Corn Masa Flour Fortification - Best Practices

Summary: Fortification has three main requirements: the vitamin premix, a dosifier/feeder, and a way to thoroughly mix the premix into the flour. This document provides recommendations for best practices, but the specific inputs can be tailored to your production facility.

Setting up for Fortification

Premix

Premix is a combination of folic acid, filler, and free-flow agent. To procure premix, identify a licensed provider and compare quotes from multiple sources to determine the most cost-effective and reliable option. Ensure all shipments include a certificate of analysis and addition rate instructions. Premixes should be stored using a first-in, first-out system. The premix supplier should provide an estimated addition rate.

Equipment

First determine if your existing microingredient feeder or dosifier can be used to add folic acid.

- Options for purchasing a dosifier [1]:
  - Volumetric feeders dispense a set volume of premix at a constant rate. This is the most common and least expensive option.
  - Loss-in-weight feeders take a continuous reading of the weight of premix over time, allowing for a true addition rate measurement. This system is more complex and expensive.
- Different feeders are available, but the most common and easiest to maintain is a screw feeder.
- An anti-bridging device is needed to ensure consistent premix flow.

Dosifier (feeder) location

- Dosifiers should be installed in a dry, easily accessible location out of the sun.
- The dosifier should be located such that the premix enters the flour stream at least 3 meters (10 feet) before the discharge end of a flour conveyor.

Dosifier (feeder) continued

- **Do not** mix folic acid with other additives in the same dosifier. Premix is very concentrated and can react with other additives until diluted in the masa.
- The feeder must be calibrated before usage in a production run.

Fortifying Your Corn Masa

Premix can be added to flour using either a continuous or batch procedure.

Continuous	Batch
Premix is added constantly to the flour stream using a feeder	Premix is added to a batch of flour and blended in a mixer
The addition rate is proportional to the rate of flour production	Addition rate is based on the size of the flour batch

Control Systems

Premix control systems should match the technical capacity of the production facility and maintenance program.

- Manual: Feeder settings and operation controlled manually by the miller
- Basic sensors and interlocking: Sensors are used to monitor incoming flour and switch premix feeder on and off as needed. Sensors also can monitor premix level and flow and are able to warn operator of issues.

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Control Systems - Continued

- Advanced sensors and interlocking: Loss in weight feeders are used with an online flour scale that starts and stops the premix feeder using a baseline flow rate
- Automated controls: Programmable logic controller continuously matches the addition rate of premix to the measured flow rate of the flour

Estimated premix discharge rate

Milling capacity (MT of grain per day)	Masa flour flow rate* (kg/minute)	Premix** discharge rate (g/minute)
100	62.5	9.4
200	125	18.8
300	187.5	28.1
400	250	37.5
500	312.5	46.9
600	375	56.3
700	437.5	65.6

*At 90% extraction rate
** At 150 grams premix per metric ton of flour

Mixing

Adding premix at the correct point is essential for proper homogenization of premix in the flour. Feeders should be placed on the front half of a collection conveyor, above the blades of a mixing screw. To ensure proper blending, the conveyor should be at least three meters (10 feet) long. Mixing can also be done in batches, or with a mixing conveyor between the holding bin and pack out bins or bulk load out bins.

Stability and Storage

Store fortified flour away from moisture and heat. Proper packaging (moisture-resistant, opaque, tightly sealed) and storage are key to preserving the nutritional value of the product over time [2].

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Internal Monitoring

Premix reconciliation

Compare the amount of premix used over a given time period to the amount of flour produced in the same period, then compare that to the target addition rate [3]. This should be done on a daily or weekly basis. In automated systems with loss in weight premix feeders and in line flour scales this reconciliation can be programmed for real-time reconciliation.

Sampling for quantitative testing

Take five (5) 500 gram samples at 10 minute intervals and combine them into a composite sample. This composite should be sent for testing at laboratory with an ISO-17025 certification for folic acid [4]. Sample at least every quarter for manual systems, and every 6 months for loss-in-weight systems.

Record Keeping

- Maintain documentation of premix use and reconciliation
- Ensure composite sample test results are kept on file

Why Fortify?

Folic acid is a manmade form of vitamin B9 needed for development of a baby's brain and spine during pregnancy. Fortifying milled grain products with folic acid is a proven method to reduce severe birth defects of the brain and spine [2]. Folic acid fortification of wheat flour has helped reduce these birth defects in the US, and fortifying corn masa flour can contribute to further prevention.

References

1. Johnson Q. Feeders and Mixers for Flour Fortification: A Guide for Selection, Installation, and Procurement. Ottawa, Canada: The Micronutrient Initiative; 2005.
2. World Health Organization. Guideline: Fortification of Wheat Flour with Vitamins and Minerals as a Public Health Strategy. Geneva: World Health Organization; 2022.
3. World Health Organization. Monitoring flour fortification to maximize health benefits: a manual for millers, regulators, and programme managers. Geneva: World Health Organization; 2021.
4. Nutrition International. Capacity Building of Small Millers: Training Manual. Nutrition International; 2017.

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