J. Indian Dietetic Association Volume 38, No.1, pp. 61-66, 2016

EFFECT OF FEEDING AN ANTIOXIDANT RICH JUICE ON THE LIPID PROFILE OF YOUNG FEMALES

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ABSTRACT

Objective:To study the organoleptic qualities of the antioxidant rich juice prepared by combining Beetroot, Tulsi, Lemon, Ginger, Amla and investigate the effect of feeding the juice on lipid profile of a group of young females. **Method:** A group of 23 No. young females, in the age group of 20 to 22 years were recruited from P.G Department of Home Science; Sardar Patel University. 30ml of the juice was fed to each of the subjects for a period of 30 days. Prior to feeding and at the end of the experimental period, the blood and serum were analyzed for various lipid parameters. **Results:** Feeding antioxidant rich juice for one month non significantly decreased total cholesterol and LDL -c by 8.32% and 16.75%, respectively. A non significant increase in the HDL-c was observed. Serum triglyceride and VLDL-c levels were significantly ($p \leq 0.05$) decreased. **Conclusion:** The formulated juice is an excellent source of antioxidant which may confer positive health outcome in cases of cardiovascular diseases, diabetes, cancer and age related degenerations.

Key Words: Lipid profile, Young females, Cardiovascular diseases

INTRODUCTION

India has one of the highest burdens of cardiovascular disease (CVD) worldwide. The annual

number of deaths from CVD in India is projected to rise from 2.26 million (1990) to 4.77 million (2020)[1]. Coronary heart disease prevalence rates in India have been estimated over the past several decades and have ranged from 1.6% to 7.4% in rural populations and from 1% to 13.2% in urban populations[2]. Nutrition plays a key role in the prevention and treatment of Cardiovascular Diseases (CVD) by modification of various risk factors. Natural foods, especially citrus products, play a major role in human nutrition as excellent sources of antioxidants, including ascorbic acid, carotenoids, tocopherols and phenolic compounds. Citrus fruits contain a variety of sugars, citric acid, vitamin C, vitamin B, and carotenoids, mineral substances; also, fruit peel contains 1–2% of essential oils. Citrus fruits and juices contain biologically active compounds (or substances) which possess antioxidant activity. They are essential components of functional food. Citrus juice nutrients such as vitamins and flavonoids help to prevent unwanted damage to cell membranes and other structures of the body by neutralizing free radicals. Antioxidants in citrus fruit juices possess antitumor activity[3]. Citrus

juices, especially orange juice and grapefruit juice, are rich sources of vitamin C, but their health benefits remain poorly understood. Recent reports suggested that drinking generous amounts of a mixture of various juices improves the blood lipid profile, reduces oxidative stress, prevents atherogenic modifications of LDL cholesterol and platelet aggregation[4] and improves HDL-cholesterol concentrations[5]. Ginger is an underground rhizome of plant *Zingiber officinale* that belongs to the family *Zingiberaceae*, and act as a common constituent of diet worldwide[6]. Moreover, ginger is well known globally especially for its use in disorders of the gastrointestinal tract such as constipation, dyspepsia, nausea and vomiting. Basil plant (Tulsi) and its active ingredient eugenol acts on various systems like immune system, reproductive system, central nervous system, cardiovascular system, gastric system, urinary system and blood. Tulsi is generally known as a vitalizer and increases physical endurance[7]**.** Amla belongs to family Euphorbiaceae. Amla is useful in treatment of ophthalmopathy, dyspepsia, colic, flatulence, hyperacidity, peptic ulcer, erysipelas, skin disease, leprosy, haematemesis, inflammations, anaemia, emaciation, hepatopathy, jaundice,strangury, diarrhoea, dysentery, haemorrhages, leucorrhoea, menorrhagia, cardiac disorders, intermittent fevers and greyness of hair[8].

MATERIALS AND METHODS:

Juice preparation and composition of antioxidant rich juice- It deals with development of an antioxidant rich juice having beetroot, ginger, amla, lemon juice and tulsi mixed in different proportions (table-1) and used for sensory evaluation using hedonic rating test[9].

Selection of Subjects :- 23 young females in the age of 20 - 22 years were enrolled from P.G. department of Home Science Vallabh Vidyanagar, Gujarat for the study. The subjects were chosen on their willingness and free from any apparent complication. Their anthropometric measurements were taken to confirm that all the subjects were having normal body mass index (BMI).

Feeding Trial:- 30ml of the juice was fed to the subjects for a period of 30 days.

Collection and analysis of blood Sample:- After an overnight fasting (12 hours), 5 ml of venous fasting blood sample was drawn from each subject by a pathologist. The blood was collected in a clean dry tube containing dried Ethylene Diamine Tetra Acetic acid (EDTA). The

Table 1:Composition of antioxidant rich juice

Ingredients	Sample !	Sample B
Beetroot	400gm	400gm
Ginger	30gm	50gm
!mla	40gm	30gm
Tulsi	30gm	-
Lemon juice	42ml	30ml

blood samples were collected on 0 day (before starting the experiment) and on the 30th day (at the end of experiment).

Cholesterol: Cholesterol content of serum was estimated by using auto kit supplied by Sigma Diagnostics. (I) pvt. Ltd. The intensity of coloured complex produced is directly proportional to the concentration of cholesterol content which is measured at 505 nm (500 – 540 nm or w ith green filter). Serum triglyceride and HDL cholesterol were also estimated by using auto kit supplied by Sigma Diagnostic. (I) pvt. Ltd. Serum LDL and VLDL cholesterol were calculated by formula.

Statistical analysis:- The data obtained were compared satisfactory using paired 't' test and scatter chart by M.S. Excel (2007). Pearson correlation was calculated using SPSS (Version 15).

RESULTS:

Two antioxidant rich juice samples, sample A and sample B were used for sensory evaluation. For sample A, equal percentage (49.99%) of respondents liked the juice "extremely" and "very much" (Figure–1). In case of sample B, 44.44% of respondents liked the juice "moderately". 33.33%, 11.11%, 5.55% and 5.55% rated the juice "like slightly", "dislike slightly", "like very much" and "neither like nor dislike" respectively (Figure–2). Based on the results of sensory evaluation, Sample A was used for the feeding trial.

Figure:1 Percentage distributions of subjects based on acceptance of sample A

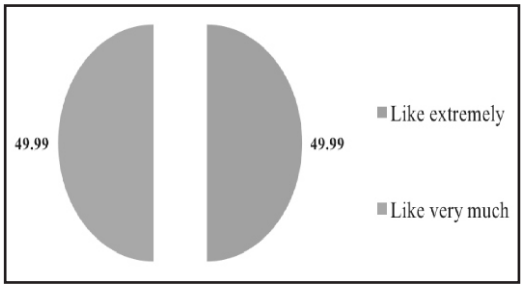
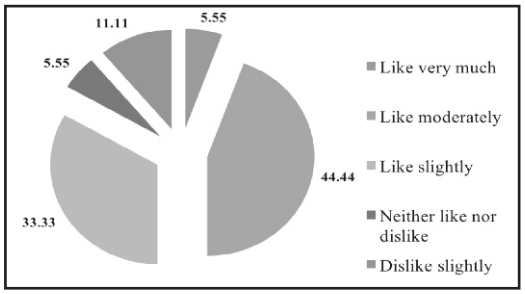


Figure: 2 Percentage distributions of subjects based on acceptance of sample B



Antioxidant Value of Juice:-Total antioxidant capacity of the juice was measured by FRAP (mg TE / 100 ml) value, the same was found to be of 576.40 ± 9.38.

Cholesterol:-Cholesterol is a constituent of all cell membranes. It is necessary for the synthesis of all steroid hormones, bile salts and vitamin D. Abnormality of cholesterol metabolism may lead to cardiovascular accidents and heart attacks. The initial level of serum cholesterol was found to be 139.77 mg% which non significantly ($p \leq 0.05$) decreased to 128.14 mg% after one month feeding of antioxidant rich juice **(Table-2).** In the present study the reduction in cholesterol may be attributed to various hypocholesterolemic agents present in the juice. Bhandari et al[10]revealed that ethanolic extract of ginger produced a significant decrease in serum total cholesterol. Elraheem et al[11] reported a decrease in total cholesterol concentration after supplementation of ginger extract to alloxan induced diabetic rats. Rai, Iyer and Mani[12]reported a decrease in total cholesterol levels in diabetic rats who were fed tulsi. Khan et al[13]reported that the citrus lemon juice (1ml/kg/day) revealed a significant reduction in serum cholesterol. These results suggested that the hypocholesterolemic effect

Table – 2 :-Serum cholesterol, HDL-c and LDL-c levels of subjects (n=23) fed antioxidant rich juice

	Initial level	*Final level*	*T-value*
Cholesterol (mg %)	139.77 ± 7.13	128.14 ± 5.63	0.101
HDL-c (mg %)	62.05 ± 2.28	67.15 ± 3.81	0.120
LDL-c (mg %)	61.11 ± 7.19	50.87 ± 6.11	0.163

of citrus lemon juice may be due to its antioxidant effect.A possible explanation with regards to decrease in the total cholesterol in the present study may be attributed to the presence of vitamin C rich ingredients in the juice. Eteng et al[14] studied the plausible explanation for the observed effect on serum lipids may be due to the activation of the enzyme 7 α- hydroxylase by vitamin C which enhances the conversion of plasma cholesterol into bile acid hence resulting in a decrease in serum levels of cholesterol.

HDL cholesterol:- The initial level of serum HDL cholesterol was found to be 62.05 mg% which non significantly ($p \leq 0.05$) increased to 67.15 mg% after one month feeding of antioxidant rich juice **(Table-2)**. The percentage increase in the serum HDL cholesterol levels was found to be 8.22 after feeding the antioxidant rich juice **(Figure-3).**Akhtar et al[15]reported that vitamin C gave a significant positive correlation with HDL cholesterol. Bhandari et al[10]revealed that ethanolic extract of ginger produced significant increase in HDL cholesterol. Kim et al[16]reported that HDL cholesterol in simvastatin- beet group was significantly increased.

Plasma LDL:-The initial level of serum LDL cholesterol was found to be 61.11 mg% which non significantly ($p \leq 0.05$) decreased to 50.87mg% after one month feeding of antioxidant rich juice **(Table-2)**. The percentage decrease in the serum LDL cholesterol levels was found to be 16.75 after feeding an antioxidant rich juice **(Figure-3).** Eteng et al[14]reported that oral administration of vitamin C for 30 days resulted in a significant decrease in LDL-c. Akhtar et al[15]reported that vitamin C gave a negative significant correlation with LDL cholesterol. A significant reduction in LDL+VLDL-c was observed on feeding 1% tulsi powder to diabetic rats[10].

Serum triglyceride: The initial level of serum triglyceride was found to be 83.06 mg% which significantly ($p \leq 0.05$) decreased to 50.57mg% after one month feeding of antioxidant rich juice (Table-**3**). The percentage decrease in the serum triglyceride levels was found to be 39.11 after feeding the antioxidant rich juice **(Figure-4).**

Serum VLDL:- The initial level of serum VLDL was found to be 16.61 mg% which significantly ($p \leq 0.05$) decreased to 10.11mg% after one month feeding of antioxidant rich juice(**Table-3**) .

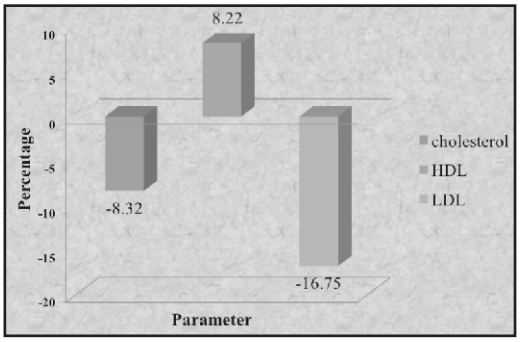
The percentage decrease in the serum VLDL levels was found to be 39.13 after feeding the antioxidant rich juice **(Figure-4).** **Figure- 5** revealed a positive and significant relationship of serum HDL-c with serum total cholesterol ($R^2 = 0.374$, $P = 0.001$). A significant reduction in serum triglyceride and VLDL-c may be attributed to the presence of antioxidants in the juice. Feldman[17]reported scientific evidence for a beneficial health relationship between antioxidant containing nuts (walnuts) and coronary heart disease. Anderson[18]noted that fruits containing polyphenols inhibited *in vitro* human plasma LDL oxidation.

CONCLUSION:

The study concludes that feeding the

antioxidant rich juice significantly reduces the serum triglyceride levels and serum VLDL levels of young females. The juice provides antioxidants that may help in the prevention of oxidative stress induced diseases like CVD, diabetes, cancer and age related degeneration.

Figure – 3 Percentage change in serum cholesterol, HDL-c and LDL levels of subjects after antioxidant rich juice supplementation.



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Table-3:Serum triglyceride and VLDL levels of subject (n=23) fed antioxidant rich juice

	Initial level	*Final level*	*T-value*
Triglyceride (mg %)	83.06 ± 3.88	50.57 ± 7.81	0.001*
VLDL (mg %)	16.61 ± 0.77	10.11 ± 1.56	0.001*

Values are Mean ± SEM
* indicates significant difference (P ≤ 0.05)

Figure-4: Percentage change in serum triglyceride and VLDL levels of subjects after antioxidant rich juice supplementation.

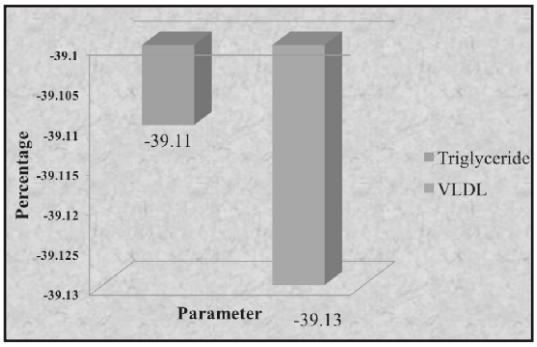
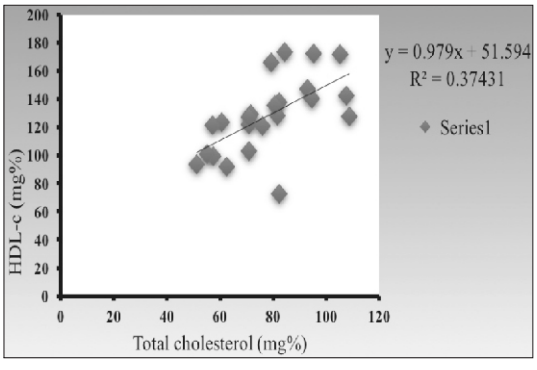


Figure- 5: A positive and significant relationship of serum HDL-c with serum total cholesterol (R2 = 0.374, P = 0.001).



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ACKNOWLEDGEMENT:

The paper was presented at the 48th Annual Conference of the Indian Dietetic Association.