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PRELIMINARY STUDIES ON THE ANTI-DIABETIC EFFECTS OF CABBAGE (*BRASSIA VAR CAPITATA* L.) OIL ON STREPTO-ZOTOCIN DIABETIC RATS

S. P. TARFA, P. K. JOSEPH and
K. T. AUGUSTI*

Department of Biochemistry, College of Medical Sciences, University of Maiduguri, Nigeria.
** Present address: Department of Biochemistry, University of Kerala, Kariavattom, Trivandrum 695 581, India.*

CABBAGE contains S-methyl cysteine sulphoxide[1] (SMCS) and it is converted to dimethyl disulphide on crushing and extraction[2,3]. Itokawa *et al*[4] showed that SMCS and S-allyl cysteine sulphoxide (SACS), the precursors of the disulphide containing oils of cabbage and garlic respectively, are antihyper-cholesterolemic in action. Farva *et al*[5] showed that garlic oil has definite antidiabetic action. In the present communication, the diabetic effects of cabbage oil as compared to those of insulin in streptozotocin diabetic rats are studied.

Cabbage oil was prepared from a fresh sample of the vegetable which was sliced, dried and soaked in diethyl ether for two days. The decanted solution was distilled at 40°C and the oil left was used. White albino rats weighing 100–150 g were made diabetic by intravenous injection of streptozotocin (40 mg/kg)[6] in citrate buffer with pH 4.5. Fasting blood sugar of the rats was estimated after a week by the method of Asatoor and King[7]. Rats with blood sugar above 180 mg/100 ml were used. Plain insulin (40 units/ml) was used to study the effects of insulin in diabetic rats for a comparison of the effects of cabbage oil. Six normal rats were used to get normal values. Diabetic rats were divided into four groups of six each. All the rats were given rat food supplied by Pfizer (Kaduna, Nigeria). The particulars of the treatment were as follows for groups 3–5: (i) Normal rats for normal control values; (ii) diabetic rats for untreated control values; (iii) diabetic rats injected daily with insulin 10 units/kg; (iv) diabetic rats injected daily with insulin 5 units/kg; (v) diabetic rats orally administered daily with cabbage oil 100 mg/kg.

Insulin was diluted in normal saline in the ratio 1:3 and 0.1 ml and 0.05 ml/100 g body weight were injected to the corresponding groups subcutaneously every day for a month. Cabbage oil was made into a suspension in normal saline and it was fed intragastrically by a stomach tube (dose 100 mg/kg) for the same period to the last group. After one month the rats were again weighed and their fasting blood sugar estimated. They were then sacrificed by decapitation and their blood, liver and kidneys were collected for various estimations. In serum and tissues, cholesterol by the method of Zlatkis *et al*[8] and triglycerides by the method of Lambert and Neish[9] were estimated. Total lipids in tissues were determined by a gravimetric method[10]. All the values were analysed statistically based on student's *t* test. A known antidiabetic agent garlic oil[5] composed of diallyl disulphide was run side by side with cabbage oil on alumina coated with thin layer chromatography (TLC) plates using hexane:diethyl ether: glacial acetic acid (70:30:1, v/v) system for 2 hr. The plate was then dried and sprayed with sodium nitroprusside reagent to locate the organic sulphides. Purple spots appeared and their R_f values were measured.

On treatment with insulin and cabbage oil, blood sugar, serum and liver cholesterol, serum, liver and kidney triglycerides and total liver lipids reduced significantly. As shown in table 1, some parameters were brought to near normal and the effects of the oil were quite comparable to those of a high dose of insulin. As insulin completely prevented a weight loss and increased the weight, cabbage oil could only reduce the weight loss to half.

In TLC cabbage and garlic oils showed only single spots of sulphides with R_f values 0.65 and 0.66 respectively. The sulphur compound present in garlic oil is diallyl disulphide[5] and that detected in cabbage oil could be dimethyl disulphide as reported earlier[3]. Cysteine sulphoxide derivatives present in cabbage, garlic and onion are converted to corresponding disulphide oxide and then to disulphides (dimethyl disulphide from cabbage and diallyl disulphide from garlic) on crushing and extraction as a result of the action of allinase[2]. The antidiabetic action of garlic oil is well established[5]. On TLC cabbage oil and garlic oil showed spots of organic sulphides with very close R_f values. In controlling diabetic condition cabbage oil is as effective as a

Table 1 *Hypoglycemic and hypolipidemic effects of cabbage oil compared with those of insulin in streptozotocin diabetic rats (Mean value ± S.D of six rats in each group)*

Parameters studied	Normal	Diabetic groups			
		Untreated control	High insulin treated	Low insulin treated	Cabbage oil treated
Blood sugar mmol/l	4.6±0.6	20.0±2.0*	8.0±1.5*	9.0±2.0*	8.5±1.0*
Serum cholesterol mmol/l	3.4±0.2	6.2±0.3*	4.8±0.3*	5.5±0.3†	3.5±0.2*
Liver cholesterol mmol/kg	18.0±3.0	26.0±2.0*	18.5±2.0*	22.4±3.0*	19.0±2.0*
Kidney cholesterol mmol/kg	2.5±0.5	6.2±1.5*	4.5±1.0	5.0±1.2	4.2±1.0
Serum triglyceride glycerol mmol/l	0.5±0.1	1.2±0.2*	0.75±0.12‡	1.10±0.15	0.88±0.1†
Liver triglyceride glycerol mmol/kg	10.0±2.0	20.0±3.0*	9.5±1.5*	12.0±2.0*	9.6±1.0*
Kidney triglyceride glycerol mmol/kg	3.0±0.5	11.0±2.0*	4.8±0.5*	5.7±0.4*	5.8±0.5*
Liver total lipids g/kg	31.0±2.9	40.0±5.0‡	32.0±1.5†	35.0±2.0	30.0±1.0‡
Change in body wt g/100g	40.0±5.0	−16.0±2.0*	20.0±3.0*	10.0±2.0*	−8.0±2.0*

Negative value for change of body wt indicates loss of weight; Diabetic control is compared with normals and treated groups are compared with diabetic control. Level of significance is based on student's *t* test; †$P<0.01$; ‡$P<0.002$; *$P<0.001$.

high dose of insulin, except that it could not increase the body weight. The mechanism of action of the oil is not clear; however it could be similar to that of garlic oil. Tashiko *et al*[11] ascribed the hypocholesterolemic action of cabbage to a sterol but Itokawa *et al*[4] and the present authors ascribe such action of cabbage to sulphur compounds.

7 February 1987; Revised 7 August 1987

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ADDITIONAL RECENT OSTRACODES FROM RAJASTHAN

B. A. HABIBNIA and M. S. MANNIKERI
Department of Geology, Karnatak University, Dharwad 580 003, India.

DURING a geological investigation (October 1986), 10 substrate samples were collected from 2 perennial