

# GLYCEMIC AND LIPIDEMIC RESPONSE TO DICOCCUM WHEAT (TRITICUM DICOCCUM) IN THE DIET OF DIABETIC PATIENTS

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## ABSTRACT

Glycemic and lipidemic responses to incorporation of dicoccum whole wheat flour in the diet of diabetic patients for six weeks in comparison with common bread wheat flour were evaluated. Sixteen non insulin dependent diabetes mellitus (NIDDM) subjects, taking oral hypoglycaemic drugs and six insulin dependent diabetes mellitus (IDDM) subjects, inclusive of both genders, age group 42-71 years, were selected for the study from Diabetes Specialities Center, Hubli. Subjects were randomly asked to incorporate dicoccum whole wheat flour (13 subjects) as group I or bread wheat flour (9 subjects) as group II. About 200-300g of flour daily was added to any two meals (breakfast/lunch/supper) in the form of unleavened bread for six weeks. Subjects were assessed fortnightly for six weeks. Blood glucose was estimated periodically, and lipid profile was estimated initially and then at the end of six weeks. The incorporation of dietary fibre rich, dicoccum whole wheat flour in the regular diet of 13 diabetic subjects for six weeks, significantly reduced total lipids ( $p \leq .01$ ), triglycerides ( $p \leq .01$ ) and LDL-Cholesterol ( $p \leq .05$ ). However, the incorporation of common bread wheat flour in the diet of group II subjects did not show any significant variation in lipid profile. Dicoccum wheat has therapeutic properties that can effectively reduce the cardiovascular risk factors. It can be recommended as a staple cereal alternative to coarse cereals in the dietary management.

**KEY WORDS :** Dicoccum wheat; Glycemic index; Lipidemic response; Diet; Diabetes mellitus.

## INTRODUCTION

Managing diabetes, a life long ailment, with medicines is very expensive and diet plays a crucial role in reducing the levels of plasma cholesterol and lowering glycemic responses (1). In this scientific and technological age, the demand for wheat based

products is gaining popularity due to its unique properties. Dicoccum, the hulled wheat commonly called by the name as 'jave or khapli wheat' differs from commercially available bread and durum wheat, by its physical characteristics, nutritional and processing quality parameters and also, cultivation practices (2). Scientific studies related to dicoccum wheat carried out in the Department of Food and Nutrition, University of Agricultural Sciences, Dharwar, revealed that dicoccums wheat and bread are nutritionally superior over commercially available durum wheat and bread in their protein and dietary fibre contents (3). Dicoccum based products are more tasty, soft and have high satiety value (4). Products of this wheat have also low digestibility and low glycemic value (5). The existing health image of dicoccum wheat was evaluated in the present study for its glycemic and lipidemic responses in comparison with common bread wheat flour.

## MATERIAL AND METHODS

**Selection of subjects:** Sixteen non insulin dependent diabetic mellitus (NIDDM) subjects, taking oral hypoglycaemic drugs and six insulin dependent diabetic mellitus (IDDM) subjects inclusive of both genders were selected for the study from Diabetes Specialities Center, Hubli. The Ethics Committee of the University gave approval for the study. The detailed characteristics of the selected subjects were collected from hospital records.

**Dietary modification:** Subjects were informed to collect the whole wheat flour in the beginning and once in two weeks thereafter and asked to include around 200-300g of flour daily in any two meals (breakfast/lunch/supper), in the form of unleavened bread for six weeks. Common bread wheat flour was supplied to nine subjects as group II and dicoccum wheat flour to thirteen subjects to the test group I.

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**Analysis of biochemical parameters:** The selected subjects were requested to report to the clinic four times at two weeks intervals, in the morning after 12 hrs of fasting. On the first day, and once every two weeks, the fasting and post prandial (after 2 hrs) blood was drawn and analyzed for glucose by using enzymatic diagnostic kit (Span Diagnostic Ltd., India). Fasting blood drawn on the first and last day of the experiment was also analyzed for total cholesterol, triglycerides and HDL-C by using diagnostic kit (Span Diagnostic Ltd., India). LDL-C was estimated using the formula. For statistical analysis, Student's t-test for paired data was used.

## RESULTS

This study was conducted on 25 patients. Only 22 completed the study. Table 1 gives the detailed characteristics of the diabetic subjects. The 22 selected subjects (male 8 and female 14) were in the age group of 42-71 years. The mean weight and height of the male subjects was 62.9kg and 165.1cm respectively and those of female subjects was 52.8kg and 150.4cm respectively. The mean body mass index of the male subjects was 22.4 and of female was 23.2. The blood sugar profile during the study period in group I and II, is given in table 2. There was no significant difference in fasting as well as post prandial blood glucose before and after intake of dicoccum flour in group I and bread in group II. In group I there was slight decrease in fasting blood glucose level at the end of the study of 6 weeks. Lipid profile in these two groups prior to the initiation of study and at the end of the study is shown in table 3. There was significant decrease in the lipid profile of total lipids ( $p \leq .01$ ), triglycerides ( $p \leq .01$ ), and LDL-cholesterol ( $p \leq .05$ ) in subjects of group I. However, the incorporation of common bread wheat flour in the diet of group II subjects did not show any significant variation in lipid profile.

**Table 1: Characteristics of Diabetic Subjects**

Sex	No	Age	Height(cm)	Mean $\pm$ SD	
				Weight	BMI
Male	8	55.1	165.1	62.9	22.4
		$\pm 10.8$	$\pm 6.3$	$\pm 6.6$	$\pm 2.4$
Female	14	56.3	150.4	52.8	23.2
		$\pm 8.9$	$\pm 5.0$	$\pm 9.0$	$\pm 3.1$

**Table 2: Blood Sugar Profile in Diabetic Patients During 6-week Study Period**

Blood glucose	Group I (n=13) Mean+SD	Group II (n=9) Mean + SD
<b>Initial</b>		
Fasting	132.6 $\pm$ 28.0	137.7 $\pm$ 31.3
PP	182.5 $\pm$ 52.7	207.9 $\pm$ 41.8
<b>2 weeks</b>		
Fasting	145.9 $\pm$ 36.8	138.6 $\pm$ 48.6
PP	198.8 $\pm$ 46.4	218.8 $\pm$ 72.3
<b>4 weeks</b>		
Fasting	149.6 $\pm$ 51.2	144.1 $\pm$ 58.3
PP	200.2 $\pm$ 55.3	202.0 $\pm$ 93.9
<b>6 weeks</b>		
Fasting	112.4 $\pm$ 40.4	148.4 $\pm$ 41.3
PP	184.2 $\pm$ 54.6	199.0 $\pm$ 43.1

Initial vs final blood glucose: p value not significant

**Table 3: Blood Lipid Profile in Diabetic Subjects During 6-week Study Period**

Lipid profile	Group I (n=13) Mean+SD	Group II (n=9) Mean + SD
<b>Total lipids</b>		
Initial	214.5 $\pm$ 16.1	212.7 $\pm$ 13.0
Final	184.3 $\pm$ 12.1	219.2 $\pm$ 15.1
Calculated 't' value	5.41*	0.98
<b>Triglycerides</b>		
Initial	160.6 $\pm$ 11.4	150.0 $\pm$ 11.3
Final	136.9 $\pm$ 5.8	150.3 $\pm$ 9.4
Calculated 't' value	6.72*	0.06
<b>HDL-Cholesterol</b>		
Initial	38.9 $\pm$ 1.6	37.4 $\pm$ 5.9
Final	36.6 $\pm$ 0.9	39.4 $\pm$ 1.6
Calculated 't' value	8.77*	3.2
<b>LDL-Cholesterol</b>		
Initial	144.0 $\pm$ 14.9	140.2 $\pm$ 13.3
Final	128.0 $\pm$ 15.3	149.8 $\pm$ 12.9
Calculated 't' value	2.70*	1.55

\* Significant at 1% level; \*\* Significant at 5% level

## DISCUSSION

Incorporation of dicoccum whole wheat flour in the diet of diabetic patients resulted in 11% reduction each in total lipids, triglycerides and LDL-cholesterol concentration, over a six week study period. The mean value of low-density lipoprotein was also reduced by 5%. The high amount of total dietary fibre(3), low *in vitro* digestibility and low glycemic value of dicoccum wheat products (5), are responsible for effective lipidemic reduction in group I subjects. For more effective glycemic response, probably it would have been more fruitful to study glycosylated hemoglobin level for a period of twelve weeks instead of six weeks. Lipoprotein lowering effects of psyllium enriched, ready to eat cereal food was observed on 44 diabetic subjects for seven weeks (6). Thus the results of the study concludes that nutritious dicoccum wheat, with special therapeutic quality, can be substituted for commercial bread wheat as health food.

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