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International Journal of Multi-disciplinary Research

Vol. II, No. 1, June 2009
ISSN: 2006 - 7534

Published by:
The Postgraduate School,
Olabisi Onabanjo University.
Ago-Iwoye, Nigeria

Improving Weaning Diets through Germination and Fermentation of Sorghum Grains

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Abstract

Malnutrition at the level of the individual child is the product of inadequate food quality and quantity and the effect of illness, usually due to infection. At household level, food technologies of Germination and Fermentation are traditional household level food technologies which can be used to improve weaning practices in developing countries Amylace Rich Flour (ARF) produced by improving feed energy density, while fermentation reduces contamination of feeds with pathogens, and facilitates more frequent child feedings. The main fermenting organisms used are yeasts, mould and bacteria. Lactic acid producing bacteria are responsible for most ferment cereal porridges and drinks and it is these that are most suitable for use as weaning foods.

Keywords: Improved weaning technology.

Introduction

Malnutrition especially among the children remained one of the major health problems in developing countries including Nigeria. It is a major cause of morbidity and mortality. At the level of the individual child, it is the product of inadequate food quality and quantity, and the effect of illness, usually due to infection.

In many developing countries Savage et al (1992) identified three main problems with weaning practices, namely foods being generally of low energy density, susceptibility to microbiological contamination and children being fed too infrequently.

A weaning food technology was defined by Darling *et al.*, (1992) as any process which when applied during food preparation or processing brings about changes which optimize the food quality for use in weaning babies. Many such technologies are used in the commercial production of weaning foods, but unless these can be marketed cheaply and universally, they will have little impacts on the nutritional status of children in poor communities. Many communities in Tanzania has adopted the principles of germination and fermentation for infant weaning and rearing. Ashworth *et al.*, (1992).

Table I : Good Weaning Practice

Good weaning practice consists of:

- ❖ Exclusive breast feeding until the age of 4-6 months
- ❖ Gradual introduction of optimum weaning foods
  - medium to high energy density (>0.5 kcal/g)
  - appropriate micro nutrients and protein quality
  - low viscosity (semi-liquid or soft) for easy consumption
- ❖ High feed frequency (5-6 times per day) in addition to breast feeds
- ❖ Breast feeding encouraged throughout the first two years
- ❖ Avoidance of bottle feeding with its hazard of infection

Table 2 : Problems With Weaning

Low energy density
Most weaning foods are made by cooking starchy staple flour with water to form a porridge.
Starch granules bind water, swell, and gelatinize on cooking, to give a thick voluminous food.
In order to produce a food of a consistency thin enough for child feeding, large amounts of water must be used to dilute the flour, resulting in a low nutrient and enery density.
Addition of energy rich foods is often too expensive

Microbiological contamination
Studies show high levels of contamination with pathogenic bacteria in traditional local weaning foods.

The weaning's dilemma is the difficulty of choice between:

- Prolonged exclusive breast feeding microbiologically safe, but eventually inadequate for growth
- Early commencement of weaning foods, with the associated harzad of infection

Infrequent child feeding
Weaning children require frequent feeds because the small stomach capacity limits the intake per feed.
In practice, feed frequency is usually only two to three times per day

Reasons for low feed frequency:

- Food preparation consumes time and fuel both may be scare
- Feeding the child is also time consuming
- Storage of prepared food is difficult

This study is considering the role of traditional method of germination and fermentation as a way of reducing malnutrition and its consequences in infant weaning diets.

Methodology

Germination:

For improving energy density Sorghum grains (about 2kg) was soaked in water overnight, then allowed to germinate for 48 72 hours at 20-30^{0}Cin damp dark conditions, after which it is sun dried or gently heated and then ground to flour. An Amylace Rich Flour (ARF) is thus produced which when added in small amounts to a thick cereal porridge dramatically reduces its viscosity by digesting starch to its continent dextrin and sugar.

Fermentation:

For reducing pathogens and increasing feed frequency.

At fermentation level, the complex carbohydrates, such as starches are partially broken down by bacterial actions with the production of acids and possibly antimicrobial substances, Tomkins (1989).

Fermentation- a way of reducing pathogens and increasing feed frequency
Here, complex carbohydrates, such as starches, are partially broken down by bacterial action, with the production of acids, and possibly antimicrobial substances. This technology has been used for food preparation and preservation across the world since ancient times and examples of its used occur in almost every culture. The main fermenting organisms used are yeasts (for bread and alcoholic beverages), moulds (for cheese production) and bacteria. Lactic acid producing bacteria are responsible for most fermented cereal porridges and drinks and it is these that are most often suitable for use as weaning foods. Maize is the most commonly used cereal and in

Africa there are at least 20 different fermented maize products. Ljunguist *et al.,* (1981)

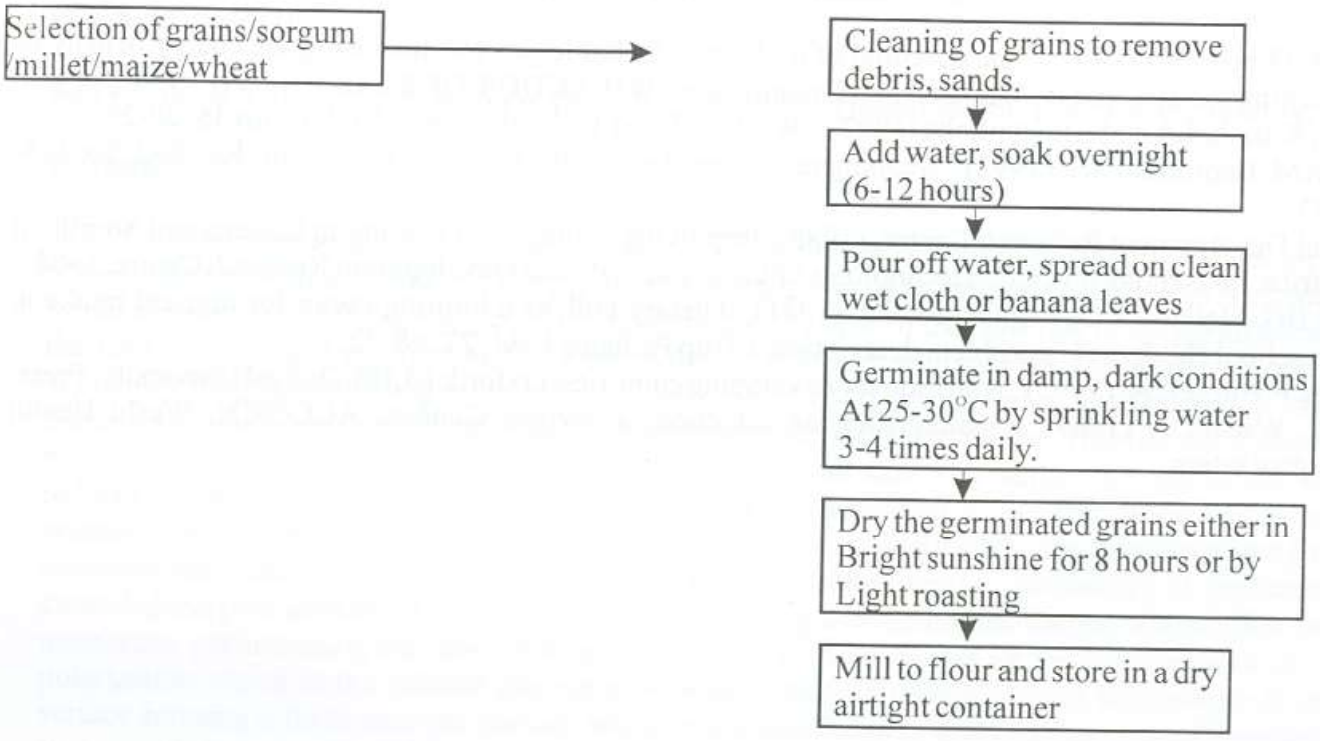
Fermentation may be carried out either before or after cooking, or both, and may be allowed to occur spontaneously or initiated by inoculation with a starter culture.

In Tanzania, fermentation is usually combined with the use of ARF, and is initiated either by microbes contained within this flour, or by addition of a starter culture.

During fermentation, the pH drops, and this is associated with the production of a characteristic tangy taste. After 12-24 hours at room temperature (25-30°C), the pH of the porridge falls below 4, a level at which studies have shown that the growth of enteropathogenic bacteria is inhibited, and the porridge is suitable for consumption over at least the next 12 hours without refrigeration or reheating. IDRC (1988)
Fermentation is therefore a method of improving microbiological safety of wearing foods, and allows the child to be fed more frequently because a fresh meal does not need to be prepared every time.

Germination and fermentation can be used together. Foods produced in this way have the combined advantages of viscosity reduction and improved microbiological safety. Recent research suggests that these foods are of particular value in improving energy intake in sick children, especially those with acute diarrhoea.

Flow Chart of Making Amylace Rich Flour (ARF)



Source; Darling J. C. *et al.,* (1992)

Result And Discussion

The use of ARF enables the preparation of cereal feeds with a much higher energy and nutrient density; because the starting flour concentration can even be tripled without increasing the final feed viscosity.

The cost of this increase in energy density is mainly that of the extra flour used, and is a much cheaper way of providing extra calories than the use of energy rich, supplements. A variety of other foods can be added in order to ensure a balanced nutrition intake. The production of ARF is labour efficient, in that only a small amounts is required per feed (approximately 10 per cent of the total flour used), and a batch will keep for several weeks if stored in a dry, airtight container. The procedure to many communities in Tanzania, since it is traditionally used in the production of local beverages. Feeds produced using ARF have a sweeter taste, due to the sugars produced from starch digestion, and this may improve their appeal to children.

The process of germination has other beneficial effects, such as improving bioavailability of iron and zinc, to reduction of phytate.

The theoretical possibilities of osmotic diarrhea, due to increased sugars, and cyanide toxicity when sorghum ARF is used, have been investigated and not found to occur in practice. Hend (1992) Normal cooking practices, effectively remove cyanide precursors. After the addition of ARF, porridge should be reboiled to ensure this is the case, as well as to complete cooking and kill any bacteria that may contaminate the ARF. Mouldy grain should not be used to prepare ARF, because of the risk of aflatoxins from some moulds. Regular washing of the grains during germination prevents mould formation.

Conclusion

Germination and fermentation are traditional household-level food technologies which can be used to improve weaning practices in developing countries. Amylace rich flour produced by germination is particularly effective in improving feed energy density, while fermentation reduces contamination of feeds with pathogens, and facilitates more frequent child feeding.

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