

## Effect of Psyllium Supplementation on Postprandial Glycemia and Glycemic Index of Amaranthus Chapattis in Healthy Controls and Diabetic Subjects.

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### Abstract:

Psyllium husk obtained from *plantago ovata* is high in both soluble fiber (70%) and insoluble fiber (30%). Fiber improves the control of blood glucose and delays glucose absorption. The purpose of this study was to determine glycemic index of Amaranthus chapatti and to evaluate effect of psyllium supplementation on glycemic response of Amaranthus chapatti. Subjects were randomly selected from Jhalawar Medical College, Jhalawar to participate in a case-controlled study; ninety six subjects were included in this study, subjects were given diet counseling before the study. Amaranthus chapattis were given in 50 grams of digestible available carbohydrates as test **diet-1**. Same Amaranthus chapatties were given along with 5 gm of psyllium husk as test **diet-2**. The reference food was a solution in water (250 ml) containing 50 g glucose. In the morning, 5 times the blood was collected - on an empty stomach and 30, 60, 90 and 120 minutes after eating for both test diets and reference food for three consecutive days in healthy controls and in patients with type II diabetes. Difference in Glycemic indices of Amaranthus chapatti  $95.4 \pm 6.6$  is statistically highly significant with Amaranthus chapattis with psyllium husk  $87.4 \pm 6.2$  for healthy subjects ( $P < 0.0001$ ) and for diabetic patients Amaranthus chapatti (GI-  $95.9 \pm 1.6$ ) and for Amaranthus chapatti with psyllium husk GI -  $90.8 \pm 1.3$  ( $P < 0.0001$ ). Our results demonstrate values of glycemic indices for Amaranthus chapatti and evaluate effect of psyllium husk on glycemic response, addition of 5 gm of psyllium husk to test diets significantly decrease the value of glycemic index in both the groups.

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### Introduction

Psyllium seeds husk contain 10–30% mucilage. Psyllium is a common ingredient in over-the-counter bulk laxative products and has been used traditionally for constipation, diarrhoea, haemorrhoids, irritable bowel syndrome, weight loss, obesity, high cholesterol and diabetes [1]. Fiber improves the control of blood glucose and delays glucose absorption and hyperinsulinaemia [2, 3].

Psyllium supplementation, specifically 10.2 g/day given 20–30 minutes before meals, may be effective at reducing glycemic risk factors, such as average plasma glucose and post prandial plasma glucose concentrations. Studies showed that psyllium fiber might improve these risk factors in individuals with type-2 Diabetes mellitus and dyslipidemia. As the evidence shows, that psyllium fiber might be a beneficial adjuvant in patients with elevated post prandial plasma glucose levels who are already receiving oral hypoglycemic medications [4].

Amaranthus grains have high nutritional and functional values which are associated with the quality and quantity of their proteins, fats and antioxidant potential [5, 6]. Nutritionally, amaranth grains have higher protein content, higher digestibility, higher protein utilization, and a higher protein efficiency ratio than traditional cereals such as corn and wheat [7].

### Materials and Methods

**Study Design:** The study is divided into two phases In Phase 1 Glycemic Index of Amaranthus chapatti were determined, In Phase 2 effect of Psyllium Husk on Glycemic response of Amaranthus chapatti evaluated.

**Subject Involved:** The study was conducted on 96 subjects of 21 - 50 year of age of either sex; out of which 50 were healthy subjects and 46 were the patient of controlled type II diabetes. Patients were excluded from the study if they were receiving insulin, corticosteroids, other soluble fiber treatment, patients with clinically significant renal,

hepatic, gastrointestinal disorder, and cancer patients. Subjects with more than 13% HbA1c, Subjects with a history of allergy to psyllium seed, were also excluded. The study was approved by the Institutional Ethics Committee (IEC) of Jhalawar medical college, Jhalawar, Rajasthan.

**Diets involved:** Test diet -1 Amaranthus chapattis and test diet -2 Amaranthus chapattis with 5 gm Psyllium husk. For reference food 50 gm glucose dissolved in 250 ml of water and asked to drink within 15 minutes.

**Interventions:** In this case control study glycemic response of Amaranthus chapatti for healthy person and diabetic patients measured with and without psyllium husk. All participants completed a consent form, and all of them had been given diet counseling. All participants were evaluated for blood sugar level for consecutive three days after they have been in fasting mode for at least 10-12 hours. Day first, 50 gm of glucose in 250 ml water (reference food) was given to the volunteers, Day second, The Amaranthus chapattis were given to the same volunteers and at Day third, the same test food with 5 gm psyllium husk was given to the volunteers. A capillary blood sample was taken daily in the fasting state and at 30 min, 1 hr, 1 hr 30 min and 2 hour after consuming different diets. Each sample was analyzed using glucometer "On Call Plus" and

strips to produce a graph of glucose levels over time. Incremental area under curve (IAUC) for a

given time-period can be calculated as described below in accordance with the method recommended by (Wolver et al. 2004) [8]. Glycemic index calculated as per the formula.

Glycemic index = IAUC of 50g test carbohydrates / IAUC of 50g reference carbohydrate X 100

**Statistical Analysis:** Analysis of data was done by using SPSS software (version 20.0), unpaired – t test, ANOVA, post hoc test were used in data analysis. The data in the study was expressed as mean  $\pm$  SD, and p value < 0.05 was considered as statistically significant. To compare the change in glycemic response in consecutive 3 days, unpaired Student's t-tests, was used.

### Results

The mean Glycemic Index in Diabetic patients after Amaranthus Chapatti was found to be (95.9  $\pm$  1.6), and for healthy controls after Amaranthus Chapatti was found to be (95.4  $\pm$  6.6), showed that p – value 0.621 therefore the difference in Glycemic index after Amaranthus Chapatti both groups were statistically not significant. Glycemic Index in Diabetic patients after Amaranthus Chapatti was found to be (90.8  $\pm$  1.3), and for in healthy controls after Amaranthus Chapatti with Psyllium Husk was found to be (87.4  $\pm$  6.2), showed that p – value P = <0.0001 (S) therefore the difference in Glycemic after Amaranthus Chapatti with and without Psyllium Husk for both groups were statistically significant.

**Table: 1 Comparison of GI of diets in case and control group**

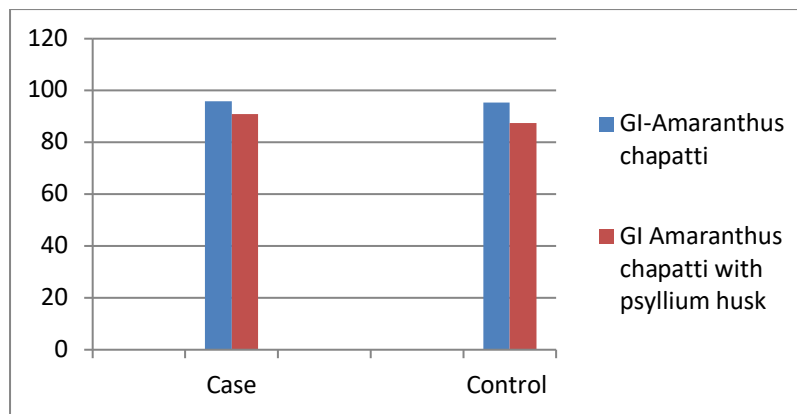
Diets	GI Case	GI Control	statistical significance
Amaranthus chapatti	95.9 $\pm$ 1.6	95.4 $\pm$ 6.6	P= 0.621 (NS)
Amaranthus chapatti with psyllium husk	90.8 $\pm$ 1.3	87.4 $\pm$ 6.2	P <0.0001 (S)

### Effect of psyllium supplementation on glycemic index of test diets,

**Table: 2 Effect of psyllium husk on glycemic index of test diets**

Group studied	GI-Amaranthus chapatti	GI Amaranthus chapatti with psyllium husk	p value
Case	95.9 $\pm$ 1.6	90.8 $\pm$ 1.3	p < 0.0001 (HS)
Control	95.4 $\pm$ 6.6	87.4 $\pm$ 6.2	p < 0.0001 (HS)

Glycemic indices of Amaranthus chapattis were statistically highly significant with Amaranthus chapattis with psyllium husk for both healthy subjects (P < 0.0001) diabetic patients (P < 0.0001).



**Figure- 1 Effect of psyllium husk on glycemic index of Amaranthus chappatti in healthy subjects and diabetic patients.**

### Discussion

Table – 1 shows comparison of GI of diets in case and control group similar results were obtained in study that demonstrate that amaranthus has high GI values [9]. Studies demonstrate that combination of amaranth and wheat, wheat and rice can be considered low glycemic index food, 50:50 grain amaranth and wheat medium glycemic index food and popped amaranth and milk combination high glycemic index food [10, 11].

Table- 2 show Effect of psyllium husk on glycemic index of test diets

A Significant inverse association found between dietary fiber intake and risk of type 2 diabetes mellitus. Psyllium husk when mixed with the food have the effect of reducing blood glucose responses, and that the mechanism of action relates to a reduced rate of digestion rather than carbohydrate malabsorption [12]. The combination of a high glycemic index and a low cereal fiber intake further increased the risk of diabetes when compared with a low glycemic load and high cereal fiber intake [13]. Psyllium husk with meal reduces postprandial glucose and insulin concentrations in NIDDM [14]. Plantago psyllium and acarbose, both significantly reduce glycemic index of carbohydrate food [15]. Results of some studies show that 5.1 g b.i.d. of psyllium for persons with type II diabetes is safe, well tolerated, and improves glycemic control [16, 17, and 18].

### Conclusion

The findings Our study reveal that Amaranthus is very high on GI scale , So amaranth alone cannot be suggested for use in diabetic diets, our study also reveal that psyllium improves glycemic response. Psyllium can be added on safely and effectively to a traditional diabetes diet in patients with type 2 diabetes. Significant differences between glycemic index of Amaranthus chapatti with and without psyllium were seen in both control group and diabetic patients with the

psyllium group showing improved glycemic control compared with the without psyllium diets. Present study obtained use of psyllium husk important for medical management of not only diabetes but also for pre-diabetics and control of glycemic response in healthy subjects.

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