

Case Report

A Case Study on Using Millets in Daily Diet for Weight Loss

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Abstract

Millets are nutritious, easily digestible, gluten-free whole grains. They are good sources of proteins, fibers and iron content. They are also good sources of polyphenols, flavonoids and other phytochemicals that have anti-inflammatory effects. This case study aims to show that eating millets twice a day for breakfast and dinner helps to lose weight. Kodo millet, little millet, foxtail millet and barnyard millet were included in the diet. Consuming these millets for four weeks, the average weight loss per week was noted as 1.2kg. Body Mass Index (BMI) was reduced from 28.8 to 26.6.

Keywords: Millets; Weight loss; Body mass index

Introduction

Small millets are nutritious whole grains. They are rich in proteins, fibers, minerals, flavonoids, polyphenols. Foxtail millet has twenty-one phenolic compounds in the free fraction and twenty-three phenolic acids in the bound fraction. Ferulic acid is found in bound fractions is the predominant content [1]. Several *in-vitro* studies showed that ferulic acid is a potent antioxidant [2] which can inhibited the expression of cyclooxygenase -2, an enzyme that is involved in production of inflammatory response [2]. Adiposity leads to inflammation and antioxidants acts as potent anti-inflammatory agents. Thus using millets as part of a regular diet might help to reduce weight. This case study involves using Kodo millet, little millet, foxtail millet, and barnyard millet as part of dietary intervention for weight loss.

Kodo millet (*Paspalum scrobiculatum*)

Kodo millet is rich in proteins, fibers, iron and antioxidants. The Kodo millet grain is composed of 8% proteins [3]. It is also rich in fibers. It has 9% fibers compared to rice (0.2%) and wheat (1.2%) for 100g of grain [3]. The mineral contents of the Kodo millet are 2.6% [3]. These include Calcium, iron, potassium, magnesium and zinc [3]. Kodo millet is rich in lecithin, which is good for the nervous system [4]. It is a good source of vitamins like niacin, vitamin B6, and folic acid [4].

Little millet (*Panicum sumatrense*)

There is not much literature about little millet. The popped seed of little millet and popped little millet flour helps to increase the bioavailability of phenolic compounds of the millet [5]. It is also a rich source of iron.

Foxtail millet (*Setaria italica*)

Foxtail millet is a good source of phenolic compounds like ferulic acid, chlorogenic acid, caffeic acid, p- coumaric acid, syringic acid [6]. Foxtail millet also has carotenoids like xanthophylls and zeaxanthin. These phytochemicals in foxtail millet have free radical scavenging capacity [6].

Barnyard millet (*Echinochloa crusgalli* (L.) P. Beauvois)

Barnyard millet is a good source of easily digestible proteins [4]. Barnyard millet has good amounts of soluble and insoluble fibers [4]. The carbohydrate present in barnyard millet is low and slowly digestible [4]. Barnyard millet shows high retrogradation of amylase that is responsible for the formation of resistant starch, this helps in controlling blood sugar levels [4].

Case Presentation

A 24 years old female, with 5 feet height, 67 kilograms and a Body Mass Index (BMI) of 28.8, was visited for nutritional counselling for weight loss. Medical history shows that she was on epileptic medication for a year because she was suspected to have calcium crystals in her brain. She stopped using the medication, by the time she started with the weight loss program. She was not presented with any other medical issues or on medications by that time; she started the weight loss program. Her periods were regular.

Materials and Methods

This is a virtual weight loss consultation program. Her consultation was done using a telephonic interview. She used zoconut software application (<https://www.zoconut.com/>) as the medium of communication. She measured her weight using a regular electronic weighing machine and height using a measuring tape. She updated the zoconut mobile application weekly with her weight. She received diet charts through the application. She was supposed to fill her daily food diary in the application.

Weight loss program

Her weight loss program included four diet charts, each diet chart containing different millet every week. Every diet chart has three major meals and three small snacks. Out of three major meals, she was supposed to have two meals made with millets every day. These included breakfast and dinner. In a week, she was supposed to eat only one kind of millet twice a day. In this way, she was given four different millets for four weeks. These included Kodo millet, little millet, foxtail millet and barnyard millet. Her weight was updated every week and her food diary was updated daily in the application.

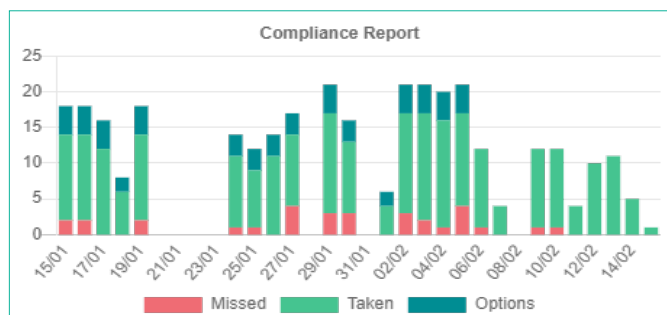


Figure 1: Food compliance reported for four weeks by the subject taken from zoconut application.

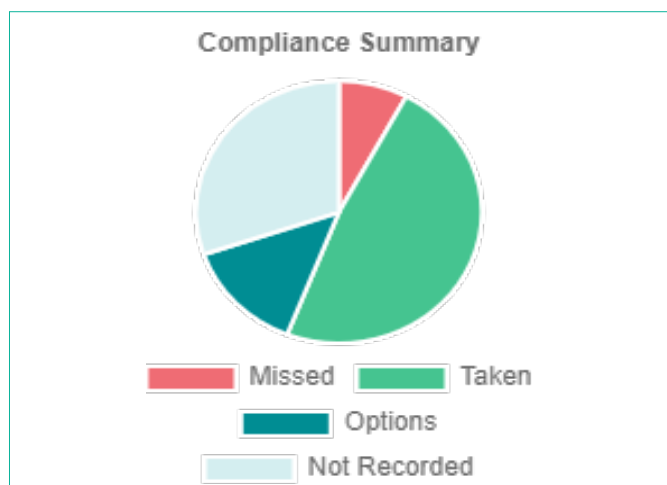


Figure 2: Food compliance Summary.

As part of the consultation, her parameters like height, weight, age was taken and measured to be 5 feet height, 67 kilograms weight and 24 years age respectively. Using the formula weight in kilograms/height in meters [2] her BMI was calculated as 28.8. Her medical information for any existing chronic ailments, medications,

menstrual issues were collected and everything was normal. Her dietary habits were collected using a 24hrs dietary recall. Her total calorie intake was 1100kcal, Protein 39g, Carbohydrates 170g, fats 26.02g, Fiber 21g. These results were obtained from food calculator software that is part of zoconut software.

Results

She used the kodo millet, little millet, foxtail millet and barnyard millet-based diet for 4 weeks that was from 15th January 2021 to 14th February 2021. Her breakfast and dinner included either fermented versions of these millets like idli (made with fermented batter of black gram and millet in 1:2 ratio by steam cooking), dosa (made with fermented batter of black gram and millet in 1:3 ratio by roasting on pan) or whole grain-based recipes like upma (millet cooked with vegetables), Pongal (millet cooked with split green gram), kichadi (millet cooked with different pulses and vegetables) etc. She was asked to eat eggs and chicken twice a week respectively. She mostly preferred to eat plant-based foods. End of the four-week trial her weight was 61.9kg, calorie intake was 1277kcal, protein intake was 42.34g, fat intake was 48.19g, carbohydrate intake was 178.73g and fibre intake was 31.54g.

Food compliance summary was taken from zoconut application. 48.11% compliance towards given diet chart was reported. Missed 7.81% foods in diet chart 30.23% did not record foods, 13.85% took optional foods in the period of four weeks.

Discussion/Conclusion

After one month of dietary millets trail, she lost 5.1kg of her body weight, and the BMI was reduced to 26.7. There is nearly 7.5% weight loss seen in this case. Her average weight loss per week was 1.2kgs. On average, her protein and fibre intake were increased by 4g and 5g respectively. Food compliance report showed that 48.11% compliance of foods given in the chart. The polyphenols, flavonoids, protein and fibre contents of millets might have been attributed to weight loss in this case study. A clinical study on chronic disease burden associated with overweight and obese in Ireland showed that

Table 1: Nutritive values of millets in comparison to rice and wheat.

Food Grain	Carbohydrates (g)	Protein (g)	Fat (g)	Energy (Kcal)	Crude Fibre (g)	Mineral Matter (g)	Ca (mg)	P (mg)	Fe (mg)
Raw Milled Rice	78.2	6.8	0.5	345	0.2	0.6	10	160	0.7
Whole Wheat	71.2	11.8	1.5	346	1.2	1.5	41	306	5.3
Kodo Millet	65.9	8.3	1.4	309	9	2.6	27	188	0.5
Little Millet	67	7.7	4.7	341	7.6	1.5	17	220	9.3
Foxtail Millet	60.9	12.3	4.3	331	8	3.3	31	290	2.8
Barnyard Millet	65.5	6.2	2.2	307	9.8	4.4	20	280	5

Source: Nutritive Value of Indian Foods, NIN 2007.

Table 2: Type of millets used along with calories and macronutrient content per week given in diet chart in comparison to subject's diet with rice before weightloss program.

Type of Millet/Grain	Calories (Kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Fiber (g)
White Rice /Roti	1100	39	26.02	170	21
Kodo Millet	1132	46	30.16	165.85	25.52
Little Millet	1273	41.05	42.92	178.79	28.05
Foxtail Millet	1150	43.01	55.01	124.21	21.59
Barnyard Millet	1277	42.34	48.19	178.73	31.54

Table 3: Variation in weight in four-week trial.

Date	Weight (kg)
08-01-2021	67
15-01-2021	65
22-01-2021	63.6
29-01-2021	62.8
06-02-2021	61.9

Note: 8th January was the weight of client before starting weightloss program it was 67kg. By the end of 4th week that is 6-02-2021, her weight was reported as 61.9.

chronic diseases like diabetes and hypertension are attributable with increased BMI noticeably 42% of women for diabetes and 30% of men for hypertension [7]. There is supporting evidence to show that 5-10% of weight loss shows modest health benefits [8]. Thus using millets twice a day in a regular diet promotes weight loss. There is a need for further evaluation of nutrients containing in millets that are contributing to weight loss.

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