Egyption Journal
For Specialized Studies
Quarterly Published by Faculty of Specific Education, Ain Shams University

Correspondence:
Editor in Chief
365 Ramses St- Ain Shams University,
Faculty of Specific Education
Tel: 02/26844594
Web Site :
https://ejos.journals.ekb.eg
Email :
egyjournal@sedu.asu.edu.eg

ISBN : 1687 - 6164
ISNN : 4353 - 2682

Evaluation (July 2023) : (7) Point
Arcif Analytics (Oct 2023) : (0.3881)
VOL (12) N (42) P (3)
April 2024

الصفحة الرئيسية

م	القطاع	اسم المجلة	اسم الجهة / الجامعة	ISSN-P	ISSN-O	السنه	نقاط المجله
1	Multidisciplinary علم	المجلة المصرية للدراسات المتخصصة	جامعة عين شمس، كلية التربية النوعية	1687-6164	2682-4353	2023	7

Arcif Analytics — معامل التأثير والاستشهادات المرجعية العربي — قاعدة البيانات العربية الرقمية — Arab Citation & Impact Factor — Arab Online Database — معرفة e-MAREFA

التاريخ: 2023/10/8

الرقم: L23/177ARCIF

سعادة أ. د. رئيس تحرير المجلة المصرية للدراسات المتخصصة المحترم

جامعة عين شمس، كلية التربية النوعية، القاهرة، مصر

تحية طيبة وبعد،،،

يسر **معامل التأثير والاستشهادات المرجعية للمجلات العلمية العربية (ارسيف – ARCIF)**، أحد مبادرات قاعدة بيانات **"معرفة"** للإنتاج والمحتوى العلمي، إعلامكم بأنه قد **أطلق التقرير السنوي الثامن للمجلات للعام 2023.**

ويسرنا تهنئتكم وإعلامكم بأن **المجلة المصرية للدراسات المتخصصة** الصادرة عن **جامعة عين شمس، كلية التربية النوعية، القاهرة، مصر، قد نجحت في تحقيق معايير اعتماد معامل "ارسيف Arcif"** المتوافقة مع المعايير العالمية، والتي يبلغ عددها **(32) معياراً**، وللاطلاع على هذه المعايير يمكنكم الدخول إلى الرابط التالي:

http://e-marefa.net/arcif/criteria/

وكان **معامل "ارسيف Arcif " العام** لمجلتكم لسنة 2023 **(0.3881)**.

كما صُنفت مجلتكم في **تخصص العلوم التربوية** من **إجمالي عدد المجلات (126)** على المستوى العربي ضمن الفئة **(Q3)** وهي الفئة الوسطى، مع العلم أن **متوسط معامل ارسيف لهذا التخصص** كان **(0.511)**.

وبإمكانكم الإعلان عن هذه النتيجة سواء على موقعكم الإلكتروني، أو على مواقع التواصل الاجتماعي، وكذلك الإشارة في النسخة الورقية لمجلتكم إلى معامل **"ارسيف Arcif"** الخاص بمجلتكم.

ختاماً، نرجو في حال رغبتكم الحصول على شهادة رسمية إلكترونية خاصة بنجاحكم في معامل " **ارسيف** "، التواصل معنا مشكورين.

وتفضلوا بقبول فائق الاحترام والتقدير

أ.د. سامي الخزندار

رئيس مبادرة معامل التأثير

" ارسيف Arcif"

+962 6 5548228 -9
+ 962 6 55 19 10 7
info@e-marefa.net
www.e-marefa.net
Amman - Jordan
2351 Amman, 11953 Jordan

محتويات العدد

* **بحوث علمية محكمة باللغة العربية:**

* **بحوث علمية محكمة باللغة الإنجليزية :**

The Effect of Banana (Musaceae) and Onion (Allium cepa) on Diabetic Rats

Prof. Naeem M. Rabeh (1)

Prof. Eid Ali Zaki (2)

Mayada Said Mohamed (3)

(1) Prof of Nutrition, Nutrition and food science dept, Vice Dean of Education & Students Affair, Faculty of Home Economic, Helwan University

(2) Prof of Nutrition, Head of Home Economic dept, Faculty of Specific education, Banha University, Former Vice Dean of Education & Student Affairs

(3) Nutrition and food science dept, Faculty of Home Economic, Helwan University

The Effect of Banana (Musaceae) and Onion (Allium cepa) on Diabetic Rats

Prof. Naeem M Rabeh
Prof. Eid Ali Zaki
Mayada Said Mohamed

Abstract

A study was conducted to assess the impact of dried green and yellow bananas, as well as dried onion and ready-made onion powder, on diabetic rats. Sixty adult male rats were divided into 10 groups, with one group being a control group. The diabetic rats were fed a basal diet supplemented with different percentages of dried green and yellow banana, dried onion, and ready-made onion powder for eight weeks. The results showed that the supplementation led to a significant reduction in glucose levels, improved kidney function, and better lipid profile compared to the control group. Dried green or yellow bananas were found to be more effective in lowering glucose levels and increasing insulin concentrations than onions. This suggests that these fruits and onion products could be suitable for diabetic patients.

Keywords: green or yellow banana, onion, diabetes, Glucose, Insulin activity, Liver and Kidney functions, Lipid profile.

ملخص:

العنوان : تأثير الموز (Musaceae) و البصل (Allium cepa) على الفئران المصابة بالسكر

المؤلفون : نعيم محمد رابح ، عيد على زكى ، ميادة سعيد محمد

أجريت دراسة لتقييم تأثير الموز الأخضر والأصفر المجفف، وكذلك البصل المجفف ومسحوق البصل الجاهز، على الفئران المصابة بالسكري. تم تقسيم 60 فأر من الذكور البالغين إلى 10 مجموعات، وكانت مجموعة واحدة هي مجموعة الضابطة. تم تغذية الفئران المصابة بالسكري بنظام غذائي أساسي مكمل بنسب مختلفة من الموز الأخضر والأصفر المجفف والبصل المجفف ومسحوق البصل الجاهز لمدة ثمانية أسابيع. أظهرت النتائج أن المكملات أدت إلى انخفاض كبير في مستويات الجلوكوز، وتحسين وظائف الكلى، وتحسين مستوى الدهون مقارنة بالمجموعة الضابطة. وجد أن الموز الأخضر أو الأصفر المجفف أكثر فعالية في خفض مستويات الجلوكوز وزيادة تركيز الأنسولين من البصل. وهذا يشير إلى أن الموز والبصل يمكن أن تكون مناسبة لمرضى السكري.

الكلمات الدالة : الموز الأخضر أو الأصفر ، البصل ، مرض السكري ، الجلوكوز ، نشاط الأنسولين ، وظائف الكبد والكلى ، صورة دهون الدم.

Introduction

Diabetes mellitus is a multifactorial disease characterized by hyperglycemia and an increased basal metabolic rate **(Bos and Agyemang, 2013)**. High blood glucose levels damage the cell membranes and generate reactive oxygen species (ROS) **(Ha and Kim, 1999)**. As the prevalence of this disease increases, there is a need to look for more efficient drugs with fewer side effects. Available drugs may lead to obesity and hyperandrogenemia even though they bring down glucose levels **(Latha *et al*., 2014)**.

The prevalence of diabetes is higher in men than women, but there are more women with diabetes than men. The urban population in developing countries is projected to double between 2000 and 2030. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people > 65 years of age **(Wild *et al*., 2004).** In Egypt, the prevalence of diabetes is around 15.56% among adults between 20 and 79 years of age, with an annual death rate of 86,478 related to diabetes. In 2013, the IDF estimated that 7.5 million individuals have diabetes and around 2.2 million have prediabetes in Egypt. It is expected that this number will jump to 13.1 million by 2035. It is estimated that 42% of patients with diabetes in Egypt have diabetic retinopathy, 5% are legally blind, and 22% have peripheral neuropathy. Diabetes is also the major cause of end-stage renal disease and leg amputation in Egypt **(Hegazi *et al*., 2015).**

Medicinal plants have long been used against life-threatening diseases including diabetes, with more or less success. Some of these plants have been shown to possess antioxidant activities, which could help improve diabetes inconveniences **(Gargouri *et al*., 2016).** Bananas are a widely consumed food, mainly due to their sensory aspects, nutrition, and low cost **(Zandonadi, 2009)**. The pulp of a green banana has no taste. It contains a high starch and is low in sugars and aromatic compounds. The green fruits are rich in flavonoids, and also have a high content of resistant starch (similar to dietary fiber). The high content of resistant starch hinders the

absorption of fats and glucose, so bananas are suggested for patients with DM **(Ramos *et al*., 2009)**.

Banana contains different concentrations of nutrients like vitamin C (12.7 mg/100 g), vitamin A (12.4 mg/100 g) and total soluble solids (17.9%). A medium-sized banana contains about 6 g of fiber. Banana is also a good source of minerals, the medium-sized banana contains 450–467 mg of potassium **(Pareek, 2016).** The phenolic compounds identified in bananas by **Sidhu and Zafar, (2018)** include salicylic, gallic, p-hydroxybenzoic, ferulic, sinapic, gentisic, p-coumaric, syringic and vanillic.

Various parts of the plant can be used for the treatment of various diseases including diabetes, diarrhea, scabies and inflammations as all parts of the plant exhibit different pharmaceutical properties **(Rai *et al*., 2009).** To get low−fat, low−sodium, and cholesterol−free diet, the banana is suitable for consumption making it particularly recommendable for people with cardiovascular and kidney problems, arthritis, gout, or gastrointestinal ulcers **(Sumathy *et al*., 2011).**

Therefore**,** this study was conducted to evaluate the effect of dried green and yellow bananas as well as dried onion and ready-made onion powder at 5 and 10% on diabetic rats.

Materials and Methods

This study and all stages of experimentation and analysis were conducted in the Graduate labs, Nutrition and Food Science Department, Faculty of Home Economics, Helwan University

Chemicals: casein, vitamins, minerals, cellulose and streptozotocin (STZ) were purchased from El-Gomhoria Company, Cairo, Egypt. **Kits** for blood analysis were purchased from Alkan Company for Biodiagnostic Reagents, Dokki, Cairo, Egypt. **Animals**: Forty adult Male Sprague-Dawley rats weighing (200+10g) were purchased from the farm of experimental animals in Helwan, Egypt. **Plants:** green and yellow bananas and onions were obtained from the Agriculture Research Centre. The ready-made onion was purchased from the local market.

Methods:

- **Induction of Diabetic Rats:** Diabetes was induced in rats via a single intraperitoneal injection of freshly prepared streptozotocin (STZ) at a dose of 60 mg/kg body weight. Three days following the injection, random blood samples were collected from the rats' eyes to assess blood glucose levels, with readings equal to or exceeding 250 mg/dl considered indicative of diabetes. **(Sarkar *et al*., 1996).**
- **Preparation of dried banana and onion**: Banana fruits with peels were washed and the onion without peels was washed and brushed under distilled water, then boiled in boiling water to decrease the oxidative effect, then it was air dried and hand peeled. Banana fruits were dried using solar energy at National Research Center, Dokki, Giza, then grinded by an electric grinder.

- **Preparation of the basal diet:** The diets were formulated to cover the nutrient requirements of rats following the recommendations of the American Institute of Nutrition (AIN-93M). The AIM-93M Diet was formulated for the maintenance of adult rodents **(Reeves, *et al*., 1993).**

Experimental animal design: A total of sixty male healthy rats, weighing approximately 200 ± 10g each, were divided into 10 groups as follows: Group 1: Negative control group fed on the basal diet. Group 2: Positive control diabetic rats fed on the basal diet. Groups 3 and 4: Diabetic groups fed on the basal diet supplemented with dried green banana at 5% and 10%, respectively. Groups 5 and 6: Diabetic groups fed on the basal diet supplemented with dried yellow banana at 5% and 10%, respectively. Groups 7 and 8: Diabetic groups fed on the basal diet supplemented with dried onion at 5% and 10%, respectively. Groups 9 and 10: Diabetic groups fed on the basal diet supplemented with commercially available dried onion at 5% and 10%, respectively.

At the end of the experimental period (8 weeks), rats were fasted over night before sacrificing. blood samples were

collected into a centrifuge tube without any anticoagulant and centrifuged to obtain serum which was stored at- 20°C until used for subsequent analysis.

Biochemical analysis: The serum glucose level was determined according to **Asatoor and King, (1954).** Serum total cholesterol (TC) was determined according to **Richmond (1973),** serum triglycerides (TG) was determined according to **Wahlefeld (1974)**, high density lipoprotein cholesterol (HDL-C) was determined according to **Albers *et al*. (1983)**, the concentrations of very low-density lipoprotein cholesterol (VLDL-c) and low-density lipoprotein cholesterol (LDL-c) were estimated according to the method described by **Friedewald *et al*. (1972).**

VLDL-c = Triglyceride **/** 5, **LDL-c** = Total cholesterol – (HDL-c + VLDL-c)

Serum urea was determined according to the method described by **Tabacco (1979),** uric acid was assayed in serum according to the method described by **Jelikić-Stankov *et al. (*2003),** serum level of creatinine was determined according to the method described by **Burton and Ashwood (1999)**. **Insulin hormone:** Insulin activity was estimated using the enzyme-linked immunosorbent assay (ELISA) method as described by (**Clark and Hales, 1994).**

Statistical Analysis: The obtained results were analyzed according to SPSS program. ANOVA (Analysis of Variance) test was used to compare results among different groups. All differences were considered significant if ($P<0.05$) (**Clark and Hales, 1994).**

Results:

The influence of dried green and yellow bananas, along with onion and pre-made onion powder on the serum glucose level and insulin concentration of diabetic rats is shown in Table (1). The positive control group consisting of diabetic rats exhibited a significant increase ($P<0.05$) in glucose level and a significant decrease in insulin concentrations compared to the negative control group. The addition of all examined substances

at 5% and 10% levels led to a significant reduction (P<0.05) in the average glucose levels and a notable increase in insulin concentrations compared to the positive control group. Green bananas at 10% caused a significant decrease (P<0.05) in serum glucose as compared to the group fed green bananas at 5%. These treatments decreased this parameter by about 31.40 versus 23.74% compared to the positive control group. Additionally, there was a significant decrease in glucose levels observed between the groups fed yellow banana at 10% or 5%. These treatments decreased the mean value of serum glucose by about 21.25 VS 17.29%, compared to the positive control group. There was a significant difference in serum glucose levels among the groups fed green or yellow bananas at the different tested levels.

The group fed dried onion at 10% exhibited a significant decrease in glucose levels compared to the group fed dried onion at 5%, with reductions of 16.92% and 14.36%, as compared to the positive control group respectively. A similar trend was evident in the groups fed ready-made onion powder, with reductions of 15.35% and 10.93% between 10% and 5% concentrations respectively. However, no significant alterations in serum glucose were noted between the group fed either dried onion (10%) or ready-made onion powder at 10%.

Green banana at (10%) caused a significant (P<0.05) increase in insulin concentration as compared to the group fed on green banana at (5%), however, there were no significant changes in insulin concentration between the groups fed yellow banana at 5% or 10%. A significant difference in insulin concentrations were observed among the groups fed green or yellow bananas at the different tested levels. No significant changes in the insulin concentration at the groups fed either dried onion at 10% or 5%, as well as the groups fed on ready-made onion powder. A significant difference in serum insulin levels between the group fed dried onion (10%) and the group fed ready-made onion powder at 10%. In addition, dried green or yellow bananas were more effective in increasing the insulin concentration as compared to onions (dried or ready-made powder). The highest decrease in the mean value of serum

glucose levels and increased the concentration of insulin were recorded at the group fed on green banana at 10%.

Administering the tested materials to diabetic rats at both levels resulted in a significant decrease in elevated serum kidney functions compared to the positive control group, as indicated in Table (2). There were no changes in urea levels among the groups fed on green or yellow bananas at the two different levels. The same trend was observed for the groups fed on dried onion or ready-made onion powder. Diabetic rats fed on green banana at 5% had no significant changes in serum creatinine as compared to the group fed on green banana at 10%. The same results were observed at the groups fed on yellow banana at 5 and 10%. A non-significant difference in creatinine level was observed between the group fed on green banana at 10% and the group fed on yellow banana at 10% was observed. Dried onion or ready-made onion powder at the tested levels caused no significant difference in serum creatinine. Dried onion or ready-made onion powder at the 5 and 10% caused no significant difference in serum uric acid. It was clear that, banana supplementation improved kidney functions to greater extent than onion supplementation. The highest improvement was observed at the group fed on green banana.

Injection with STZ resulted in a significant ($P<0.05$) elevation in serum levels of TC, TG, LDL-c, and VLDL-c, accompanied by a significant decrease in serum HDL-c compared to the negative control rats, as depicted in Table (3). Rats fed on basal diet supplemented with, green or yellow banana, dried onion or ready-made onion powder had significant ($P<0.05$) decrease in serum TC, TG, LDL-c and VLDL-c, and significant increase in serum HDL-c as compared to the -ve control rats. Serum TC and LDL-c were significantly decreased due to feeding on a basal diet supplemented with green bananas at 10% as compared to green bananas at 5%. While there were no changes in the mean of serum TG and VLDL-c between the same groups. Serum HDL-c was increased significantly ($P<0.05$) due to green banana at 10% when compared to 5%.

Rats fed on yellow bananas at 10% had a significant decrease in serum TC as compared to yellow bananas at 5%. While there were no changes in the mean values of serum TG, VLDL-c, LDL-c and HDL-c between the same group. There were significant differences in lipid profiles among groups fed green or yellow bananas at the tested levels. Dried onion supplementation at 10% caused non-significant changes in serum TC, TG, HDL-c, VLDL-c, and LDL-c when compared to the group fed on dried onion at 5%. On the other hand, ready-made onion powder (10%) significantly decreased the mean value of serum TG and VLDL-c, and caused no significant differences in serum TC, HDL-c and LDL-c when compared to the ready-made onion powder (5%). It was observed that, there were no differences in serum TC, HDL-c and LDL-c among the rats fed on dried onion (10%), ready- made onion powder at 5 and 10%. The highest decrease in lipid profile and highest increase in serum HDL-c was observed at the group fed on green banana at 10%. It was clear that, dried banana either green or yellow was more effective in lowering the diabetic complications that include disturbances in lipid profile than onion.

Table (1): the effect of dried green, yellow banana, onion and ready-made onion powder on glucose and insulin concentrations of diabetic rats

Parameters / Groups	Glucose (mg/dl)	%of glucose reduction	Insulin (mIU/ml)
Control (-ve)	97.11±1.54^{h}	Zero	19.58±0.84^{a}
Control (+ve)	280.26±1.70^{a}	Zero	5.90±0.12^{g}
Green Banana (5%)	213.70±3.55^{f}	23.74	13.87±0.20^{c}
Green Banana (10%)	192.24±2.25^{g}	31.40	15.80±0.21^{b}
Yellow Banana (5%)	231.80±3.27^{d}	17.29	12.26±0.12^{d}
Yellow Banana (10%)	220.70±0.77^{e}	21.25	12.53±0.13^{d}
Dried onion (5%)	240.00±1.11^{c}	14.36	10.33±0.17^{ef}
Dried onion (10%)	232.83±1.02^{d}	16.92	11.06±0.08^{e}
Ready-made onion powder (5%)	249.60±0.78^{b}	10.93	9.63±0.23^{f}
Ready-made onion powder (10%)	237.23±1.82^{cd}	15.35	9.86±0.31^{f}

*Values were expressed as Means ± SE.

* Values at the same column with different letters are significant at P<0.05.

Table (2): the effect of dried green, yellow banana, onion and ready-made onion powder on kidney functions of diabetic rats

Parameters / Groups	Urea	Creatinine	Uric acid
	mg/dl		
Control (-ve)	26.18±0.80d	0.69±0.03e	3.36±0.06e
Control (+ve)	70.27±1.06a	1.41±0.03a	8.54±0.27a
Green Banana (5%)	35.02±0.83c	0.79±0.006cd	4.68±0.09c
Green Banana (10%)	33.02±0.69c	0.75±0.01de	4.23±0.13d
Yellow Banana (5%)	34.91±0.64c	0.82±0.006cd	4.96±0.06bc
Yellow Banana (10%)	33.00±1.22c	0.84±0.004c	5.13±0.06b
Dried onion (5%)	44.58±2.56b	0.95±0.006b	5.36±0.12b
Dried onion (10%)	45.78±2.33b	0.93±0.01b	5.16±0.14b
Ready-made onion powder (5%)	44.93±1.18b	0.96±0.04b	5.26±0.10b
Ready-made onion powder(10%)	43.45±0.20b	0.98±0.04b	5.23±0.13b

*Values were expressed as Means ± SE.

* Values at the same column with different letters are significant at P<0.05.

Table (3): the effect of dried green, yellow banana, onion and ready-made onion powder on lipid profile of diabetic rats

Parameters / Groups	TC	TG	HDL-C	VLDL-C	LDL-C
	(mg/dl)				
Control (-ve)	111.93±2.96g	96.23±2.89f	66.16±0.67a	19.24±0.57f	26.52±2.84f
Control (+ve)	212.60±4.36a	239.23±2.70a	30.72±1.09f	47.84±0.54a	134.02±5.80a
Green Banana (5%)	134.26±2.01e	183.20±1.20e	54.18±0.82c	36.64±0.24e	43.44±1.77e
Green Banana (10%)	125.23±1.28f	178.86±0.67e	58.78±1.36b	35.77±0.13e	30.67±2.64f
Yellow Banana (5%)	171.76±2.86c	194.84±4.29d	46.03±2.92d	38.96±0.85d	86.76±4.88cd
Yellow Banana (10%)	164.83±0.59d	190.53±1.66d	47.07±1.80d	38.10±0.33d	79.65±2.51d
Dried onion (5%)	183.00±2.16b	206.62±1.53bc	39.43±1.09e	41.32±0.30bc	102.24±3.46b
Dried onion (10%)	178.70±1.28bc	201.25±1.10c	41.70±0.76e	40.69±0.22c	96.74±2.10bc
Ready-made onion powder (5%)	175.16±0.92c	210.21±0.68b	37.70±1.25e	42.04±0.13b	95.42±2.17bc
Ready-made onion powder (10%)	176.30±0.76bc	203.49±1.15c	41.24±0.84e	40.69±0.23c	94.35±0.63bc

*Values were expressed as Means ± SE.

* Values at the same column with different letters are significant at P<0.05.

Discussion

The obtained results revealed a significant increase in the serum glucose level with streptozotocin induction. This might be due to the destruction of Langerhans islet β-cells by STZ which also elevates oxidative stress by compromising the intrinsic antioxidant mechanism and increasing the production of free radicals **(Negm, 2020** and **García-Sánchez, 2020)**. Oxidative damage induced by reactive oxygen species can promote

negative consequences including uncontrolled hyperglycemia **(Pitocco et al., 2010)**.

Bai et al., (2022) found that banana starch intervention is an effective way to alleviate diabetes and its associated symptoms such as mood disorders. Previous studies of banana starch showed that unripen banana-enriched resistant starch was effective in alleviating the diabetic condition in diabetic mice study **(Konda et al., 2020 and Lotfollahi et al., 2020)**. The obtained results are consistent with the findings that banana starch intervention can significantly improve the health condition of diabetic animals. The results implied that unripe bananas could serve as a good source of resistant starch when applied to a human who had diabetic complications. **Rosado et al., (2020)** showed that GB attenuated dyslipidemia and glucose intolerance. Similarly, to our results, **Dos Santos Bueno et al., (2018**) and **Agustin et al., (2019)** also showed a reduction in glycemia after treatment with resistant starch **(Matsuda et al., 2016)**. An increase in the levels of glucose in plasma may be related to alterations in the insulin response, and this condition may lead to insulin resistance and diabetes mellitus, which are also related to cardiovascular diseases **(Arnold et al., 2018)**.

Famakin et al., (2016) performed a study about the nutritional properties, glycemic index, and antidiabetic properties of plantain (*Musa paradisiaca*) based functional dough meals and significantly found a reduction in glucose levels compared to metformin. **Bai et al., (2022)** found that the banana starch (BS) intervention significantly lowered the insulin resistance index by 25% in diabetic rats, compared to the control groups of rats.

The consumption of banana peel flakes for a 3-week period was associated with blood glucose concentration and immobility time scores in rats **(Meliala et al., 2020)**. Resistant starch in banana peel flakes exerts several beneficial effects by improving insulin resistance and glucose homeostasis, both in healthy individuals and in prediabetic individuals with metabolic syndrome **(Bodinham et al., 2014)**.

The effect of onion supplementation on reducing blood glucose levels was also reported in some recent studies

(Abouzed et al., 2018 and Lolok et al., 2019). Phytochemicals such as quercetin and allyl-propyl disulfides found in onion peel and bulb might be responsible for the beneficial effect on blood glucose level by up-regulating the expression of insulin receptors and glucose transporters, improving insulin sensitivity and promoting glucose metabolism in peripheral tissues in diabetic rats. Hence, it is anticipated that phytochemicals present in onions might improve insulin sensitivity by amending the insulin receptor and glucose transporter expression and promoting glucose metabolism in the peripheral tissues of diabetic rats **(Jung et al., 2011)**. **Ülger and Çakiroglu, (2020)** showed that lyophilized onion powder may be a protective agent against hyperglycemia arising from diabetes.

Diabetic dyslipidemia is one of the major complications of diabetes and occurs in diabetic patients due to insulin insufficiency or insensitivity. Besides hypercholesterolemia and hypertriglyceridemia, other characteristics of diabetic dyslipidemia are decrease of HDL-C concentration, and increase of LDL-C and VLDL concentrations **(Tangvarasittichai, 2015)**. Dysregulation of lipid metabolism, characterized by elevated levels of TG, TC, and LDL-C and decreased levels of HDL-C, is an important determinant of the course and status of diabetes mellitus and its complications **(Jiang et al., 2015)**.

Rosado et al., (2020) showed that the inclusion of GB in the diet improved cholesterol metabolism, glucose tolerance and insulin resistance, all of which were found in the HF-GB group. Green bananas may also exhibit hypolipidemic effects possibly due to the presence of flavonoids. This effect was shown by **Vijayakumar et al., (2009)** in their study with flavonoids form banana paradisiaca in rats. They observed a reduction in the levels of triglycerides, cholesterol, phospholipids and free fatty acids in the blood, kidney, liver, and brain. **Verma, et al., (2014)** showed that green banana flour might play a role as anti-atherosclerotic activity in rats. **Agustin et al., (2019)** concluded that Berlin banana flour has the potential to improve lipid profiles in dyslipidemia rats.

Agustin et al., (2019) stated that unripe banana flour (UBF) can reduce TC and LDL levels. **Bai et al., (2022)** found that the metabolic products of HDL-c were increased by 164%, while LDL-c were reduced by 50%, compared to the control groups of rats. The triglyceride level in diabetic rats remains relatively stable. Patients with pre-diabetes and those who consume green bananas could improve their plasma low-density lipoprotein particle functionality **(Lotfollahi et al., 2020)**. Preliminary studies with high-fat induced obesity mice demonstrated that resistant starch from green bananas was able to improve liver lipid metabolism **(Konda et al., 2020)**.

Regarding onion, **Ülger and Çakiroglu, (2020)** showed that lyophilized onion powder may be protective against dyslipidemia arising from diabetes. **Wu and Parhofer, (2014)** reported that TC, TG and LDL-C levels are increased, and HDL-C levels are decreased in the presence of diabetes. In addition, it was reported that these effects of onion and its sulfurous compounds on plasma lipid profiles, were produced by inhibiting HMG-CoA reductase activities and decreasing intestinal cholesterol absorption **(Hasimun et al., 2011)**. It is also believed that onion may protect against diabetic dyslipidemia by regulating lipoprotein lipase and hepatic lipase activities due to its insulinotropic effects.

So, it could be concluded that, green or yellow bananas fruit, dried onions and ready-made onion powder might be suitable for diabetic patients.

References

- **Abouzed T., Contreras M., Sadek K., Shukry M., Abdelhady D., Gouda W., Abdo W., Nasr N., Mekky R., Segura-Carretero A., Kahilo K. and Abdel-Sattar E. (2018).** Red onion scales ameliorated streptozotocin-induced diabetes and diabetic nephropathy in Wistar rats in relation to their metabolite fingerprint. Diabetes Res Clin Pract.; 140:253–64.
- **Agustin, F., Febriyatna, A., Damayati, R., Hermawan, H., Faiziah, N., Santoso, R. and Wulandari, R. (2019).** Effect of Unripe Berlin Banana Flour on Lipid Profile of Dyslipidemia Rats. Maj Kedokt Bandung, 51(2):70-74.

- **Albers, N., Benderson, V. and Warnick, G. (1983).** Enzymatic determination of high-density lipoprotein cholesterol, Selected Methods. Clin. Chem, 10(5):91-99.
- **Arnold, S., McGuire, D., Inzucchi, S., Tang, F., Mehta, S., Lam, C., Goyal, A., Sperling, L., Wong, N., Hammar, N., Fenici, P. and Kosiborod, M. (2018).** Assessing use of patient-focused pharmacotherapy in glycemic management through the Diabetes Collaborative Registry (DCR). J Diabetes Complications, S1056-8727(17): 31407-1.
- **Asatoor A. and King E. (1954).** Simplified colorimetric blood sugar method. The Biochemical Journal, 56 (325th Meeting), xliv.
- **Bai, Y., Xin, M., Lin, J., Xie, J., Lin, R., Peng, Z. and Bai, W. (2022).** Banana starch intervention ameliorates diabetes-induced mood disorders via modulation of the gut microbiota-brain axis in diabetic rats. Food and Agricultural Immunology, 33(1):377-402.
- **Bodinham C., Smith L. and Thomas E. (2014).** Efficacy of increased resistant starch consumption in human type 2 diabetes. Endocr Connect; 3:75–84.
- **Bos M. and Agyemang C. (2013).** Prevalence and complications of diabetes mellitus in Northern Africa, a systematic review. BMC Public Health. 13:1-7.
- **Burtis, C. A. and Ashwood, A. (1999).** Tietz textbook of clinical chemistry 3rd ed. Philadelphia, London Pub Saunders WB and CO.
- **Clark, P. and Hales, C. (1994).** How to measure plasma insulin. Diabetes/metabolism reviews, 10(2): 79-90.
- **Dos Santos Bueno, M., Guiguer, É. and De Souza, M. (2018).** Effect of green banana flour on the metabolic profile of wistar rats". International Journal of Development Research, 8(10):23298-23302.
- **Famakin, O., Fatoyinbo, A., Ijarotimi, O., Badejo, A. and Fagbemi, T. (2016).** Assessment of nutritional quality, glycaemic index, antidiabetic and sensory properties of plantain (Musa paradisiaca)-based functional dough meals. J FoodSciTechnol., 53(11):3865-3875.
- **Friedewald, W., Levy, R. and Fredrickson, D. (1972).** Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clinical chemistry, 18(6): 499-502.
- **García-Sánchez A., Miranda-Díaz A. and Cardona-Muñoz E. (2020).** The Role of Oxidative Stress in Physiopathology and Pharmacological Treatment with Pro- and Antioxidant Properties in Chronic Diseases. Oxidative Med Cell Long.; 23:2082145.
- **Gargouri, M., Magné, C. and El Feki, A. (2016).** Hyperglycemia, oxidative stress, liver damage and dysfunction in alloxan-induced

diabetic rat are prevented by Spirulina supplementation. Nutrition research, 36(11): 1255-1268.

- **Ha H. and Kim K. (1999)**. Pathogenesis of diabetic nephropathy: the role of oxidative stress and protein kinase C. Diabetes Res Clin Pract. 45:147–151.
- **Hasimun P., Sukandar E., Adnyana I. and Tjahjono D. (2011).** A simple method for screening antihyperlipidemic agents. Int J Pharmacol.;7:74–78.
- **Hegazi, R., El-Gamal, M., Abdel-Hady, N. and Hamdy, O. (2015).** Epidemiology of and risk factors for type 2 diabetes in Egypt. Annals of global health, 81(6): 814-820.
- **Jelikić-Stankov, M., Đurđević, P. and Stankov, D. (2003).** Determination of uric acid in human serum by an enzymatic method using N-Methyl-N-(4-aminophenyl)-3-methoxyaniline reagent. Journal of the Serbian Chemical Society, 68(8-9):691-698.
- **Jiang, C., Wang, Q., Wei, Y., Yao, N., Wu, Z., Ma, Y. and Yin, Z. (2015).** Cholesterol-lowering effects and potential mechanisms of different polar extracts from Cyclocarya paliurus leave in hyperlipidemic mice. Journal of ethnopharmacology, 176:17-26.
- **Jung J., Lim Y., Moon M., Kim J. and Kwon O. (2011).** Onion peel extracts ameliorate hyperglycemia and insulin resistance in high fat diet/streptozotocin-induced diabetic rats. Nutr Metab.;8:1–18.
- **Konda, P., Poondla, V., Jaiswal, K., Dasari, S., Uyyala, R., and et al., (2020).** Pathophysiology of high fat diet induced obesity: Impact of probiotic banana juice on obesity associated complications and hepatosteatosis. Scientific Reports, 10(1):16894.
- **Latha, S.; Rajaram, K. and Suresh Kumar, P. (2014):** Hepatoprotective and antidiabetic effect of methanol extract of Caralluma fimbriata in streptatozocin induced diabetic albino rats. International Journal of Pharmacy and Pharmaceutical Sciences, 6(1):665–668.
- **Lolok N., Mashar H., Annah I., Saleh A., Yuliastri W. and Isrul M. (2019).** Antidiabetic effect of the combination of garlic peel extract (Allium sativum) and onion peel (Allium cepa) in rats with oral-glucose tolerance method. Res J Pharm Technol; 12.
- **Lotfollahi, Z., Mello, A., Costa, E., Oliveira, C., Damasceno, N. R., Izar, M. and Neto, A. (2020).** Green-banana biomass consumption by diabetic patients improves plasma low-density lipoprotein particle functionality. Scientific Reports, 10(1), 12269.
- **Matsuda, H., Kumazaki, K., Otokozawa, R., Tanaka, M., Udagawa, E. and Shirai, T. 2016.** Resistant starch suppresses postprandial hypertriglyceridemia in rats. Food Res Int., 89(Pt 1): 838-842.

- **Meliala, A., Sumiwi, Y., Narwidina, P., Rini, S. and Setyaningsih, W. (2020).** Banana peel flakes alleviate blood glucose and stress in a dose-dependent manner. Int. J. Pharm. Pharm. Sci, 12(8):75-81.
- **Negm, H. (2020).** Study of Glycemic Control by Ketogenic Diet Supplemented with Different Oils in Type II Diabetic Rats.Journal of Home Economics, 36(2):21-40.
- **Pareek, S. (2016).** Nutritional and Biochemical Composition of Banana (Musa Spp.) Cultivars. Nutri compost fruit cultivars, 49–81.
- **Pitocco D., Zaccardi F., Di Stasio E., Romitelli F., Santini S. and Zuppi C.** (2010): Oxidative stress, nitric oxide, and diabetes. Rev Diabetic Stud.; 7(1): 15–25.
- **Rai, P., Jaiswal, D., Rai, N., Pandhija, S., Rai, A. and Watal, G. (2009).** Role of glycemic elements of Cynodon dactylon and Musa paradisiaca in diabetes management. Lasers Med. Sci. 24:761–768.
- **Ramos D., Leonel M. and Leonel S. (2009).** Amido resistente em farinhas de banana verde. Alim Nutr.;20(3):479-83
- **Reeves R., Nielsen F. and Fahey G. (1993).** AIN-93 Purified Diets for Laboratory Rodents. J. Nutr.,123(1):1939-1951.
- **Richmond, N. (1973):** Colorimetric determination of total cholesterol and high-density lipoprotein cholesterol (HDL-c). Clin. Chem, 19:1350-1356.
- **Rosado, C., Rosa, V., Martins, B., Soares, A., Santos, I., Monteiro, E. and Daleprane, J. (2020).** Resistant starch from green banana (Musa sp.) attenuates non-alcoholic fat liver accumulation and increases short-chain fatty acids production in high-fat diet-induced obesity in mice. International journal of biological macromolecules, 145, 1066-1072.
- **Sarkar S., Pranava M. and Marita R.A. (1996).** Demonstration of the hyperglycemic action of Momordica charantia in a validated animal model of diabetes". Pharmacol. Res; 33: 1-4.
- **Sidhu, J. and Zafar, T. A. (2018).** Bioactive Compounds in Banana Fruits and Their Health Benefits. Food Qual. Saf. , 2(4):183–188.
- **Sumathy, V., Jothy Lachumy S., Zakaria Z. and Sasidharan S. (2011).** In vitro bioactivity and phytochemical screening of Musa acuminata flower. Pharmacology online., 2:118–12.
- **Tabacco, A. (1979).** Quantitative enzymatic colorimetric determination of blood urea nitrogen in serum or plasma. Clin. Chem, 25: 336-338.
- **Tangvarasittichai S. (2015).** Oxidative stress, insulin resistance, dyslipidemia and type 2 diabetes mellitus. World J Diabetes.; 6:456–480.
- **Ülger, T. and Çakiroglu, F. (2020).** The effects of onion (Allium cepa L.) dried by different heat treatments on plasma lipid profile and fasting blood glucose level in diabetic rats. Avicenna Journal of Phytomedicine, 10(4):325.

- **Verma, V., Singh, N. and Jaggi, A. (2014).** Sodium-hydrogen exchanger inhibitory potential of Malusdomestica, Musa x paradisiaca, Daucuscarota, and Symphytumofficinale. J Basic Clin Physiol Pharmacol., 25(1): 99-108.
- **Vijayakumar, S., Presannakumar, G. and Vijayalakshmi, N. (2009)**. Investigations on the effect of flavonoids from banana, Musa paradisiaca L. on lipid metabolism in rats. J Diet Suppl. 6:111-23.
- **Wahlefeld, A. (1974).** Triglycerides determination after enzymatic hydrolysis. In Methods of enzymatic analysis. Academic Press, 4(2):1831-1835.
- **Wild, S., Roglic, G., Green, A., Sicree, R. and King, H. (2004).** Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes care, 27(5): 1047-1053.
- **Wu L, & Parhofer KG. (2014).** Diabetic dyslipidemia. *Metabolism.* 2014; 63:1469–1479.
- **Zandonadi R. (2009).** Green banana mass: an alternative to exclusion of gluten. Doctoral Thesis. (Doctorate in Health Sciences), University of Brasilia – School of Health Sciences, Brasilia, Brazil.

المجلة المصرية للدراسات المتخصصة

دورية فصلية علمية محكمة – تصدرها كلية التربية النوعية – جامعة عين شمس

المجلة المصرية للدراسات المتخصصة

Egyptian Journal for Specialized Studies

المراسلات :

ترسل المراسلات باسم الأستاذ الدكتور/ رئيس التحرير، على العنوان التالى

٣٦٥ ش رمسيس – كلية التربية النوعية – جامعة عين شمس ت/ ٠٢/٢٦٨٤٤٥٩٤

الموقع الرسمي:
https://ejos.journals.ekb.eg

البريد الإلكتروني:
egyjournal@sedu.asu.edu.eg

الترقيم الدولي الموحد للطباعة : 6164 - 1687

الترقيم الدولي الموحد الإلكتروني : 2682 - 4353

تقييم المجلة (يونيو ٢٠٢٣) : (7) نقاط

معامل ارسيف Arcif (أكتوبر ٢٠٢٣) : (0.3881)

المجلد (١٢)، العدد (٤٢)، الجزء الثالث

إبريل ٢٠٢٤

(*) الأسماء مرتبة ترتيباً ابجديًا.