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CAMELLIA SINENSIS – A COMPREHENSIVE STUDY ON ITS HYPOGLYCAEMIC EFFECTS IN HEALTHY-INDIVIDUALS

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ABSTRACT

Herbs and spices are traditionally defined as any part of a plant that is used in the diet for their aromatic properties with no or low nutritional value. However, more recently, herbs and spices have been identified as sources of various phytochemicals, many of which possess powerful antioxidant activity. Thus, herbs and spices may have a role in antioxidant defence and redox signalling. Rauwolfia serpentine, the oldest herb to have known antihypertensive action which treats schizophrenia also, are well documented. Other commonly used plants which are vastly studied for their remedial effects are pepper, turmeric and clove to name few. Camellia sinensis commonly known as green tea have anti- oxidants substances which belong group called Catechin, (water- soluble polyphenols) which have varied effects like blood glucose lowering, anti-ageing and even anti cancerous effects. All of them are well studied and to establish these facts further studies are going on. We have studied green tea (imported/ procured from Sri Lanka with phytosanitary clearance) on healthy individuals for 18 weeks for their hypoglycaemic effects. The control subjects were given standardised quantity of green tea steeped in 150 ml of boiled water for 3-5 minutes daily and their blood glucose was checked as per protocol. Same quantity of hot water was given to control group. The same process was repeated at the end of 1,3,6,9,12 and18 week. The observations were documented, which shows marked reduction, 7- 15% in blood glucose levels in individuals administered with green tea. We have chosen green tea of fine quality and studied its hypoglycaemic effects in healthy individuals.

KEYWORDS: camellia sinensis, green tea, catechin, glucose.

INTRODUCTION

Herbs are[1] traditionally used as drug for common ailments to potential diseases in Asian countries, predominantly in India and China. *Rauwoifia serpentine* remains the oldest herb to have known antihypertensive action to cure schizophrenia. The commonly used plant products like turmeric and pepper remain well known and tested active ingredients. Similarly *Camellia sinensis* (commonly called as green tea) is rich source anti- oxidants catechins (EC, EGC, ECG, EGCG), In recent years, the health benefits[2] of consuming green tea, including the prevention of cancer[3] and cardiovascular diseases[4], anti inflammatory[5] anti arthritic[6] anti oxidative[7], neuroprotective[8] cholestrol lowering effects[9] have been studied and are well documented. Catechin, an antioxidant, is another important ingredient of green tea. Its beneficial effects like anti-ageing, blood glucose lowering and even anti cancerous, are well documented.

Green tea also contains alkaloids including caffeine, theobromine, and theophylline. They provide green tea's stimulant effects. L-theanine, anamino acid compound found in green tea, has been studied for its calming effects on the nervous system. These alkaloids have been found to have bronchodilator effects in humans.Green tea also contains psychogenol.

In the scientific and public literature, antioxidants and oxidative stress are very often presented in a far too simple manner. First, reactive oxygen species (ROS) are lumped together as one functional entity. However, there are many different ROS that have separate and essential roles in normal physiology and are required for a variety of normal processes. These physiological functions are not overlapping, and the different ROS that exist cannot, in general, replace each other. Different ROS are also strongly implicated in the etiology of diseases such as cancers, atherosclerosis, neurodegenerative diseases, infections, chronic inflammatory diseases, diabetes, and autoimmune diseases[10] (Gutteridge and Halliwell 2000; McCord 2000). Second, the various antioxidants that exist are often viewed as a single functional entity. However, the different endogenous antioxidants that are produced by the body (e.g., glutathione, thioredoxins, glutaredoxin, and different antioxidant enzymes) cannot, in general, replace each other. They have specific chemical and physiological characteristics that ensure all parts of the cells and the organs or tissues are protected against oxidative damage. Dietary antioxidants also exist in various forms, with polyphenols and carotenoids being the largest groups of compounds. These have different functions and are produced by plants to protect plant cells against oxidative damage[11] (Halliwell1996; Lindsay

and Astley 2002). Green tea is also showing good anti oxidant properties and the results indicate the antioxidant effect of green tea extract on reactive oxygen species produced by neutrophils, may be effective in reducing oxidative stress in cancer patients. Anticancer Res. 2012 Jun; 32(6): 2369-75. Green tea also has blood glucose lowering properties. A 2013 research review published in the Diabetes and Metabolism Journal outlined the potential benefits of tea when it comes to diabetes as well as obesity, which is a risk factor for diabetes. It highlighted a Japanese study that found that people who drank 6 or more cups of green tea a day were 33 percent less likely to develop type 2 diabetes than were people who drank less than a cup of green tea a week. It also reported on Taiwanese research that found that people who drank green tea regularly for more than a decade had smaller waists and a lower body fat composition than those who weren't regular consumers of green tea.

As India is becoming hub of diabetes above studies are conducted to check the role of green ***tea in lowering the blood glucose and hence possible role in prophylaxis of diabetes***. Also by virtue of its increasing glucose utilization by cells it helps the diabetics to reduce drug dosage and in type 1 diabetes insulin requirement.

MATERIAL AND METHODS

Green[12] tea from Hyson Sri Lanka with phytosanitary clearances, Glucometer equipped with all accessories (Roche)Accucheck, disposable sterile spirit swabs, weighing balance (shamadzu), Heating Kettle(borosil), Standardised disposable cups

Method

Blood Glucose testing

A glucose meter or Glucometer is for determining approximate concentration of glucose. It can also be a strip of glucose paper dipped into a substance and measured to the glucose chart. It is a key element of home blood glucose monitoring (HBGM) by people with diabetes mellitus or Hypoglycaemia, a small drop of blood obtained by pricking the skin with a lancet is placed on a disposable test strip that the meter reads and use to calculate the blood glucose level. The meter than display level in units of mg/dl or mmol/l.

Since approximately 1980 a primary goal of the management of type I diabetes and Type II diabetes mellitus has been achieving closer to normal levels of glucose in the blood for as much of the times as possible guided by HBGM several times a day. The benefits include a reduction in the occurrence rate and severity of long term complications from

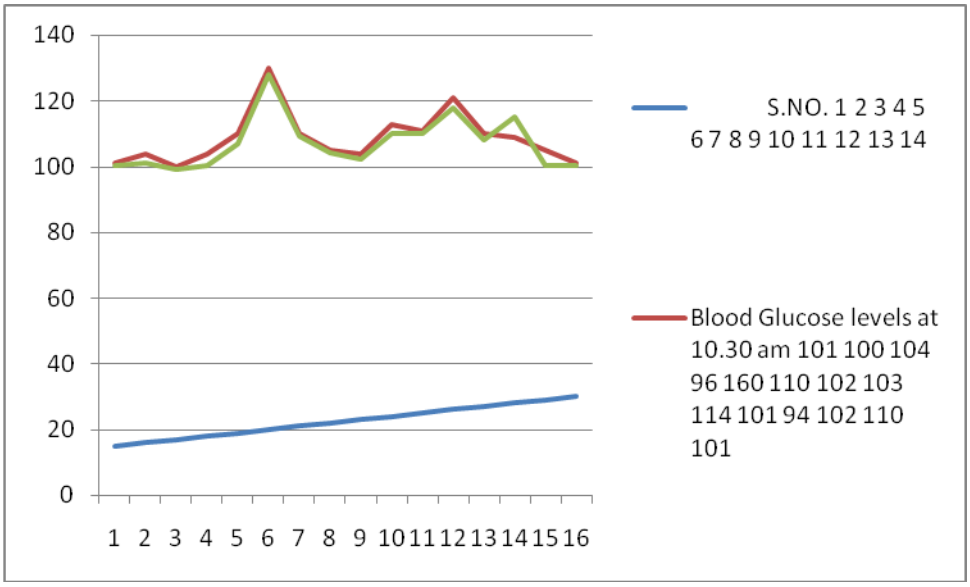
hyperglycaemia as well as a-reduction in the short term potentially life threatening complications of hypoglycaemia.

The tip of finger chosen to draw the blood is cleaned with disposable spirit swab. The glucometer is simultaneously loaded with strip in such a way that its impregnated portion is at desired place. The finger tip is pierced with lancet and the blood drawn is touched gently on the impregnated portion (the screen is showing blood drop blinking image). The blood glucose reading is automatically displaced on screen.

Hypoglycaemic effect of Green tea on 0 day along-with blood pressure measurements

Table 1.

S.NO.	Blood Glucose levels at 10.30 am	Blood Glucose levels at 11.30 am After taking 100 ml hot water	% Change
1	101	100	.99
2	100	99	1
3	104	105	.96
4	96	94	2.0
5	160	156	2.5
6	110	108	.90
7	102	103	-0.98
8	103	103	nil
9	114	112	1.75
10	101	100	1
11	94	92	2.12
12	102	101	.98
13	110	107	2.7
14	101	100	.99
15	101	100	.99
16	104	101	2.88
17	100	99	1
18	104	100	3.8
19	110	107	2.7
20	130	128	.76
21	110	109	.90
22	105	104	.95
23	104	102	1.9
24	113	110	2.65
25	111	110	.90
26	121	118	2.4
27	110	108	1.8
28	109	115	3.6
29	105	100	4.7
30	101	100	.99



Observations

Table 2

Test Group

Hypoglycaemic effect of Green tea on 0 day along-with blood pressure measurements

S.NO.	Blood Glucose levels at 10.30 am	Blood glucose levels after 90 minutes at 12 pm	% age change	B.P.(Blood pressure	B.P. after Green Tea	% Change
1	101	92	8.9	110/70	105/70	5.5/nil
2	100	79	21	120/79	110/70	12/7.11
3	104	89	14.42	114/70	108/69	6.84/1.42
4	96	81	15.6	114/84	105/70	10.26/11.76
5	160	133	16.8	130/90	110/80	26/9
6	110	91	17.27	110/70	108/65	13.2/3.2
7	102	84	7.84	120/80	110/70	8.3/12.5
8	103	91	11.65	123/88	110/70	15. 9/15.8
9	114	91	20.75	110/74	105/70	5.5/2.9
10	101	91	9.9	114/76	110/70	4.5/2.9
11	94	81	13.82	115/85	110/70	5.72/12.7
12	102	89	12.74	110/89	110/85	0/4.4
13	110	90	18.18	110/72	100/70	11/1.4
14	101	92	8.9	120/80	100/80	16.6/nil
15	101	87	13.86	110/82	107/75	2.72/nil
16	104	92	11.5	108/78	105/75	2.77/4
17	100	89	11	125/77	110/77	12/nil
18	104	89	12.5	120/80	108/75	10/6.2
19	110	99	10	110//85	105/79	4.5/7.0
20	130	113	13.07	120/80	110/70	8.33/12.5
21	110	99	10	118/80	108/75	8.4/6.2
22	105	94	10.47	119/80	115/70	3.3/12.5

23	104	92	11.53	130/92	122/88	6.1/4.3
24	113	99	12.38	115/82	110/75	4.3/8.5
25	111	101	9	114/76	105/70	7.8/7.8
26	121	100	17.35	115/85	110/70	4.3/17
27	110	99	10	118/77	112/72	5.08/6.4
28	109	99	10.09	129/82	120/80	6.9/2.4
29	105	96	8.57	120/72	110/70	8.33/1.44
30	101	92	8.91	111/72	107/70	3.6/1.4

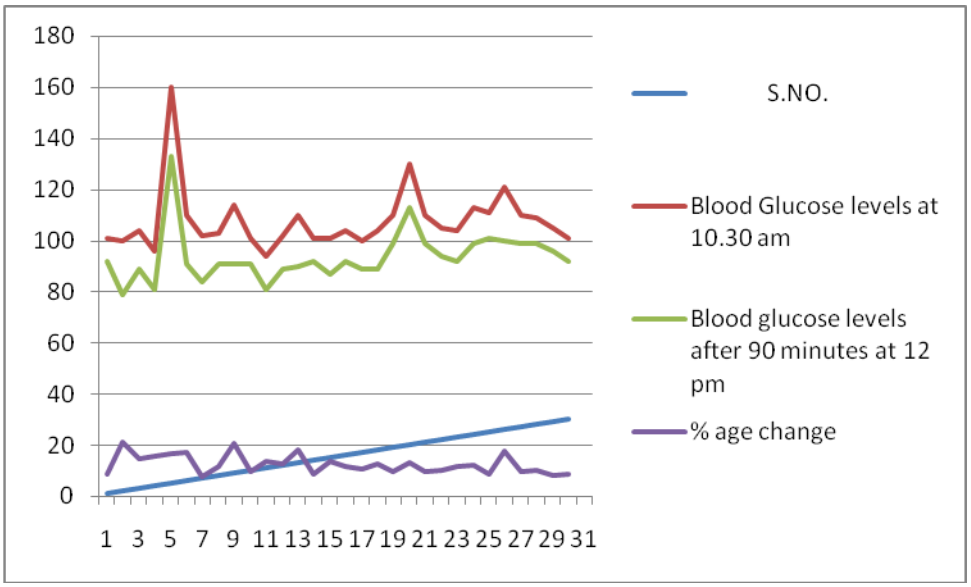
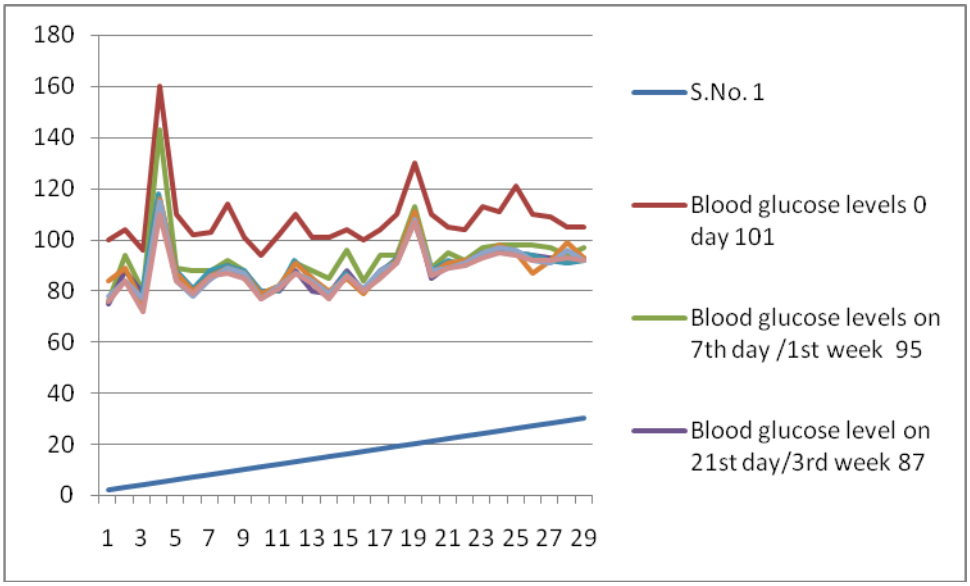


Table 3: Hypoglycaemic effect of Green tea on 1^{s},3rd,6th, 9th, 12 th and 18 th week.

S.No.	Blood glucose levels 0 day	Blood glucose levels on 7th day /1st week	Blood glucose level on 21st day/3rd week	Blood glucose levels on 42 nd day/day6th week	Blood glucose levels on 63 rd day/9th week	Blood glucose levels on 84th day/12 th week	Blood glucose levels after on126 thday/18th week
1	101	95	87	88	85	86	85
2	100	76	75	80	84	78	76
3	104	94	88		89	84	84
4	96	80	79	78	75	77	72
5	160	143	114	118	116	115	110
6	110	89	85	88	87	84	84
7	102	88	80	81	80	78	79
8	103	88	85	88	86	85	86
9	114	92	90	90	89	89	87
10	101	88	85	88	87	87	85
11	94	79	80	80	79	77	77
12	102	82	80	80	82	82	81
13	110	91	88	92	91	87	87
14	101	88	80	85	85	84	83
15	101	85	79	78	80	79	77
16	104	96	88	87	85	86	86

17	100	84	80	80	79	81	80
18	104	94	88	87	87	88	85
19	110	94	92	93	92	91	91
20	130	113	110	108	111	108	107
21	110	89	85	88	87	88	86
22	105	95	90	92	91	89	89
23	104	92	91	90	92	91	90
24	113	97	95	94	94	95	93
25	111	98	95	96	98	97	95
26	121	98	95	95	95	96	94
27	110	98	94	94	87	92	92
28	109	97	93	92	92	91	92
29	105	94	91	91	99	96	93
30	**105**	**97**	93	92	93	92	92



RESULTS

In the present study, we have studied the role of green tea in determining the blood glucose levels in different groups of selected healthy individuals, with one exception (one person with type two diabetes on oral hypoglycaemic agent).with 8.9 to 20 % with average change of 10 %(Table 2) While in individuals taking hot water only it was 1 to 2.75 % (Table1) which is due to physiological reasons only.

CONCLUSION

Green tea has blood glucose lowering properties. We know people with diabetes have problems metabolizing sugar Insulin comes along to decrease sugar, but with type 2 diabetes, the body isn't so sensitive to insulin, so blood sugar levels goes up. Through a complex biochemical reaction, tea -- especially green tea -- helps sensitize cells so they are better able

to metabolize sugar. Green tea is good for people with diabetes because it helps them. The blood glucose lowering after 0 days is more or less stable after initial variation Table 3) with +- 5-7% which is more or less stable showing that initial phase has shown rapid decline due to physiological changes induced by green tea. We further want to make it clear though tests are performed weekly but subjects were taking standardized green tea regularly for stipulated 18 weeks. Some of subjects even have tested Hb1Ac which has shown reduction from their previous records but because of few readings this claim is beyond the reach of current study. Further there is blood pressure drop 5-10% average on zero day only.It was not studied further. It might be due to calming effect of green tea on nerves and relaxation an individual feels while taking green tea.

The P-Value is <.00001. The result is significant at p <.05.

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