



IN-VITRO AND IN-VIVO HYPOGLYCEMIC EFFICACY OF ROSA DAMASCENA PETALS EXTRACTS

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Rosa damascena, which belongs to the Rosaceae family, is considered as one of the most important plants used in traditional medicine due to its different pharmacological properties, such as treatment of abdominal and chest pain, menstrual bleeding, and reduction of inflammation. The objective of our study was to investigate the hypoglycemic efficacy of *R. damascena*.

Aqueous and methanolic extracts were prepared from the petals of *R. damascena* mill (RDM). The phenolic content of the extracts was assessed using the Folin-Ciocalteu colorimetric method. The hypoglycemic activity was evaluated by the determination of in vitro alpha-amylase inhibitory activity. The in vivo post-prandial hypoglycemic effect was performed in normal and alloxan-induced diabetic mice. Acarbose (alpha-glucosidase inhibitor) was used as a standard drug.

The total phenolic content of aqueous and methanolic extracts was 29.23 gGAE/l and 58.8 gGAE/l. The alpha-amylase inhibition assay was performed using concentrations of (20, 40, 60, 80, 100, and 120 µg/ml) of aqueous extract, methanolic extract, and acarbose. The percentage inhibition of alpha-amylase was dependent on dose and varied between (33.66-89.96%), (41.57-92.16%) and (23.4-81.82%), respectively. Both aqueous and methanolic extracts revealed higher inhibitory activity of alpha-amylase compared to acarbose.

Oral administration of methanolic extract in normal and diabetic mice significantly decreased glucose blood levels after maltose loading in a dose-dependent manner. These results suggest that *R. damascena* petal extracts might have a hypoglycemic effect. They also imply that *R. damascena* may have anti-diabetic properties by inhibiting of alpha-glucosidase-mediated carbohydrate absorption in the intestine and lowering postprandial glucose levels.

Keywords: *Rosa damascena*, Rosaceae, diabetes mellitus, alpha-amylase and alpha-glucosidase, postprandial glucose levels.

INTRODUCTION

Diabetes mellitus (DM) is considered one of the most common diseases in the 21st century, and the number of people suffering from this disease is increasing significantly annually. According to the International Diabetes Federation (IDF) statistics in 2019, the number of people who suffered from diabetes around the world reached about 463

million, which is equivalent to 8.8% of adults, 79% of these patients lived in low or middle-income countries¹. Globally, the number of deaths due to diabetes in 2019 reached about 4.2 million patients¹.

DM is a chronic disease characterized by abnormalities in glucose tolerance and insulin resistance². There are two main types of diabetes: insulin-dependent (T1DM) and non-insulin-dependent (T2DM). The second type of

DM is the most prevalent among the main types and represents for about 90% of the conditions. Diabetes is associated with complications such as metabolic syndrome, heart disease³⁻⁵, retinopathy^{6&7}, nephropathy⁸ and neuropathy⁹. It's hard to achieve the effective treatment of T2DM because of its non-insulin-dependent manner. Diet, weight control, and physical activity are the first-line treatments. If the desired blood glucose levels wasn't accessed after these lifestyle changes, medications (sulfonylureas, biguanides, thiazolidinediones, meglitinides, dipeptidyl peptidase IV inhibitors, glucosidase inhibitors) are usually recommended¹⁰.

Postprandial hyperglycemia is a significant risk factor for T2DM¹¹. Controlling blood glucose levels is one of the most efficient approaches to avoid diabetes and hyperglycemia¹². Digestive enzymes (alpha-glucosidase and alpha-amylase) catalyze the hydrolysis of carbohydrates to produce blood glucose. Alpha-glucosidase is a carbohydrates hydrolyzing enzyme found in the membrane of intestinal cells. While alpha-amylase is an enzyme secreted by the pancreas and salivary glands which can break down starch and oligosaccharides into simple sugars. Inhibiting these enzymes can delay the digestion of carbohydrates, resulting in a lower rate of glucose uptake into the blood. Therefore, inhibition of these enzymatic activities in the gastrointestinal tract considered as a therapeutic approach for the treatment of diabetes^{13&14}.

Some synthetic inhibitors of alpha-glucosidase and alpha-amylase enzymes have been developed, such as acarbose and voglibuse¹⁵. However, some side effects are associated with these inhibitors, such as flatulence and digestive and liver disorders. Therefore, it is preferable to use inhibitors that have less side effects and are derived from natural sources. Several *in vitro* and *in vivo* studies have investigated the anti-diabetic properties of such phytochemicals^{13&16}.

One of the most important health-promoting phytochemicals are phenolic compounds, secondary plant metabolites, including phenolic acid, flavonoids, and anthocyanins, known to inhibit the former enzymes.

Rosa damascena is a popular ornamental plant that belongs to the *Rosaceae* family. UNESCO has recently listed it as a national intangible culture heritage of the Syrian Arab

republic. *Rosa damascena* is not only famous for its aromatic uses, but it has also been scientifically. It has many therapeutic uses such as treating abdominal and chest pain, menstrual bleeding and digestive problems^{17&18}. Chemically, several components responsible for most of *Rosa damascena's* therapeutic properties have been isolated: terpenes, flavonoids, glycosides, kaempferol, anthocyanins, myrcene, carboxylic acid, quercetin, vitamin C, tanning matter and fatty oil¹⁸⁻²¹.

The present study aimed to determine the amounts of phenolic compounds in the methanolic and aqueous extracts of *Rosa damascena* Mill (RDM), and assess its hypoglycemic effect using the assay of alpha-amylase inhibitory activity. In addition, we studied its hypoglycemic effect in normal and alloxan-induced diabetic mice compared to acarbose as a reference hypoglycemic drug.

MATERIAL AND METHODS

Material and equipment

Alloxan, 3,5-dinitro salicylic acid (DNSA), alpha-amylase, starch, maltose and gallic acid were purchased from Titan Biotech, India. Acarbose was procured from Oushar Pharmaceutical, India. Methanol was purchased from Al Mohandes.CO, Egypt. Folin-Denis reagent was purchased from Sigma- Aldrich, Switzerland. Sodium Carbonate was purchased from BDH, England. Sodium Dihydrogen phosphate and Di-Sodium hydrogen phosphate were purchased from Merck. HCl was purchased from SHAM Lab, Syria. NaOH was purchased from Avonchem Ltd. Sodium potassium tartrate tetrahydrate was purchased from SCP Ltd. Accu-check performa was purchased from Roche, Germany.

Plant material and preparation of plant extracts

The study samples included the petals of the *Rosa damascena*, which is widespread in Syria during its flowering season (May). Samples were transferred to the laboratory after harvesting. A voucher specimen has been deposited in the herbarium of the Faculty of Pharmacy, Tishreen University, Latakia, Syria. The plant was identified by Abed Almajid Alsalti and recorded with a code number (22-5-2021).

The petals were dried on a glass surface in a ventilated room away from light, moving them over several times. Then the petals were crushed by a home mixer to get a fine powder and were put in dark, tightly closed packages until used.

Aqueous extract was prepared by introducing (10 g) of petal powder into (100 ml) of distilled water, then placing the mixture in a water bath at 60° C for 3 min. Thereafter the mixture was cooled, filtered, and lyophilized. The dried residue of aqueous extract was collected in a special flask and kept in a freezer at -20°C. Next, the concentration of phenolic compounds was determined after dissolving the dried residue in 4 ml of distilled water and the hypoglycemic activity was assessed *in vitro*.

To obtain the methanolic extracts, (10 g) of petal powder was placed in (100 ml) of methanol, then the mixture was sonicated for 30 min at room temperature. After that, the mixture was filtered and dried using a rotary evaporator. The sample was lyophilized and kept in a freezer at -20°C. Next, the concentration of phenolic compounds was determined after dissolving the dried residue in 4 ml of distilled water, and the hypoglycemic activity was assessed *in vitro* and *in vivo*.

Determination of total phenolic content

The total content of phenolic compounds (which include flavonoids, phenolic acids, coumarins, stilbenes, and lignans) was determined according to the Folin-Ciocalteu method mentioned by Vermerris and Nicholson²².

2 ml of 2% (w/v) anhydrous sodium carbonate solution was added to 0.1 ml of the sample, mixed well and after 5 min, 0.1 ml of a 1:1 dilution Folin-Ciocalteu reagent was added. The reaction mixture was left at room temperature in a dark place for 30 min, and then the absorbance was measured at a wavelength of 750 nm. The absorbance was measured three times. At the same time, the blank was prepared as formerly described, using 0.1 ml of distilled water instead of the sample.

Finally, the total content of phenolic compounds was calculated based on the standard series of gallic acid, whose concentrations ranged between (0.1 - 0.6 g/l). The results were expressed as grams of gallic

acid equivalent (GAE) to the phenolic compounds in 1 liter of extract (g GAE/l).

Alpha-Amylase Inhibition assay

The *in vitro* hypoglycemic activity was determined using the alpha-amylase inhibitory activity method described by Miller²³, while the inhibitory activity of alpha-glucosidase was tested *in vivo* as alpha-glucosidase exists in mice.

The complete assay mixture included: 200 µl 0.02M sodium phosphate buffer, 20 µl alpha-amylase (2 Unit/ml), 200 µl plant extracts (20, 40, 60, 80, 100, and 120 µg/ml)²⁴. The mixture was incubated for 10 min at room temperature before adding 200 µl starch 1 % to all test tubes. The reaction was terminated by adding 400 µl of DNSA. Thereafter, the tubes were placed in a boiling bath for 5 min, cooled down to room temperature, and expanded by adding 15 ml of distilled water. The absorbance was measured at a wavelength of 540 nm. The standard drug sample was prepared in the same way. Blank was prepared by adding all chemicals except the enzyme, acarbose, and the extracts. A negative control sample was prepared using the enzyme without any extracts or acarbose. Each test was performed three times, and the mean value was used to indicate the inhibitory activity of the plant extract.

The results were computed as a percent inhibition by the following formula:

$$\text{Inhibition activity (\%)} = \frac{\text{Abs (control)} - \text{Abs (extract)} \times 100}{\text{Abs (control)}}$$

The IC₅₀ values (inhibitor concentration at which 50% inhibition of the enzyme activity occurs) of the plant extracts were determined by performing the assay as above with different concentrations of the plant extracts ranging from 20 to 120 µg/ml. Acarbose was used as a positive control in the concentration range of 20-120 µg/ml.

Animals and induction of Diabetes

Male Albino mice weighing 17–23 g were kept in individual cages at room temperature (22–25°C) in 12/12-hour light/dark cycles. Water and a commercial rodent diet were provided. Mice were fasted for 16 hours prior to the experiment, but were given free access to water.

A single intra-peritoneal injection of alloxan monohydrate (150 mg/kg) in saline was used to induce diabetes. Diabetic mice were confirmed by fasting blood glucose concentrations greater than 250 mg/dl after 72 hours of alloxan injection.

Experimental design

To assess the post-prandial hypoglycemic effect of RDM extracts in normal mice, albino mice were divided into three groups ($n = 6$ in each group). Group 1 (control group) was given 2 g/kg body weight of maltose. Group 2 (standard drug) was given 2 g/kg body weight of maltose and 50 mg/kg body weight of acarbose. Group 3 (experimental group) received 2 g/kg body weight of maltose and a single dosage of 500 mg/kg body weight of RDM extract. Maltose, acarbose, and RDM extract were dissolved in distilled water and given by oral gavage. An Accu-check glucometer was used to measure blood glucose levels at 0 (before administration), 30, 60, and 120 min after maltose administration.

For hypoglycemic efficacy evaluation in alloxan-induced diabetic mice, the animals were divided into six groups ($n= 6$ in each group, except the last group, $n= 2$). The control group was given 2 g/kg body weight of maltose. The second group was given 2 g/kg body weight of maltose and 50 mg/kg body weight of acarbose. The other four groups were given 2 g/kg body weight of maltose and a concentration of 100, 250, 500, and 1000 mg/kg body weight of RDM extract, respectively²⁵. Maltose, acarbose, and RDM extract were dissolved in distilled water and given by oral gavage. Using an Accu-check Glucometer, blood glucose levels were measured at 0 (before administration), 30, 60, 120, and 180 min after maltose administration.

Statistical analysis

All the data was shown as mean \pm standard error of means (SEM). The Statistical Package for Social Sciences (SPSS version 20.0) programme was used to achieve the research's aims, and p values lower than 0.05 were defined as statistically significant and corresponded to a confidence level of (95%). The statistical analysis was performed using

one-way ANOVA and LSD (least significant differences) tests.

RESULTS AND DISCUSSION

Results

Content of phenolic compounds

The total phenolic contents were 29.23 g_{GAE}/l and 58.8 g_{GAE}/l for the aqueous and methanolic extracts, respectively.

Alpha-amylase inhibitory activity of RDM extracts

The percentage of inhibition activity of aqueous, methanolic extracts, and acarbose is shown in table 1.

The results show significant statistically differences between the means of the inhibition activities of each of the acarbose, aqueous, and methanolic extracts of RDM at all concentrations compared to the negative control (p value < 0.05), suggesting an inhibitory activity of RDM on alpha-amylase.

To compare the means of each assay (acarbose, methanolic, and aqueous extracts), an LSD test was conducted. The test showed a significant difference between all groups at each concentration, except for the concentration of 20 μ g/ml, where the significant difference was between acarbose and the methanolic extract of RDM only, and for the concentration of 80 μ g/ml where the significant difference was between acarbose and each of the two extracts.

The highest inhibition activity was achieved by the use of the methanolic extract of RDM, where it was higher than the aqueous extract by (23.48, 17.24, 17.43, 2.36, 7.89, 2.44%) and also higher than acarbose by (77.68, 80.32, 40.48, 60.17, 21.06, 12.64%) at concentrations of (20-40-60-80-100-120 μ g/ml), respectively. The inhibition activity mean of aqueous extract of RDM was higher than acarbose by (43.89, 53.80, 19.61, 65.48, 12.21, and 9.94%), at concentrations of (20-40-60-80-100-120 μ g/ml), respectively.

Table 1 :Alpha-amylase inhibitory activity of acarbose and RDM extracts (when two means have a different letter, then there is a significant difference between them), mean \pm SEM.

Concentration <i>ug/ml</i>	Alpha-amylase inhibitory activity		
	Acarbose	Methanolic extract	Aqueous extract
20	A 23.40 \pm 4.78	B 41.57 \pm 3.27	AB 33.66 \pm 2.28
40	A 29.69 \pm 2.58	C 53.53 \pm 1.54	B 45.66 \pm 2.48
60	A 45.50 \pm 0.85	C 63.92 \pm 2.59	B 54.43 \pm 1.32
80	A 50.24 \pm 1.21	B 80.48 \pm 0.71	B 78.62 \pm 1.16
100	A 72.68 \pm 1.34	C 87.99 \pm 0.70	B 81.56 \pm 0.37
120	A 81.82 \pm 0.36	C 92.16 \pm 0.26	B 89.96 \pm 0.17

IC 50 Value Calculation

The IC₅₀ of aqueous, methanolic extracts and acarbose are plotted in figure 1.

The methanolic extract showed an IC₅₀ of 32.53 μ g/ml, which was less than the IC₅₀ of acarbose (68.98 μ g/ml) by 52.84 %. The aqueous extract showed an IC₅₀ of 46.23 μ g/ml, which was less than the IC₅₀ of acarbose by 32.98%.

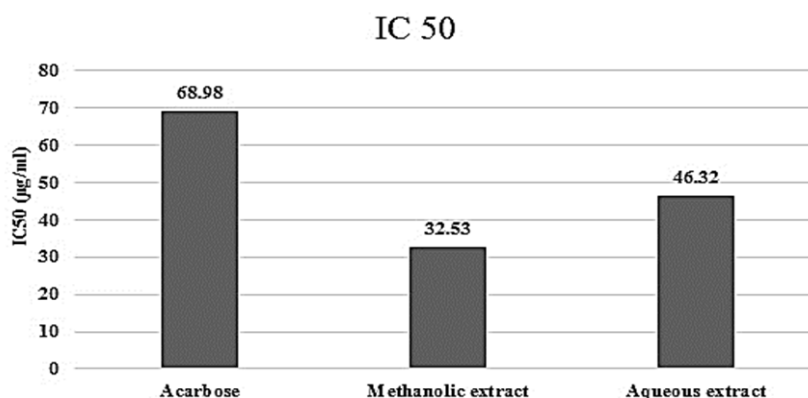


Fig. 1: IC₅₀ for RDM extracts and acarbose (μ g/ml).

Effects of RDM Methanolic Extract on Postprandial Blood Glucose Levels of Normal and Diabetic Mice

Based on the findings of the *in vitro* alpha-amylase inhibitory activity, we investigated whether RDM may have the same effect on alpha-glucosidase activity and postprandial glucose levels in mice after administration of a high-maltose dose.

In normal mice, oral administration of RDM methanolic extract (500 mg/kg) significantly decreased blood glucose levels after 30, 60, and 120 min of maltose administration (*p* value < 0.05) (group 3) more than the mice that did not receive any treatment (group 1). Additionally, this reduction was significantly more efficient than that one of acarbose (group 2), with about 37.91%, 33.11%, and 21.59% after 30, 60, and 120 min of maltose administration, respectively (Figure

2, a). Table 2 shows the mean glucose blood level (mg/dl) in the three normal mice groups.

Similarly, in alloxan-induced diabetic mice, treatment with RDM methanolic extract (500 mg/kg) showed the same decline profile in blood glucose levels after 30, 60, and 120 min of maltose administration, compared to the

control group (group 1), with a p value < 0.05 for the time points of 30 and 60 min after administration. The extract was more capable to reduce blood glucose levels than acarbose at the same time points with a p value < 0.05 . (Figure 2, b)

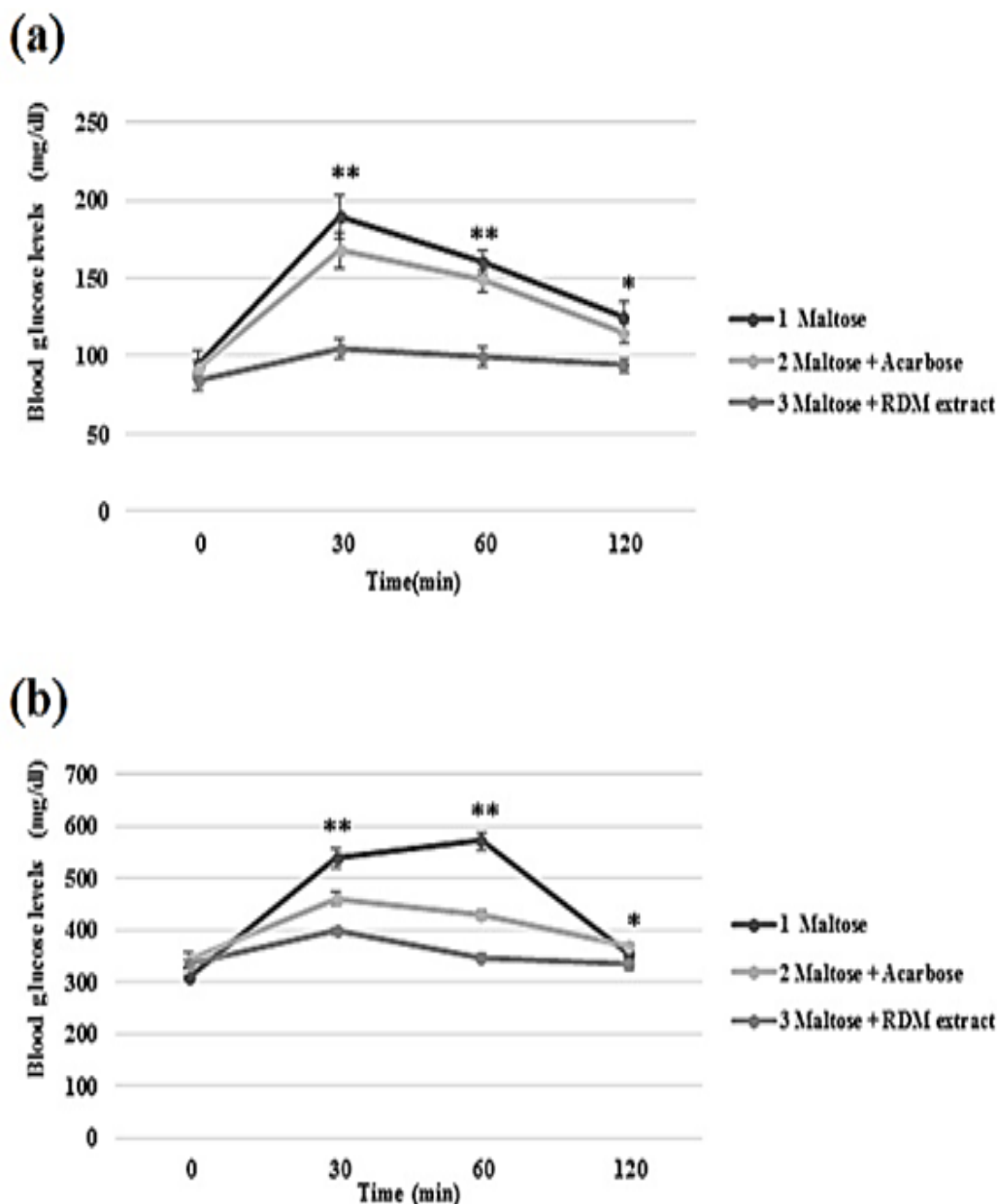


Fig. 2: Effects of RDM extract (group 3) on blood glucose levels in normal mice (a) and diabetic mice (b) following maltose administration. The mice were fasted for 16 hours before receiving maltose (2 g/kg) and RDM extract dosage (500 mg/kg) via oral gavage. Maltose alone (group 1) or maltose plus 50 mg/kg body weight acarbose (group 2). Blood glucose levels were measured before administration, 30, 60, and 120 minutes after the materials were given. The results were expressed as mean \pm SEM, $n = 6$, * $p < 0.05$, ** $p < 0.01$.

Table 2: Means of Glucose blood level (mg/dl) in normal mice between three groups.

Group Time(min)	Maltose	Maltose + Acarbose	Maltose + 500 mg RDM
0	94.67	91	83.5
30	189.33	167.5	104
60	159.83	148.5	99.3
120	124.5	119.67	93.8

To investigate whether this effect was dose-dependent, different concentrations (100, 250, 500, and 1000 mg/kg body weight of RDM extract) were administrated to alloxan-induced diabetic mice. The treatment with RDM reduced the increase in blood glucose

levels in a dose-dependent manner after 30, 60, 120, and 180 min of maltose administration (p value < 0.01) (groups 3, 4, 5 and six) compared to the mice that did not receive any treatment (group 1) Figure 3. Table 3 shows the mean glucose blood level (mg/dl) in the six diabetic mice groups.

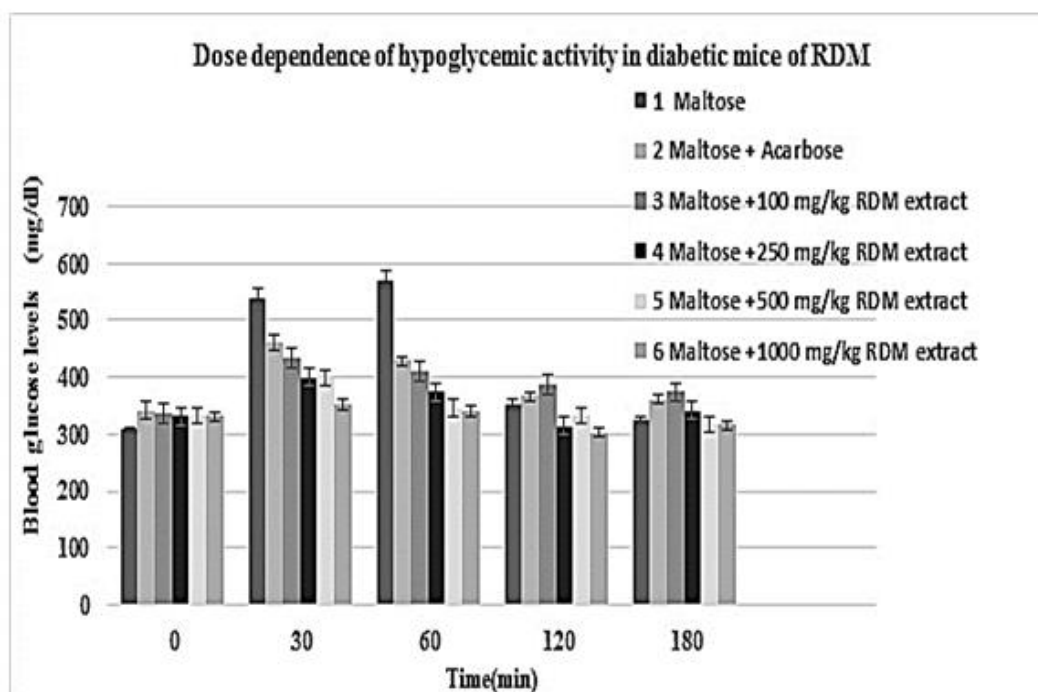


Fig. 3: Inhibitory effects of RDM on blood glucose levels in diabetic mice following maltose administration. The mice were fasted for 16 hours before receiving maltose (2 g/kg) and RDM dosages via oral gavage. Group 1, maltose alone ($n=6$); group 2, maltose + acarbose 50 mg/kg body weight ($n=6$); group 3, maltose + 100 mg/kg RDM ($n=6$); group 4, maltose + 250 mg/kg RDM ($n=6$); group 5, maltose + 500 mg/kg RDM ($n=6$); group 6, maltose + 1000 mg/kg RDM ($n=2$). Glucose blood levels (mg/dl) were measured before administration, 30, 60, 120 and 180 minutes after the materials were given. The results were expressed as mean \pm SEM. All the p values were lower than 0.01 except at 0 minute.

Table 3: Means of Glucose blood level (mg/dl) in diabetic mice between six groups.

Group Time(min)	Maltose	Maltose+ Acarbose	Maltose+100 mg MDR	Maltose+250 mg MDR	Maltose+500 mg MDR	Maltose+100 0 mg MDR
0	308.83	341.67	336	331.67	333	331.5
30	538	460	433.33	399.17	397.5	351.5
60	571.67	428.33	410	374.17	346.33	340
120	352.5	366.67	387.5	314.17	332.83	303.5
180	324.17	360.83	374.17	340.83	315.83	316.5

Discussion

Management of blood glucose levels is a critical strategy in controlling complications of diabetes. Inhibitors of polysaccharide hydrolysis (via alpha-amylase and alpha-glucosidase) are useful as oral hypoglycemic agents to control hyperglycemia, especially in patients with T2DM²⁶. Reducing the rate of glucose absorption leads to a decrease in the rise in plasma glucose after meal²⁷. Alpha-amylase is one of the main enzymes in the human body responsible for converting starch into simpler sugars. Alpha-amylase hydrolyzes polysaccharides to produce oligosaccharides and disaccharides, which are hydrolyzed by alpha-glucosidase to monosaccharides and then absorbed through the small intestine into the hepatic portal vein, which by turn increases postprandial glucose blood levels²⁸.

Traditional plant remedies or herbal formulations have been used since ancient centuries and their use is constantly increasing despite their controversial efficacy and safety profile^{29&30}. Previous research indicates that plants produce a large variety of alpha-glucosidase and alpha-amylase inhibitors that provide protection against insects and their larvae, and many microbial pathogens³¹.

The present study reveals that the potential for alpha-amylase and alpha-glucosidase inhibition exists even in ornamental plants. *Rosa damascena* is a famous plant which is not only used for its aromatic properties, but recently, many researches have showed several medical benefits for this plant^{17&18}, which might be due to its content of many phenolic compounds such as flavonoids, glycosides, kaempferol, anthocyanins, myrcene, quercetin, tanning matter, and fatty oil¹⁷.

The inhibitory properties of alpha-amylase and alpha-glucosidase by these plant extracts

may be useful in reducing various side effects such as flatulence, gastrointestinal and liver disorders, and possibly diarrhoea that appear with synthetic drugs³². This study indicates that the mechanism by which *Rosa damascena* acts as a hypoglycemic agent is by inhibiting alpha-amylase and alpha-glucosidase enzymes. The inhibitory effects of methanolic and aqueous extracts of *Rosa damascena* against alpha-amylase were evaluated in vitro, and the inhibitory activity of alpha-glucosidase and alpha-amylase of methanolic extract was studied in normal and diabetic mice.

The *in vitro* results revealed that *Rosa damascena* petals have a great ability to inhibit alpha-amylase, where the methanolic extract showed the highest inhibitory effect and the lowest IC₅₀ in comparison to the aqueous extract and acarbose group. Methanol exhibited more effective extraction of the phenolic compounds compared to water (29.23 g_{GAE}/l VS 58.8 g_{GAE}/l.). *In vivo*, the results show that *Rosa damascena* has a dose-dependent effect on glucose levels after meals in comparison to acarbose groups in both normal and diabetic mice.

The results of the RDM methanolic extract were similar to those reported by researcher Suresh Challa and his colleagues in 2013, who studied the effects of flower extracts (organic and aquatic) for several plants, including *Rosa damascena*, on the activity of alpha-amylase. They noticed that the methanolic extract of *Rosa damascena* achieved the highest enzyme inhibition. They supposed that the large amounts of phenolic compounds are responsible for RDM's effects²⁴. Another study also revealed that the application of RDM methanolic extract on normal and diabetic rats after maltose loading has significantly decreased the glucose blood levels, in a dose-

dependent manner in comparison to the positive control (Acarbose) and negative control (Maltose)²⁵.

Gholamhosienian and his colleagues studied the effects of some plants including RDM on alpha-glucosidase *in vitro*. They found that the organic and aquatic extracts achieved an inhibitory effect more than 75% while acarbose achieved 51%³³.

In a study accomplished by Hussain and his colleagues, a solution of quercetin dihydrate, a common phenolic compound in RDM, (600 mg/kg) and acarbose (5 mg) were applied to diabetic rats. They also noticed that quercetin achieved a higher inhibitory effect on alpha-glucosidase after the oral administration of maltose solution (2 g/kg)³⁴.

Another study investigated the effect of scopoletin, a coumarin compound, on alpha-glucosidase and alpha-amylase. Scopoletin showed a distinct inhibitory effect on α -glucosidase and α -amylase and an increase in postprandial blood glucose levels was significantly suppressed in the scopoletin group compared to the control group of streptozotocin (STZ)-induced diabetes in mice⁷⁵.

Conclusion

Our study suggests that RDM can be used to prevent postprandial hyperglycemia in diabetic patients. Because of the common and side effects-free uses of this plant, it would be an alternative and/or complementary medicine in the treatment of diabetic patients. RDM can also be used in combination with synthetic anti diabetic drugs, and thus reduce the dosage and undesirable side effects, as well as in pre-diabetes.

It can also be applied to control obesity by reducing the amount of absorbed dietary carbohydrates. Thus, we suggest that *Rosa damascena* might be used in medicinal and nutraceutical preparations.

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نشرة العلوم الصيدلانية جامعة أسيوط



الفعالية الخافضة لسكر الدم لخلاصة بتلات الوردة الدمشقية في الزجاج والجسم الحي

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تعتبر الوردة الدمشقية التي تنتمي للفصيلة الوردية من أهم النباتات المستخدمة في الطب التقليدي لما لها من خصائص دوائية مختلفة، مثل علاج آلام البطن والصدر، نزوف الطمث وتقليل الالتهابات. هدفت هذه الدراسة إلى التحقق من فعالية نبات الوردة الدمشقية الخافضة لسكر الدم.

تم تحضير خلاصات مائية وميتانولية من بتلات الوردة الدمشقية المطحونة، وتقييم المحتوى الفينولي للخلاصات باستخدام طريقة Folin-Ciocalteu اللونية. أجري تقييم الفعالية الخافضة لسكر الدم عن طريق تحديد الفعالية المثبطة لإنزيم ألفا أميلاز في الزجاج. أما دراسة التأثير الخافض لسكر الدم التالي للوجبة في الجسم الحي فقد أجريت لدى فئران طبيعية وفئران محرض لديها داء السكري باستخدام الألوكسان. استُخدم الأكاربوز (مثبط إنزيم ألفا جلوكوزيداز) كدواء مرجعي.

كان المحتوى الفينولي الكلي للخلاصات المائية والميتانولية 29,23 gGAE/l و 58,8 gGAE/l على التوالي. تم إجراء تفاعل تثبيط لإنزيم ألفا أميلاز بتركيز (20، 40، 60، 80، 100، 120 ميكروجرام/مل) من الخلاصة المائية والخلاصة الميتانولية والأكاربوز. كانت النسبة المئوية لتثبيط ألفا أميلاز معتمدة على الجرعة وتراوحت بين (33,66-89,96%)، (41,07-92,16%)، (23,4-81,82%) على التوالي. أظهرت الخلاصتان المائية والميتانولية فعالية مثبطة للأميلاز أعلى مقارنة مع الأكاربوز.

أدى إعطاء الخلاصة الميتانولية عن طريق الفم لفئران طبيعية وفئران سكرية انخفاض كبير في مستويات الجلوكوز في الدم بعد إعطاء المالتوز بطريقة معتمدة على الجرعة.

تشير هذه النتائج إلى احتمال وجود تأثير خافض لسكر الدم لخلاصات بتلات الوردة الدمشقية. كما تشير إلى أن هذه الخصائص المضادة للسكري لنبات الوردة الدمشقية قد تكون ناتجة عن تثبيط امتصاص الكربوهيدرات المتواسط بإنزيم ألفا جلوكوزيداز في الأمعاء وبالتالي خفض مستويات الجلوكوز التالية للوجبة.