Nat. Volatiles & Essent. Oils, 2021; 8(4): 9639-9648

NVEO
Natural Volatiles & Essential Oils

# Traditional Plant Gerigeria Alataused In Sudanese Folk Medicine To Treatment Diabetes In Northerndarfur

**[a]" Ard elshifa Mohammed Elhassan Mohammed and "Adam Ibrahim Ahmed Osman"[b]"**

[a]. department of Chemistry, College of Science and Arts, Oyun Aljiwa Qassim University Saudi Arabia

[b]. Department of Chemistry, Faculty of Education, Al Fashir University, Sudan

E-mail: shifahassan22@yaho,comadamibra124@gmail.com.

**Abstract:**

Thestudyaimestodocumentdata regardingtraditional usesofplantsinhealth-carepracticesamongtheruralcommunitiesofareas whichmayleadtonaturaldrug discoverydevelopment and providessignificantinformationabouttraditionalknowledgeofmedicinalplantsto treatdiabetes disordersinNorthernDarfur.Medicinal plants are the potential sources of wide range of biologically active compounds and play a vital role in drug discovery and they have the capacity to produce a large number of phytochemical constituents with complex structural diversity that is known as secondary metabolites. Geigeria alataare used extensively as crude drugs for the treatment of diabetes mellitus. Hypoglycemic agents from natural sources the activity of powder extract of Gerigeria alata might be due to the chemical profiles as phenolic compounds, alkaloids, flavonoids, terbonoids and steroidsare available for treatment of diabetes. The results illustrated that Gerigeria alatahas contain largest anti-diabetic activities components.

**Keywords:** phenolic, flavonoids, terbonoids and steroidscompounds,Gerigeria alata,diabetic, Folk medicine.

## 1 - Introduction:

Plants has always played a major role in the treatment of human traumas and diseases worldwide (27). Geigeria alata is a traditional plant used in Sudanese folk medicine for treatment of diabetes by rural peoples. Many rural areasdepend on medicinal plants for the management of different diseases, including colds, Sore throat, cough and diabetes. Among them, Geigeria alata (DC.) is one of the herbs widely used in western Sudan against various diseases, including diabetes [(1,2)]. They have been used as sources of modern drugs, either by providing pure compounds, starting materials for partial synthesis of useful compounds or models for synthesis of new drugs (28).Medicinal plants play a vital role in drug discovery and

have been source of wide range ofbiologically active compounds for many centuries and theyhave been used extensively as crude drugs or as purecomponents for treating varieties of disease conditions.When compared to synthetic ones, natural remedies haveless side effects and toxicity. Medicinal herbs are the important sources for the treatment of human health. Although allopathicmedicines are readily available, it is estimated that almost 70-80% of the people particularly in rural areasin the developing countries of Africa uses medicinal plants for primary health care [(3)]. Manyplant species contain secondary metabolites, antioxidants and other bioactive compounds beside basicnutrients which are medically potent to combat many diseases and disorders[(4)], commonlyknown as '**Gud-gad**,'isan aromaticplantbelongingtotheAsteraceaefamilyfoundin northernandwesternSudan.G.alatais aglabrous,erect, branched, annual herb, upto 1 m high withthree- wingedstems and yellow flower (Figure 1). Importance of natural products for diabetes treatment Herbal medicines has long been used effectively in treating dis-eases/disorders in Asian communities and throughout the world. The mechanism of most of the herbs used has not been scientifically determined. Diabetes is a disease in which the body does not produce insulin or use it properly. Insulin is a hormone needed to convert sugar, starch and other food into energy needed for daily life. The cause of diabetes continues to be a mystery, although both genetic and environmental factors such as obesity and lack of exercise appear to play a part (29). Many traditional plants and their derived bioactive compounds are used for treatments of diabetes through various mechanisms of actions. But most of the scientific evidence for their beneficial effects is anecdotal [(5)].

Figure (1) Gerigeria alata

InSudanesetraditionalmedicine,G.alatais beingusedagainstColds, Sore throat, cough, intestinalcomplaints, epilepsy, as an antispasmodic and diabetes[6,7], Plantorigin phytochemical have an enormous therapeuticpotential to heal many infectious diseases [8]. At presentnearly 80% of the world populationsrely on plant baseddrugs for their health care need[9]. Various plants stillavailable in the nature are yet to be explored for theirmedicinal potential [10]. Alternative strategies to the current pharmaco-therapy of diabetes such as herbal medicine are urgently needed because of enormous cost and limited access to modern therapies for many rural populations in developing countries such as Sudan. Plants are extensively used in the African continent, where up to 90% of the population still relies on medicinal plants as the principal source of medicines for their health[11, 2]

Diabetes is a group of disorders characterized byhyperglycaemia, altered metabolism of lipids,carbohydrates and proteins [12]. It is becoming the third"killer" of the health of mankind along with cancer,cardiovascular and cerebrovascular diseases [13]. Diabetes isa major worldwide health problem predisposingtomarkedly increased cardiovascular mortality and seriousmorbidity related to the development of Nephropathy,Neuropathy and Retinopathy[14]. Theincidence of diabetes is alarmingly increasing throughout the world. One of the worst affected areas appears to be Asia and Africa where diabetes could rise two- to three-folds in the near future. More than 50% of diabetic patients in the world are from Africa and Asia [15], which was recently called the type 2 diabetes red zone. For this particular region, it is crucialtoidentify effective and low-cost medications for treating diabetes considering the economic constraints.Diabetes mellitus is a conventional disease that is invading the citizens of both civilized and civilizing countries. It is predicted that 25% of the world demography is affected by this disease. It is responsible by the abnormality of carbohydrate metabolism which is associated to low insulin level in blood or impercipient of target organs to insulin [16]. Diabetes is a disease as old as mankind, and ancient literatures datingback to first century BC have documented its existence in different civilizations. In spiteof the tremendous progress achieved in medical sciences in the last century, the completecure and the management of diabetes mellitus are still absent.

Diabetes mellitus, characterized by chronic hyperglycemia and disturbances in thecarbohydrate, fat, and protein metabolism, results from either impaired insulin secretion(type 1 diabetes mellitus) or insulin action (type 2 diabetes mellitus) or at times both[17].Diabetes mellitus is a very common metabolic disorder whichaffects the human population throughout the world,

characterizedby hyperglycaemia and arises due to defects in insulin secretion,insulin action or both. Chronic hyperglycaemia which is acommon effect of uncontrolled diabetes causes long-termdamage, dysfunction and failure of several organs such askidneys, eyes, nerves,blood vessels and heart [18].Phytochemical like alkaloids, tannins, vanillin phenolics, terpenoids, flavonoids, saponins, xanthones, polysaccharides etc. together play important role in keeping blood glucosewithin the normal range [19].The mechanism of antidiabetic action of thesecompounds has been claimed by their presence in Gerigeria alata. Extract ofexerts antidiabeticactivity by increasing and decreasing the activities of enzymes involved in glycogen synthesis and glycogen phosphorylase respectively and thus plays dual function increases glucoseutilization by glycogen synthesis and decreases glucose generation from glycogen breakdown. Moreover,altered activity of enzymes involved in gluconeogenesis has also been reported [20]. Recently, spices and other natural products have been used in the prevention and treatment of diabetes mellitus and its associated complications. In addition, spices are also considered more natural, economical and safe in the treatment of diabetes mellitus. Control of diabetes by spices is becoming more popular and is more appropriate for use in developing Asian countries. These spices and its derived active compounds may have a direct role in the prevention and control of diabetes. Yeast extract had insulin-potentiating property and this is the first evidence that natural products have insulin-potentiating activity in 1929. Further scientific reports on the several plant species possess antidiabetic properties [21].

## 2. Materials and methods

### 2-1 Plant Material

They collected plant materials fresh leaves, flowers and stems of Gerigeria alata, plucked from Al Fashir Valley in September 2020 were shade dried at room temperature about 10 days. Then the samples were cut into small pieces and were grinded with local mortar and pestle into powder to make 250g of dried Gerigeria alata powder, coarsely powdered crude of Gerigeria alata placed in container and macerated with the mixture solvent of (methanol, chloroform 1:1) and allowed to stand at room temperature for a period of 7 days with frequent agitation until the soluble matter has dissolved, the extract was filtered and removed the mixture solvent by using rotary flask evaporator (SUPERFIT) (IKA®RV10) (rotate 20 rpm heat 25 C°) after 3hours remove the solvent and let it to dry, the residue obtained was stored in a sterile container kept for further assay.

**2-3 Gas Chromatography/Mass Spectrometry (GC/MS) Analysis**

GC/MS analyses were performed on an Agilent Technologies 7890A GC System, 5975C with Triple-Axis Detector mass spectrometer with a built-in- Auto sampler formed with the usage of HP-5 capillary column (30 m x 0.32 mm x 0.25 mm). GC/MS detection, electron ionization system and ionization energy was used. Helium carrier gas at a flow rate of 1 mL $min^{-1}$, the column temperature program was the same as described above [22].

**RESULT AND DISCUSSION**

From the ancient times medicinal plants are used for the treatmentof many diseases like as diabetes. The herbs are widely used inthe treatment because they are considered as more safe and moreeffective. By utilizing theethnobotanical and ethnopharmacological knowledge we came to know about themedicinal plants which have potent antidiabetic activity. Thisreview article described about the medicinal plants which arecommonly used for the treatment of diabetes. The parts of theplant such as leaf and the specific extract such as Methanol /Chloroform extractwhich are more effective are also described here. It is also seenthat several researches are also carried out for the desire ofestablishing an effective treatment against diabetes in India aswell as abroad also.

(Table 1) The determinations of contents with GC-MS of mixture solvent extract obtained from Gerigeria alata.

| No | Name | % |
|---|---|---|
| 1 | Thiocyanic acid,1,1,3trimethyl3phenylbutyl ester | 3.57 |
| | Dehydrotrametenolic acid | 3.80 |
| 2 | 1,3Dioxolan2one,4methyl5methylene 4(2methyl2phenylpropyl) | 1.94 |
| 3 | 1Butoxy1isobutoxybutane | 1.99 |
| 4 | 1,8Cyclopentadecadiyne | 1.66 |
| 5 | Cyclopentane3'spirotricyclo[3.1.0.0(2,4)]hexane6' spirocyclopentane | 3.12 |
| 6 | 10,12Pentacosadiynoic acid | 2.36 |
| 7 | 3,4-dihydroxybenzoic acid | 2.36 |
| 8 | 2HPyran,2(7heptadecynyloxy)tetrahydro | 2.36 |

| | | |
|---|---|---|
| 9 | 4,4'Dinitro3,3",5,5"tetraphenyl1,1':4',1"terphenyl | 1.32 |
| 10 | N,N'Bis(Carbobenzyloxy)lysinemethyl(ester) | 3.71 |
| 11 | 1,7Bis(3,5bis(bromomethyl)phenyl)heptane | 1.32 |
| 12 | 5Hexen2one,5methyl3methylene | 2.49 |
| 13 | Hexadecanoic acid,2[(trimethylsilyl)oxy]1,3propanediylester(CAS) | 1.15 |
| 14 | 1{3[2(3Pyridinyl)Piperidinyl]1Propynyl}Cyclohexyl Acetate | 1.15 |
| 15 | 4[5Methyl2(1methylethylidene)cyclohexyl]3cyclohexen1one | 60.03 |
| 16 | 9,12,15Octadecatrienoic acid, methyl ester | 60.03 |
| 17 | 2 Propanone, 1,1dibutoxy | 1.99 |
| 18 | 4,5,6,7Tetrakis(pchlorophenoxy)1,2diiminoisoindoline | 1.16 |
| 19 | Milbemycin B,5demethoxy5one6,28anhydro25ethyl4methyl13chlorooxime | 1.16 |
| 20 | 3,4Diphenyl7styrylpyridazino[4',3':4,5]thieno[3,2b][1,8]naphthyridine | 1.02 |
| 21 | Benzyl3oxo5(1nitro2oxocycloheptyl)pentanoate | 2.49 |
| 22 | Spirost4ene3,6dione | 1.02 |

Anti-diabetic activity and GC-MS analysis (Table **1**) of all extracts were performed as powder extracts, the largest anti-diabetic activities components were obtained.The activity of powder extract ofGerigeria alatamight be due to the chemical profiles as studied in GC-MS decatrienoic acid, methyl ester60.03%,Dehydrotrametenolic acid3.80%and(Carbobenzyloxy)lysinemethyl(ester) 3.71% this compounds Decrease blood glucose level.

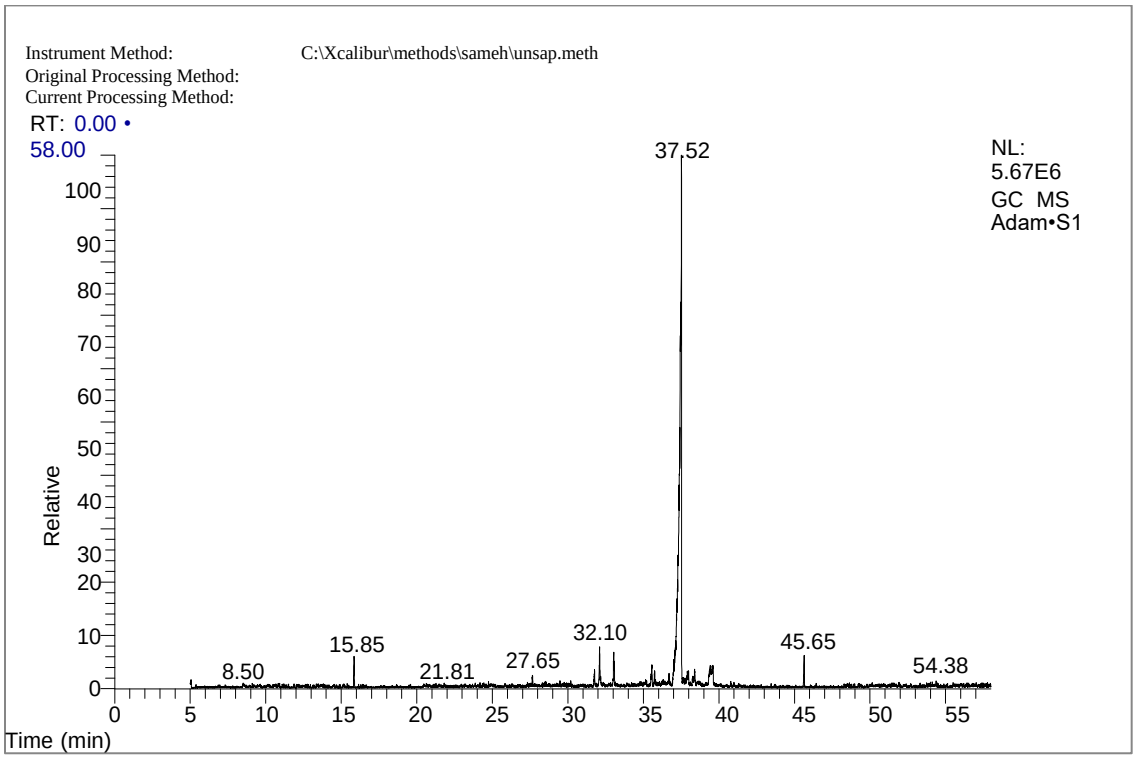


Figure (1) GC-MS of Gerigeria alata

**ANTIDIABETIC ACTIVITY OF PLANTS**

Some plantsparts are showed their pharmacological activities and these actions are obtained from 1:1of methyl alcohol/ chloroform extracts of plant parts, these processes are continuing and recognized some important compoundsprovide a new drug. Mainly these compounds are obtained the plant naturesthat are involved to diabetes disorder[23]. A large number of studies have been carried out into the antidiabetic activity of terpenoids of plant origin.Phenolic compounds are known to interact with proteins and inhibit enzymatic activity. [24] Alkaloids are naturally occurring nitrogenous organic molecules with pharmacological effects on humans and other animalsdue to their structural diversity and wide variety of biological activities[25].The flavonoids are polyphenolic compounds show awidevariety of activities, including anti-hyperglycemic activity[26].Traditional antidiabetic plants might provide new oral hypoglycemic lead com-pounds, which can counter the high cost and poor availability of the current medicines/present day drugs for many rural populationsparticularly in developing countries. However, detailed studies on the efficacy, mechanism of action and safety of phytoextracts are needed for further translational investigations.

**Conclusion**

Most research focused on the identification and characterization of active principle component from crude extracts of medicinal plants. However, many hidden therapeutic molecules are present in the crude plant drugs all of them should be brought into lime light. The occurrence of arthritis is increasing now day by day due to present living conditions. In this review article, an attempt has been made to aggregate the reported of anti-inflammatory and anti-diabetic plants along with several medicinal properties in consideration to the health aspects. The results illustrated that Gerigeria alatahas contain largest anti-diabetic activities components. For that the researcher recommendation to continuous study forGerigeria alatato determine another compound and to identify any side effect of Gerigeria alata use, and must be developing method of medicalproducts form Gerigeria alata uses.

**ACKNOWLEDGEMENTS**

I'm extremely grateful to thank my God who gave me good health and enabled me to finished this work. my thank extend to everyone who has helped me throughout my project. At last i would like to thank my college and all peoples who supported me morally, my family and colleagues.

**References**

1) EL-Kamali HH 2009 Ethnopharmacology of medicinal plants used in north Kordofan (western Sudan). Ethnobotanical Leaflets 13 203–210.

2) EL-Kamali HH & EL-amir MY 2010 Antibacterial activity and phytochemical screening of ethanolic extracts obtained from selected Sudanese medicinal plants. Current Research Journal of Biological Sciences 2 143–146.

3) Sheng-Ji P (2001) Ethnobotanical approaches of traditional medicine studies: some experiences fromAsia. Pharmaceutical biology 39(sup1):74-9.

4) Tapsell LC, Hemphill I, Cobiac L, Sullivan DR, Fenech M, Patch CS, Roodenrys S, Keogh JB, CliftonPM, Williams PG, Fazio VA (2006) Health benefits of herbs and spices: the past, the present, thefuture. The Medical Journal of Australia 185 (4): S1-S24. 5) Bailey CJ, Day C. Traditional plant medicines as treatments for diabetes. Dia-betes Care 1989;12(8):553–64.

6) El Ghazali GEB, El Tohami MS & El Elegami AAB 1994 Medicinal plants of the white nile provinces. In Medicinal Plants of the Sudan, Part 3, pp 56.

7) El Ghazali GEB, El Tohami MS, El Elegami AAB 1997. Medicinal plants of Northern Kordofan. In Medicinal Plants of the Sudan, Part 4, pp 69.

8) MW Iwu, AR Duncan, CO Okunji. NewAntimicrobials of Plant Origin. In: Janick J. (ed.):Perspectives on New Crops and New Uses. ASHSPress, Alexandria, 1999, 43: 457–462.

9) S Shil, M Dutta Choudhury, S Das. Indigenousknowledge of medicinal plants used by the Reangtribe of Tripura state of India. J Ethnopharmacol,2014, 152,135–41.

10) SK Sharma, JN Govil, VK Singh. Recent Progressin Medicinal Plants: Phytotherapeutics. StadiumPress LLC., U.S.A., 2005, 10.

11) Hostettmann K & Marston A 2002 Twenty years of research into medicinal plants: results and perspectives. Phytochemistry Reviews 1 275–285.

12) DK Patel, R Kumar, SK Prasad, K Sairam, SHemalatha. Anti-diabetic and in vitro antioxidantpotential of Hybanthus enneaspermus (Linn.) F.Muell in streptozotocin-induced diabetic rats.Asian Pacific Journal of Tropical Biomedicine,2011, 1(4): 316-322.

13) A Chauhan, PK Sharma, P Srivastava, N Kumar, RDudhe. Plants having potential anti-diabeticactivity: A review. Der Pharmacia Lettre, 2010,2(3): 369-387.

14) A Wilkinson, L Bian, D Khalil, K Gibbons, PFWong. Type 1 Diabetic Children and SiblingsShare a Decrease in Dendritic Cell and MonocyteNumbers but are differentiated by Expansion ofCD4+T Cells Expressing IL- 17. J Clin CellImmunol. S2, 2011, 1.

15) Al-Rubeaan K 2010 Type 2 diabetes mellitus red zone. International Journal of Diabetes Mellitus 2 1–2. (doi:10.1016/j.ijdm.2009.12.009).

16) Maiti R, Jana D, Das UK, Ghosh D. Antidiabetic effect of aqueous extract of seed of Tamarindusindicain streptozotocin induced diabetic rats. J Ethnopharmaco.2004; 92: 85-91

17) Andrew, J.K., 2000. Diabetes. Churchill Living Stone, New York.

18) WHO expert consultation. Report of the expert committee onthe diagnosis and classification of diabetes mellitus. DiabetesCare 2002; 25: 5–20.

19) Parikh H, Khanna A 2014:Pharmacognosy and Phytochemical Analysis of Brassica juncea Seeds.PharmacognosyJournal 6(5): 47-54

20) Khan BA, Abraham A, Leelamma S 1995: Hypoglycemic action of Murraya koenigii (curry leaf) andBrassica juncea (mustard): mechanism of action. Indian journal of biochemistry & biophysics32(2):106-8.

21) Ivorra MD, Paya M, Villar A. A review of natural products and plants as poten-tial antidiabetic drugs. J Ethnopharmacol 1989;27(3):243–75.

22) Ucuncu, O.; Cansu, T.B.; Ozdemir, T.; Alpay, K.; Yaylı, N. Chemical composition and antimicrobial activity of the essential oils of mosses (Tortula muralis Hedw., Homalothecium lutescens (Hedw.) H. Rob., Hypnum cupressiforme Hedw., and Pohlia nutans (Hedw.) Lindb.) from Turkey. Turk. J.

23) Lim HS, Ee CH, Aw TC. Annals Acad. Med. Singapore .1990;19 (4): 455- 458

24) R.K. Dawra, H.P. Makkar, B. Singh. Protein-binding capacity of microquantities of tannins. Anal Biochem. **1988,** 170, 50–3.

25) G.A. Cordell, M.L. Quinn-Beattie, N.R. Farnsworth. The potential of alkaloids in drug discovery. Phytother Res. **2001,** 15, 183–205.

26) U.J. Jung, M.K. Lee, K.S. Jeong, M.S. Choi. The hypoglycemic effects of hesperidin and naringin are partly mediated by hepatic glucose-regulating enzymes in C57BL/KsJ-db/db mice. J Nutr. 2004, 134, 2499–503.

[27] Principe, P.E. (1991). Valuing the biodiversity of medicinal plants. In: Akerele,O., Heywood,V., Synge H. (Eds). Conservation of medicinal Plants. Proceedings of an International Consultation. 21-27 March 1988. Chiang Mai, Thailand, Cambridge University Press, Cambridge, pp 79-124.

[28] Hansel, R. (1972). Medicinal Plants and empirical drug reseach. In : Swain,T. (Eds). Plants in the Development of Modern Medicine. Harvard University Press. Boston pp. 161-174.

29 ) José M. Barbosa-Filho*, Tereza H.C. Vasconcelos, Adriana A. Alencar, Leônia M. Batista, Rinalda A.G. Oliveira, Diego N. Guedes, Heloina de S. Falcão, Marcelo D. Moura, Margareth F.F.M. Diniz, João Modesto-Filho Plants and their active constituents from South, Central, and North America with hypoglycemic activity, Revista Brasileira de Farmacognosia Brazilian Journal of Pharmacognosy 15(4): 392-413, Out./Dez. 2005 .