

Effects of some medicinal plants on liver structure and some physiological parameters in rats

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ABSTRACT

This experiment was to study the effect of using *Zingiber officinale* Roscoe (ginger), *Ambrosia maritime* L. (damssisa) and their mixture on liver structure and some physiological parameters of male rats. A total of 24 male albino rats were distributed into 4 groups (6 rats each), G1-control group, G2 fed normal diet + 5% ginger, G3 fed normal diet + 5% damssisa and G4 fed normal diet + 2.5% ginger + 2.5% damssisa. Blood samples were collected after 4 and 8 weeks from the start of the experiment. At the end of the experiment rats were sacrificed to obtain the Livers. Results indicated that treatment of rats with 5% ginger for 8 weeks caused mild ischemic changes of hepatocytes, while treatment of rats with damssisa or its mix with ginger did not have any effect on liver sections. Treatment of rats with 5% ginger for 8 weeks significantly increased serum AST and ALT activities, meanwhile treatment of rats with ginger and damssisa mix did not show any significant effect on serum AST and ALT activities as compared with control group. Medicinal plants did not show any significant effect on serum total protein or albumin. It could conclude that *Ambrosia maritime* (damssisa) or its mix with *Zingiber officinale* Roscoe (ginger) is safe to use at rate 2.5% for 8 weeks without any adverse side effects on Liver function. While 5% ginger had side effect on liver structure and function.

Key words: Rat, ginger, damssisa, liver function.

Introduction

Medicinal plants become indispensable and considered as essential part of the primary health care of human and animals. The medical arts had its origin when mankind first began to use remedial measures to get rid of pains, sufferings and other illnesses. For that reason medicinal plants could use for healing by preparing potions from these plant (Badr *et al.*, 2012)

Ambrosia maritime L. (damssisa) is an annual herbaceous plant widely distributed throughout the Mediterranean region and Africa. It well known in Egypt under the name of damssisa. It acts as antispasmodic, diuretic and useful in bronchial asthma, spasms, and frequent urination (Ghazanfer, 1994; Alard *et al.* (1991) revealed that no toxic signs were detected after oral administration of dried leaves of such plant. Phytochemical analysis on *Ambrosia maritime* extract has identified the presence of some pseudo guaianolidesesqui terpenes such as; neoambrosin, chloroambrosin, damsinic acid andhymenin. (Abdelgaleil, 2010).

Zingiber officinale Roscoe (ginger) is gaining popularity amongst modern physicians and its underground rhizomes are the medicinally useful part (Mascolo *et al.*, 1989). The main components of ginger are volatile oil, phenolic derivatives (zingerone) and oleoresin (gingerols and shogaols) which have antioxidant effect. It can scavenge superoxide anion and hydroxyl radicals. *Zingiber officinale* can inhibit the activity of lipoyxygenase and peroxidase (Jabran *et al.*, 2015). Lamfon (2011) indicated that ginger has protective effect against liver damage induced by metalaxyl and this may attributed to its antioxidant and free radicals scavenging properties.

The objective of this study was to assess the effect of supplementation with *Ambrosia maritime* L., *Zingiber officinale* or their combination on Liver structures and some physiological parameters of male albino rats.

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Materials and Methods

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

Experimental animals:

The albino rats used in the study originally brought from El-Osman farm, Cairo, Egypt. Animals were housed in stainless steel cages. Light dark cycle was maintained for about 12-hours. Animals provided with feed and water ad libitum. All animals were healthy and clinically free from diseases.

Experimental design:

The following parts of the two medicinal plants involved in the present study were; rhizomes of *Zingiber officinale* Roscoe (ginger) and whole plant of *Ambrosia Maritima* L. (damssisa). Plants were obtained from the local market in Cairo, Egypt.

The study included 24 adult male albino rats with an average live body weight was 115 gm (ranged from 100-130 g). Animals were randomly divided into four equal groups (6 rats each); G1- Control group, G2 rats fed normal diet + 5% ginger, G3 rats fed normal diet + 5% damssisa and G4 rats fed with normal diet + 2.5% ginger + 2.5% damssisa.

Rats were fed the experimental diets for eight weeks. At the end of experiment rats were sacrificed to obtain the Livers. Immediately after dissection the livers were immersed in formalin 10% for two days, then washed in water, dehydrated in ascending grade of ethyl alcohol and finally cleared by xylene and embedded in melted paraffin wax. The liver block was sectioned at six – micron thickness and stained by eosin and hematoxylin according to Pearse, (1968).

Blood sampling and analyses:

Blood samples were collected after 4 and 8 weeks from the start of experiment. Blood samples were obtained from rats by withdrawing blood from the orbital venous plexuses using a capillary tube. Then centrifuged at 3000 rpm for 15 min to obtain serum which transferred to Ependorff tubes and stored at -20°C until subsequent analyses.

Serum ALT was determined by using a colorimetric method according to Schumann and Klauke, (2003). Serum AST was determined by using a colorimetric method according to Schumann and Klauke, (2003). Serum total protein was determined using a colorimetric method according to Burtis and Ashood, (1999). Serum albumin was determined by the method of Tietz, (2007).

Statistical analysis

Statistical analysis applied by using SAS Package (1996). The means and standard errors of all parameters were calculated and Duncan Multiple range test (Duncan, 1955) was used when difference were significant to explore which means are different.

Results and Discussion

Histopathological changes in the liver

Light microscope examination of liver tissue sections of control group showed preserved lobular architecture. The portal tracts consisted of normal hepatic artery, portal vein and bile duct. The central veins were normal. The hepatocytes were normal in arrangement of cytoplasm and nuclei (Fig. 1). In rats treated with ginger 5% liver tissue sections showed mild ischemic changes of hepatocytes (Fig2). Meanwhile in rats treated with 5% damssisa or with 2.5% ginger and 2.5% damssisa mixture (Figs 3 and 4, respectively) liver tissue sections did not show any histological alterations compared with the control group. These results demonstrate that treatment of rats with 5% ginger for 8 weeks

caused mild ischemic changes of hepatocytes in all treated rats. The results of the current study are in contrast with the results obtained by El-Ghonaimy, (2015) who concluded that metalaxyl caused histological and immunohistochemical changes in liver probably through oxidative stress. Ginger therapy could ameliorate these changes in liver and this may be attributed to its antioxidant and free radicals scavenging properties.

The results also revealed that treatment of rats with damssisa or the mixture did not have any effect on liver sections.

Helal *et al.* (2014) reported that liver sections of diabetic rats showed hepatocytes necrotic changes, ballooning degeneration, pyknotic nuclei and fatty degeneration around the congested central vein. While treatment of diabetic rats with damsissa (28.5 mg/kg body weight twice/day by the plant extract) considerably improved the morphological changes observed in diabetic groups. Barakat *et al.* (2012) reported that neither gross lesions nor microscopic changes had seen in the vital organs of rats, on the 2% damssisa diet or the control rats. They also reported that rats on 10% damssisa diet there had fatty cytoplasmic vacuolations and individual – cell necrosis in the hepatic centrilobular zone, mild intestinal congestion and desquamation with no significant lesions in other tissues.

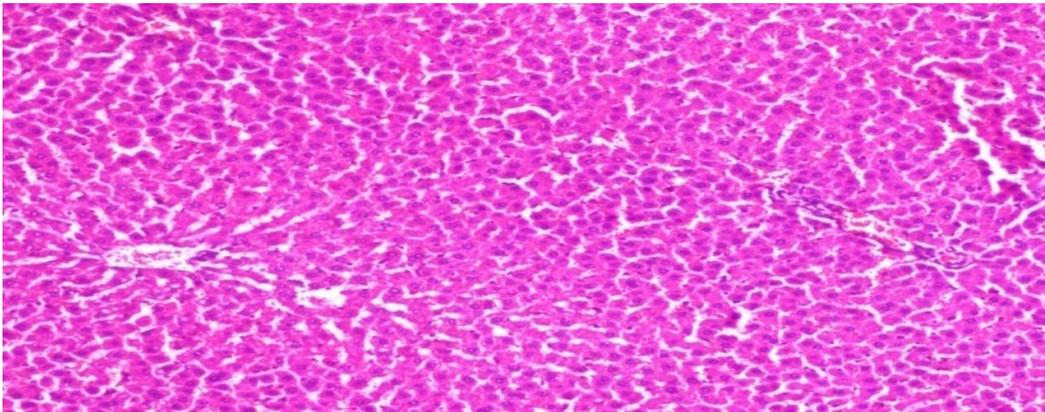


Fig. 1: Section in the liver tissue of control group showed preserved lobular architecture. The portal tracts consisted of normal hepatic artery, portal vein and bile duct. The central veins, were normal. The hepatocytes were normal in arrangement of cytoplasm & nuclei. (H& E., stain, x100).

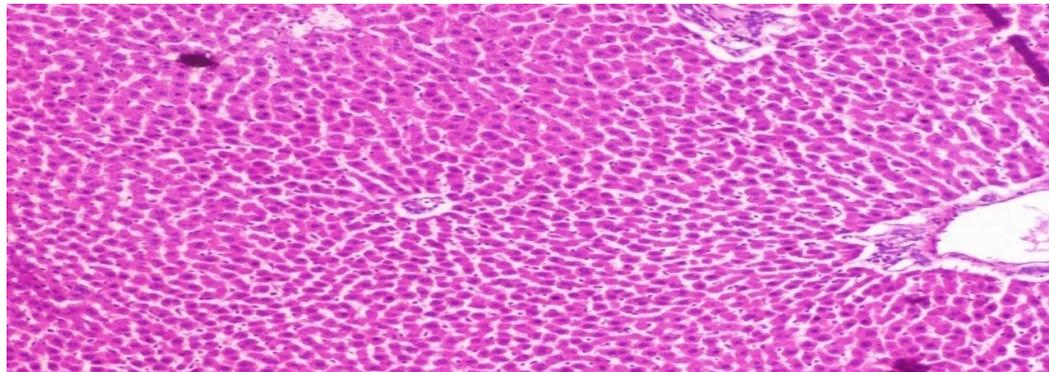


Fig. 2: Section in the liver tissue of 5% ginger show preserved lobular architecture. The portal tracts consisted of normal hepatic artery, portal vein and bile duct. The hepatocytes reveal mild ischemic changes of cytoplasm and normal nuclei and normal hepatic sinusoids. (H & E., stain, x100). (Mild ischemic changes of hepatocytes).

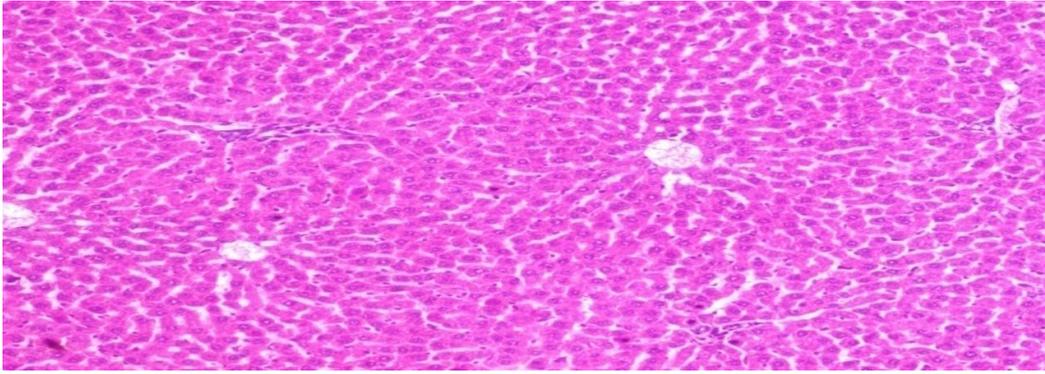


Fig. 3: Section in the liver tissue of 5% damssisa show preserved lobular architecture. The portal tracts consisted of hepatic artery, portal vein and bile duct. The central veins, were normal. The hepatocytes reveal minimal degenerative changes of cytoplasm & normal nuclei. (H & E., stain, x100).

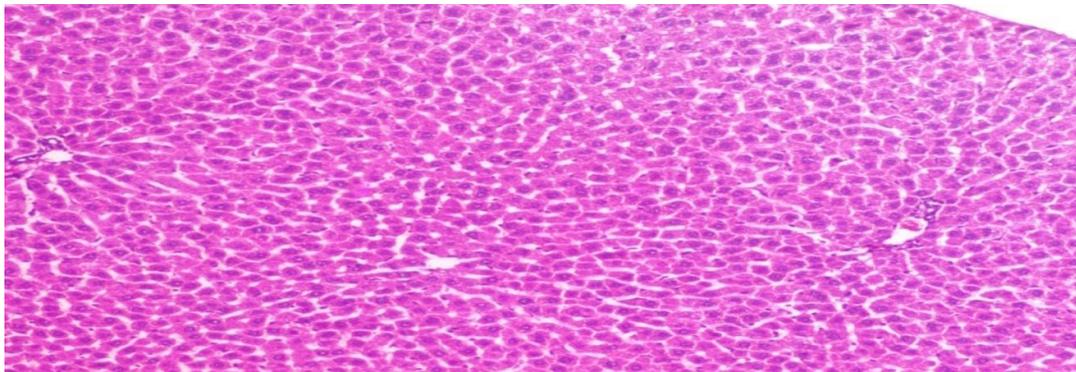


Fig. 4: Section in the liver tissue of 2.5% ginger and 2.5% damssisa preserved lobular architecture. The portal tracts consisted of hepatic artery, portal vein and bile duct. The central veins, were normal. The hepatocytes were normal in arrangement and cytoplasm & nuclei. (H & E., stain, x100).

Serum parameters

Tables (1 & 2) showed that after 4 or 8 weeks of the experiment, treatment of rats with 5% ginger significantly increased serum AST and ALT activities compared to the control group. While treatment with 5% damssisa for 8 weeks caused insignificant increase of serum AST activity without any effect on serum ALT activities. Meanwhile, treatment of rats with the mixture did not show any significant effect on serum AST and ALT activities. The significant increase in serum AST, after treatment with 5% ginger, is in accordance with the histological results that showed mild ischemic changes of hepatocytes. Ademola *et al.* (2009) reported that treatment with garlic or ginger or their mixture significantly affected the activities of serum alanine and aspartate aminotransferases. On the other hand, Ezeonu *et al.* (2011), found a significant reduction in serum enzymes (GOT and GPT) after administration of ethanolic extract of *Zingiber officinal* Rose either alone or its fraction. They also indicated that *Zingiber officinal* has hepatoprotective properties.

The contradiction among results may be due to the different doses used and duration of treatment between the present work and those in the literature.

The present results also showed that treatment of rats with 2.5% ginger + 2.5% damssisa hadn't significant effect on serum AST and ALT activities. These results are in accordance with Lamfon, (2011) who reported no significant difference in serum AST activity in albino mice treated with ginger. Badr *et al.* (2012) reported that oral administration of damssisa, *cymbopogon proximus* and *Ammi visnaga* did not show any significant effect on plasma ALT and AST activities.

Table 1: Serum AST (GOT) activities (U/I) as affected by medicinal plants.

Time	4 weeks			8 Weeks		
	Mean	S.E	d.t	Mean	S.E	d.t
G1 control	52.66	3.48	B	51.33	1.452	B
G2 ginger 5%	71.66	8.96	A	70.66	8.282	A
G3 damssisa 5%	62.00	1.73	AB	60.00	1.154	AB
G4 ginger 2.5%+damssisa 2.5%	53.00	1.57	B	52.00	1.154	B

S.E. Standard error.

d.t: Duncan's multiple range test between groups.

Means with the same letter are not significantly different.

Table 2: Serum ALT (GPT) activities (U/I) as affected by medicinal plants.

Time	4 weeks			8 Weeks		
	Mean	S.E	d.t	Mean	S.E	d.t
G1 control	21.33	1.45	B	21.66	2.02	B
G2 ginger 5%	34.33	2.96	A	33.33	1.33	A
G3 damssisa 5%	28.66	5.54	AB	25.33	1.88	B
G4 ginger 2.5%+ damssisa 2.5%	27.33	2.02	AB	23.66	3.84	B

S.E. Standard error.

d.t: Duncan's multiple range test between groups.

Means with the same letter are not significantly different.

Tables (3&4) shows that treatment of rats with ginger or damssisa or their mixture for 4 or 8 weeks hadn't any significant effect on serum total protein and albumin as compared with the control group. These results are similar to those reported by Badr *et al.* (2012) that oral administration of rats with damssisa did not show any significant effect on plasma total protein and albumin levels.

The insignificant effect of ginger on serum total protein and albumin are in contrast with the findings of Salah, (2012) who found that levels of plasma total soluble protein and albumin were significantly decreased in paracetamol treated rats. They also showed that the abnormal values of protein profile were readjusted and improved by ginger ingestion.

Table 3: Serum total protein concentrations (g/dl) as affected by medicinal plants.

Time	4 weeks			8 Weeks		
	Mean	S.E	d.t	Mean	S.E	d.t
G1 control	4.78	0.54	A	5.33	0.46	A
G2 ginger 5%	4.97	0.14	A	5.17	0.60	A
G3 damssisa 5%	5.10	0.80	A	5.46	0.33	A
G4 ginger 2.5%+ damssisa 2.5%	5.56	0.04	A	5.01	0.48	A

S.E. Standard error.

d.t: Duncan's multiple range test between groups.

Means with the same letter are not significantly different.

Table 4: Mean \pm S.E of the effect of medicinal plants on serum albumin concentrations (g/dl)

Time	4 weeks			8 Weeks		
	Mean	S.E	d.t	Mean	S.E	d.t
G1 control	3.16	0.47	A	3.73	0.30	A
G2 ginger 5%	3.35	0.23	A	3.18	0.50	A
G3 damssisa 5%	3.53	0.55	A	3.15	0.43	A
G4 ginger 2.5%+ damssisa 2.5%	3.64	0.03	A	3.40	0.27	A

S.E. Standard error.

d.t: Duncan's multiple range test between groups.

Means with the same letter are not significantly different.

Conclusion

It is safe to supplement rats' diet with *Ambrosia maritime* (damssisa) for 8 weeks for antispasmodic, diuretic and useful in bronchial asthma, spasms, and frequent urination without any adverse side effects on Liver function. The results suggest to carrying out further studies to find out whether ginger or its extract have a hepatoprotective effect.

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