia nilotica in Alloxan Induced Diabetic Mice :-

Diabetes is increasingly affecting a growing number of patients and seriously reducing their quality of life. Use of conventional drugs in diabetes management is expensive, thus, unaffordable to most patients. Furthermore most of these conventional drugs are associated with undesirable side effects. Incorporation of herbal medicine into conventional healthcare system may significantly improve the overall healthcare system. Nilotica showed antidiabetic activity. The intraperitoneal route of herbal extract administration was found to be more effective than the oral route. Further qualitative and quantitative phytochemical screening of aqueous leaf extracts of A. nilotica indicated the presence of phenols, alkaloids, flavonoids, tannins and saponins.

However, cardiac glycosides and phylobatanins were not detected.

Isolation and characterization of anti-diabetic component (bioactivityguided fractionation) from Vechellia Nilotica aerial part :

To isolate and characterize antidiabetic component (bioactivity-guided fractionation) from hydro alcoholic extract of Vechellia Nilotica aerial part. Methods: Ten fractions (F1 - F10) were isolated from hydro alcoholic extract of O. sanctum aerial part by column chromatography. All the fractions F1 to F10 were screened for antidiabetic activity in alloxan induced diabetic rats by estimating serum glucose level and lipid parameters. The isolated bioactive component was elucidated on the basis of extensive spectroscopic (UV, IR, MS, 1 H and 13 C NMR) data analysis.

Experimental procedures :-

Preparation of aqueous extract :-

The collected plant materials were chopped into small pieces, dried under shade at room temperature forfour weeks, and then ground into fine powder by a mechanical grinder, followed by sieving through a 40mesh sieve. The extracts were decanted into clean dry conical flasks and then filtered through Whatman filter paper number 1 by use of a Buchner funnel at the biochemistry laboratory of Kenyatta University. The filtrates were stored in a refrigerater at 4ºC. Freeze drying was done in 200 ml portions in a Modulyo freeze dryer (Edward England) for 48 hours and yield of each extract determined, freeze dryed materials were stored in a freezer at -20ºC until the time that they were used.

Extraction and Purification :-

Vechellia Nilotica leaves were extracted by maceration. Briefly, dried and pulverized plant materials (1.7 kg) were extracted with EtOAc (for 3 days) at room temperature (25 C). Removal of the solvent under reduced pressure provided EtOAc extract (GCEA, 465.74 g, 27.36% w/w). A portion of GCEA (200.5 g) was subjected to QCC using silica gel eluting with a gradient of hexanes-EtOAc (100:0 to 0:100), yielding seven major fractions (GC1-GC7) based on TLC analysis. All fractions were prepared for α-glucosidase inhibitory assay, and active fractions were further isolated. Fractions GC1 and GC2 were combined (GC1-2,20.35 g) and was subjected to QCC with silica gel eluting with a gradient of hexanes-EtOAc (100:0 to 0:100) to obtain three fractions (GC1-2A,GC1-2B, and GC1-2C). Fraction GC1-2A (3.27 g) was purified by CC on silica gel using hexanes-EtOAc (1:9) to obtain compounds 9 (8.1 mg), 10 (11.4 mg), and 11 (8.9 mg). Compound 1 (8.9 mg) was obtained from fraction GC1-2B (97.3 mg) by washing with hexanes. Fraction GC3 (3.70g) was subjected to CC on silica gel using EtOAc-hexanes (1:9) to obtain compound 2 (6.2 mg). Fraction GC4 (6.32 g) was isolated by CC on Sephadex LH-20 using 100% MeOH, yielding compound 3 (13.8 mg) and fraction GC4-A (2.13 g), which was further subjected to CC on silica gel using EtOAc-hexanes (2:8) to obtain compound 8 (1.4 mg).

Design :-

The following groups of mice were used for the experiments, group I, normal untreated mice was administered with 0.1 ml physiological saline, group II diabetic untreated mice (the negative control) was administered with 0.1 ml physiological saline, group III, alloxan induced diabetic control mice was administered with 0.06 mg of glibenclamide (for oral based experiment) or insulin (for intraperitoneal based experiment) 3 mg/kg body weight (positive control group) in 0.1 ml physiological saline, group 1V, (diabetic mice treated with 50 mg/kg body weight of plant extracts, Group V, (diabetic mice treated with 100 mg/kg body weight) of plant extract, group V1 (diabetic micetreated with 200 mg/kg body weight of plant extracts), group V11 (diabetic mice treated with 300 mg/kg body weight of plant extract. The extracts were first dissolved in 0.1 ml physiological saline, oral and intraperitoneal routes were used in separate groups as indicated above.

II. Conclusion :-

This project is successfully isolated and identified antidiabetic agents from babool, with compound 2 showing the most promising antidiabetic activity. The findings support the traditional use of babool in diabetes management and suggest a potential avenue for the development of new antidiabetic treatments. From this study it can be concluded that the aqueous leaf extracts of A. nilotica showed antidiabetic activity. The intraperitoneal route of herbal extract administration was found to be more effective than the oral route. Further, qualitative and quantitative phytochemical screening of aqueous leaf extracts of A. nilotica indicated the presence of phenols, alkaloids, flavonoids, tannins and saponins. However, cardiac glycosides and phylobatanins were not detected.

References :-

[1]. PubMed: PubMed is a widely used database for scientific research articles in the field of medicine and life sciences. You can use keywords such as "Acacia nilotica," "Babool," "antidiabetic agent," and related terms to search for relevant studies.
[2]. Google Scholar: Google Scholar is a useful tool for finding scholarly articles. Similar to PubMed, you can use keywords to search for research on antidiabetic agents from Babool.
[3]. Academic Journals: Many scientific journals publish research related to the isolation and identification of bioactive compounds from plants. Look for journals that specialize in pharmacology, natural products, and diabetes research.
[4]. University and Research Institution Websites: Check the websites of universities and research institutions known for their work in natural product chemistry and medicinal plant research. They often provide access to their published research papers.
[5]. Citation in Existing Research Papers: When you find a relevant research paper, be sure to check its references and citations. This can lead you to other research articles on the same topic.
[6]. Library Databases: If you have access to a university or research library, you can use their databases to search for research articles related to Babool and antidiabetic properties