Review article

EFFECT OF *CATHA EDULIS* LEAVES ON PLASMA GLUCOSE

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Abstract

The short-term three months biochemical effects of varying levels of Catha edulis leaves on the the plasma concentration of glucose were examined. The results demonstrated a significant decrease in plasma glucose during the experimental period by all levels of Catha. edulis leaves chewing. This significant decrease in plasma glucose was halved at the end of c. edulis chewers experimental period, compared with plasma glucose patients with diabetes users of insulin and daonil. It was observed that healthy khat chewers have 61.22% reduction in blood sugar within 4 hours after consumption.

Key words: *Catha edulis*, khat, plasma glucose, cathinone

INTRODUCTION

The habit of khat (*Catha edulis* Forsk.) chewing has prevailed for centuries among populations in the horn of Africa and the Arabian Peninsula including the Yemen. Fresh leaves of khat are customarily chewed to attain a state of stimulation (Kalix, 1984). Cathinone in khat leaves has a close structural similarity with amphetamine, and that both share common pharmacodynamic features. It had led to the conclusion that cathinone is the most important active ingredient of khat, causing the major pharmacological effects (Hollister, 1995). The common adverse effects of khat use include insomnia, anorexia, and hyperthermia. The detrimental effects of the active principle of khat in men and animals have been described (Kalix and Khan, 1984), such as elevated blood pressure and tachycardia and khat is reported to produce constipation and antispasmodic action (Makonnen, 2000).

MATERIALS AND METHODS

Plant material

Catha edulis leaves were regularly obtained from the local supplier in Yemen (Yafeh Mountains). Precipitation was limeted by less than 3061 m/hr. It ranged betwen once to twice time a month. The soils which support khat in yafeh sandstone and limestone soils. Daily duration of sunlight intensity during the experimental period were about 6 hours/day. The mean average temperature is below 20°C and the plant used is 10 years old. The insecticides were used are heptachlor and the fertilizer were used Potassium chloride 60% potassium chloride were used for protection and nutrition purposes. The distance between individual trees was one meter. The amount of 3 g/kg washed leaves was used for experimental purposes.

Hypoglycemic testing

This study involved the random selection 30 male subjects aged 25–60 years. 20 of which were previously diagnosed as type 2 diabetics and the other 10 were healthy non-diabetics. The parents were non diabetics, too.

The three groups were subdivided in accordance on whether they were regular khat chewers and non-khat chewers. In Algamhoria hospital in Aden. Group I and II included 20 individuals, group I using antidiabetics oral tolbutamid daonil, and group II using antidiabetics Insulin. The check group III included 10 individuals healthy khat chewers.

Three blood samples were collected from each subject. The first sample was collected before the khat chewing session approximately 1 h after lunch the second, third , fourth blood samples were collected at 2, 3 and 4 hours after the starting khat chewing. In groups I and II blood samples were collected after treatment by antidiabetics. Blood samples group I and II were centrifuged, serum was separated and divided into aliquots. Samples for glucose determination were stored at 20°C and analyzed on the second day of separation. Blood samples group III we use Device Measurement EZ smart Blood Glucose monitoring system tyson bioresearch, inc SF 22 Ke E.

All subjects were instructed not to eat or drink following the lunch and before of the first blood sample as well as the following except for drinking water consumption.

RESULTS AND DISCUSSION

Table 1 shows the effect of khat chewing on serum glucose (mg/dl) on non diabetic khat chewers. The levels of serum glucose at 1–4 hrs after lunch of normal

individual's khat chewers were significantly different when compared with respective values at the 2 h, 3 h and 4 hrs after lunch. The maximum decrease glucose values after 4h and the rate decrease was 61.22%. Table 2 and Table 3 show that the rate of sugar decrease in normal khat chewers was higer than effect of antidiabetics (daonil and insulin). Table 4 show average decrease serum glucose in oral daonil 11.99% and in insulin 22.14%. The effect of regular khat chewing on serum glucose levels healthy non-diabetics compared with both 2 groups diabetics using oral and insulin antidiabetics was examined. Our results chowed serum glucose at 1.3 and 4 hrs after khat chewing in group I and in both type antidiabetic II, III after use (daonil and insulin). Was significantly different (Table 1, 2, 3). These findings are in agrreement with the earlier results presented by (Bajubair, 1997). The results however differ from those reported by (Ahmed, 1984). They suggested a significant decrease in serum glucose. Another results can be explained by the fact that khat might increase norepinephrine release which has one tenth of the potency of epinephrine on blood glucose level in normal individuals (Cryer, 1987). The sympathetic action of khat may increase glucose production via activation of glycogenolysis especially that of muscles, which increase blood glucose by an indirect mechanism through increased glycolysis, and subsequeent releas of lactate. The latter is transported to the liver where it serves as a gluconeogenic substrate (Shafrir, 1987). In addition, the increase of peripheral norepinephrine would stimulate hormone sensitive lipase which hydrolyzes tissue triacylglycerol into free fatty acids and glycerol which are released into blood circulation (Gillham, 1997). These in turn are transported to the liver where glycerol acts as gluconeogenic substrate and fatty acids as energy sources for glucose synthesis by the liver moreover; cathinone (a major active constituent of khat alkaloids) has also been reported to significantly increase free fatty acids in rats and rabbit (Nencini, 1980). The base-line serum glucose of non-diabetic individuals at 4 hrs after khat chewing ranged between 28 mg/dl. And in diabetic individuals between 14–78 mg/dl, in oral antidiabetics and between 8–115 mg/dl after insulin injection. The lower limit being based on the new diagnostic criterion of diabetic patient stating that random serum glucose should be < 200 mg/dl.

CONCLUSION

Our results demonstrated a significant decrease in plasma glucose throughout the experimental period by all levels of *Catha edulis* leaves tested leaves consumption. It was observed that healthy khat chewers have 61, 22% reduction in blood sugar within 4 hours khat chewing.

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Tab. 1: Effect of khat chewing on serum glucose (mg/dl) of normal khat chewers

Parameters (n = 10)	1 h	2 h	3 h	4 h	Decrease mg/dl	%
1	159	138	72	25	134	25
2	168	159	94	80	88	80
3	133	120	118	58	75	58
4	137	125	122	105	32	105
5	155	115	66	40	115	40
6	149	132	115	83	66	83
7	140	138	115	112	28	112
8	165	159	141	121	44	121
9	125	103	72	66	59	66
10	140	134	116	47	93	47
Average	147	132	103	57	90	61.22

Decrease serum glucose (mg/dl) after 4 hours of khat chewing

Tab. 2: Effect of antidiabetics oral on serum glucose (mg/dl) of non-khat chewers

Parameters (n = 10)	2h	3h	4h	Decrease mg/dl	%
1	209	198	195	14	
2	233	211	296	63	
3	238	234	222	16	
4	275	260	257	18	
5	228	159	150	78	
6	271	257	240	31	
7	236	215	190	46	
8	205	192	170	28	
9	247	205	173	74	
10	244	226	209	35	
Average	238.6		210.2	28.6	11.99

Decrease serum glucose (mg/dl) after 3 hours antidiabetics oral

Tab. 3: Effect of antidiabetics insulinon serum glucose (mg/dl) of non-khat chewers

Parameters (n = 10)	2 h	3 h	4 h	Decrease mg/dl	%
1	266.5	257	244	22.5	
2	200	185	162	38	
3	252	150	144	8	
4	250	237	238	12	
5	240	220.5	182	58	
6	178.7	161	150	28.7	
7	206	200	175	31	
8	235	236	183	52	
9	250	233	192	58	
10	290	280	175	115	
Average	236.28		184.5	52.32	22.14

Decrease serum glucose (mg/dl) after 3 hours antidiabetics insulin

Tab. 4: Average decrease serum glucose among the three groups

Parameters	Normal khat chewers	Oral diabetics non-khat chewers	Insulin diabetics non-khat chewers
Average decrease, mg/dl	90	28.6	52.32
Average, %	61.22	11.99	22.14

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