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Development of Weaning Food from Germinated Grains

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Abstract: The present research is carried out to develop weaning food with from cheap, locally available grains and improving its nutritional availability by germination. The sugar was substituted with dry date powder (till 10%) to reduce sugar content of weaning food. Developed weaning foods ingredients composition was confirmed on the basis of sensory, nutritional and functional properties evaluation. The confirmed formulation was packed in three different packaging materials (LDPE pouch, HDPE standing pouch, aluminium laminate pouch) and effect of storage period on moisture content, total plate count, yeast and mold count, peroxide value were analysed to check storage stability of weaning food. The weaning food sample with 5% dry date powder and 15% sugar got highest score in sensory analysis (colour-8.3, taste-8.6, flavour-8.3, mouthfeel-8.4) and received higher overall acceptability (overall acceptability-8.3) compared to other samples. The moisture content, crude protein, crude fat, crude fiber and crude ash of weaning food were increased with increase in the concentration of dry date powder. However, carbohydrates were decreased with decrease in dry date powder. The iron and calcium content were increased with increased with increase in dry date powder. The water absorption capacity and swelling capacity were directly proportional to the concentration of dry date powder. The moisture content, total plate count, yeast and mold count, peroxide value were in acceptable limit in all packaging material but slight less in aluminium laminate pouch as compare to HDPE standing pouch and LDPE pouch after the period of 42 days.

Index Terms **- Malnutrition, weaning food, germinated soybean flour, germinated pearl millet flour, germinated barley flour, skim milk powder, dry date powder.**

I. INTRODUCTION

Weaning is known to be very critical period in the life of children's between age of 6 to 18 or 24 months of age. Weaning is phase in which mothers' milk is substituted with complimentary food. This phase is very vulnerable to occurrence of malnutrition due to protein deficiency, nearly 40% of children below age of five years suffers from malnutrition worldwide during this phase. Weaning is gradually substituting mothers' milk with family food (Sethy *et al*., 2020). The developing countries are facing major problem of protein energy malnutrition in infants. The good quality protein food is not available in the rural areas of developing countries and existing products in market are way more expensive than the affordability of low-income families. The low-income families go towards traditional practices of weaning food preparation. Traditional weaning foods are bulky and nutritionally inferior due to material used for preparation is mainly cereals and grains (Palukurty, 2019). Unorganised weaning of infant during critical period of weaning might lead to poor health and malnutrition (Talib *et al*., 2017).

The present investigation is an attempt to come up with a weaning food which is sufficiently rich in nutrients to meet the needs of growing infant and by the use of cheap and locally available ingredients. Millets and barley are the major cereals cultivated in India which are inexpensive and are widely available. They contribute to the energy need of many low-income families too. They are rich in protein, calcium, Iron and B-complex vitamins (Srivastava *et al*, 2015). Soybean is rich source of protein, dietary fiber, vitamins and minerals and contains less carbohydrates. Soybean protein provides all essential amino acids and have high biological value. The high protein content in soybean provides good protein content in weaning food and help to overcome malnutrition (Okwunodulu *et.al*., 2020). Barley provides good amount of nutrition and widely available in India. The importance of barley is due to its unique soluble fiber beta-glucan and antioxidant phytochemicals (Badea *et al*., 2021).

In view of the increased demand from people toward weaning food, the present research work is designed to develop process technology for weaning food from germinated soybean flour, germinated barley flour, germinated pearl millet flour, wheat flour and dry date powder with standardization of recipe, nutritional, functional, sensory, storage stability evaluation and production cost estimation.

II. MATERIAL

Weaning food was developed by using germinated soybean flour, germinated pearl millet flour, germinated barley flour, wheat flour, skimmed milk powder with varying proportions (%) of sugar and dry date powder (22.5:2.5, 20:5, 17.5:7.5, 15:10). The control formulation was prepared without dry date powder.

2.1 Preparation of germinated soybean flour

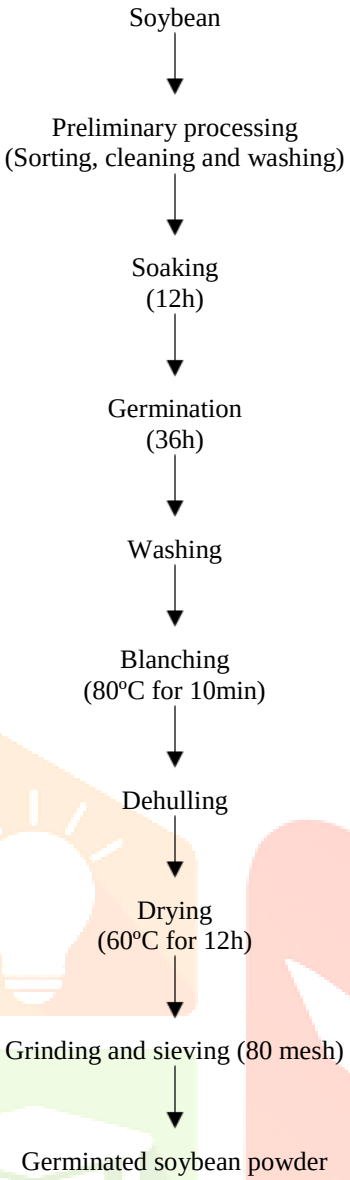
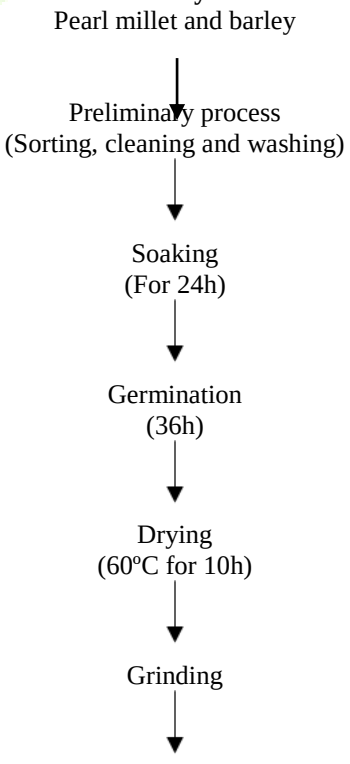


Fig 2.1. Flowsheet for preparation of germinated soybean flour

2.2Preparation of flour from germinated pearl millet and barley



Sieving (80 mesh)

↓

Germinated pearl millet and barley powder

Fig 2.2. Flowsheet for preparation of germinated flour from pearl millet and barley

2.3. Preparation of weaning food

Pearl millet flour, barley flour, soybean flour, wheat flour

↓

Blending
(Sugar and skim milk powder)

↓

Packaging
(LDPE pouch, HDPE standing pouch and aluminium laminate pouch)

↓

Storage study (25±2°C)

Fig 2.3. Flowsheet for preparation of weaning food

Table 1. Ingredient formulation of weaning food

Samples	Soybean (%)	Pearl millet (%)	Barley (%)	Wheat (%)	SMP (%)	Sugar (%)	Dry date powder (%)
S_0	20	20	15	10	10	25.00	0.00
S_1	20	20	15	10	10	22.50	2.50
S_2	20	20	15	10	10	20.00	5.00
S_3	20	20	15	10	10	17.50	7.50
S_4	20	20	15	10	10	15.00	10.00

S_0 - Without date powder and 25% sugar
S_1 - 2.5% dry date powder and 22.50% sugar
S_2 - 5% dry date powder and 20% sugar
S_3 - 7.5% dry date powder and 17.50% sugar
S_4 - 10% dry date powder and 15% sugar

2.4. Proximate composition analysis

Estimation of moisture, fat, ash, carbohydrates, iron and calcium were done by standard methods from AOAC (2005). The estimation of fat and fiber were done by standard methods from AOAC (2019).

2.5. Sensory analysis

The sensory evaluation of weaning food was carried out by using 9- point hedonic rating (1-Extremely dislike to 9- Extremely like) Guddad *et al*. (2014). The weaning food was assessed for sensory parameters (colour, taste, flavour, mouthfeel and overall acceptability) by a panel of semi trained judges. The final score for each attribute was obtained by taking the mean of the scores of all the panellists.

2.6. Functional properties analysis

2.6.1. Water absorption capacity

Water absorption capacity was determined as per the method suggested by Sakare *et al*. (2020). 1g of powdered sample was weighed into centrifuge tube. Then 10ml of distilled water was mixed with sample in centrifuge tube. Vortex mixer was used at high speed to agitate a sample for 1min. The sample was rested for 30min and then centrifuged at 6400 rpm for 20min. Then the weight of remained sample after discarding the supernatant was taken. Then absorption of water per g of sample was calculated.

$$\% \text{ Water absorption capacity} = \frac{\text{Weight of remained sample}}{\text{Weight of sample}} \times 100$$

2.6.2. Swelling capacity

Swelling capacity of sample was determined as per the method recommended by Chandra (2013). The graduated cylinder of 100ml was taken. Then sample was filled in the cylinder up to 10ml mark. Then distilled water was added in cylinder till it reaches to 50ml volume. Then the top of cylinder was closed and inverted for mixing. The inverting process was carried out for 2min continuously. Then the cylinder was left to stand for 8min. Then after 8min the occupied volume by the sample was taken and represented in the terms of swelling capacity (ml/g).

2.7. Storage stability analysis

2.7.1. Moisture

The moisture content was determined by standard methods from AOAC (2005).

2.7.2. Peroxide value

Determination of peroxide value was carried out by using method of AOAC (2000). 5g of sample was weighed into 250ml stopperd conical flask. 30ml of acetic acid – chloroform mixture was added in flask and dissolved by swirling. 0.5ml of saturated potassium iodide solution was added. The mixture was kept in the dark for one minute with occasional shaking, and then 30ml of water added. Liberated iodine was titrated with 0.01N sodium thiosulphate solution ($Na_2S_2O_3$) until the yellow colour disappearance. 0.5ml of starch solution was added as indicator titrated with vigorous shaking until blue colour disappeared. The % peroxide value was calculated by using following equation,

$$\text{Peroxide value} = \frac{A \times N \times 1000}{\text{weight of sample}} \text{ meq/kg oil}$$

2.7.3. Total plate count

The total plate count of weaning food was determined by using method by Kukade *et al*. (2017). The nutrient agar media was used as media for growth. The dilution of 10^3 was made up and aliquot of 0.1ml was used for isolation. All process was carried out in the sterile area with the help of laminar air flow. Then plates were placed into the incubator for 48h at 37℃.

$$\text{Total plate count (cfu/g)} = \frac{\text{Number of colonies} \times \text{Dilutions}}{\text{Volume of the sample taken}}$$

2.7.4. Yeast and mold count

The yeast and mold count of weaning food was determined by using method by Kukade *et al*. (2017). The potato dextrose agar was used as media for growth. The dilution of 10^3 was made up and aliquot of 0.1ml was used for isolation. All process was carried out in the sterile area with the help of laminar air flow. Then plates were placed into the incubator for 48h at 37℃.

$$\text{Yeast and mold count (cfu/g)} = \frac{\text{Number of colonies} \times \text{Dilutions}}{\text{Volume of the sample taken}}$$

2.8. Statistical analysis

One way variance was used to perform statistical analysis. The triplicate values were taken to calculate mean. The critical difference (CD) was used to calculate level of significance. Completely randomized design (CRD) was used for analysis of data.

III. Result and discussion

3.1. Proximate composition of raw material

The proximate composition of germinated soybean flour, germinated pearl millet flour, germinated barley flour, wheat flour and dry date powder depicted in table 3.1 justifies suitability of raw ingredients for development of weaning food. The moisture content was found to be highest (7.60%) in germinated barley flour followed by dry date powder (6.10%). The lowest (3.40%) moisture content was found in soybean followed by pearl millet (5.13%). The highest (15.80%) fat content was found in germinated soybean flour followed by germinated pearl millet flour (3.66%). The lowest (0.23%) fat content was found in dry date powder followed by wheat flour (1.46%). The highest (40.30%) protein content was observed in germinated soybean flour followed by germinated pearl millet (11.87%). The lowest protein content was observed in dry date powder (1.80%). The highest (10.83%) crude fiber content was found in wheat flour followed by germinated barley flour (9.52%). The Lowest (2.20%) crude fiber was found in dry date powder followed by germinated pearl millet flour (2.55%). The highest (5.54%) ash content was found in germinated soybean flour followed by germinated pearl millet (2.04%). The lowest (1%) ash content was observed in wheat flour followed by dry date powder (1.03%). The highest (88.64%) carbohydrate content was found in dry date powder followed by germinated pearl millet flour (74.54%). The lowest (26.56%) carbohydrate content was found in germinated soybean flour followed by germinated barley flour (67.95%).

Table 3.1: Proximate composition of raw materials

Raw materials	Moisture (%)	Crude fat (%)	Crude protein (%)	Crude fiber (%)	Crude ash (%)	Carbohydrates (%)
Germinated soybean flour	03.40±0.2	15.80±0.25	40.30±0.20	08.40±0.21	05.54±0.07	26.56±0.14
Germinated pearl millet flour	05.13±0.15	3.66±0.15	11.87±0.01	02.55±0.05	02.04±0.02	74.75±0.26
Germinated barley flour	07.60±0.26	01.50±0.10	11.87±0.03	09.52±0.31	01.56±0.04	67.95±0.56
Wheat flour	05.76±0.15	01.46±0.15	11.19±0.05	10.83±0.05	01.00±0.02	69.76±0.47
Dry date powder	06.10±0.10	00.23±0.05	01.80±0.10	02.20±0.01	01.03±0.02	88.64±0.15

(The triplicates observations are represented as mean ± standard deviation)

3.2. Sensory profile of weaning food from germinated grains

The data on sensory properties presented in graphical format (Fig 3.1) projected effect of ingredient composition (germinated soybean, germinated pearl millet, germinated barley, wheat, skim milk powder, sugar and dry date) on colour, taste, flavour, mouthfeel and overall acceptability score of germinated flour based weaning food. The weaning food sample with 5% dry date powder recorded slightly higher sensory score as compared to control sample. The weaning food prepared with 5% dry date powder was found to have highest score for colour (8.3), taste (8.6), flavour (8.3), mouthfeel (8.4) and overall acceptability (8.3) among all the samples. The addition of dry date powder as replacement to sugar at this extent could have blended well together with other ingredients therefore improved sensory score and overall acceptability of sample with 5% dry date powder was recorded.

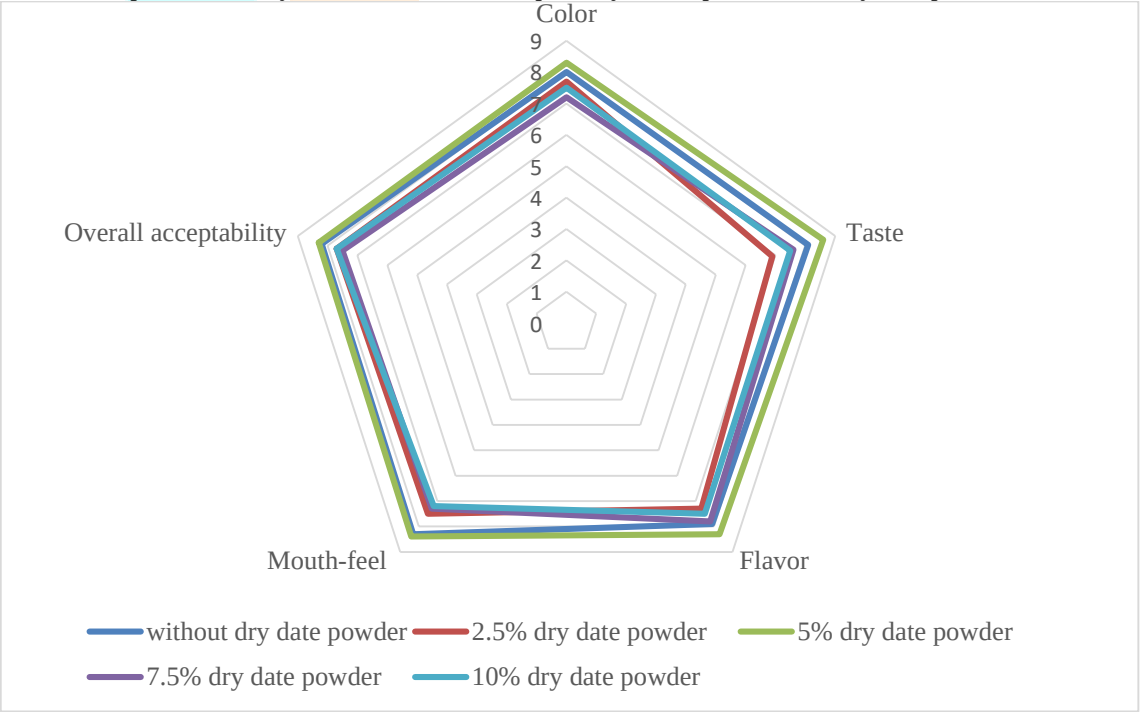


Fig. 3.1: Graphical representation of sensory evaluation studies of weaning food

(S_0-Without dry date powder, S_1-2.5% dry date powder, S_2-5% dry date powder, S_3-7.5% dry date powder, S_4-10% dry date powder)

3.3. Proximate composition of weaning food

The data on proximate composition of developed weaning food depicted in table 4.2 reflects on effect of date powder concentration on moisture, crude fat, crude protein, crude fiber, crude ash and carbohydrates. The significant increase in moisture content was observed from 4.16% (without dry date) to 4.73% (10% dry date) with increase in dry date powder (Table 3.2). The increase in moisture content of samples might be due to the ability of date powder to absorb more water than sugar powder (Alsenaien *et al*., 2015). The significant increase in crude fat of weaning food was observed from 4.60 to 4.91% with increase in dry date concentration (0 to 10%). The increased crude fat (4.91%) with 10% dry date sample as compared to other formulations can be attributed to higher fat content in date than the sugar (Nadeem *et al*., 2017). The significant increase in the crude protein and crude fibre was observed with increase in dry date concentration. The crude protein and crude fiber content in weaning food sample was increased from 17.06 and 3.54% (without dry date) to 17.94 and 4.02% (10% dry date), respectively. The increase in protein and fiber content as increase in the composition of date powder may be associated with higher composition of these nutrients in date than sugar (Shahida *et al*., 2020). The ash content reported significant increase from 1.56% (without dry date) to 2.01% (10% dry date). This increase in ash content might be due to higher non-organic matter in dry date powder as compared to sugar. The carbohydrate content was found to be highest in sample without dry date (68.54%) and lowest in sample with 10% dry date (66.39%). The significant decrease in carbohydrates was recorded that could be attributed to higher carbohydrate content in sugar as compared to dry date (Nadeem *et al*., 2017).

Table 3.2: Nutritional composition of weaning food developed from germinated grains

Sample	Moisture (%)	Crude fat (%)	Crude protein (%)	Crude fiber (%)	Crude ash (%)	Carbohydrates (%)
S_0	04.16	04.60	17.06	03.54	01.56	68.54
S_1	04.26	04.73	17.76	03.75	01.60	67.90
S_2	04.43	04.78	17.81	03.80	01.62	67.56
S_3	04.60	04.81	17.85	03.84	01.81	67.09
S_4	04.73	04.91	17.94	04.02	02.01	66.39
SE ±	0.17	0.15	0.21	0.28	0.24	0.85
CD @5%	0.57	0.48	0.67	0.92	0.79	2.74

(Average value of triplicate observations is presented)

(S_0- Without dry date powder, S_1-2.5% dry date powder, S_2-5% dry date powder, S_3-7.5% dry date powder, S_4-10% dry date powder)

3.4. Mineral composition of weaning food

The data on mineral composition depicted in table 3.3 project the effect of date powder composition on iron and calcium content of developed weaning food. The iron content recorded significant increase (8.13 to 8.89mg/100g) with increase in dry date concentration (without date powder to 10%). This increase in iron content might be due to higher concentration of iron in dry date powder than sugar (Ali *et al*., 2012 and Ahmad *et al*., 2014). The significant increase in calcium content was observed in all weaning food samples from 145.30mg/100g (without date powder) to 147.40mg/100g (10% date powder). Significant increase in calcium content with increasing dry date powder concentration can be corelated with higher calcium content in dates (Ali *et al*., 2012 and Ahmad *et al*., 2014). The incorporation of dry date powder as replacement to sugar resulted in increased iron and calcium content in weaning food responsible for neurodevelopment, improving immunity and bone strength in infants (Bueno *et al*., 2008 and Domellof *et al*., 2014).

Table 3.3: Mineral composition of weaning food

Sample	Iron (mg/100g)	Calcium (mg/100g)
S_0	08.13	145.30
S_1	08.32	145.65
S_2	08.50	146.00
S_3	08.68	147.00
S_4	08.89	147.40
SE ±	0.17	0.69
CD @5%	0.57	2.22

(Average value of triplicate observations is presented)

(S_0- Without dry date powder, S_1-2.5% dry date powder, S_2-5% dry date powder, S_3-7.5% dry date powder, S_4-10% dry date powder)

3.5. Functional properties of weaning food

The data on functional properties of developed weaning food depicted in table 3.4 illustrate the effect of date powder composition on water absorption capacity and swelling capacity. The water absorption capacity in weaning food was increased from 1.42ml/g (without date powder) to 2.23ml/g (10% date powder). The significant increase in water-absorption capacity might be due to higher content of broken starch, protein and fiber in date powder (Awuchi *et al*., 2019). The significant increase in swelling capacity of all weaning food samples was observed from 1.21ml/g (without date powder) to 1.34ml/g (10% date powder) with increase in concentration of date powder. The increase in swelling capacity was attributed to higher amount of branched amylopectin and amylose in date powder than sugar (Awuchi *et al*., 2019).

Table 3.4: Functional properties of weaning food formulations

Sample	Water absorption capacity (ml/g)	Swelling capacity (ml/g)
S_0	1.42	1.21
S_1	1.67	1.23
S_2	1.86	1.27
S_3	2.08	1.30
S_4	2.23	1.34
SE ±	0.17	0.06
CD @5%	0.56	0.19

(Average value of triplicate observations is presented)

(S_0- Without dry date powder, S_1-2.5% dry date powder, S_2-5% dry date powder, S_3-7.5% dry date powder, S_4-10% dry date powder)

3.6. Storage stability of weaning food

The weaning food prepared with 5% dry date powder (higher overall acceptability) was stored at ambient temperature (25±2°C) in three different types of packaging material (LDPE pouch, HDPE standing pouch and aluminium laminate pouch) and effect of storage on moisture, peroxide value, total plate count and yeast and mold count is presented in tabular form (Table 3.5 to 4.7).

3.6.1. Moisture content

The effect of storage period on moisture content of selected weaning food sample (5% date powder) packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch depicted in table 3.5 projected increasing trend with advancement of storage period. The significant increase in moisture content of sample packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch was observed from 4.43% to 4.61, 4.57 and 4.52%, respectively after the period of 42 days. The increase in moisture content might be due to hygroscopic weaning food and nature of packaging material. The similar results were reported by (Sethy *et al*., 2020). Increase in the moisture content was within the acceptable limit in all the packaging materials but, it was slight less in aluminium laminate pouch followed by HDPE standing pouch and LDPE pouch.

Table 3.5: Effect of packaging material and storage period on moisture content (%) of weaning food

Days	LDPE pouch	HDPE standing pouch	Aluminium laminate pouch
Day 0	04.43	04.43	04.43
Day 7	04.45	04.44	04.44
Day 14	04.47	04.47	04.46
Day 21	04.50	04.49	04.48
Day 28	04.53	04.52	04.49
Day 35	04.61	04.54	04.50
Day 42	04.61	04.57	04.52
SE ±	0.02	0.02	0.01
CD @5%	0.07	0.06	0.04

(Average value of triplicate observations is presented)

3.6.2. Peroxide value

The data on peroxide value of weaning food (5% date powder) packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch (table 3.6) projected effect of storage period on storability index (peroxide value). Significant increase was recorded in peroxide value of weaning food packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch from 0.40meq/kg to 1.20, 1.12 and 1.90meq/kg, respectively after the storage period of 42 days. The similar results of increase in peroxide value due to lipid oxidation was recorded by (Sethy *et al*., 2020). The gradual increase in peroxide value was recorded in sample packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch. However, it was lower in aluminium laminate pouch as compared to other packaging material.

Table 3.6: Effect of packaging material and storage period on peroxide value (meq/kg) of weaning food

Days	LDPE pouch	HDPE standing pouch	Aluminium laminate pouch
Day 0	0.40	0.40	0.40
Day 7	0.64	0.52	0.48
Day 14	0.80	0.70	0.52
Day 21	0.92	0.84	0.64
Day 28	01.00	0.90	0.76
Day 35	01.10	01.00	0.84
Day 42	01.20	01.12	0.90
SE ±	0.07	0.06	0.05
CD @5%	0.20	0.19	0.14

(Average value of triplicate observations is presented)

3.6.3. Total plate count

The effect of storage period on total plate count of selected weaning food sample (5% date powder) packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch is presented in table 3.7. Total plate count was not found in sample packed in LDPE pouch, HDPE standing pouch and aluminium laminate pouch till 21 days and recorded comparatively higher increase from 28th day as 1.28, 1.27 and 1.10×10^{3}cfu/g to 2.20, 2.12 and 2.00×10^{3}cfu/g, respectively at 42nd day. The said increase in total plate count might be due to post processing contamination (Kukade *et al.*, 2017). Total plate count of samples packed in all types of packaging material was observed to be in acceptable limit till 42 days of storage but, slightly higher in HDPE standing pouch and LDPE pouch than the aluminium laminate pouch.

Table 3.7: Effect of packaging material and storage period on total plate count (10^3cfu/g) of weaning food

Days	LDPE pouch	HDPE standing pouch	Aluminium laminate pouch
Day 0	0	0	0
Day 7	0	0	0
Day 14	0	0	0
Day 21	0	0	0
Day 28	01.28	01.27	01.10
Day 35	01.83	01.79	01.70
Day 42	02.20	02.12	02.00
SE ±	0.26	0.25	0.23
CD @5%	NS	NS	NS

(Average value of triplicate observations is presented)

3.6.4. Yeast and mold count

The yeast and mold count were absent in all packaging material throughout the storage period (42 days). Similar results were reported by (Jadhavar *et al*., 2022).

3.7 Production cost estimation of weaning food

The production cost of developed weaning food (5% dry date powder) was estimated on the basis of raw material cost, processing cost and showcased in table 3.8.

Table 3.8: Cost analysis for 1kg product

Items		Cost (Rs/kg)	Quantity required/kg	Cost of raw material required/kg (Rs.)
Soybean		55	200	11.00
Pearl millet		31	200	06.20
Barley		40	150	06.00
Wheat		25	100	02.50
Skim milk powder		450	100	45.00
Sugar powder		40	200	08.00
Dry date		180	50	09.00
Cost of raw material/kg				87.70
Packaging material cost/kg				04.00
A. Total cost including packaging				91.70
Fluctuation charges in price (10%)				09.17
Overhead charges (20%)				18.34
B. Processing charges /kg				27.51
C.	**Production cost/kg (A+B)**			119.21
D.	**Profit (20%)**			23.84
E.	**Selling price/kg (C+D)**			143.05

IV. Conclusion

Weaning food incorporated with 5% dry date powder confirmed the consumer acceptability on the basis of highest sensory score of color (8.3), taste (8.6), flavor (8.3), mouthfeel (8.4) and overall acceptability (8.3). The moisture content (4.16 to 4.73%), crude fat (4.60 to 4.91%), crude protein (17.06 to 17.94%), crude fiber (3.54 to 4.02%) and crude ash (1.56 to 2.01%) were increased with increase in concentration of dry date powder. However, carbohydrates (68.54 to 66.39%) were decreased with the increase in concentration of dry date powder. The highest iron (8.89mg/100g) and calcium (147.40mg/100g) content were found in the sample containing 10% dry date powder. The minerals were found to be increased with increase in composition of dry date powder. The functional properties as water absorption capacity (1.42 to 2.23ml/g) and swelling capacity (1.21 to 1.34ml/g) were increased with increase in concentration of dry date powder in weaning food. The moisture content of weaning food increased with increase in the storage period. The moisture content of weaning food packed in LDPE pouch, HDPE standing pouch, aluminium laminate pouch was increased from 4.43% to 4.61, 4.57, 4.52%, respectively. The lowest moisture content after 42 days of storage period was observed in aluminium laminate pouch. The peroxide value of weaning food as 1.20, 1.12 and 0.90 meq/kg on 42nd day of storage in LDPE pouch, HDPE standing pouch aluminium laminate pouch, justified storage stability of weaning food for 42 days. The lowest peroxide value after 42 days of storage period was observed in aluminium laminate pouch. The weaning food packed in aluminum laminate pouch (2.00×10^3cfu/g) shown very less count of colonies after the period of 42 days followed by HDPE standing pouch (2.12×10^3cfu/g) and LDPE pouch (2.20×10^3cfu/g). The lowest count of colonies after the 42 days period was observed in aluminium laminate pouch. Total plate count of weaning food packed in all types of packaging material was observed to be in acceptable limit (<10000cfu/g) till 42 days of storage. The weaning food packed in all packaging materials were free from yeast and mold growth till the period of 42 days.

The production cost for 1kg of developed weaning food (5% date powder) was Rs. 119.21. The selling price was estimated as Rs. 143.05 considering 20% profit margin.

From present investigation it can be concluded that the techno economically feasible weaning food can be developed from germinated grain flours (soybean, pearl millet and barley), wheat flour, by replacing 5% sugar with dry date powder as a supplementary diet to infants that may provide nutrition at low cost.

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