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SHORT COMMUNICATION

Hypolipidaemic Activity of *Ficus carica* Leaf Extract in Streptozotocin-diabetic Rats

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A decoction of *Ficus carica* significantly lowered plasma triglyceride levels in rats with insulin-dependent diabetes (streptozotocin 80 mg/kg body weight) when it was administered orally (357±206 mg/dL before administration and 81±81 mg/dL 3 weeks after administration, $p<0.01$, $n=11$). The plasma triglyceride levels in diabetic rats were also lower when the *Gicus carica* extract was administered intraperitoneally (608±391 mg/dL before administration; 444±310 mg/dL 90 min after administration; and 106±129 mg/dL 48 h after administration; $p<0.005$, $n=7$). The cholesterolaemia remained unchanged.

Keywords: hypolipidaemic activity; *Ficus carica* extract; streptozotocin-diabetic rats.

INTRODUCTION

Leaves from *Ficus crica* (fig tree; *Ficus carica* L., Sp. Pl. 1059 (1753) are commonly used to treat diabetes mellitus in the traditional medicine of Extremadura (Spain) (Torres *et al.*, 1993). Hyperlipidaemia is considered to be a problem in patients with diabetes and is one of the major risk factors in the development of atherosclerotic heart diseases (Favalli *et al.*, 1985). Dietary fibre from a number of plant foods such as guar gum (Jenkins *et al.*, 1975), oat bran (Kirby *et al.*, 1981) and wheat bran (Goswami *et al.*, 1985) has been reported to be hypolipidaemic. The action of other plants with hypolipidaemic effects (Dixit *et al.*, 1988) has not been clarified.

The present study is an investigation of the hypolipidaemic activity of an aqueous extract from *Ficus carica* leaves in streptozotocin-diabetic rats.

MATERIALS AND METHODS

Adult female Wistar rats (200–250 g) were maintained on a standard laboratory pellet diet (Sanders, Barcelona, Spain) with free access to food and fluid. Diabetes was induced by a single intraperitoneal injection of streptozotocin, (80 mg/kg b.w., Sigma, St. Louis, MO, USA) dissolved in sodium citrate buffer (1 mM, pH 4.5) immediately before use.

The *Ficus carica* (*Ficus carica* L., Sp. Pl. 1059 (1753) leaf preparation, consisted of filtered decoctions (100 g) of air-dried leaves boiled in 900 mL water for 30 min. The chronic effect (3 weeks of treatment) was evaluated in four groups of animals: untreated non-diabetic rats N ($n=5$), treated non-diabetic rats NT ($n=9$), untreated diabetic rats D ($n=14$) and treated diabetics rats DT ($n=11$), by a weekly check on the state of the animals (previously fasted for 18 h) in which they were weighed and a blood sample (1 mL) was taken from the tail vein. The acute effect was investigated by intraperitoneal injection of either serum saline or of the extract in its concentrated form, (each filtered decoction being evaporated down to provide 9 doses of 0.5 mL), in four groups of animals: 6 normal rats and 7 diabetic rats injected with serum saline; and 7 normal rats and 7 diabetic rats injected with the *Ficus carica* extract. Blood was taken from the tail vein of the unfasted animal 0 min, 90 min and 48 h after the injection of the extract. Serum was separated by centrifugation (2500 rpm, 10 min, room temperature) and analysed for glycaemia (glucose oxidase method), triglycerides (GPO, POD method), total cholesterol (CHOD, POD method) in a Coulter CPA analyser.

Groups of data are expressed as mean±SD; the differences were considered to be statistically significant if $p<0.05$ (*) as evaluated by using the ANOVA test.

RESULTS AND DISCUSSION

The insulin-dependent diabetes induced by streptozotocin treatment is accompanied by hyperlipoproteinaemia of multifactorial origin (Chorvathova *et al.*, 1993). An aqueous extract of *Ficus carica* has hypoglycaemic properties (Perez *et al.*, 1992), we completed our study by determining the action of the extract on plasma triglyceride and total cholesterol levels. Oral administration of the extract from *Ficus carica* significantly decreased plasma glucose and triglyceride levels but did not affect the cholesterol concentration in diabetic rats. We were also interested in determining the effects of the extract on basal glucose, triglyceride and total cholesterol values in non-diabetic rats, but, in this case, no significant effect could be detected. In diabetic rats, plasma glucose levels were significantly ($p<0.01$) higher than those recorded in normal rats. In diabetic rats treated with *Ficus carica* decoction, plasma glucose levels were significantly ($p<0.05$) reduced after 3 weeks of treatment (from 501±66 to 356±180 mg/dL, $n=11$, Fig. 1) In diabetic rats, plasma triglyceride levels were significantly ($p<0.05$) higher than those recorded in normal rats. Treatment with *Ficus carica* leaves reduced significantly ($p<0.01$) the plasma triglyceride levels in

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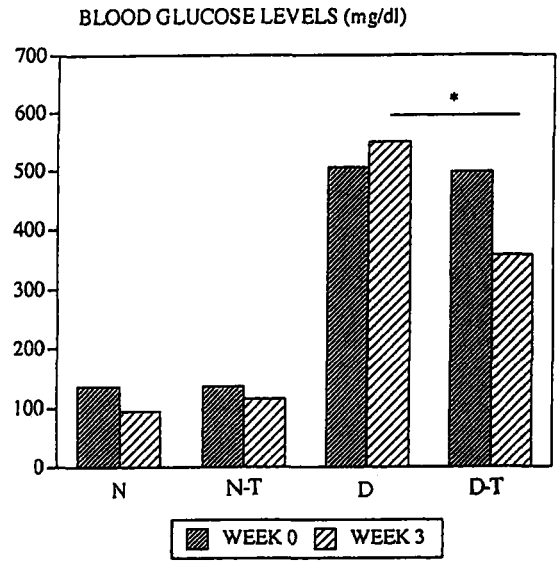
diabetic rats (from 357±206 to 81±81 mg/dL, $n=11$ Fig. 1) at the end of the 3 weeks of study. In normal rats treated with *Ficus carica* decoction, plasma glucose and triglyceride levels were unaffected (Fig. 1). Plasma cholesterol levels were not modified under any of the various experimental conditions.



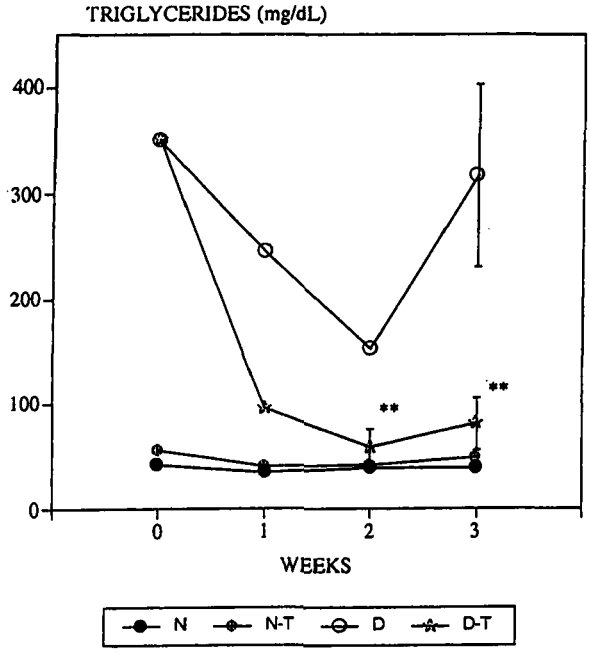


Figure 1. Glycaemic values (mg/dL) at the start and after 3 weeks of *Ficus carica* oral treatment. * $p<0.05$ week in DT vs week in D. Evolution of plasma triglyceride levels (mg/dL). ** $p<0.01$ with respect to D.

It is likely that the correct choice of administration mode is essential. When the *Ficus carica* leaf extract was administered intraperitoneally to diabetic rats, no statistically significant decline was observed either in glucose levels or in plasma triglyceride levels 90 min after the injection of the treatment. Nonetheless, after 48 h, both biochemical parameters, glucose and triglycerides, had undergone a statistically significant decline (Table 1). In the control group (diabetic rats injected with serum saline solution at 0.9%), the glycaemia values at 48 h of treatment were significantly greater than at time zero, and than at 48 h of treatment in the diabetic group injected with the *Ficus carica* extract; while the triglyceride values presented no statistically significant variation (Table 1). A lowering effect of dietary pectin on liver triglyceride levels was reported by Quazi *et al.* (1983). Certain dietary fibres like dietary alfalfa meal have also been known to reduce hepatic lipogenesis including triglyceride synthesis which may result in a decreased hepatic lipid deposition, but the *Ficus carica* treatment cannot be acting via a fibre effect alone since it is also effective when administered intraperitoneally (with the plasma triglyceride levels approaching normal values). We are, therefore, dealing with a natural treatment not only of diabetic hyperglycaemia, but also of the hypertriglyceridaemia that diabetics present.

Table 1. Plasma triglycerides (mg/dL) and glucose (mg/dL) levels after saline serum or *Ficus carica* treatment via i.p. administration

Plasma triglyceride (mg/dL)	0 min	90 min	48 h
Serum saline:			
N	92.7±34.5 *(n=6)*	84.0±36.2 (n=6)	77.8±34.1 (n=6)
D	761±250 *(n=6)*	589±242 (n=6)	856±698 (n=6)
Ficus carica			
N	67.1±19.3 *(n=7)*	49.9±18.3 (n=7)	44.3±16.0[a] (n=7)
D	608±391 *(n=6)*	444±310 (n=6)	106±129[b] (n=6)
Glucose (mg/dl)			
Serum saline			
N	166.3±21.5 *(n=6)*	186.6±33.5 (n=6)	190.0±27.5 (n=6)
D	507±91 *(n=7)*	438±88 (n=7)	636±107[a] (n=7)
Ficus carica			
N	126.4±38.9 *(n=7)*	138.8±52.6 *(n=7)*	129.6±47.7 *(n=7)*
D	501±80 *(n=7)*	515±101 (n=7)	380±153[a] (n=7)

[a] $p<0.05$. [b] $p<0.005$.

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