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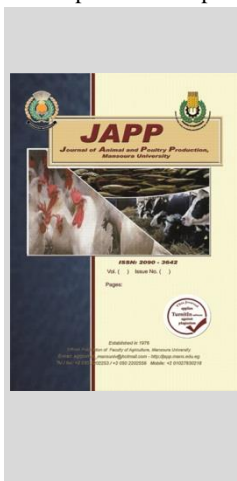
Effects of Zingiber Officinale and Ambrosia Maritima on some Physiological Parameters and Kidney Structure in Rats



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ABSTRACT

The present work was carried out to investigate the effect of ZOR Roscoe (ZOR), AML L (AML) and their mixture on some physiological parameters and kidney structure of male albino rats. This study was undertaken in the animal house belong to Animal Production Department, Faculty of Agriculture, Al-Azhar University. Twenty-four male albino rats with an average body weight 100-130 g. The animals were divided into 4 similar groups group₁ (Control untreated group), group₂, (rats fed with diet contain 5% ZOR Roscoe), group₃ (rats fed on diet contain 5% AML L) and group₄ (rats fed on diet containing 2.5% ZOR Roscoe +2.5% AML L.). During the whole experimental period blood samples were collected and serum was analyzed for concentration of glucose, cholesterol, triglyceride, urea and creatinin. At the end of the experiment, rats were sacrificed to obtain the kidneys. Results indicated that treatment of rats with zingiber officinal and AML for 8 Weeks showed mild ischemic changes of some glomeruli and tubules in the cortex of the kidney, Meanwhile mix with zingiber officinal and AML showed minimal ischemic changes of some glomeruli and tubules in the cortex of the kidney. All medicinal plants treatment had hypochlosterolemic and hypolepidimic effects being the highest for the comparing treatment. Treatment of rats with medicinal plants for 8 weeks significantly increased serum urea and creatinine concentration.

Keywords: Rat, Zingiber officinal, Ambrosia maritima kidney function.

INTRODUCTION

The kidney is one of the major organs involved in whole – body homeostasis, with its major functions being to excrete waste of metabolites, blood pressure regulation and metabolism of lipid, secretion and degradation of hormones and the production and utilization of systemi glucose (Khalil, 2004) and Gai *et al* 2014). Recently the use of herbal medicines have become indispensable and considered as essential part of the primary health care in human and veterinary medicine. Medicinal plants have essential constituents such as essential oils, terpenes, sesquiterpenes, quinines and alkaloids for maintain the health and treatment of various animals disorders (Oliver – Bever, 1986, Bakhiet and Adam 1995 and Barakat *et al* 2012). Many plant products exert antioxidant effects and some of these are widely used in food in different parts of the world Uz *et al* (2009)

Many natural products are used to protect tissues from oxidative stress, various drugs or chemicals – induced toxicities. Among of the natural products ZOR and Ambrosia maritima. Zingiber officinale, ginger commonly known (Ahmed *et al.*, 2008). Ginger is a rhizome that is widely used as culinary herb and herbal remedy for some common ailments Lakshmi and Sudhakar (2010) Ginger is belong to the family of Zingiberaceae and considered a usual ingredient of diet worldwide (Sertie *et al.*, 2005). Ginger roots and its extract contain 6- gingerol and its derivatives, which are active phenolic compounds with high antioxidant activities both in vivo and *in vitro* that could protect against free radical damage as effectively as ascorbic acid (kim *et al*, 2007). It had been reported that ginger exhibit anti-inflammatory, antipyretic, antimicrobial, hypoglycemic, ant migraine, antioxidant, hepatoprotective, diuretic and hypochlosterolemic effects (Uz *et al.* 2009,

Masuda *et al* 2004 and Langner *et al.* 1998). Ambrosia maritima L. (Compositae) an annual herbaceous plant widely distributed throughout the Mediterranean region and Africa. It is well known in Egypt under the name of Damsissa (Mohamed and Saber 2011), It contains important sesquiterpene lactones and flavonoids which showed molluscicidal effect (Evans 1996). It is used in some renal tea due to its proved effect in renal colic and expel renal stones Sakar *et al* (2000), Mohamed and Saber (2011) demonstrate the protective role of damsissa against oxidative stress and biochemical changes of potassium dichromate. This study aims planned to evaluate the effect of ZOR, Ambrosia maritima and its mix on Kidney structure, functions and some serum lipid profile.

MATERIALS AND METHODS

This study was carried out in Animal House Laboratory, Department of Animal Production, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt.

Experimental animals

The male albino rats used in this study were originally bought from El Osman farm, Cairo, Egypt. Animals were housed in stalsteel cages. The laboratory standard for chow and tap water were provided *ad libitum*. All animals were healthy and clinically free from diseases.

Plant materials

Rizomes of Zingiber officinal Roscoe (ginger) and whole plant of AML L (Damssisa) were used in this study. Medicinal plant were purchased from the local market in Cairo Egypt.

Experimental design

A total of 24 male albino rats were used in this study. Rats with live body weight ranged from 100-130 gm. All rats were housed in stalsteel cages from 2 week prior to the

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experiment for acclimatization and to ensure normal growth and behavior . After 2 weeks from acclimatization rats were divided randomly into four groups each group contain 6 rats G₁ control group, G₂, G₃ and G₄ fed diets contioned 5% Zingiber officinal, AML L. and 2.5% ZOR + 2.5% Ambrosia Maritima respectively.

Rats were fed the experimental diets for 8 weeks, Blood samples were collected from all rats (after 4 and 8 weeks from the the experiment) by withdrawing blood from the orbital venous plexuses using a capillary tube. Blood samples were centrifuged at 3000 rpm from 15 min to obtain serum which transferred to Ependorff tubes and stored at – 20°C until subsequent analyses.

At the end of the experiment rats were sacrificed to obtain their kidneys. Immediately after extraction, the kidneys were immersed in formalin 10% for two days, washed in water, dehydrated in ascending grade of ethyl alcohol and finally cleared by xylene and embedded in melted paraffin wax. The kidney blocks were sectioned at six- micron thickness and stained by eosin and heamatoxylin according to Pearse (1968).

Serum parameters

Concentration of serum urea measured according to the colorimetric method described by (Tabacco *et al.*, 1979). Serum creatinine concentration was determined by using enzymatic colorimetric method according to (Junge *et al.*, 2004). Serum glucose measured according to the oxidas method (Trinder, 1969). Serum cholesterol was measured by enzymatic colorimetric method according to of (Roeschlau *et al*, 1974) Serum triglyceride determined using enzymatic colorimetric method according to Bucolo and David (1973)

Statistical Analysis:

Statistical analysis was conducted by analysis of variance using SPSS Package (2016). The means and standard errors of all parameters were calculate and Duncan Multiple Range test (Duncan 1955) was used to test the significant differences

RESULTS AND DISCUSSION

Histopathological examination of the kidney

Examination of eosin and heamatoxylin stained sections of kidney tissue of the control group showed preserved architecture the cortex revealed normal glomeruli , tubules and cortical blood vessels. The medulla revealed normal tubules and normal blood vessels of interstitial tissue (fig 1). Eeasin and heamatoxylin stained sections of kidney of the 5% ZOR or 5% Ambrosia maritima treated rats also showed preserved architecture. The cortex revealed mild ischemic changes of some glomeruli and tubules with normal cortical blood vessels. The cortex revealed normal tubules and normal blood vessels of interstitial tissue (figs 2 & 3) Examination of eosin and heamatoxylin stained sections of kidney tissue of the 2.5% ZOR + 2.5% Ambrosia maritima treated group (fig. 4) showed preserved architecture. The cortex revealed minimal ischemic changes of some glomeruli and tubules with normal cortical blood vessels.

The above results revealed that treatment of rats with 5% ZOR or 5% AML for 8 weekes caused mild ischemic changes of some glomeruli and tubules. Meanwhile treatment of rats with 2.5% ZOR + 2.5% Ambrosia maritima for 8 weeks caused minimal ischemic changes of some glomeruli and tubules in the renal cortiex.

These results are in accordance with those found by Ilham *et al.* (2016) who reported that renal damage was severe should by focal necrosis of cortical convoluted tubules and extended to medullary tubules were detected in goats treated with AML 2000 mg/ Kg/ day. They also stated that Ambrosia maritima was toxix to both female and male goats at 2000 mg/kg/ day but the female goats are more sensitive to the plant toxicity than the males and the plant was found to have revel and hepatic chronic toxicity, Vassiliades and Diaw (1980) stated that Ambrosia maritima up to 1000 ppm had no toxic effects in mice and Alard *et al* (1991) concluded that Ambrosia maritima has a very low toxicity to aquatic non-target organisms and it is not toxic when used at the molluscidal concentration of 35 to 70 mg/ litre, Lakshmi and sudhokar (2010) control rats showed normal glomeruli with intact bowma's capsule and proximal convoluted capsule. Rats treated with gentamicin, showed bubuler epithelial loss with intense granular degeneration involving >50% renal cortex, In addition to the tubular epithelial loss, some of the tubular epithelium contains tubular casts and blood vessel congestion and result in the presence of inflammatory cells in kidney sectons. The histomorphology of rats treated with ethyl acetate extract from Zingiber officinal plus gentamicin showed moderate tubular epithelial degeneration with desquamation in patehy ereas of the renal eortex, Concurrent treatment of rats with the dried fresh juice extract from Zingiber officinal also was found to reduce such changes moderately in kidney histology induced by gentamicin.

El- kott *et al* (2015) showed that kidney section of both control and ginger – treated group exhibited normol renal archite eture.

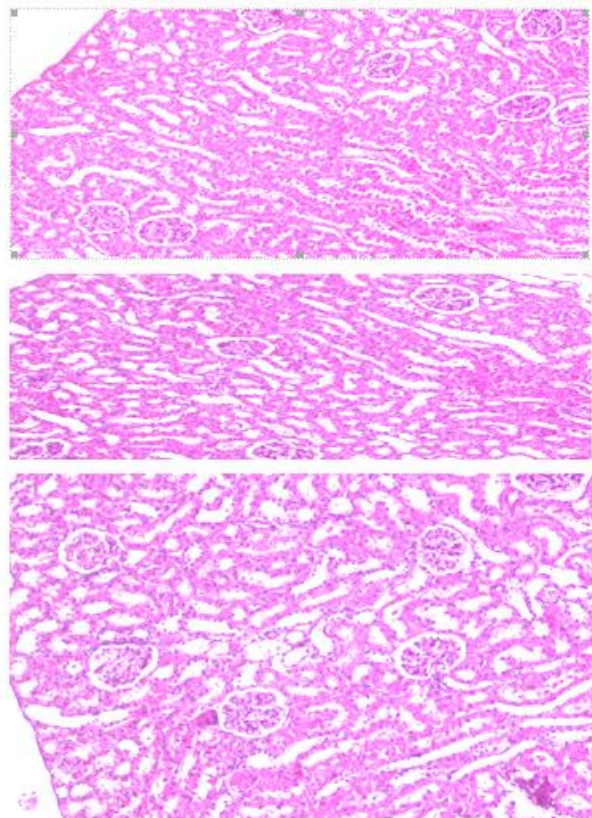


Fig. 1. Kidney structure in the control rats showing preserved architecture. The cortex revealed normal glomeruli, tubules and cortical blood vessels.. (H&E., stain, x100).

Serum parameters:

Table (1) shows that treatment of rats with 5% zingiber officinal, Ambrosia moritima or its mix for 4 weeks did not show any significant effect on serum urea and creatinine concentration. Meanwhile after 8 weeks all medicinal plant treatment groups significantly increased serum urea and creatinine levels as compared with the control group.

The insignificant effect of treatment with Ambrosia maritima for 4 weeks on serum urea and creatinine are in accordance with those found by (Barakat *et al.*, 2012) and (Badr *et al.*, 2012) they showed that oral administration of medicinal plants (cymbopogon proximus, Ammi visnaga and Ambrosia maritima) had no significant effect on plasma creatinine and urea concentrations (Lakshmi and Sudhakar, 2010) reported that ZOR treatment did not produce detectable changes in serum creatinine and urea levels in normal rats.

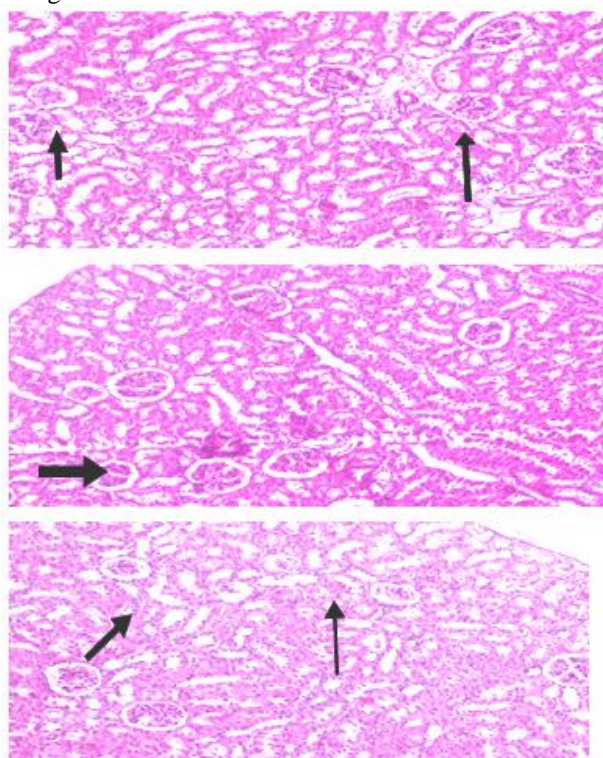


Fig. 2. Kidney structure in the 5% ZOR group showing preserved architecture. The cortex revealed mild ischemic changes of some glomeruli and tubules with normal cortical blood vessels.. (H&E., stain, x100). Mild ischemic changes of glomeruli).

The above results also showed that treatment of rats with 5% zingiber officinal, 5% Ambrosia maritima for 8 weeks significantly increased serum urea and creatinine. These results indicated that treatment of rats with Zingiber officinal and Ambrosia maritima for long time (8 weeks) had an adverse effect on kidney functions. These results are in accordance with those found by (Ilham *et al.*, 2016) stated that Ambrosia maritima was toxic to both female and male goats at 2000 mg/kg/day. They also reported that Ambrosia maritima was found to have renal and hepatic chronic toxicity. On the other hand (Halal *et al.*, 2014) reported that treatment of diabetic rats with Ambrosia maritima extract produced a significant decrease in serum urea and creatinine levels in comparison with the diabetic group. (El-Kott *et al.*, 2015) indicated that extract of ginger alone rendered significant protection against

glycerol – induced nephrotoxicity which was evident from the lowered serum urea and creatinine levels.

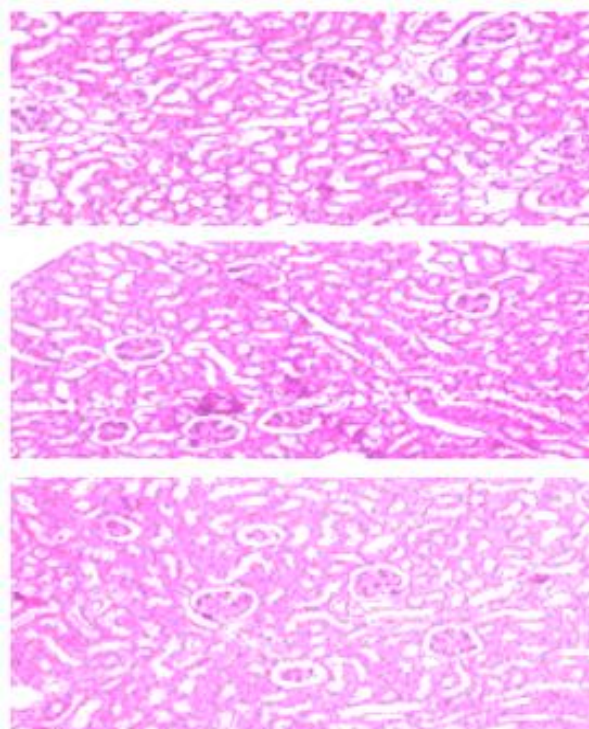


Fig. 3. Kidney structure in the 5% Ambrosia maritima group showing preserved architecture. The cortex revealed mild ischemic changes of some glomeruli and tubules with normal cortical blood vessels.. (H&E., stain, x100).

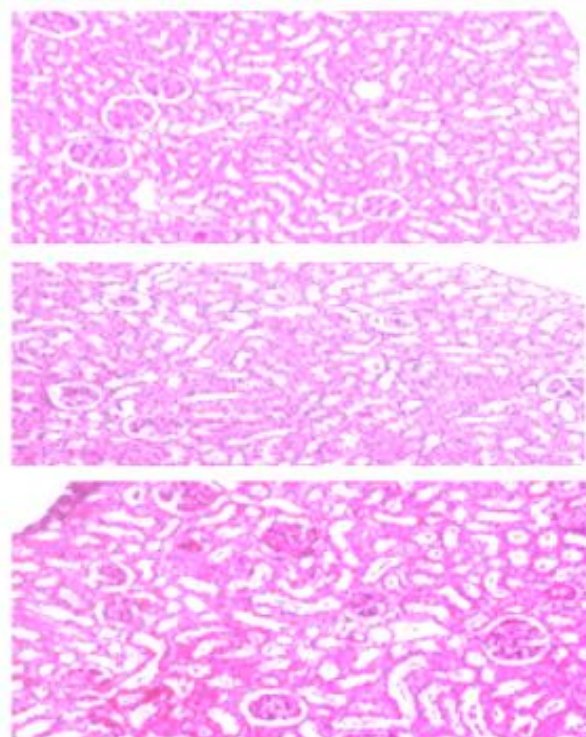


Fig. 4. Kidney structure in the 2.5% Zingiber officinal + 2.5% Ambrosia maritima group showing preserved architecture. The cortex revealed minimal ischemic changes of some glomeruli and tubules with normal cortical blood vessels.. (H&E., stain, x100).

This contradiction may be due to the different doses used, duration of treatment between the present work and the others.

Table (1) also showed that treatment of rats with 5% Zingiber officinal, 5% Ambrosia maritima and 2.5% zingiber officinal + 2.5% Ambrosia maritima for 4 or 8 weeks significantly decreased serum cholesterol, triglycerides and glucose as compared with the control group.

The results in the current study showed that medicinal plants significantly decreased serum cholesterol and triglycerides. These results may be due to the presence of saponins in Ambrosia maritima which has a direct saponin antioxidant activity and Ambrosia maritima contain flavonoids that can reduce the levels of cholesterol and triglycerides through its anti-oxidant activity (Helal *et al* 2014 and Jadeja *et al.* 2010). Barakat *et al.* 2012 reported that treatment of rats with Ambrosia maritima (2% or 10%) significantly decreased cholesterol and triglycerides

concentrations. (Atta *et al*, 2010) reported that carbon tetrachloride (CCl₄) significantly increased serum triglycerides and cholesterol concentration. Methanol extract of chicory and zingiber officinal as well as their mixture significantly decreased serum triglycerides and cholesterol concentration.

The above results indicated that treatment of rats with medicinal plant significantly decreased serum glucose level. The hypoglycemic effect of medicinal plant may be due to that flavonoids in Ambrosia maritima that have hypoglycemic effect Helal *et al* (2014), Barakat *et al.* (2012) reported that glucose were significantly decreased in rats fed 2% and 10% Ambrosia maritima with diet. Kazeem *et al.* (2013) reported that oral administration of free polyphenol extracts of Zingiber officinal significantly decreased fasting glucose reaching 12.22 mmol/L from the initial 20.44 mmol/L. It may be due to insulinomimetic activity of the polyphenols giving rise to direct peripheral glucose uptake (Lolitkar and Rao, 1996).

Table 1. The effect of the medicinal plants on different serum parameters

Parameters	Interval time weeks)	Control	Groups (N=6)			
			5% Zingiber officinal	5% AML	2.5% Zingiber officinal	2.5% AML
Urea mg/dl	4 weeks	75.71 ± 3.18 A	76.24 ± 2.67 A	77.35 ± 2.31 A	76.58 ± 2.19 A	
	8 weeks	76.74 ± 2.11 B	85.18 ± 4.24 A	87.7 ± 3.51 A	87.08 ± 3.67 A	
Creatinine mg/dl	4 weeks	3.57 ± 0.71 A	3.21 ± 0.62 A	3.67 ± 0.53 A	3.71 ± 0.66 A	
	8 weeks	3.89 ± 0.68 B	4.91 ± 0.91 A	4.87 ± 0.88 A	5.11 ± 0.93 A	
Cholesterol mg/dl	4 weeks	111.75 ± 2.1 A	100.07 ± 1.26 B	99.17 ± 2.78 B	92.24 ± 3.11 C	
	8 weeks	116.12 ± 2.81 A	107.41 ± 1.71 B	104.76 ± 2.85 B	93.24 ± 2.81 C	
Triglycerides	4 weeks	145.46 ± 4.66 A	121.55 ± 3.54 B	125.73 ± 4.22 B	109.21 ± 6.54 C	
	8 weeks	148.77 ± 4.36 A	127.23 ± 3.66 B	125.82 ± 4.11 B	111.44 ± 4.81 C	
Glucose	4 weeks	110.75 ± 3.36 A	100.91 ± 2.11 B	101.90 ± 2.11 B	93.52 ± 1.92 C	
	8 weeks	112.66 ± 2.53 A	101.41 ± 2.31 B	103.81 ± 1.54 B	95.33 ± 2.34 C	

Means within each row with similar letters are not significantly different at P ≤ 0.05 Duncan's Multiple Range test between groups.

CONCLUSION

Zingiber officinal, Ambrosia maritima and their mix is safe to be used for 4 weeks as an effective remedy for hypoglycemic and hypolipidemic effect without any adverse side effects on kidney structure and functions. Treatment of rats with zingiber officinal, Ambrosia maritima or its mix for 8 weeks had a side effect on kidney structure and functions.

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تأثير الزنجبيل والدمسيصة علي بعض القياسات الفسيولوجية وتركيب الكلي في الفئران

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قسم الانتاج الحيواني - كلية الزراعة بالقاهرة جامعة الازهر

هذا البحث لدراسة تأثير الزنجبيل (ZOR) ، والدمسيصة (AML) والخليط بينهم على بعض القياسات الفسيولوجية و الكلية في الفئران الذكور. أجريت هذه الدراسة في بيت الحيوان التابع لقسم الإنتاج الحيواني ، كلية الزراعة ، جامعة الأزهر. أربعة وعشرون من ذكور الفئران البيضاء مع متوسط وزن الجسم 100-130 جرام تم تقسيم الحيوانات إلى 4 مجموعات متساوية المجموعة الاولى (المجموعة الضابطة غير المعالجة) ، المجموعة الثانية ، (الفئران التي تتغذى على الزنجبيل 5%) ، المجموعة الثالثة (الفئران التي تتغذى على الدمسيصة 5%) و المجموعة الرابعة (الفئران التي تتغذى على الزنجبيل 2.5% والدمسيصة 2.5%). خلال فترة التجربة ، تم جمع عينات الدم وتم اجراء التحاليل لقياس مستويات الجلوكوز والكوليسترول والدهون الثلاثية ووظائف الكلى. في نهاية التجربة ، تم تشريح الفئران للحصول علي الكلية. كان الهدف من هذه الدراسة هو دراسة تأثير نبات الزنجبيل والدمسيصة ومزيجها على بعض القياسات الفسيولوجية و الكلية في ذكور الفئران البيضاء. أشارت النتائج إلى أن معاملة الفئران بالزنجبيل لمدة 8 أسابيع أظهر شحنات إقفارية خفيفة لبعض الكبيبات والأنابيب في قشرة الكلى ، وفي الوقت نفسه ، أظهر المزيج مع الزنجبيل والدمسيصة تغيرات إقفارية بسيطة في بعض الكبيبات والأنابيب في قشرة الكلى. كما أظهرت النتائج أن جميع النباتات الطبية لها تأثير علي نقص مستويات الكوليسترول في الدم ونقص الدهون الثلاثية في الدم وكان هذا التأثير أكثر وضوحاً في مزيج النباتات الطبية. علاج الفئران مع النباتات الطبية لمدة 8 أسابيع عمل علي زيادة كبيرة في اليوريا والكرياتينين.