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## Impact of fortified wheat flour with *moringa* leaf for the improvement of nutritional status of farm women of district Hamirpur (U.P.)

**Phool Kumari and Md. Mustafa**

### Abstract

In reality, the majority of the world's population such variety in food is unaffordable or seasonally unavailable. The *Moringa* supplementation is very simple and readily available solution to overcome malnutrition problem. The leaves of the *Moringa* tree are a superb source of vitamin A, leaves are rich in vitamin and also as rich source of B-complex vitamin and other minerals. The leaves also are an impressive source of calcium protein and potassium). The percentage of population from anaemia in the age group 5-9 years is higher than across 6-59 months but lower across 10-17 year group in Hamirpur district of Uttar Pradesh. In this view KVK, Hamirpur conducted on-farm trial to assess the effective supplementation of fortified wheat flour for improvement of nutritional status of Farm Women. Multi-grain flour (wheat 70%) + (Chick pea 20%) + (Barley 10%) + 5 gm *Moringa* leaf powder /person/ day was provided for 180 days. The analysis of data revealed that supplementation of Multi-grain flour which consist Protein 15-16.5 gm/100gm, Iron 4.0 – 4.2 mg/100 gm. Where as in farmer's practice consume only wheat flour consist Protein 11.1 gm/100gm, Iron 2.7 mg/100 gm. It was found that consumption of Fortified wheat flour till 180 days, increased Haemoglobin level 17.74% as well as BMI 5.65%. Taste and colour was also preferred by most of the farm women.

**Keywords:** Fortified, malnutrition, supplementation, BMI, nutritional status

### Introduction

The situation of malnutrition in India is really worrisome and disgraceful. Children and youth in this condition suffer from numerous nutritional deficiencies which adversely impact their health. Per capita net availability of food grains increased by about 10% over the last few decades in India; however, this increase in food grains has not been able to keep pace with the increase in population. In order to realise the vision and optimise impact, India needs multi-sectoral efforts to fight mal-nutrition. Food insecurity is an important issue for vulnerable people in India. Macro- and micronutrient malnutrition have lasting and devastating consequences for individual health and national development, as malnutrition early in life often leads to stunted growth (ACC/SCN, 2000) <sup>[1]</sup>, Agricultural interventions to improve household food availability and dietary diversity are considered one of the most sustainable solutions to addressing these problems of high household food insecurity and malnutrition by increasing household's access to diverse foods and consumption of micronutrient rich food.

It is thought that if people have access to a sufficient quantity and variety of foods, they will meet their nutritional needs. The current practice of evaluating nutritive value of diets should include not only energy and protein adequacy but also the micronutrient density of the diet. A healthy diet can be attained in more than one way because of the variety of foods, which can be combined. Including foods in the diet, which have high micronutrient density-such as fruits and vegetables and pulses or legumes is the preferred way of ensuring optimal nutrition including micronutrient adequacy for most population groups

For instance, *Moringa* leaves can supplement many minerals and vitamins which are essential for our body. *Moringa* leaf is rich with diverse vitamins, minerals, and amino acids. *Moringa* leaves are rich in protein including sulphur containing amino acids. The leaves of the *Moringa* tree are a superb source of vitamin A (four times more than carrots), the raw leaves are rich in vitamin C (seven times the amount in oranges), and also as rich source of B-complex vitamin and other minerals. The leaves also are an impressive source of calcium (four

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times more than in milk), protein (twice the quantity in milk), and potassium (three time more than in bananas). Moreover, there is 09 times more iron than spinach and 4 times more fiber than oats in *moringa*. In District Hamirpur about 51.8% women are anaemic, 28.3% women with BMI less than 18.5 kg/m<sup>2</sup> (NRC, Hamirpur). Thus the study was planned to provide *moringa* leaf powder mixed with flour to overcome malnutrition problem in farm women of the District in a view that this leads to enhanced food security and poverty reduction. The intervention of the project focused on farm women to use as food supplements to combat malnutrition in young children and pregnant as well as lactating women.

## Materials and Methods

### Selection of target group

The most common group of women are involve in farm related activities and affected with malnutrition due to heavy workload and improper diet. Hence, 20-40 years age group of 120 farm women were randomly selected from 6 village of Hamirpur district of Uttar Pradesh. Thus 20 farm women were selected from each village. Out of 120 farm women only 30 farm families were selected purposively for experimental study having 4-5 members in the family to study the nutritional status as well as impact of Fortified wheat flour with *Moringa* Leaf.

### Technology tested

Fortified wheat flour with *moringa* leaf powder was provided by the Krishi Vigyan Kendra, Hamirpur (U.P.) under OFT Programme 2019-2020 and 2020-20-21 for incorporating in the daily diet of farm families through wheat chapatti. Wheat flour and soy flour was mixed in the ratio of 9:1 fortified with 5 gm *moringa* leaf powder in daily routine diet till 180 days, so that the protein and micronutrients are available from all the different sources of food item consumed during the whole day. Thus 315 gm Wheat + 35gm. Soybean + 05 gm *Moringa* Powder were provided per day per person till 180 days as per ICMR-NIN recommended grains for a person per day. The study was conducted for 180 days and all the related data were measured before and after the completion of the research.

### Preparation of Mix flour

The soybean seeds were soaked in water upto 8 hr. after that boil for 20 min. Thereafter, seeds were drained and dried in sunlight. The process ensures effective removal of most anti-nutritional factors. Soybean seeds were sorted and roasted until light brown. The dried seeds were milled with cleaned wheat (1: 9) into flour. *Moringa* leaves were also dried, prepare powder and store in a container. Before making

Chapati mixed with flour at the ratio of 5 gram/ person/day.

### Observations recorded

Height and weight of every Farm Women were measured in the metric system, using standardized technique. A Anthropometric Scale was used to assess height of the subjects. The subject was made to stand without footwear with the feet parallel and with heels, buttocks, shoulders, touching the measuring scale, hands hanging by the sides and head was held comfortably upright. A portable balance with an accuracy of 100g was used to record the weight of the subjects. Farm Women were instructed to stand on the balance with light clothing and without footwear and with feet apart and looking straight. Weight was recorded to them nearest value. Nutritional status was assessed using different indices based on height and weight of Farm Women according to World Health Organization (WHO) with the help of following formula:

$$\text{BMI} = (\text{weight} / \text{height in meter}^2) \times 100$$

### Test of Hemoglobin level

The haemoglobin level of the selected participants was checked before and after intervention with the help of CMO and doctors of Community Health Centre, Kurara, Hamirpur (U.P.) to know the impact of mixed grain Fortified with *Moringa* Leaf.

### Feedback

A simple questionnaire was prepared for assessing the acceptability of the Mix flour fortified *moringa* leaf powder by covering the four main aspects viz. appearance, texture, taste and digestibility. To know the right answer questions were put up to the farm women who can describe the food habits of the family members as well as likes and dislikes about the food stuffs. Feedback was taken at the end of the research experiment. A three point scale was used for assessing the feedback in which questions related to the study were asked to the participants viz.-Like (03), Neutral (02) and Dislike (01).

Analysis of data was done qualitatively and quantitatively by using frequency distribution and percentage.

### Results and Discussion

Ageing in person is accompanied by changes, which may impair food acquisition, digestion, and metabolism. Anorexia and weight loss are common and important clinical problems in older people, and the causes are multi-factorial (Forster S. and Gariballa S. 2005) [2].

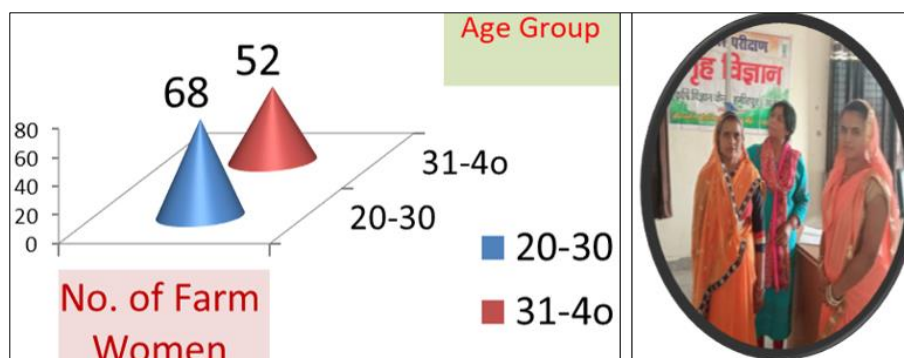


Fig 1: Age wise distribution of the Farm Women (n=120)

Fig. reveals that 68 Farm women belongs between 20-30 years of age while 52 Farm women came under 31-40 year of

age. They were clinically assessed in the present study.

**Table 1:** Incidence of clinical deficiencies and excesses

S. No.	Clinical Signs	Farm Women		
		20-30 yrs. (n=68)	31-40 yrs. (n=52)	Total (n=120)
A	<b>General appearance</b>			
i	Normal (BMI 18.5-24.9 kg/m <sup>2</sup> )	29	18	47(39.16)
ii	Under weight (BMI Below 18.5 kg/m <sup>2</sup> )	37	27	64(53.33)
iii	Obese(BMI above 25.0 kg/m <sup>2</sup> )	02	07	09 (7.5)
B	<b>Anaemia</b>			
i	Absent (Hb 11.6-12 gm/dl)	27	22	49(40.83)
ii	Present (Below Hb 11.6 gm/dl)	41	30	71 (59.16)

Normal Hemoglobin Level for women 11.6-15.0 gm/dl

It was found about 53.33% respondents belong to low body weight (BMI Below 18.5kg/m<sup>2</sup>) and 39% belong to normal category (BMI 18.5-24.9 kg/m<sup>2</sup>) only 7.5% is over weight (BMI above 25.0 kg/m<sup>2</sup>). About 59% women are anemic (Hb below 11.6 gm/dl) whereas approx, 41% having normal hemoglobin level (Hb 11.6-12 gm/dl). Kumari, P. and Dhawan, Tripti (2019) also found that Mild anaemia was present in 30% of children, and only 5% were severely anaemic. Mild anaemia was common in both age group children; the reason could be due to worm infestation and inadequate supply of iron rich food in the diet of a growing child. Phool *et al.* (2022) also found that on the basis of their general appearance, 54% were normal and 45% were thin and obese 1% in a different village of Bhagyanagar Block of Auraiya district.

#### Nutritional value of *Moringa* blended Mixed Grain Atta

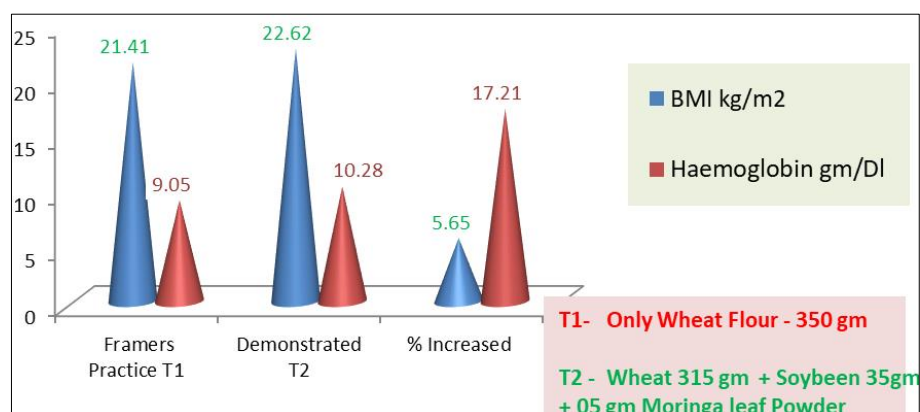
Agricultural interventions to improve household food availability and dietary diversity are considered one of the most sustainable solutions to addressing these problems of high household food insecurity and malnutrition by increasing household's access to diverse foods and consumption of micronutrient rich food. In addition to whole grain benefits, multigrain concept can provide breakfast foods with number of benefits associated with these grains. This multigrain blends help to mix different whole grains to maximize their nutritional, functional and sensory properties. Integration of fortification and supplementation strategies together with other mother and child health and prevention programs may be the answer to address the widespread global under-nutrition and to ensure sustainable benefits (Das *et al.* 2013).

**Table 2:** Evaluation of the effective supplementation of fortified wheat flour with *Moringa* leaf powder for improvement of nutritional status of Farm Women

Treatment	Composition on multigrain Atta	Requirement gm/day	Nutritional Value full filled							
			Energy	Protein	Fat	CHO	Fiber	Ca	P	Iron
Farmers Practice T1	Only wheat flour	350	1186.5	39.9	6.65	253.9	42.7	119.0	1211.0	11.83
Technology demonstrated T2	Wheat 90%	315	1067.8	35.9	5.98	228.5	38.4	107.1	1089.9	10.65
	Soy bean 10%	35	156.1	15.12	6.98	10.56	3.25	96.95	246.4	5.49
	<i>Moringa</i> leaf powder	5 gram /day	10.25	1.35	0.12	1.91	0.97	100.15	66.2	1.41
	Total 100%	350 + 5 gram leaf powder	1234.1	52.37	13.08	240.97	42.62	304.2	1402.5	17.55

The supplementation of Fortified Wheat Flour with *Moringa* Leaf powder which consist Protein 15-16.5 gm/100gm, Iron 4.0 – 4.2 mg/100 gm. Whereas in farmer's practice consumed (according to ICMR 350 gm cereals/person/ day) only wheat flour consist Protein 11.1 gm/100gm, Iron 2.7 mg/100 gm. It was found that consumption of Fortified wheat flour till 180 days, increased BMI 5.65% as well as Haemoglobin level 17.74% Farm women also complain that rate of exertion also

reduce during activities after intervention of technology The inclusion of enriched *Moringa* blended flour not only gave a new colour and flavour but also enriched the Flour with more nutrients. Inclusion of these products in diet helps in improving the nutritional status as well as these can contribute to the food security of farm women and their family members



**Fig 2:** Assessment of effectiveness of nutritional practices for correcting malnutrition

Fig. 2 reveals that consumption of Fortified wheat flour till 180 days, increased Haemoglobin level 17.21% as well as BMI 5.65%, because BMI depends upon the height and weight parameters. It was observed that cent percent respondents appreciated the appearance of the fortified wheat flour with *moringa* leaf powder. Taste was preferred by 95.0% and 05% were neutral about disliked the taste of multi-frain flour fortified with *moringa*. Farm women also complain that rate of exertion also reduce during activities after intervention of technology. The leaves, flowers, seedpods, seeds, roots, bark, and gum are used as food sources, traditional treatment of various illnesses, and to improve health. However, leaves and seeds have the most pharmaceutical potential and nutritional and medicinal benefits (Gopalakrishnan *et al.*, 2016).

## Conclusions

From the above findings, it was evident that addition of wheat flour with soy flour in the ratio of 9: 1+ 5 gm *Moringa* leaf powder in daily diet definitely improves the health status of farm women. It helped in increasing haemoglobin level as well as the weight and BMI of the Farm women. This study enlightens that the nutritional diversification of *Moringa oleifera* and other benefits which make it a better choice to use in our daily diet to combat malnutrition. As the Wheat flour fortified with *Moringa* leaf powder are highly effective in nutritional point in increasing haemoglobin level. Therefore it is a potential for enhancing nutritional security to overcome malnutrition problem in rural community as well as urban areas also.

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