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## List of Abbreviations

ALT	Alanine aminotransferase
AST	Aspartate aminotransferase
FFA	Free Fatty Acids
HDL	High density lipoprotein
HSL	Hormone Sensitive lipase
GA	Gum Arabic
LDL	Low density lipoprotein
LPL	Lipoprotein Lipase
PG1	Prophylaxis group 1 (Received 25 g/day gum Arabic)
PG2	Prophylaxis group 2 (Received 50 g/day gum Arabic)
TG1	Treatment group 1 (treated with 25 g/day gum Arabic)
TG2	Treatment group 2 (treated with 50 g/day gum Arabic)
TGC	Triglycerides
VLDL	Very low density lipoprotein



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## **Abstract**

Hyperlipaemia is a pathophysiological response to prolonged negative energy balance associated with gross lipaemia. In donkeys, hyperlipaemia was associated with high mortality rates. A series of two studies was conducted to evaluate the therapeutic and/or prophylactic potential of Gum Arabic as antihyperlipidaemic agent.

The first study was designed to determine whether treating with Gum Arabic would lower plasma lipids in a group of donkeys with experimentally induced hyperlipidaemia. Three groups each of six male donkeys, 4-10 years of age, were subjected to four days fasting to induce hyperlipidaemia and then they were randomly assigned to receive either 25 or 50g /day orally for seven successive days gum Arabic or left untreated. Following fasting triglycerides level was increased significantly ( $P<0.05$ ) in the plasma of donkeys in the three groups. Simultaneous increase in Plasma level of cholesterol, urea, creatinine and albumin was also observed in the three groups following fasting. No significant difference was observed in total protein, glucose concentration as well as AST and ALT activities.

Treatment of donkeys with gum Arabic with 25mg/day resulted in significant decrease in the plasma level of triglycerides, cholesterol, urea and creatinine. The level of triglycerides in the group treated with 50g/day exhibited no significant decrease and remained at high level up to the end of the experiment. The concurrent decrease in urea and creatinine may indicate a further additive effect in kidney function.

Another experiment was conducted to evaluate the prophylactic effect, if any, of gum Arabic against experimentally induced hyperlipidaemia in donkeys. For this purpose, three groups of donkeys each of six were either: drenched with gum Arabic at dose rate of 25 g/day (PG1) or 50 g/day (PG2) for seven successive days, or left without

treatment as control group. Animals then were subjected to five successive days fasting. During gum Arabic supplementation triglycerides concentration showed fluctuation with no significant ( $P>0.05$ ) change. Significant increase ( $P<0.05$ ) during the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> days of fasting was observed in the control and the PG1, while the level increased significantly ( $P<0.05$ ) only at the 4<sup>th</sup> day of fasting PG2 and to a level that was noticed to be lower when compared with the level of the control and PG1. A similar pattern for cholesterol was observed in the control and PG1, where significant ( $P<0.05$ ) increase was observed at the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> day of fasting; while the significant increase was only observed at the fourth day of fasting in the PG2. The level returned to normal by the end of the experiment. Urea concentration increased significantly ( $P<0.05$ ) in the three groups during fasting period and returned to normal level by the end of the experiment. ALT activity was significantly ( $P<0.05$ ) increased during fasting in the control and the first group (PG1), while the increase in the second group did not reach the level of significance.

The fluctuation in albumin, creatinine and glucose concentration did not show any significant difference following either administration of gum Arabic or five days fasting.

Significant increase in total protein concentration was observed in the first prophylactic group (PG1) during fasting. The level returned to non-significant change by the end of the experiment

Significant increase in AST activity was observed only in the second prophylactic group (PG2) during fasting period and at post fasting the level returned to a non significant ( $P>0.05$ ) change by the end of the experiment.

Here it is to be concluded that gum Arabic at dose rate of 25g/day for seven successive days has positive effect in lowering plasma

triglycerides level in donkeys with experimentally induced hyperlipidaemia; and that the increase in the gum Arabic dose was not necessary to affect the level of triglycerides in donkeys. Gum Arabic supplementation at dose rate 50 g/day would exert prophylactic effect against experimentally induced hyperlipidaemia in donkeys.

Daily intake of gum Arabic at dose rate of 50g/day for seven successive days delayed the increase in triglycerides as well as cholesterol concentration when compared with control group, that considered to be of value in controlling hyperlipaemia.

Keywords: Lipid profile, hyper-triglyceridaemia, gum Arabic, donkeys

## المستخلص

ارتفاع الدهون في الدم هو استجابة مرضية وظيفية عند حدوث توازن سالب للطاقة لفترة طويلة من الزمن و يؤدي الي تراكم الدهون في اعضاء الجسم مع ارتفاع نسبة النفق في الحيوانات المصابة. اجريت دراسة من تجربتين لتقييم الاثر المحتمل للصمغ العربي في العلاج او الوقاية من ارتفاع الدهون في الدم .في التجربة الاولى تم استخدام ثلاثة مجموعات كل مجموعة تحتوي علي ستة حمير تم تصويمها لمدة اربعة ايام متتالية بغرض احداث ارتفاع الدهون في الدم و بعد ذلك تم توزيعها عشوائيا لتعالج بجرعة مقدارها 25 جرام/اليوم او 50 جرام/اليوم من الصمغ العربي (مذابة في الماء و تعطي شرايا عن طريق الفم) لمدة سبعة ايام متتالية او تترك من غير علاج كمجموعة تحكم (ضابطة).

مستوي الجلوسريدات الثلاثية ارتفع ارتفاعا متتابعا مع الصيام بمستوى ذو دلالة احصائية معنوية في المجموعات الثلاثة كما لوحظ ايضا ارتفاعا متزامنا في كل من الكلسترول, اليوريا, الكرياتينين و الزلال في بلازما الدم. لم تلاحظ تغييرات ذات دلالة احصائية معنوية في بروتين البلازما الكلي و سكر الدم و لا في نشاط انزيمات الالانين امينوترانسفيريز و لا الاسبارتيت امينو ترانسفيريز.

ادت معالجة الحمير ب 25 جرام/اليوم من الصمغ العربي الي انخفاض ذو دلالة احصائية معنوية في مستوى البلازما من الجلوسريدات الثلاثية و الكلسترول و اليوريا و الكرياتينين . الجلوسريدات الثلاثية في المجموعة التي تم علاجها ب 50 جرام/اليوم من الصمغ العربي لم تظهر انخفاضا ذو دلالة احصائية معنوية و ظلت مرتفعة حتى نهاية التجربة. الانخفاض المتزامن في اليوريا و الكرياتينين قد يشير الي وجود تأثير اصافي للصمغ العربي علي وظائف الكلى.

أجريت تجربة أخرى لتقييم أثر الصمغ العربي ,ان وجد, في الوقاية من ارتفاع الدهون المحدث تجريبا في الحمير. لهذا الغرض تم استخدام ثلاثة مجموعات من الحمير, ستة في كل مجموعة. المجموعة الاولى تم تجريبها 25جرام/اليوم لسبعة ايام متتالية (المجموعة العلاجية الاولى) و مجموعة تم تجريبها 50 جرام/اليوم لسبعة ايام متتالية (المجموعة العلاجية الثانية) ومجموعة تركت من غير علاج. تم اخضاع المجموعات للصيام لخمسة ايام متتالية.

التذبذب في مستوي الجلوسريدات الثلاثية خلال تجريب الصمغ العربي لم يكن ذو دلالة احصائية معنوية. في اليوم الثاني و الثالث و الرابع للصيام لوحظ ارتفاع ذو دلالة احصائية معنوية في كل من المجموعة العلاجية الاولى و المجموعة الضابطة (التحكم) بينما كان الارتفاع ذو دلالة احصائية معنوية فقط في اليوم الرابع للصيام في المجموعة العلاجية الثانية وكان الارتفاع بمستوى اقل مقارنة بالمجموعتين الاخرين. و بنفس النمط لوحظ الارتفاع في الكلسترول فكان الارتفاع في المستوى ذو دلالة احصائية معنوية في اليوم الثاني و الثالث و الرابع للصيام في كل من المجموعة العلاجية الاولى و المجموعة التي لم

تعالج بينما كان الارتفاع ذو دلالة احصائية معنوية فقط في اليوم الرابع للصيام في المجموعة العلاجية الثانية. هذه المستويات رجعت للمستوى الطبيعي بنهاية التجربة.

تركيز اليوريا ارتفع ارتفاعا ذا دلالة احصائية معنوية اثناء فترة الصيام ثم عاد للمستوى الطبيعي بنهاية التجربة. نشاط انزيم الالنين امينوترانسفيريز ارتفع ارتفاعا ذا دلالة احصائية معنوية اثناء فترة الصيام في كل من المجموعة العلاجية الاولى و المجموعة التي لم تعالج بينما لم يكن الارتفاع ذو دلالة احصائية معنوية في المجموعة العلاجية الثانية.

التقلبات في تراكيز الزلال و سكر الدم و الكرياتينين لم تظهر تغييرات ذات دلالة احصائية معنوية اثناء فترة اعطاء الصمغ العربي ولا فترة الصيام لخمسة ايام.

لوحظ ارتفاع ذو دلالة احصائية معنوية في تركيز البروتين الكلي للبلانزما اثناء فترة الصيام في المجموعة العلاجية الاولى ثم عاد التركيز للمستوى الطبيعي بنهاية التجربة. في المجموعة العلاجية الثانية فقط لوحظ ارتفاع ذو دلالة معنوية احصائية اثناء الصيام في نشاط انزيم الاسبارتيت امينوترانسفيريز وبعد الصيام عاد النشاط للمستوى الطبيعي.

تخلص الدراسة الى ان الصمغ العربي بمعدل جرعة 25 جرام/اليوم لمدة سبعة ايام متتالية له تأثير ايجابي في خفض مستوى الجلوسريدات الثلاثية في حالة ارتفاع الدهون المحدث تجريبا في الحمير و ان الزيادة في جرعة الصمغ العربي غير ضرورية لاحداث تأثير على مستويات الجلوسريدات الثلاثية في الحمير. أيضا إعطاء الصمغ العربي بمعدل جرعة 50 جرام/اليوم لمدة سبعة ايام متتالية أثبت أنه قد يحدث أثرا وقائيا ضد احداث ارتفاع الدهون تجريبا.