FAQs on Fortification of Wheat Flour

Food Fortification Resource Centre
www.ffrc.fssai.gov.in/fortification

FORTIFIED
SAMPOORNA POSHAN
SWASTH JEEVAN

FOOD SAFETY AND STANDARDS
AUTHORITY OF INDIA

Inspiring Trust, Assuring Safe & Nutritious Food
Ministry of Health and Family Welfare, Government of India
FAQs on Fortification of Wheat Flour

A. General:

1. Understanding Wheat Flour and its Processing:

Wheat flour has different varieties, ranging from whole wheat flour to refined wheat flour. These wheat flour varieties are produced by milling and combining different parts and types of wheat grain. Whole-wheat flour contains all three parts of the wheat kernel: the endosperm, the bran and the germ, while the varieties of refined flour are made from the endosperm after removal of the bran and germ.

The bran and germ contain large quantities of the B vitamins, fiber, trace minerals, unsaturated fats, antioxidants and phytonutrients, and the main nutrients in the endosperm are carbohydrates, proteins and a small amount of the B vitamins.

When wheat grain is milled to convert it into wheat flour, a large proportion of the thiamin, riboflavin, niacin, vitamin B-6, folic acid and iron present in whole-wheat kernels are lost. This decreases the nutritive value of the flour. The loss of nutrients depends upon the extent of milling and processing, i.e. whether wheat grain is converted into whole wheat flour or refined wheat flour.

Q: Why fortify wheat flour?

A. As nutrient loss occurs during milling, nutrients are added to flour in amounts equal to those present before processing to make enriched flour. **Fortified flour is made by adding nutrients in excess to quantities lost during milling, or adding additional nutrients to improve its nutritive value.**

Wheat flour is one of the most commonly consumed staple food in India with an average per capita per day consumption of wheat flour ranging between 150-300 grams in India. Wheat flour is thus a...
suitable food vehicle for fortifying with Iron, Folic Acid and Vitamin B12.

There is adequate evidence that fortification of wheat flour is most effective, simple and an inexpensive strategy for providing important vitamins and minerals to large segments of the population without requiring change in food habits or dietary pattern or measures to address the problem of compliance.

**Q:** Does wheat flour fortification help reduce vitamins and minerals deficiencies in the general populations?

A. Several research studies conducted in children and young women have demonstrated that regular consumption of fortified wheat flour with adequate levels of easily absorbed nutrients results in a significant reduction in the prevalence of micronutrient deficiencies.

Fortifying wheat flour with iron has made a positive health impact by improving the iron status in populations consuming iron fortified wheat flour. Many studies at the national and global level, prove that fortifying flour with folic acid reduces the incidence of birth defects such as neural tube defects by 31% to 78%.

**Q:** How fast can health effects of consuming fortified wheat flour be expected?

A. Regular intake of fortified wheat flour can show positive impact on the iron status within 6-12 months of starting the consumption. With folic acid, changes in folate status may be observed within 3 to 4 months after fortification is fully implemented. It will take at least 12 months to see an impact on the prevention of neural tube defects / birth defects because women need to be consuming wheat flour fortified with folic acid before they conceive.

**B. Product Specific Information**

**Q:** What nutrients are added to flour for fortification?

A. The most common nutrients added to flour are iron, folic acid and vitamin B12. Other vitamins and minerals that can be added to flour are thiamin, riboflavin, niacin, zinc, calcium and vitamin A.
Q: Does fortified flour change its baking qualities? Does fortification affect the colour, smell and taste of foods made with fortified flour?

A. Fortification does not impact the organoleptic and food technology attributes of flour such as color, taste, smell when used in foods such as chapati (flat bread), baked products, breads and noodles. Also, the nutrients added to the flour as a part of fortification are heat stable and not lost during cooking.

Q: Does fortification affects the shelf life of atta and maida?

A. Fortification has no impact on the shelf life of the product. Shelf life of flour is largely influenced by the moisture content of flour, storage temperature, microbial contamination, hygiene and sanitation practices.

Q: How will you distinguish fortified flour and non-fortified flour?

A. There is no distinction in taste, colour or smell between fortified flour and the non fortified flour.

However, the fortified flour package will have a logo indicating that it is fortified and it the nutrition label on the packed flour product would indicate the various micronutrients and their quantities, as specified by FSSAI.

Non-fortified flour products cannot use the fortified logo.

C. Regulatory Requirements

Q: What is wheat flour fortification standard?

A. A standard is a technical specification for fortification of wheat flour. A standard for fortified flour includes a list of vitamins and minerals to be included in flour. This provides a level that can be expected to have a public-health impact. The flour fortification standard as issued by Food Safety Standards Authority of India (FSSAI) prescribes to add iron (Sodium Iron EDTA), folic acid and B12 for claiming the atta or maida as a fortified product. Other nutrients such as Zinc, Vitamin A, Thiamine, Riboflavin, Niacin and Vitamin B6 can also be
added in addition to the above three micronutrients.

**Q: What quality control and quality assurance procedures are needed for flour fortification?**

**A.** The following steps provide quality control and quality assurance at the flour mill.

- Store premix in a dry, secure location and away from direct light to prevent degradation of the vitamins.
- Calibrate the feeder on a regular basis and whenever the premix composition is changed or the supplier is changed.
- Calculate the feed rate for the feeder to establish an acceptable dosage target addition rate for premix.
- Conduct the check weighing process of the feeder regularly.
- Perform the iron spot test at least three times per eight-hour shift.
- Send monthly samples for full analytical testing of all the nutrients added to flour.
- Use of an inventory control system to verify that the amount of premix being used is close to the specified or target rate.

**D. Technology of Flour Fortification**

**Q: How is flour fortified at the mill?**

**A.** The fortification process is usually a continuous process that adds premix to flour as it is being produced. In some cases, fortification takes place in a high speed blending system following the flour milling process. In this case, this system is usually installed as part of a new flour-mill.

**Q: What is feeder and what does it do?**

**A.** Stainless steel feeders accurately add premix directly to flour. The feeder is equipped with a variable speed drive motor which has a discharge mechanism and a hopper agitation device attached with a gearbox. The agitation device provides an even, consistent flow of premix into the flour.

**Q: What types of feeders are there?**
A. Feeders have one of three discharge systems: Screw discharge, disk discharge and drum discharge. Most modern feeders use the screw discharge system. The size of the discharge screw and the speed range of the variable speed motor allow for a wide range of discharge rates. The feeders can be connected electronically or electrically to the main control panel or microprocessor that controls the flour mill. In addition, the feeder can be equipped with load cells which convert the feeder from a volumetric feeder into a gravimetric or loss-in-weight feeder.

Q: Where is the feeder installed?
A. The feeder is usually on top of the final flour collection conveyer where premix drops by gravity into flour as it move through the conveyer. When an existing mill has to install a feeder to begin fortification, there may not be room on top of the conveyer for a feeder. In this case the feeder can be installed on the same floor as the conveyer. The feeder is connected to the conveyer using a blow-line which blows the premix from the feeder into flour.

Q: How do you ensure that feeder is operational?
A. The feeder must consistently deliver premix to the flour conveyer at a point that allows for sufficient mixing time so that the premix is evenly dispersed in the flour. Tips for doing that are:
   • Place the feeder more than three meters from the discharge end of the conveyer where the premix is added.
   • Interlock the feeder with the mill control panel or the first break sifter or the conveyer motor so that if the mill stops, the feeder stops.
   • Equip the feeder with a low level alarm indicator so that the feeder does not run out of premix.

E: What is Premix?
A premix is a powdered blend of vitamins and minerals that flour millers use for fortification. Premixes are usually prepared with diluents so they can be added to flour at a standard dosage rate such
as 200, 250, or 300 grams per metric ton. A premix allows a miller to add several micronutrients at the same time to flour. A standard premix specification also allows millers to compare prices from different suppliers on a standardized basis which will prevent pricing and costing errors. It has a vegetarian source of origin.

**Q. Who supplies premix?**

A. A number of reputable premix manufacturers and suppliers are located in Mumbai, Chennai, Delhi and Bangalore. Many companies of Indian origin have agencies operating in many countries. Many international pre-mix companies are also based in India and located in many places. List of premix suppliers is attached in the annexure.

**F. Cost of Fortification and Equipment**

**Q. How much does premix cost?**

A. The cost of the premix is mostly affected by the number of vitamins and minerals included and the quantity of each nutrient. Vitamin A is the most expensive nutrient to include in flour.

*The following table gives an indication of the premix cost:*

<table>
<thead>
<tr>
<th>Nutrients in Premix</th>
<th>Cost Range per Metric Ton of Flour (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron (NaFeEDTA) and folic acid</td>
<td>120-130</td>
</tr>
<tr>
<td>Iron (NaFeEDTA), folic acid and B12</td>
<td>140-150</td>
</tr>
<tr>
<td>Iron (NaFeEDTA), folic acid and vitamin A</td>
<td>220-250</td>
</tr>
</tbody>
</table>

These estimates may vary depending on the premix market price and location of distribution.

*These prices do not reflect excise duty (ED), central state tax (CST) and value added tax (VAT). Millers should request premix price quotations from more than two suppliers to ensure competitive prices.

**Q. What does fortification cost the milling industry?**

A. To fortify flour, the miller has to make a one-time fixed expense of buying feeders. Apart from that, there will be variable costs owing to
the purchase of premix and supplies for quality control and quality assurance testing. The one-time capital cost of purchasing equipments and setting up a laboratory for qualitative tests for internal quality assurance is estimated between 80,000 INR to 150,000 INR. Some costs may also be associated with staff training.

G. Safety of Fortification

Q. Is it safe for children, pregnant and lactating women?

A. Children, pregnant and lactating women especially benefit from consuming fortified wheat flour as they require high levels of vitamins and minerals to support physical growth and the development of new tissues. The standards for fortification are set keeping in view that when many fortified foods reach the population, the population is not consuming excessive levels of nutrients and there is no toxicity.

Q. Are there any known side effects to consume fortified wheat flour?

A. No side effects on health have been reported in the studies published on fortified wheat flour.