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Mas Cotek *(Ficus deltoidea)*: A Possible Supplement for Type II Diabetes: (A Pilot Study)

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ABSTRACT

The aim of this research was to study the effect of the *Ficus deltoidea* (Mas Cotek) leaves on fasting blood sugar, renal and lipid profile of Type II diabetic patients. This study was carried out at Polyclinic Balok, located in Kuantan, Pahang, Malaysia. Twenty patients participated in the study and they were divided into two (2) groups of ten (10) patients each. The inclusion criteria were registered as diabetic patients in the health centre, diagnosed as type II diabetes mellitus for more than one (1) year, age 18 years and above, HbA1c more than 6.5% and have contactable telephone number. The patients in the intervention group has been given *F. deltoidea* 350 mg twice daily orally and monitored every 20 days for two (2) months. In conclusion, the effects on fasting blood sugar, HbA1C, renal and lipid profiles were not significant. The patients in the intervention group felt energetic and fresh compared to the control.

Keywords: Diabetes mellitus, energetic, fasting blood sugar, feeling fresh, ficus deltoidea, lipid profile, renal profile.

INTRODUCTION

Diabetes mellitus is a syndrome characterized by chronic hyperglycemia which is due to relative insulin deficiency, or resistance, or both (Kumar & Clark, 1998). The primary defect is a tissue insulin receptor disorder resulting in resistance to insulin action. Compensatory hyperplasia of pancreatic beta cells and increased insulin production occur and account for fasting hyperinsulinaemia and an exaggerated insulin response to glucose ingestion. Prolonged exposure over time to fasting hyperglycaemia causes beta cells desensitization and failure of insulin secretion by the beta cells (Weiss Barry, 1999). Treatment consists of oral hypoglycemic agents and insulin (Hanninen *et al.*, 1998).

The prevalence of diabetes mellitus is dramatically rising worldwide according to the International Diabetes Federation (IDF). In 2000, about 171 million people were affected, and this number was expected to increase to 366 million by 2030 (Wild *et al.*, 2004). In Malaysia, the prevalence of diabetes is found to be 8.2% (Rugayah, 1997). Based on the National Health Morbidity Survey conducted in 1986, the prevalence was 6.3%, and this was increased to

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8.3% in 1996, and 14.9% in 2006. The National Health Morbidity Survey III showed that the diabetes prevalence rate had risen drastically and at a much faster rate than expected (Zanariah H. *et al.*, 2006).

Botanical products may improve glucose metabolism, state of well-being, lipid metabolism, antioxidant status and capillary function (Bailey, 1989). Some example of these are bitter melon, Gymnema, Korean Ginseng, onions, garlic, flaxseedmeal, alphalipoicacid, biotin, carnitine, vanadium, chromium, magnesium, zinc and vitamins B_3, E and K (Shapiro *et al.*, 2002). In India, 85% of the traditional medicines used for the primary healthcare are derived from plants (Basu, 1999). It is reported that out of 17,209 different kinds of plants, more than 7,918 plants were reported to have high medicinal value (Indian Botanical Survey Report, 2002). In addition to that, there are 2400 unique species of plants that are fully documented in terms of their biological properties, actions and drug formulations for a range of health conditions (Shanker, 2006).

Although herbs can be found in the wild, it is the individuals that control their usage (Goffman, 2003). The use of herbal medicines in Asia represents a long history of human interactions with the environment. Among other, plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases (Duraipandiyan *et al*., 2006). More than 400 traditional plant treatments for diabetes mellitus have been recorded, but only a small number of these have received scientific and medical evaluations to assess their efficacy (Bailey, 1989). In Malaysia, a few plants have been scientifically investigated and reported to have anti-diabetic properties. These plants include *Morinda citrifolia, Averrhoa bilimbi, Tinospora crispa, Parkia speciosa, Andrographis paniculata, Gynura procumbens* and *Orthosiphon stamineus* (Mafauzy, 2004).

However, there are still plants with anti-diabetic properties which have not yet been studied. One of them is Mas Cotek or scientifically known as *Ficus deltoidea*. It is a shrub that reaches a height of six feet, used as an ornamental plant in the tropics or in the home and conservatories. *F. deltoidea* is in the division of Magnoliophyta, class Magnoliopsida, order of Rosales, and in the family of *Moracea* (Starr, 2003). It contains flavonoid, which could result in antioxidant activity of the plant. Flavonoid also gives the yellow pigmentation, and it also helps the plant protect itself from microorganism and insects. Any herbs that contain flavonoid could also have the ability to act as anti-allergy, anti-inflammatory, anti-microbial, and anti-cancer agent (Buhler, 2007). Furthermore, the plant also contains tannins, triterpenoids and phenols. Tannins are astringent, bitter-tasting plant polyphenols that bind and precipitate proteins. Tannins may be employed medicinally in anti-diarrheal, hemostatic, and antihemorrhoidal compounds (Vattem *et al*., 2005).

Research done on *f. deltoidea* also showed that a mixture of the extracts of its fruits and leaves can reduce blood glucose level. Animal study was conducted by Aminudin N. in 2006 using rats. The extract was given as tea and fruit extracts. After two (2) hours, the rats that took the tea had 15.6% glucose reduction, whereas those which had fruit had 14.8% reduction. The researcher conducted another study by comparing *F. deltoidea* to other herbs, namely *Orthosiphon siamineus* (Misai Kucing), *Momordica charantia* (Peria), *Andrographis paniculata* (Hempedu bumi) and *Labisia pumila* (Kacip Fatimah) in terms of glucose reduction. Among the five herbs, *Ficus deltoidea* was found to be have the highest percentage of glucose reduction, which is 18.4%, whereas *Orthosiphon siamineus* (Misai Kucing), *Momordica charantia* (Peria), *Andrographis paniculata* (Hempedu Bumi) and *Labisia pumila* (Kacip Fatimah) had 17.3%, 7.8%, 6.7% and 1.5%, respectively.

Similarly, a study by Zainah A. *et al.* (2007) also showed that the aqueous extract of *Ficus deltoidea* at a concentration of 1000mg/kg had hypoglycaemic activity in post-prandial mild diabetic rats. The extract mechanism of the action was suggested through enhancement of glucose uptake in muscle tissue and reduction

of hepatic gluconeogenesis. This plant extract can also be used by mothers after giving birth because they are believed to aid in strengthening of the uterus, or used to regulate menstrual flow (Yaakob *et al.,* 2005). The leaves of *F. deltoidea* are traditionally boiled and the decoction is taken by women after giving birth. It is believed that *F. deltoidea* helps to contract the uterus and the vaginal muscles. It also improves blood circulation and regains body strength as well as treats disorders related to menstrual cycle (Anon, 2000; Burkhill & Haniff, 1930; Fasihuddin & Din, 1995). In Indonesia, women use the decoction of the whole plants as aphrodisiac tonic (Sri Yuliani, 2001; Sorolangum, 1999). According to the Ministry of Health Malaysia, the plant is supported by evidence based on the raditional and complementary medicine. The Ministry hopes that more research will be conducted to provide this evidence (MMA, 2008).

The objective of this study was to look at the effects of Mas Cotek (*F. deltoidea*) on fasting blood glucose, lipid profile and renal profile of Type II diabetic patients. The authors hope that the study can be used as a reference to find possible supplements for diabetic patients in the future, and thus improve diabetic control.

MATERIALS AND METHOD

This study was carried out at Polyclinic Balok, Kuantan, Pahang. For the purpose of this study, 20 diabetic patients who participated voluntarily were used as subjects. In particular, ten patients took *Ficus deltoidea* 350 mg twice daily orally (Intervention) and the other ten (10) patients were used as control. The patients were followed up at 0, 20, 40 and 60 days. The patients in the control group continued their standard treatment without receiving any *F. deltoidea*.

Recruitment was undertaken from November 2008 until December 2008. The recruitment of the subjects was continuously done until a total of 20 subjects were enrolled. Prior to the recruitment, the patients received a counselling session that lasted between 10 to 30 minutes from the researchers. During these sessions, they also received advice on the complications of diabetes mellitus. The inclusion criteria were:

Inclusion Criteria

- Registered as diabetic patients in the health centre
- Diagnosed as type II DM for more than one year
- Age 18 years and above
- Poor control of DM (HbA_{1c} more than 6.5%)
- Have contactable telephone number

Exclusion criteria

Meanwhile, the exclusion criteria were:

- Age > 75 years old
- Having acute illness which needs hospitalization for a duration of 3 months before and during the study period
- On haemodialysis
- Unable to comprehend and give cooperation
- Unable to continue follow up

This study was conducted according to the ethical principles of clinical trial involving human subjects. Informed consent and protocols were approved by the Ethics Committee of the Kulliyyah of Medicine, International Islamic University Malaysia, Kuantan, Pahang.

After the counseling session, eligible subjects were explained that the study involved the use of *F. deltoidea*. Each subject was given an information sheet and a full explanation of the nature and purpose of the study. The researcher explained the possible adverse effects, risks and benefits, as well as the study protocol.

After the subjects had been fully informed about the study, the informed consent form was given to each of the subjects to sign. Only those who agreed to sign the informed consent form were accepted for enrolment. The informed consent form was also signed and dated by the researcher and one witness and later kept in the

researcher's files. A copy of the information sheet and the signed informed consent was given to the subjects for their own personal record.

Fasting blood sugar (each follow up), renal profile and lipid profile (pre and post study) were investigated during the study period. The results were compared between the intervention and controls to see the effectiveness of *F. deltoidea* in diabetic patients. The medication *F. deltoidea* 350mg, with a registration number **MLMAL 06071300TC,** was sponsored by Delto Medicana Plantation Sdn. Bhd. The patients were monitored every 20 days. The patients were provided with the researcher's handphone number, if any untoward incidents happened during the study period.

The data was analysed using Statistical Package for Social Science (SPSS) version 16. The Mann-Whitney test was used and the statistical significant level was taken at 0.05.

RESULTS

A total of ten (10) diabetic patients for each intervention and the control group were recruited in this study. However, one patient from the intervention group did not complete the study, resulting in the drop-out rate of 5%.

Tables 1 and 2 below show the comparison of the socio-demographic and clinical characteristics of the patient participants in the intervention and control group. Table 1 also presents the comparison based on the categorical characteristics using *Fisher's Exact* test because the assumption on the expected frequency was not met and the *chi-square* test could not be used, whereas Table 2 reveals the comparison of the numerical characteristics using the Mann-Whitney test.

DISCUSSIONS

Besides *Eurycoma longifolia* (Tongkat Ali) and *Labisia pumila* (Kacip Fatimah), *Ficus deltoidea* (Mas Cotek) is another medicinal plant that is gaining popularity among the herbal practitioners (Chang *et al.*, 2004). The name of Mas Cotek is given mainly due to the presence of golden spots at the upper surface of the leaf. It is also known as *sempit-sempit* in Sabah and *tabak barito* in Indonesia (Sri Yuliani, 2001; Sorolangum, 1999). The collectors have classified *Ficus deltoidea* into more than 30 accessions based on the morphology of the leaf, stem and its growth habits. However, these accessions are commonly grouped into two (2), namely female *F. deltoidea* and male *F. deltoidea* (Musa & Wan Zaki, 2004; Musa *et al.*, 2004).

As presented in Table 1, the number of patients was reduced to only 19. One of the patients in the intervention group had default the treatment due to logistic problem. The patient was also unable to be contacted. As can be seen in Table 1, the intervention and control groups were comparable because there was no significant difference found in all the pre-intervention variables, except for their diastolic blood pressure. Similarly in Table 2, it can be observed that there was also no significant

TABLE 1
Socio-demographic factors of the study subjects in the intervention and control groups

Variable	Intervention (n=9) Frequency (%)	Control (n=10) Frequency (%)	*p*-value
Sex			
Male	4 (44.4)	3 (30.0)	0.650
Female	5 (55.6)	7 (70.0)	
Education level			
Primary education	3 (33.3)	7 (70.0)	0.179
Secondary & above	6 (66.7)	3 (30.0)	

TABLE 2
A comparison of the socio-demographic and clinical characteristics of the study subjects in the intervention and control groups

Variable	Intervention (n=9) median (iqr[a])	Control (n = 10) median (iqr)	*p*-value
Age (years)	49 (26)	58 (10)	0.153
Duration of diabetes (years)	4 (2)	5.5 (12)	0.593
HbA_{1c} (%)	7.95[b] (2.261)[c]	8.85[b] (1.831)[c]	0.396[d]
Fasting blood glucose (mmol/L)	9.80 (6.15)	9.35 (6.03)	0.806
Total cholesterol (mmol/L)	5.50 (1.85)	5.35 (2.56)	1.000
Triglycerides (mmol/L)	1.32 (1.28)	1.68 (1.42)	0.775
High-density lipoprotein (mmol/L)	1.49 (0.60)	1.405 (0.42)	0.838
Low-density lipoprotein (mmol/L)	3.4 (1.85)	3.25 (1.78)	0.806
Systolic blood pressure (mmHg)	130 (20)	145 (22.5)	0.066
Diastolic blood pressure (mmHg)	80 (15.0)	90 (12.5)	0.016
Body mass index (kg/m^2)	32.45 (7.590)	28.69 (8.380)	0.221
Uric Acid (mmol/L)	304.0 (79.50)	337.5 (120.50)	0.414
Urea (mmol/L)	3.7 (1.30)	4.05 (2.28)	0.967
Creatinine (mmol/L)	82.0 (25.00)	73.5 (29.00)	0.838
Potassium (mmol/L)	4.5 (0.70)	4.35 (0.63)	0.967
Sodium (mmol/L)	138.0 (3)	137.5 (4)	0.619
Chloride (mmol/L)	102 (5.00)	100.5 (2.50)	0.185

[a] iqr = interquartile range
[b] mean
[c] standard deviation
[d] independent t-test (normally distributed variables)

association between the intervention and control groups with sex and education level.

In order to assess whether there was any change in the fasting blood glucose, fasting lipid profile and renal function tests between the intervention and control group after *F. deltoidea* had been given to the patients in the intervention group, the RM Anova analysis was used. The multivariate test results showed that there was no change in the clinical variables between the two groups. Even though the fasting blood glucose showed a reducing trend, after controlling for possible confounders (such as age, sex, education level, duration of diabetes mellitus and body mass index), no significant changes were found between the two groups (*p*-value = 0.365). Similarly, there was no significant change in the HbA1c level between the intervention and control groups (*p*-value = 0.855). Detailed results are shown in Table 3.

Table 3 reveals that the FBS from both groups were reduced, although it was not significant. Meanwhile, the intervention group was happy with the use of *F. deltoidea* and found that the medications had no side effects. A patient from the intervention group was able to work for 2 hours continuously after taking *F. deltoidea*. Before taking *F. deltoidea*, he had to stop every half an hour. Two (2) patients on insulin noted that their blood sugar controls were getting better after taking *F. deltoidea*.

Fruits and vegetables have the capabilities to deliver health benefits besides fulfilling physiological needs. Thus, a routine consumption of fruits and vegetables confer significant benefits to human health (Steinmetz & Potter, 1996). Epidemiological data as well as *in vitro* studies strongly suggest that food containing phytochemicals with anti-oxidation potential possesses strong protective effects against major disease risks (Knekt *et al*., 1997; Elliot, 1999; Kaur & Kapoor, 2001). However, according to Weiger *et al.* (2002), no herb or supplement has sufficient evidence to actively recommend or discourage its use among diabetes patients.

Those on oral hypoglycaemic agents also showed improved blood sugar range (5.7-8.4 mmol/L). More importantly, nobody claimed

TABLE 3
Glucose level between the intervention and control groups

	Mean (sd[a])	Estimated Marginal Mean[*] (95% CI[b])	F-statistic (*df*[c])	*p*-value
FBS				
Intervention				
Pre	10.55 (3.177)	9.773 (7.713, 11.833)	1.127	0.365
20 days post	10.60 (3.789)	9.822 (7.262, 12.381)	(3, 18)	
40 days post	9.73 (4.608)	8.051 (5.162, 10.939)		
60 days post	8.10(3.302)	7.070 (4.723, 9.418)		
Control				
Pre	10.21(3.277)	11.05 (8.630, 13.463)		
20 days post	9.36 (3.005)	11.60 (8.600, 14.604)		
40 days post	8.69 (2.402)	9.530 (6.142, 12.918)		
60 days post	8.03 (1.179)	8.382 (5.627, 11.136)		
HbA1c				
Intervention				
Pre	7.95(2.261)	7.237 (4.661, 9.814)	0.037	0.855
Post	9.00 (2.048)	8.219 (5.176, 11.262)	(1,5)	
Control				
Pre	8.85 (1.831)	8.229 (4.814, 11.783)		
Post	8.55 (2.430)	8.088 (3.973, 12.203)		

[a] sd = standard deviation
[b] CI = confidence interval
[c] *df* = degree of freedom
FBS = fasting blood glucose
[*] Controlled for age, sex, education level, duration of diabetes mellitus and body mass index

any side effects during the study period. One female patient noted improved sexual life. Compliance wise, they were much better, and two (2) other patients were willing to buy the product once the research was finished. These two patients noticed the edema on their legs, secondary to diabetic nephropathy, was reduced and they were less lethargic. Compliance was checked by asking patients, counting pills and HbA1c level. However, HbA_{1c} was also not that significant. A clinical review by R. Nahas in 2009 found that fibre, green tea and fenugreek have other benefits but there is little evidence that they could substantially improve glycemic control HbA_{1c}.

Tables 4 and 5 revealed that lipid profile and renal profile were found to be insignificant. The *p*-value from the multivariate test for fasting lipid profile after controlling for possible confounders (such as age, sex, body mass index and duration of diabetes mellitus) was 0.405. The results of the univariate analysis for each component of fasting lipid profile are shown in Table 4. The *p*-value from the multivariate test for renal function test after controlling for possible confounders (such as age, sex, systolic blood pressure, diastolic blood pressure, presence of hypertension, duration of hypertension and duration of diabetes mellitus) was 0.713. The results from the univariate analysis for each component of the renal function tests are shown in Table 5. It is important to check the renal profile because an early detection and an aggressive intervention are needed to retard the progression of diabetic nephropathy to end stage renal failure. Diabetic nephropathy is a spectrum of progressive renal lesions secondary to diabetes mellitus ranging from renal hyperfiltration to end stage kidney disease (CPG, 2004).

However, the researchers found that *F. deltoidea* slightly increased the HDL level, i.e. from 1.41mmol/L to 1.42mmol/L, whereas the control group showed a reduction from

TABLE 4
Fasting lipid profile between the intervention and control groups

	Mean (sd[a])	Estimated Marginal Mean* (95% CIb)	F-statistic (*df*[c])	*p*-value
TC				
Intervention				
Pre	5.51 (1.185)	4.673 (3.229, 6.117)	0.003	0.956
Post	5.54 (2.180)	4.925 (2.981, 6.869)	(1, 10)	
Control				
Pre	5.86 (1.765)	6.391 (5.118, 7.663)		
Post	5.42 (1.283)	5.713 (4.000, 7.426)		
TG				
Intervention				
Pre	2.02 (1.804)	1.300 (-0.062, 2.662)	0.799	0.392
Post	2.06 (1.685)	1.761 (0.707, 2.816)	(1, 10)	
Control				
Pre	2.16 (1.823)	3.061 (1.861, 4.261)		
Post	1.89 (1.000)	2.332 (1.403, 3.262)		
HDL				
Intervention				
Pre	1.41 (0.433)	1.471 (1.151, 1.791)	0.784	0.397
Post	1.42 (0.430)	1.397 (1.089, 1.706)	(1, 10)	
Control				
Pre	1.36 (0.292)	1.251 (0.968, 1.533)		
Post	1.21 (0.217)	1.132 (0.860, 1.404)		
LDL				
Intervention				
Pre	3.33 (1.136)	2.718 (1.520, 3.917)	0.107	0.750
Post	3.21 (1.928)	2.745 (1.107, 4.383)	(1, 10)	
Control				
Pre	3.58 (1.333)	3.859 (2.803, 4.916)		
Post	3.33 (0.920)	3.518 (2.074, 4.962)		

[a] sd = standard deviation [b] CI = Confidence interval [c] *df* = degree of freedom
TC = total cholesterol; TG = triglycerides; HDL = high-density lipoprotein; LDL = low-density lipoprotein
* Controlled for age, sex, body mass index and duration of diabetes mellitus

1.36mmol/L to 1.21mmol/L. The LDL level was also found to have been reduced in both the groups. Nonetheless, the clinical studies of *F. deltoidea* are still scarce as compared to other studies using cinnamon. Khan *et al*. (2003) found that intakes of 1g, 3g, or 6 g of cinnamon per day reduces serum glucose, triglyceride, LDL cholesterol, and total cholesterol in people with type II diabetes and suggested the inclusion of cinnamon in the diet of people with type II diabetes would reduce risk factors associated with diabetes and cardiovascular diseases. However, a meta analysis study by Baker *et al*. in 2008 indentified five prospective randomized controlled trials (n=282), and the use of cinnamon did not significantly improve HbA1c, FBG or lipid parameters in the patients with Type I or Type II diabetes.

However, the researchers only conducted a 60-day study period. The study by Khan *et al.* also took around 60 days using cinnamon, whereas Vanschoonbeek *et al*. (2006) only took 6 weeks to complete their study using cinnamon.

TABLE 5
Renal function test between the intervention and control groups

	Mean (sd[a])	Estimated Marginal Mean* (95% CI[b])	*F*-statistic (*df*[c])	*p*-value
Uric acid				
Intervention				
Pre	320.1 (63.97)	233.7 (130.74, 336.61)	0.321	0.587
Post	342.4 (55.27)	269.0 (177.14, 360.94)	(1, 8)	
Control				
Pre	353.7 (115.86)	457.0 (369.87, 544.23)		
Post	400.8 (114.63)	498.6 (420.76, 576.43)		
Urea				
Intervention				
Pre	4.52 (2.228)	4.997 (1.739, 8.255)	0.445	0.523
Post	4.26 (1.584)	5.991 (4.188, 7.794)	(1, 8)	
Control				
Pre	4.46 (2.387)	4.710 (1.951, 7.470)		
Post	5.15 (2.473)	4.381 (2.854, 5.908)		
Creatinine				
Intervention				
Pre	77.33 (16.016)	63.195 (43.257, 83.133)	4.561	0.065
Post	87.44 (30.582)	85.084 (58.256, 111.912)	(1, 8)	
Control				
Pre	82.40 (32.377)	107.6 (90.67, 124.44)		
Post	87.30 (36.661)	102.0 (79.30, 124.75)		
Sodium				
Intervention	138.89 (3.180)			
Pre	137.11 (3.689)	137.3 (132.29, 142.27)	0.071	0.797
Post		135.7 (130.83, 140.49)	(1, 8)	
Control	138.30 (2.869)			
Pre	137.70 (3.713)	138.4 (134.17, 142.63)		
Post		137.6 (133.50, 141.68)		
Potassium				
Intervention				
Pre	4.44 (0.368)	4.235 (3.798, 4.673)	0.105	0.754
Post	4.61 (0.491)	4.340 (3.819, 4.860)	(1, 8)	
Control				
Pre	4.39 (0.354)	4.672 (4.301, 5.042)		
Post	4.26 (0.372)	4.620 (4.180, 5.061)		
Chloride				
Intervention				
Pre	103.11 (3.689)	105.3 (101.50, 109.02)	3.642	0.093
Post	101.33 (2.872)	100.3 (97.89, 102.62)	(1, 8)	
Control				
Pre	101.10 (2.685)	98.3 (95.14, 101.51)		
Post	101.90 (2.079)	102.0 (100.02, 104.02)		

[a] sd = standard deviation [b] CI = Confidence interval [c] *df* = degree of freedom
* Controlled for age, sex, systolic blood pressure, diastolic blood pressure, presence of hypertension, duration of hypertension and duration of diabetes mellitus

CONCLUSION

The effect of *Ficus deltoidea* on fasting blood sugar, lipid and renal profile showed that the results were not significant. However, a few patients in the intervention group had relatively fresh feeling and became energetic compared to the control group. Nonetheless, more studies are still needed in order to explore the efficacy of *F. deltoides*.

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