

**The Effect of Solenostemma Argel Aqueous Extract on Lipid Profile of Induced Diabetic Albino Rats**

التأثير الخافض للدهون للمستخلص المائي لنبات الحرجل للجرزان المصابة بداء السكري

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## المخلص:

هدفت هذه الدراسة لتحديد أثر المستخلص المائي لنبات الحرجل على ملف الدهون للجرزان المصابه بداء السكري، مشكلة الدراسة: يستخدم السودانيون كثير من النباتات لعلاج السكري من بينها نبات الحرجل من دون المعرفة التامة للاثر البيولوجي او الجرعه المناسبه، المواد والطريقة: أجريت مقالات الدراسة الحالية على الجرزان البيضاء التي تم الحصول عليها من كلية الصيدلة، جامعة الخرطوم، السودان، تم استخدام اربع وعشرين جرذاً ألبينو من كلا الجنسين بوزن (135-250 جم) وعمرها شهرين. قسمت عشوائيا الي اربع مجموعات (ن=6)، المجموعه (1) تم تجربتها بالماء لتستخدم كمجموعه ضابطه تم تصويم المجموعات (2) و (3) و (4) لمدة 18 ساعه ثم جرعت بسكر جلوكوز تركيز 5% (200ملجم/كجم، وزن الجسم)). ثم اخذت عينات الدم لقياس مستوي السكر. صنفت الجرزان ذات التركيز الاعلي من 120مل/لتر مصابه بارتفاع السكر في الدم. تم تجرع المجموعات ( 4 و 2.36 ) بالمستخلص المائي لاوراق وسيقان نبات الحرجل (200'400 و 800 ملجم/كجم / وزن الجسم علي التوالي اخذت عينات الدم لقياس الدهون، النتائج: أثبتت نتائج الدراسة الحالية ان المستخلص المائي لنبات الحرجل له أثر فعال لخفض الدهون في دم الجرزان المريضه بارتفاع مستوي السكر في الدم باستخدام الجرعه 200 ملجم/كجم. وزن الجسم .

**الكلمات المفتاحية:** التأثير الخافض للدهون، للمستخلص المائي لنبات الحرجل للجرزان، داء السكري.

## Abstract

The current study aimed to evaluate the effect of Solenostemma argel, which widely used for the treatment of diabetes mellitus in Sudan, on lipid profile, Problem of the study: Sudanese patients used herbs traditionally to treat many diseases, without knowledge about its biological effect and its recommended dose, Material and methods: Sub chronic toxicity of Solenostemma argel has been evaluated which clearly demonstrated the non-toxic nature and safety profile. Experiment: Twenty-four albino rats were used in this experiment. Rats were assigned randomly to 4 groups (N=6). All groups were fasted for 18 hrs. Group (1) administered with tap water and served as control group, all groups were loaded with 5% glucose (2 mg/kg b.w). Blood samples were obtained to assess blood glucose, Groups (2, 3 and 4) diabetic rats were orally administered with aqueous extract of Solenostemma argel leaves and bark with (200, 400, and 800 mg/kg b.w.), respectively. Blood samples were obtained to evaluate lipid profile, Result: Obtained results indicated that Solenostemma argel aqueous extract significantly decreased concentrations of cholesterol and HDL at the dose of (200 mg/kg b.w.). However, in prospective study more investigation should be carried out to explain the mechanism of Solenostemma argel in cholesterol and HDL concentrations of diabetic animals.

**Key words:** effect, Diabetes mellitus, Solenostemma argel, lipid profile

## Introduction:

Hyperlipidemia (high cholesterol) is an excess of lipids or fats in the blood. This can increase the risk of heart attack and stroke because blood cannot flow through the arteries easily; there is a direct association between diabetes and Hyperlipidemia. Diabetic dyslipidemia is frequent among patients with type 2 DM<sup>(1)</sup> T2DM prevalence is more than 75% in developing countries, and is mainly a mixed dyslipidemia [increase in triglycerides (TGs), low high-density lipoprotein cholesterol (HDL-C), and small-dense (atherogenic), low-density lipoprotein cholesterol (LDL-C) particles <sup>(2)</sup>.

The lipid profile of type 2 diabetes (T2DM). Is characterized by the concurrent presence of qualitative as well as quantitative lipoprotein abnormalities: low levels of HDL, increased triglycerides, and prevalence of LDL particles that are smaller and denser than normal. This lipid phenotype has been defined as atherogenic dyslipidemia <sup>(1)</sup>

*Solenostemma argel* is one of the of traditional herbs which has been used in Sudan for treatment of diabetes it widely distributed in Egypt, Libya, Chad, Algeria, Saudi Arabia, Palestine, Central and Northern part of the Sudan, however, among these above mentioned countries, Sudan is regarded as the richest source of the *Hargel* plant which found between Barber and Abu Hammed area in north Sudan <sup>(3)</sup>. It used in traditional medicines for treatment of diabetes <sup>(4)</sup> the leaves and/or stem of *Solenostemma argel* contain phytates and phenolic compounds which have the active compounds <sup>(5)</sup>

## Material and methods:

### Study area:

Medicinal and Aromatic Plants Research Institute, National Center for Research, Khartoum, Sudan.

**Plant materials:** The plant was selected according to questionnaire (conducted after ethical consents in all diabetic centers in Khartoum by the researchers) which resulted

in 57.1% of Sudanese diabetic patients used *Solenostemma argel*. The plant was purchased from local market at Omdurman, purified, ground to powder using mechanical grinder, preserved in airtight container, and kept in dry bottles (6).

#### **Preparation of aqueous extraction:**

Aqueous extracts were prepared according to the method described by Harborne (7); 300g of the plant powder was soaked in 2000 ml of hot distilled water and left till cooled down with continuous stirring at room temperature. Extract was then filtered and freezes in a deep. Freeze extract was dried using Freeze drying apparatus till powdered extract obtain.

The powder residue was re-dissolved in drinking water before experiment.

**Animals and induction of diabetes:** Wistar albino rats of either sex (weighing 135-250 g and aged 60 days) were kept on a fixed diet to stabilize the fasting plasma glucose level at 70-110 mg/dl for 3 days, as an adaptation period. All tested groups were fasting for 18 hours then loaded with 5% glucose (2mg/kg b.w.)<sup>(8)</sup> To induce diabetic rats. Rats with a FBG level higher than 120 mg/dl were included in the study as diabetic animals.

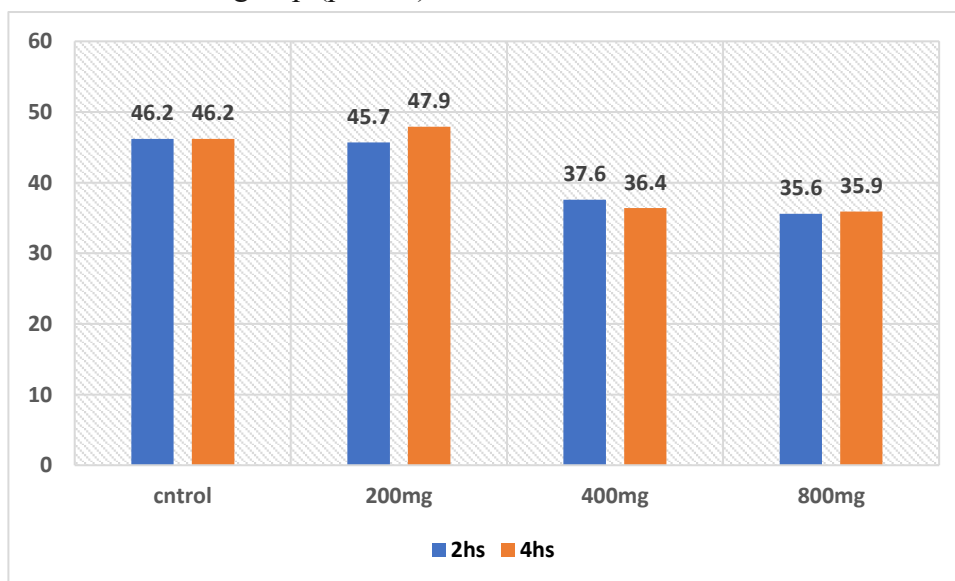
**Experimental groups:** Twenty-four diabetic rats were assigned to 4 equal groups (N=6). Group (1) was administered with tap water and serve as control group. Treated groups (G2, G3 and G4) were administered with *Solenostemma argel* aqueous extract (200, 400 and 800 mg/kg b.w., respectively). Blood samples (2 ml) were drawn out by capillary tubes in fluorinated test tubes from the orbital plexus of rats according to Khana *et al*, (9) and centrifuged at 3000 r.p.m for 5 minutes to separate plasma. The plasma prepared was used to assess cholesterol, high-density lipoprotein (HDL) and triglycerides concentrations. Cholesterol, HDL and triglycerides concentrations

#### **Data analysis:**

Data were statistically analyzed by SPSS using ANOVA-1 and LSD (10).

**Results:** The effect of *S. argel* aqueous extract on blood cholesterol, HDL, and triglycerides were determined in induced diabetic rats.

As illustrated in Fig. (1) The result revealed significant decrease ( $p<0.05$ ) of blood cholesterol concentrations of treated diabetic rats (at doses 200, 400, and 800 mg/kg b.w.) The lowest concentration of cholesterol was observed in G4, which administered with 800 mg/kg b.w.) after 2 and 4 hrs there was significant difference compared with control group ( $p<0.05$ ).



**Fig. (1): Effect of administration of deferent doses of *Solenostemma argel* aqueous extract on blood cholesterol concentration (mg/dl) in diabetic rats.**

Lower blood triglycerides were observed in *S. argel* treated diabetic rats at a dose of (200 mg/kg b.w) after 2 hrs. However, similar effect has been observed after 4 hrs. when diabetic rats (G3) have been administered with) 400 mg/kg b.w.) of *S. argel*, blood triglycerides was significantly higher ( $p<0.05$ ) slightly decreased but still slightly higher than control group after two hours, these group showed the same result as control group after four hours. Group four, which administered with 800mg/kg b.w.

showed lower concentration of triglycerides after two hours while mean it showed slightly lower than control group. (fig.2)

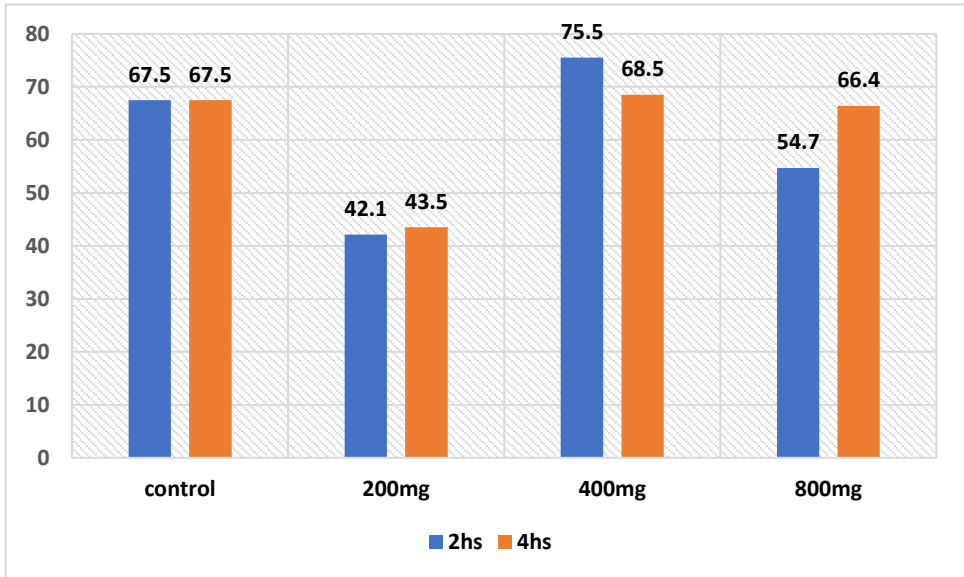
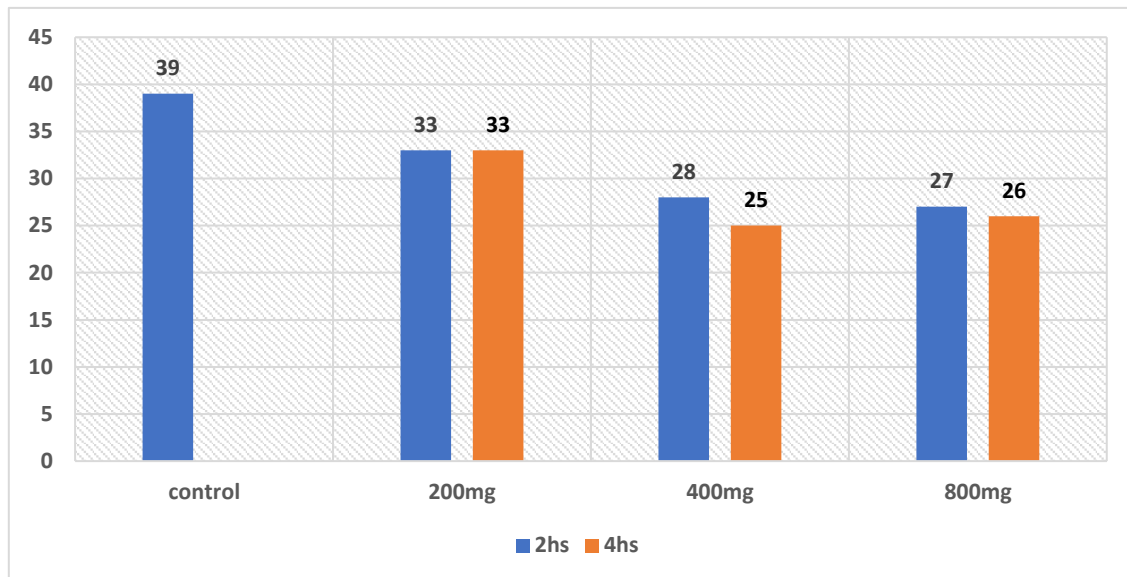


Fig. (2).Effect of administration of different doses of *Solenostemma argel* aqueous extract on blood triglycerides concentration (mg/dl) in diabetic rats.

Fig. (3) illustrated treatment with 200 mg/kg b.w. of *S. argel* aqueous extract (G2) significant decrease in blood HDL concentration in diabetic rats after 2 and 4 hrs ( $P<0.05$ ). Whereas Groups (3 and4) were treated with (400 and 800 mg/kg.b.) respectively showed significant decrease in HDL concentration ( $P<0.05$ ) after two and four 4 hours, which is not good. HDL concentration decreased with increasing of the dose.



**Fig. (3). Effect of administration of different doses of *Solenostemma argel* aqueous extract on blood HDL concentration (mg/dl) in diabetic rats**

### Discussion:

Medicinal plants are used in a wide range in order to normalize the hyperglycemia by induction of insulin secretion, improvement the utilization of glucose by body cells or by reduction of carbohydrates absorption by inhibition of  $\alpha$ -amylase activity and reduction of Gluconeogenesis. The current study resulted that beside hypoglycemic effect of aqueous extract of *S. argel*, it affects lipid profile. As it has been reported that *S. argel* is one of the traditional herbs which has been used in Sudan<sup>(3)</sup>.

In this study different concentrations (200, 400 and 800 mg/kg b.w.) of *S. argel* aqueous extract have been used. Our present investigation suggested that the aqueous extract of *S. argel* may has the capacity to affect lipids profile of diabetic rats. The results of this study revealed that the three doses (200, 400, and 800 mg/kg b.w.) of the plant extract gave a benefit result on lipid profile, by lowering concentrations of cholesterol, TGs and HDL In addition, treatment with 200 mg/kg b.w. of *S. argel*

aqueous extract significantly decreased  $\alpha$ -amylase activity after 2 hrs. This result confirmed the results of previous study which represented that phytic acid represents a complex class of naturally occurring organic form of phosphorus compounds that can significantly influence the functional and nutritional properties of foods<sup>(11)</sup>. The results of this study agreed with previous researches<sup>(12)</sup> which proved that Hargel has steroids which may give its extract high potentially antifeedent agents..

Conclusion:

It could be concluded that the aqueous extract of *S. argel* aqueous extract have reducing effect on cholesterol, triglycerides and HDL level.

### References:

- (1) Tenenbaum A, Fisman EZ. Fibrates are an essential part of modern anti-dyslipidemic arsenal: spotlight on atherogenic dyslipidemia and residual risk reduction. *Cardiovasc Diabetol*. 2012 Oct 11;11:125. doi: 10.1186/1475-2840-11-125. PMID: 23057687; PMCID: PMC3489608.
- (2) Athyros VG, Doumas M, Imprialos KP, Stavropoulos K, Georgianou E, Katsimardou A, Karagiannis A. Diabetes and lipid metabolism. *Hormones (Athens)*. 2018 Mar;17(1):61-67. doi: 10.1007/s42000-018-0014-8. Epub 2018 Apr 16. PMID: 29858856.
- (3) Murwan KSE and Murwa AM (2010). Chemical composition, minerals, protein fractionation, and anti-nutrition factors in leaf of Hargel plant (*Solenostemma argel*). *European Journal of Scientific Research*. 43 (3), p430
- (4) Kamel S (2003). Acylated phenolic glycosides from *Solenostemma argel*, M.Sc. thesis. Dept. Pharm, Faculty of Pharmacy, Assiut University, Assiut 71526, Egypt.
- (5) Yagoub AG (2003). A biophysical study on Roselle (*Hibiscus sabdariffa*.) seeds total proteins of the traditionally fermented food. Thesis for doctorate degree of philosophy. Faculty of Agri. University of Khartoum-Sudan



- (6) AOAC (1990). Association of Official Analytical Chemists. Official Methods of Analysis. 15th edition. Washington
- (7) Harborne JB (1984). Phytochemical methods. 2nd edition. Chapman and Hall. London and New York.
- (8) Konuklugil B, Denoz G, Yildi O, Senoz S and Saygi S (1997). Hypoglycemic effect Teucrium polium in rats. Fitoterapia LXV iii: (1) 39-41.
- (9) Khana AK, Chandar R, Kapoor NK, Singh C and Srivastava A K (1992) Hypoglycaemic activity of T.chebulain in rats. Fitoterapia LXIV: 315-356.
- (10) Snedecor GW and Cochran WC (1989) Statistical Method, 8th end Iowa State University Press, Ames, Iowa.
- (11) Fageer AS (2003). Effect of genotype malt pretreatment and cooking on phytates in vitro protein digestibility and protein fractions of corn flour. Ph.D. Degree, University of Khartoum.
- (12) Divya Jyoth and Marina Koland (2013): Design, Development and evaluation of antidiabetic liquid oral preparation from extract of fenugreek) international journal of Pharmaceutical research and bio-science. Volume 2(4): 39-47.