Preserving African Food Microorganism for Green Growth

Documentation of carrier materials and procedures for distribution of starter cultures (M11 and O4.2)

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Preparation of starter culture for dehydration

The procedures which were investigated for dehydration and storage of Lactobacillus fermentum and Saccharomyces cerevisiae as starter cultures were based on previous work carried out in the Microbiology Laboratory for the production and storage of lactic acid bacteria and yeasts as starter cultures. In the previous work various materials including whole maize flour, dehulled maize flour, malted maize flour, whole soybean flour and dehulled soybean flour had been used as carriers for the LAB and yeast; and glycerol, skim milk and sucrose as protectant during drying. In this work whole maize flour, dehulled maize flour, whole soybean flour and dehulled soybean flour were used and compared as carriers for the starter culture and skim milk and sucrose used as protectants during drying in a cabinet dryer.

The starter cultures, *Lactobacillus fermentum* and *Saccharomyces cerevisiae* were grown on commercial media MRS broth and Malt Extract broth respectively in a reciprocal shaker for 24 h and the cells harvested by centrifugation.

The carriers were prepared by dehulling maize and soybeans. The whole and dehulled grains were milled into flour to obtain whole maize flour, dehulled maize flour, whole soybean flour and dehulled soybean flour.

The harvested cells of the LAB was divided into four portions, and each mixed with the same weight of one of the different flours i.e. whole maize flour, dehulled maize flour, whole soybean flour and dehulled soybean flour. Each of the four mixtures of bacteria and flour was further divided into two yielding eight portions. One set of the four lots was mixed with skim milk powder as a protectant and the second set sucrose as protectant.

Dehydration of Starter Cultures

Each of the eight preparations was spread thinly on a tray and placed in a hot air oven set at 42 ^{o}C to dry. Drying was continued till the sample looked sufficiently dried. Samples were taken before and after drying for enumeration of the LAB and also the moisture content of the dried culture.

The procedure was repeated using the yeast starter culture, *Saccharomyces cerevisiae*. The percentage cell recovery during drying of microbial cultures is shown in Table 1

Starter culture of *Lactobacillus fermentum* grown on millet flour substrate fortified with 2 % glucose.

The mean percentage cell recovery during drying of microbial cultures in a cabinet dryer at 42^{o}C is shown in Table 1. The best option was using whole maize flour as carrier with skim milk as protectant.

Table 1. The mean percentage cell recovery during drying of starter cultures in a cabinet dryer

Microbial culture	Whole maize flour	Dehulled maize flour	Whole soybean flour	Dehulled soybean flour
Lactobacillus fermentum only	11.5	21.2	0.5	6.1
Lactobacillus fermentum plus skim milk	26.4	22.6	7.5	15.0
Saccharomyces cerevisiae only	10.2	14.9	4.0	21.4
Saccharomyces cerevisiae plus skim milk	36.2	32.8	5.6	23.5

Storage of Starter Cultures

Each of the eight lots was then divided into two and one stored on the shelf (room temperature ca 24 ^{o}C) and the other in a refrigerator. Cell counts were determined at 2 weeks intervals to determine the population of viable cells. The population of the cells in the dehydrated

Lactobacillus fermentum starter culture during storage in shown in Tables 2 to 5. The results show that maize served as a better carrier for the LAB than soybeans. Also the use of skim milk offered some protection to the cells during dehydration. Storage of the starter culture in the refrigerator prolonged the shelf life of the cells.

Cell count of *Lactobacillus fermentum* starter culture in CFU/g during shelf storage

Carrier, no protectant	Storage week					
	0	2	4	6	8	10
Whole maize flour	8.9	6.6	4.9	4.5	4.1	3.8
Dehulled maize flour	7.8	7.1	7.0	6.7	5.8	4.5
Whole soybean flour	7.3	5.6	4.8	4.2	3.8	3.5
Dehulled soybean flour	7.9	7.5	6.9	6.6	5.8	5.1

Cell count of *Lactobacillus fermentum* starter culture in CFU/g during refrigerated storage

Carrier, no protectant	Storage week					
	0	2	4	6	8	10
Whole maize flour	8.9	8.5	7.9	7.7	6.5	5.5
Dehulled maize flour	7.8	7.6	7.6	7.5	7.4	7.7
Whole soybean flour	7.3	6.8	5.9	4.6	4	3.9
Dehulled soybean flour	7.9	7.2	6.9	6.6	6.2	5.5

Cell count of *Lactobacillus fermentum* starter culture in CFU/g during shelf storage

Carrier with skim milk	Storage week					
	0	2	4	6	8	10
Whole maize flour	8.4	6.9	6.2	5.1	3.8	3.3
Dehulled maize flour	8.0	8	5.7	5.3	4.6	5.1
Whole soybean flour	7.6	5.7	5	4.8	4.0	3.8
Dehulled soybean flour	7.8	6	5.9	5.6	5.8	5.3

Cell count of *Lactobacillus fermentum* starter culture in CFU/g during refrigerated storage

Carrier with skim milk	Storage week					
	0	2	4	6	8	10
Whole maize flour	8.4	7.9	7.5	7.8	6.6	5.6
Dehulled maize flour	8.0	8.8	7.9	7.4	6.9	5.9
Whole soybean flour	7.6	6.6	5.2	4.9	4.1	3.5
Dehulled soybean flour	7.8	6.8	6.5	6.6	6.7	5.4

Use of starter culture by SME (Selassie Foods) to produce spiced fermented millet flour used for the preparation of a breakfast porridge, Hausa koko.

Working with the SME, Selassie Foods. 1. Washing of millet and (2) weighing of spices

Milling the millet grains

SME staff mixing the millet meal with starter culture for fermentation

The fermented meal dehydrated in a cabinet dryer

Milling of the dehydrated fermented millet dough with spices

Packaging of Hausa koko


SELASIE
New
Hausa
KOKO
HYGIENIC
HAUSA KOKO
SELASIE
New
Hausa
KOKO
HYGIENIC
HAUSA KOKO

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