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TECHNOLOGY OF WEANING FOOD FORMULATIONS PREPARED FROM GERMINATED CEREALS AND LEGUMES.

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Abstract: *The semisolid foods given to the child at this stage are generally called weaning foods. Weaning foods are adult foods, modified by processing the ingredients to make them easily digestible by the infant. The small quantity of food consumed in the first stage of weaning is of little nutritional value. Breast milk or infant milk formula will remain the major source of nutrients until a fully mixed diet is achieved. The aim is to accustom the infant to taking food from a spoon. Increasing the quantity of solid food given and the frequency with which it is offered depends on an infant's willingness to take it, but solid food should be accepted two or three times per day by about six months of age. First foods need to have the consistency of a thin, smooth puree to allow the baby to use the sucking reflex. We have reported in this Paper the effect of steeping and kilning conditions have on the development of alpha-amylase in sorghum. Result suggests that the choice of steeping and kilning conditions is fundamental to the development of high quality malts from sorghum and legumes grains. The use of malt in weaning food formulation yields a product with improved functional characteristics and high nutritive value. A formulation containing 60% sorghum malt, 30% Rajma malt and 10% moth bean flour is more nutritious and has better acceptability because of reduce viscosity.*

Keywords: *Semisolid, Infant's, Steeping, Kilning, Malt, Alpha-Amylase, Yield.*



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INTRODUCTION

When a baby reaches four to six months of age, milk alone is no longer sufficient to meet its nutritional requirements. Calories and other nutrients are needed to supplement milk until the child is ready to eat only adult foods. This is the weaning stage. Weaning is the process of expanding the diet to include food and drinks other than breast milk or infant formula. Weaning is a time of nutritional vulnerability. It represents a period of dietary transition, just when nutritional requirements for growth and brain development are high. Introduction of different tastes and textures promotes biting and chewing skills [St. Louis, Mo, USA: CV Mosby, 1975]. Chewing improves mouth and tongue coordination, which is important for speech development. Failure to introduce different textures and tastes by six to seven months can result in their rejection later. Developmentally, few infants are ready to handle anything but liquid food until 10 to 12 weeks of age. Any effort to force them earlier may result in a frustrating and unhappy feeding experience for both the mother and the child. The ability to handle foods other than milk also depends on the physiological development of the infant. The appearance of salivary amylase in the saliva between two and three months of age marks the time when the infant is ready to handle more complex carbohydrates, such as starch in cereals. By four to six months of age, most infants are able to handle most proteins. The kidney tubules become efficient by six to eight weeks, after which there is less concern over the use of a high-protein, high-sodium diet [St. Louis, Mo, USA: CV Mosby, 1975]. Concern over the safety.

MATERIALS & Methods

RAW MATERIAL:-

Raw materials required for the manufacturing of weaning food are as follows:-

Sorghum (Dadar),

Legume (Kidney Bean, Moth Bean),

Sugar,

SMP (skimmed milk powder),

Vitamin and Mineral premix.

1) Sorghum (Dadar),

Sorghum is a self-pollinating plant. It is more drought and temperature resistant than maize (corn), soybeans, wheat and other crops. The height of the plant depends on the breed and growing conditions, varying between 60 to 460 centimeters. The long, wide leaves grow off the stalk. Sorghum seed is small and round. A seed head is usually between 25 to 36 centimeters, present on the top of the stalk of a mature sorghum plant.[5]

Sorghum seed consists of three major anatomic sections - pericarp (outer layer), endosperm (storage organ) and the germ. The pericarp is made of three segments - epicarp, mesocarp and endocarp. The epicarp is the outermost layer covered with a thin waxy film. The mesocarp consists of a large amount of starch granules. Sorghum is claimed to be the only food staple that contains starch in this anatomical section of the seed. Sorghum's endosperm is composed of aleurone layer, peripheral, corneous and floury areas. The aleurone contains proteins (protein bodies and enzymes), ash (phytin bodies) and oil (spherosomes). The germ has two major parts: the embryonic axis and embryonic disc. The protein of the germ contains high levels of lysine and tryptophan that are of unusually good quality for human consumption, as well as for fodder.

2) Legum :-(Kidney Bean, Moth Bean),

Kidney Bean (Rajma) is a popular North Indian vegetarian dish consisting of red kidney beans in a thick gravy with lots of Indian whole spices and usually served with rice and roti. Although the kidney bean is not of Indian origin, it is a part of regular diet in northern regions Punjab, Kashmir, Delhi, Haryana and Himachal Pradesh. This dish developed after the red kidney bean was brought to the Indian subcontinent from Central Mexico and Guatemala. Being a popular dish, it is prepared on all important occasions. About 100 grams of boiled Rajma beans contain 140 calories. 5.7 grams of protein, 5.9 grams of fat and nearly 17.8 grams of carbohydrate.

Moth Bean :-

Vigna aconitifolia, called the moth bean mat bean, Turkish gram, matki in Marathi, is a small, drought-resistant,[1] annual, trailing herb with small yellow flowers and deeply lobed leaves, grown especially in dry parts of South Asia for its tiny (3-4mm) edible beans, which range in color from light brown to dark reddish brown. The sprouted beans taste somewhat sweet.

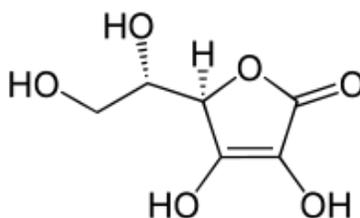
Matki is very popular in Maharashtra cuisine. The beans are soaked overnight to make them sprout. These sprouted beans are used for salad, misal or usal.

3) Powdered milk :- is a manufactured dairy product made by evaporating milk to dryness. One purpose of drying milk is to preserve it; milk powder has a far longer shelf life than liquid milk and does not need to be refrigerated, due to its low moisture content.

Another purpose is to reduce its bulk for economy of transportation. Powdered milk and dairy products include such items as dry whole milk, nonfat dry milk, dry buttermilk, dry whey products and dry dairy blends. Many dairy products exported conform to standards laid out in Codex Alimentarius.

Powdered milk is used for food and health (nutrition), and atypically also in biotechnology (saturating agent).

4) Vitamin C :



L-ascorbic acid or L-ascorbate is an essential nutrient for humans and certain other animal species. In living organisms ascorbate acts as an antioxidant by protecting the body against oxidative stress.[1] It is also a cofactor in at least eight enzymatic reactions including several collagen synthesis reactions that, when dysfunctional, cause the most severe symptoms of scurvy.[2] In animals these reactions are especially important in wound-healing and in preventing bleeding from capillaries.

Ascorbate (an ion of ascorbic acid) is required for a range of essential metabolic reactions in all animals and plants. It is made internally by almost all organisms although notable mammalian group exceptions are most or all of the order chiroptera (bats), guinea pigs, capybaras, and one of the two major primate suborders, the Anthropoidea (Haplorrhini) (tarsiers, monkeys and apes, including human beings). Ascorbic acid is also not synthesized by some species of birds and fish. All species that do not synthesize ascorbate require it in the diet. Deficiency in this vitamin causes the disease scurvy in humans.[2][3][4] It is also widely used as a food additive.

5) Sugar

is the generalised name for a class of sweet-flavored substances used as food. They are carbohydrates and as this name implies, are composed of carbon, hydrogen and oxygen. There

are various types of sugar derived from different sources. Simple sugars are called monosaccharides and include glucose, fructose and galactose. The table or granulated sugar most customarily used as food is sucrose, a disaccharide. Other disaccharides include maltose and lactose.

RESULT AND DISCUSSION

The scale up study was carried initially for 1kg of weaning food preparation, followed by 5kg weaning food.

Steeping

The optimum condition of steeping such as time and temperature for sorghum and legumes is shown in table no.11, with corresponding moisture content for sorghum and legumes the steeping temperature 25°C required about 36 hours and 24 hrs to get

Moisture of 38.8 and 58.33 respectively.

Content	Time (hr)	Temp.(°C)	Moisture Uptake
Sorghum	36	25	38.8
Legumes	24	25	58.33

Table No.7 Optimum steeping conditions

Germination

The optimum condition of germination such as time and temperature for sorghum and legume is shown in table no.12, with corresponding amylase activity. For sorghum and legumes, the germination temperature 25°C required about 72 hours and 48 hours and to set the RH-95% to get amylase activity of 54 and 19 respectively.

Content	Time (hr)	Temp.(°C)	Amylase activity
Sorghum	72	25	54
Legumes	48	25	19

Table No.08 Optimum condition of germination

Drying

The optimum condition of drying such as time and temperature for sorghum and legumes is shown in table no.13, with corresponding amylase activity for sorghum and legume, the drying temperature 80°C required about 90 min. to get amylase activity of 55 and 35 respectively.

Content	Time(hr)	Temp.(°C)	Amylase activity
Sorghum	90	25	55
Legumes	90	25	33

Table No.9 Optimum condition for drying

Process of the weaning food preparation:

Sorghum	Rajma	Moth bean
(600gm)	(300gm)	(100gm)
↓	↓	↓
Steeping	steeping	steeping
(36hrs at 25°C)	(24hrs at 25°C)	(24hrs at 25°C)
↓	↓	↓
Germination	Germination	Germination
↓	↓	↓
Drying	Drying	Drying
(90min.at 80°C)	(90min.at 80°C)	(90min.at 80°C)
↓	↓	↓
Devegetation	Devegetation	Devegetation
(loss of wt.5%)	(loss of wt.5%)	(loss of wt.5%)
↓	↓	↓

Dehusking
(Loss of wt.0%)
Dehusking
(Loss of wt.10%)
Dehusking
(loss of wt.3%)

↓

Grinding
(loss of wt.2%)

Comparison of malted weaning food with branded weaning food.

Parameters	Cerelac	Sample
Moisture (%)	2.6	2.13
Ash (%)	5.4	8.5
Reducing sugar (mg)	-	6000.50
Non-reducing sugar (mg)	-	2500.75
Crude fiber (%)	2.75	2.05
Crude fat (%)	9.0	7.5
Crude protein (%)	12.25	9.2
Starch (%)	-	76.5
Phosphorus (mg)	240	210
Calcium (mg)	325	250
Iron (mg)	6.25	4.2
Vitamin C (mg)	21.3	24.2

CONCLUSION

We have reported in this work the effect which steeping and kilning conditions have on the development of alpha-amylase in sorghum. Result suggests that the choice of steeping and

kilning conditions is fundamental to the development of high quality malts from sorghum and legumes grains. The use of malt in weaning food formulation yields a product with improved functional characteristics and high nutritive value. A formulation containing 60% sorghum malt, 30% Rajma malt and 10% moth bean flour is more nutritious and has better acceptability because of reduce viscosity.

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