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STUDIES ON DEVELOPMENT OF WEANING FOOD BASED ON LEGUMES

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Abstract: Attempts were made to utilize available food sources in formulation of weaning foods. Common legumes (chick pea and moth bean) were used as protein source. While sorghum were used as a glucose source. The semi-solid 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% Chick pea malt and 10% moth bean flour is more nutritious and has better acceptability.

Keywords: legumes, infants, nutrient, steeping, kilning, malt, alpha-amylase, protein.

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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 (Chick pea, 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 :-(Chick pea, Moth Bean),
Chick pea (Chick pea)
The chickpea or chick pea (Cicer arietinum) is a legume of the family Fabaceae, subfamily Faboideae. Its different types are variously known as gram. or Bengal gram, garbanzo or garbanzo bean, Egyptian pea. Its seeds are high in protein. It is one of the earliest cultivated legumes: 7,500-year-old remains have been found in the Middle East.[
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 Maharastrian 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 majorprimate 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 includeglucose, fructose and galactose. The table or granulated sugar most customarily used as food is sucrose, a disaccharide. Other disaccharides includemaltose 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	56.33

Table No.7 Optimum steeping conditions

1. 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	20

Table No.08 Optimum condition of germination

2. Drying

The optimum condition f 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°Crequired 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	31

Table No.9 Optimum condition for drying

Pocess of the weaning food preparation :

Sorghum	Chick pea	Moth bean
(600gm)	(300gm)	(100gm)
↓	↓	↓
Steeping	steeping	steeping
(36hrs at 25ºC)	(30hrs at 25ºC)	(24hrs at 25ºC)
↓	↓	↓
Germination	Germination	Germination
↓	↓	↓
Drying	Drying	Drying

(90min.at 80ºC)	(90min.at 80ºC)	(90min.at 80ºC)
↓	↓	↓
Devegatation	Devegatation	Devegatation
(loss of wt.5%)	(loss of wt.5%)	(loss of wt.5%)
↓	↓	↓
Dehusking	Dehusking	Dehusking
(Loss of wt.0%)	(Loss of wt.7%)	(loss of wt.3%)
	↓	
	Grinding	
	(loss of wt.2%)	

Comparison of malted weaning food with branded weaning food.

Parameters	Cerelac	Sample
Moisture (%)	2.6	2.15
Ash (%)	5.4	8.7
Reducing sugar (mg)	-	6090.50
Non-reducing sugar (mg)	-	3100.75
Crude fiber (%)	2.75	1.97
Crude fat (%)	9.0	6.9
Crude protein (%)	12.25	11.2
Starch (%)	-	75.5
Phosphorus (mg)	240	223
Calcium (mg)	325	252
Iron (mg)	6.25	4.35
Vitamin C (mg)	21.3	25.2

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% Chick pea malt and 10% moth bean flour is more nutritious and has better acceptability because of reduce viscosity.

References

1. Allowances. 10th edition Washington, DC : National Academy Pres, 1989.And Legumes. 1998 and Pigeon Pea (Cajanus cajan),2011

2. Axlesson, I.; Borulf, S. and Raiha, N.C.R. (1987a). Protein intake during weaning. II. Metabolic responses. Acta Paediatrics Scandinavica 76. 457-462.

3. Axlesson, I.; Borulf, S.; Righard, L. and Raiha, N.C.R. (1987b). Protein and energy intake during weaning. I. Effects on growth. Acta Paediatrics Scandinavica 76. 321-327.

4. Barrell, R.A.E. and Rowland, M.G.M. (1979). The relationship between rainfall and well water population in a west Africa (Gambian) village. Journal of Hygiene 33, 143-150.

5. Brandtzaeg, B.; Malleshi, N.G.; Svanberg, U.; Desikachar, HSR.; Mellander, 0. (1981). Dietary bulk as a limiting factor for nutrient intake in preschool children. J. Trop. Pediet. 27. 184-249.

6. Bressani, R. and Elias, G.L. (1983). Guidelines for the development of processed and packaged weaning foods. Food and Nut. Bull., Vol. 5. No. 3. 57-64.

7. Briggo, G.M. and Callaway, D.H. (1984). Nutritional and physical fitness, 11th* edn., CBS. College Pub. U.S.A.

8. B.C. Hobbs , J.H.B. Christian. Microbiological safety of foods. In: Microbiological brownell, phd Examining the Nutritional Quality of BreakfastCereals Marketed to Children 2008

9. E.R Monsen, Dietary reference intakes for the antioxidants nutrients vitamin C, E, selenium and carotenoids. J Am Diet Assoc 2000; 100:637-40.

10. FAO/WHO. Codex Alimentarius Commission. Codex standard for foods for infants and Food and Nutrition Board, National Research Council. Recommended dietary.

11. Modu S, Laminu HH, Nkama I (2005). Production, chemical and sensory properties of Ogi (akamu) from different pearl millet varieties. Pak. J. Biol. Sci. 5(2):103-107. Akingbala JO, Roorey LW, Faubion JM (1981).

12. Laboratory procedure for the preparation of Ogi, a Nigerian fermented food. J. Food Sci. 64:1523-1526. Akinrele IA (1970).

13. Fermentation studies on maize during the preparation of traditional African starch-cake food. J. Food Sci. Agric. 21:619-625.

14. Association of official analytical Chemist (AOAC) (2000). Official method of analysis, Washington D.C, USA. Akpapanam MA (1984).

15. Characteristic of moi-moi flour Prepared from cowpea/maize blends NIFO'S (2003) and 3(1,2 and 3):207-208.

16. Abdulrahaman AA (1997). Medicinal important of plants in the frontiers, 1 at ed. Edition by K.A Omotosho, Elopo press, Ilorin, pp.22-25. Beuchat LR (1983).

17. Traditional fermented food products in food and beverage mycology. Beuchat, L.R. Ed. A VI, West Port CT.

18. Badaloo A, Reid M, Soares D, Forrester I, Jahoor F (2006). Relation between liver fat and the rate of VLDL apoliprotein B-IOO synthesis in children with protein malnutrition. Am. J. Clin. Nutr. 81:1126-32.

19. Ezeokonkwo CA (2004). Biochemical properties of fermented Terminalia Catappa L. seed in Nigeria. J. Food. Sci. 25(2):38-42.

20. El- Tinay AH, Abdul Gadir AM, EI- Hadai M (1979). Surghum fermented kisra bread, I. Nutritive value kisra. J. Sci. Food Agric. 30:859.

21. FAO (2009). Cereals utilization for animal feed on the increase, food and Agriculture organization, Rome, Cereals. 13:6.

22. Fashakin JB, Awoyefa MB, Furst P (1986). The application of protein concentrate from locally available legumes in the development of weaning foods. Z Emahruging. Z Ernahrungswiss 25:220.

23. FAO/WHO/UNU, (1985) Expert consultation energy and proteins WHO technical Report series, No 721, Geneva (1985).

24. Hellstrom, A. Hermanson, A. M, Karson, A. Languist, B., Mallander O. and Sunberg U. (1981), Dietary bulk as a Limiting factor in nutrient intake with special reference to the feeding of pre-school children. J. Tropical Pediatrics 27: 127-135.

25. Kazanas, N. and Fields, M.L. (1981) Nutritional improvement of sorghum by fermentation, J. Food Sci. 46, 819.

26. Lancaster, P.A. Ingram, J.S., Lim, M.Y. and Coursay D.G. (1982), Traditional cassava basic foods. Survey of processing techniques Econ. Bot 36, 12-45.

27. Lee Drive, J.K. and 8.S. Kadam. (2008), Critical reviews in food science and nutrition, Food Science 28: 348-400.

28. Milner, M. (1969), Protein Enriched cereals food for world needs-st Paul, MN: American Association of cereal chemists.

29. Marero, L.M. Payumo, A.R, Aguinolda, A R, and Hammas, S. (1988), Nutritional characteristics of weaning foods prepared from germination cereals and legumes. J. Foods Science, 53 (5): 1399-1400.

30. Mahana and EscofI-Stum, (1996), S. Krause's food nutrition and diet therapy.

31. Mc Watter, KH. Cherry JP (1983), Emulsification, foaming and protein solubility properties of defatted soybean, peanut, field pea and pecon flowers. J. Food Science 12: 1444-1450

32. Newman, JK, and SS Kadam(1984), Nutritional improvement of cereals by fermentation, CRC unit Rev. Food Science- Nutr 28: 349-400.

33. Nanson NJ, Field ML (1986). Influence of temperature on the nutrient value of lactic acid fermented corn meal. J. Food Sci. 49: 958-959.

34. Osagie AU, Eka OU (1998). Nutritional quality of plant foods. Post harvest research unit, University of Benin, Benin. pp.34-4.

35. Sinha M, Lien E, Nilsen NJ (1999). Effect of processing (sprouting and/or fermentation in sorghum and maize 11: Vitamins and animal acid composition, Biological evaluation of maize protein. Food Chem. 48:201-204.

36. Pollitt E, Leibel RL, Greenfield D (1995). Brief fasting, stress and cognition in children, Am din nutr Panadalal, N.G and Kurup PV (1963), Isolation of organisms from Idli paste, Indian J. Microbia. 13:155.

37. Reddy NR, Salunkhe DK (1980). Effect of fermentation on phytate, phosphorus and mineral in black gram, rice and black gram. and rice blends. J. Food Sci. 45:1708.

38. Salmon C, Shackefford TK (2008). Family relationship, An evolutionary perspective, Oxford University press. pp.148-149.

39. Singh B (2003) Improving-the production and utilization of cowpea as food and food freed crop research 84:169-180.

40. Tangual P, Nanson NJ, Fields ML (1979). Effect of the proteolytic bacteria in natural fermentation of corn to increase its nutritive value, J. Food Sci. 44:456.

41. Uwaegbute AC (1991). Weaning practices and weaning food of Nigeria. Ecol. Food Nutr. 26:139-153.