

## THE HYPOGLYCEMIC EFFECT OF DIFFERENT EXTRACTS OF AMBROSIA MARITIMA, L. COMPOSITAE

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**SUMMARY :** The effect of the different successive extracts of the herb of *Ambrosia maritima*, L. family *compositae* wildy grown in Egypt on post-prandial and fasting blood glucose were tested in rats. The results showed that 1.5 hours post-prandial blood glucose was reduced significantly after administration of the total water, 50% alcoholic or petroleum ether extracts. The two hours post-prandial blood glucose was reduced significantly after the administration of either the petroleum ether or the ether extract. The fasting blood glucose was reduced only on giving either the total water or the alcoholic extract. Methylene chloride extract produced no significant change on post-prandial blood glucose. The effect of petroleum ether extract and 50% alcoholic extract on plasma insulin levels 2 hours and 1.5 hours respectively after glucose ingestion was determined. The results showed no significant change of insulin level in both cases. Phytochemical and chromatographic study of the extracts revealed the presence of terpenoids, flavonoids and coumarins.

**Key Words :** *Ambrosia maritima*, L. *compositae* hypoglycemic activity.

### INTRODUCTION

Now a days, the different known side effect of the synthetic drugs provoked the discovery and the use of some plants of medical value. A wide variety of medicinal plants are used in the treatment of diabetes. From these a large number of Egyptian herbs are known to be used in folk medicine (1) and are considered to be of benefit in this context. One of these plants is the herb of *Ambrosia maritima*, L. (Damsissa) family *compositae*, widely grown in Egypt (2). It is a gray hairy herb with finely dissected, fragrant leaves found on muddy canal banks. Chemically the aerial parts of this medicinal plant contained four pseudoguaiinolides, parthenin and neombrasin (3). Two new sesquiterpene lactones, characterized as 1'-noraltarnisin and (11R)-11, 13 dihydropsilostachyin, were isolated together with 7 known terpenoids from the leaves other

lactones from this species have been reported to show molluscicidal activity against the intermediate hosts of *shistosoma* spp (4). Picman *et. al.*, 1986 (5), isolated and identified the sesquiterpene lactone hymenin from the ethanolic extract of *Ambrosia maritima*. Two known sesquiterpene lactones, damsine and ambrosin were also isolated and characterized. Some researches (6) reported the presence of some coumarins as scopoletin, umbelliferone and isoscopoletin. In addition, other coumarins like isoprimpinellin, limettin, esculetin and umbelliprenin were also found. Hispidulin or (4', 5,7-trihydroxy-6-methoxy flavone) was found in 34 species of *Ambrosia* (7). Dominguez *et. al.* (8) extracted the essential oil from *Ambrosia artemisifolia* used in native medicine and analyzed it by chromatography and spectrophotometry and other routine procedures, essential oil yield was 0.14%.

The effect of the whole plant or infusion of *Ambrosia maritima* on eggs, larvae and pupae of *Anopheles pharoensis*

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sis were extensively studied in the literature (9). It was reported (10) also that the alcoholic extract of *Ambrosia maritima* showed on antibacterial activity. Our study is planned to examine the hypoglycemic effect of the different extracts of *Ambrosia maritima*, in experimental rats as well as its effect on insulin.

**MATERIAL AND METHODS**

**1. Plant material**

The herb of *Ambrosia maritima*, L. family compositae collected from the canal banks of the Nile Delta, Egypt.

**2. Phytochemical methods**

The dried powdered whole herb of *Ambrosia maritima*, L. family compositae was successively and exhaustively extracted with light petroleum ether, ether, methylene chloride, 50% methyl alcohol and water. The extracts were concentrated under reduced pressure at a temperature not exceeding 45°C to a small volume for biological and chemical tests.

The extracts were examined chromatographically by TLC using silica gel G. as adsorbent and light petroleum - chloroform - ethyl acetate (2:2:1) as solvent system. Sesquiterpene lactones were detected by spraying the chromatograms with concentrated sulphuric acid and heating for 5' at 100-110°C. Detection of phenolic compounds was achieved using cellulose as adsorbent, BAW (4:1:5) and 10% HAC as solvent systems and aluminium chloride for visualization, while coumarin compounds were detected with 5% aqueous NaoH, intense yellow green fluorescence were developed when dried paper is placed under UV light for 5-10 minutes. All isolated compounds were identified by physical means, Co-chromatography, spectroscopic methods, as well as published data (11).

**Animals**

Male adult albino rats of 170-190 g body weight were used in our experiment.

**Diet**

Rats were fed a balanced diet during the whole experiment (Table 1).

**Plant extracts**

Five successive extract of the herb *Ambrosia maritima*, L. family compositae (petroleum ether, ether, methylene chloride, 50% alcohol and water extracts) were tested in our experiment.

**Preparation of doses**

The residue of total water extract was dissolved in water, while methylene chloride was suspended in water then given to

rats. The groups of rats given the previous two extracts were compared to control group given water only.

The petroleum ether, ether and 50% alcoholic extracts were suspended in water using a suspending agent (gum acacia) before given to rats. These groups were compared with a control group given the same amount of gum acacia dissolved in water.

Table 1: Composition of diets.

Ingrdients	
Casein	10.00
Fat	10.00
Maize	Starch
50.30	Sucrose
25.20	Salt mixture (12)
03.50	Vitamin mixture (13)
10.00	
100.00 gr	

Table 2: Blood glucose (mg/100 mL) of rats given different extracts of *Ambrosia maritima*, as one single dose.

		Fast- ing blood glu- cose	Blood glucose 1.5 h. after oral glucose	% Re	Blood glu- cose 2 h. after oral glu- cose	% Re
Control	mean ±SE	72.500 05.352	91.400 07.085	-	076.000 004.950	- -
Total water extract	mean ±SE	72.800 07.465	66.400* 08.591	27	084.200 006.435	- -
Methylene chloride extract	mean ±SE	72.800 02.391	79.300 03.610	-	078.500 004.889	- -
Control	mean ±SE	75.500 03.864	91.700 06.464	-	112.300 005.666	- -
Petroleum ether extract	mean ±SE	74.000 03.582	72.900* 04.042	21	0.68.300***** 003.500	39 -
Ether extract	mean ±SE	75.800 02.770	76.500 02.858		077.000***** 005.917	31 -
50 % alcoholic extract	mean ±SE	75.400 06.091	59.600**** 05.228	35 -	111.600 008.621	- -

Values significantly differ from the control.  
\*p<0.05                      \*\*\*\*p<0.005                      \*\*\*\*\*p<0.001

Table 3: Fasting blood glucose (mg/100 mL) of rats given the different extracts of *Ambrosia maritima* for 20 days and their corresponding controls.

		Fasting blood glucose
Control	mean	74.400
	±SE	06.421
Total water extract	mean	45.700****
	±SE	04.566
Control	mean	48.600
	±SE	01.994
Petroleum ether extract	mean	57.100
	±SE	02.591
Ether extract	mean	59.100
	±SE	02.111
50% alcoholic extract	mean	33.100*****
	±SE	00.753

Values significantly differ from the control.  
\*\*\*\*p<0.005      \*\*\*\*\*p<0.001

#### Design of the experimental work

Rats were divided into seven groups each included 6 rats. All the rats were fasted 16 hours then fasting blood glucose was determined for all rats by an enzymatic method (14). The tested extracts were given to the different five test groups of rats as 200 mg/kg rat body weight. The two other groups of rats served as control. All rats were given oral glucose solution (15). Blood glucose was again determined after 1.5 hours and 2 hours of glucose ingestion.

Table 4: Plasma insulin level (ng/mL) rats given either alcoholic or petroleum ether extract of *Ambrosia maritima*, L.

		Plasma insulin in the fasting state	Plasma insulin 1.5 h. after glucose ingestion	Plasma insulin 2 h. after glucose ingestion
Control	mean	1.866	5.505	-
	±SE	0.104	1.039	-
Alcoholic extract	mean	1.901	3.606	-
	±SE	0.095	1.089	-
Control	mean	2.012	-	7.812
	±SE	0.120	-	1.121
Petroleum ether extract	mean	1.911	-	6.101
	±SE	0.134	-	1.312

No values significantly differ from the mean.

The most active hypoglycemic extract were used to test their effects on post-prandial serum insulin level by radio immunoassay (INCSTRA Cooperation, Stillwater, Minnesota, USA).

All the previous rats were continually given one daily oral dose of 200 mg extract/kg body weight for 20 days (except the group of rats given the methylene chloride extract which produced no significant changes on post-prandial blood glucose as shown described water or suspending agent) were run besides the test groups for the same period. The doses were given at 9 o'clock in the morning. Rats were fed the balanced diet (Table 1) during the whole experiment. At the end of the experiment, rats were fasted 16 hours and fasting blood glucose was determined at 9 o'clock in the morning. The results were analyzed statistically using the student's t test.

#### RESULTS AND DISCUSSION

It is clear from the results (Table 2) that the tested extracts possess a significant hypoglycemic effect on post prandial blood glucose except that of methylene chloride. The hypoglycemic effect of the extracts in some cases was clear after 1.5 hours of glucose ingestion and in others after 2 hours. The total water extract and the 50% alcoholic extracts produced their significant hypoglycemic effect only after 1.5 hour from glucose ingestion where  $p<0.05$  (27% reduction) and  $p<0.005$  (35% reduction) respectively. The petroleum ether extract produced significant hypoglycemic effect on both 1.5 and 2 hours post prandial blood glucose where  $p<0.05$  (21% reduction) and  $p<0.001$  (39% reduction) respectively. Ether extract produced 31% reduction of 2 hours post prandial blood glucose, where as the fasting and the post-prandial blood glucose, where as the petroleum ether and ether extract produced their hypoglycemic effect only on post prandial blood sugar. This indicates that the hypoglycemic effect of the water and alcoholic extracts lasted for 24 hours, while that of the ether and petroleum ether extracts did not (Table 3).

Chromatographic examination of the active extracts were carried out. The results revealed the presence of the sesquiterpene lactones, damsine, ambrosin, hymenin as well as umbelliferone and methoxylated flavones. Damsine the sesquiterpene lactone isolated from the ethanolic extract of the plant (5) was reported by Kiliani *et al.* (16) to be an effective hypoglycemic agent on 1.5 and 2 hours post prandial blood glucose. Bioassay directed fractionation of the active extracts are in progress.

The results of the insulin determination level (Table 4) showed that neither the alcoholic extract nor the petroleum ether extract has a significant effect on serum insulin level after 1.5 and 2 hours respectively from glucose ingestion. This result indicates that those two active extracts did not exert a stimulatory effect on B cells of the pancreas at these points of determination (1.5 and 2 hours) but they may have the stimulatory effect before these points (i.e. before 1.5 hours in case of the alcoholic extract or 2 hours in case of the petroleum ether extracts). The hypoglycemic effects may be exerted through the inhibition of glucose absorption, increase sensitivity of receptors to insulin, insulinase inhibiting effect, stimulation of B cells of pancreas to secrete insulin or stimulation of peripheral tissues uptake of glucose.

#### REFERENCES

1. Abdel Wahab SM, Wassel GM, Ammar NM and Hanna T : *Herba Hungarica Tom*, 26, No 1, 27-31, 1987.
2. Vivi Täckholm : "Student Flora of Egypt" published by Cairo Univ, p 568, 1974.
3. Abdel Salam NA, Mahmoud ZF, Ziesche J and Jakupavic J : *Phytochemistry*, 23:12-2851, 1984.
4. Delgado G, Chaves MA and Alvarez L : *Journal of Natural Products*, 51:1-83, 1988.
5. Picman AK, Arnason JT, Lambert JDH and Nat J : *Prod*, pp 49-556, 1986.

6. Khalil AM, El Tawill BAH, Ashy MA and Elbeih FKA : *Pharmazie*, pp 36-569, 1981.
7. Carman NJ, Watson T- Bierner, MW, Avertt J, Sanderson S, Seasam FC and Mabry TJ : *Phytochemistry*, 11:3271, 1972.
8. Dominguez XA, Gomez E, Gomez PA, Villareal AN and Rombold C : *Planta Medica*, 19:52, 1970.
9. El Sawy MF, El Hamd ZMS, Loutfy NF, El Masry S and Abdel Gualil MZ : *J of the Egypt. Society of Parasitology*, 16:1, pp 57-64, 1986.
10. Ross SA, Megalla SE, Bishav DW and Awad AH : *Fitoterapia*, 51:303, 1980.
11. Harborne JB : "Phytochemical Methods", 2nd Ed, London, New York, Chapman and Hall, 1984.
12. Briggs GM and Williams MA : *Fed Proc*, 22:261, 1963.
13. Morcos SR : *J Britt*, pp 21-269, 1967.
14. Triender P : *Ann Clin Biochem*, 6:24, 1969.
15. Arango PE : *J Food Sciences*, pp 44-365, 1979.
16. Kiliani AI, Ibraheem FK, Kamel NAH, Hareedi MA, Ali AA and Shahwan MM : *Proceedings of Eighth Annual Scientific Conference*, March, 1990.

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