

Original Research Article

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Development of Therapeutic Food for Adolescent Girls

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ABSTRACT

Adolescents constitute over 21.4 % of the population in India. This age group needs special attention as is a period of rapid transition from childhood to adulthood that normally is characterized by important psychological and social changes in the age group of 10 -19 years. The adolescents number is expected to reach 1.13 billion by the year 2025. It is during the period of adolescence that nutrient needs are the greatest. Hence, the specific objectives of our study are to identify the key nutritional problems that affect adolescents and to develop a therapeutic food fulfilling their requirements. The present study was undertaken for the preparation and evaluation of a therapeutic food for Adolescent girls formulated with Bengal gram, Soya bean, Barley, Green gram, wheat and Ragi. Experiments were carried out in the Quality control lab, Andhra Pradesh Foods Pvt. Ltd. to study their chemical composition and overall acceptability. All the formulations were prepared according to the RDA requirements for adolescent girls. The therapeutic food formulated with Soya bean, Ragi and Green gram of 16g, 18g, and 30g respectively has attained the high levels of nutritional properties values but lower organoleptic properties. The formulation with composition of 17g of soya bean, 18g of barley and 30g of green gram has attained good nutritional values and highest acceptability in terms of hedonic rating. This formulated sample is highly preferable to adolescent girls suffering from anemia, stomach pain and nerves weakness patients as the food contains high amount of iron and the soya bean acts as the nutritional supplement to the growing adolescents.

Keywords

Therapeutic food, RDA (Required Dietary Allowances), Adolescents, Soya bean, High protein etc.

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Introduction

The term youth encompasses ages 10 to 24 years, while the term adolescents as defined by WHO (1986) includes persons aged 10-19 years. Adolescents are sometimes designated as 'children', for instance, in the UN

Convention on the Rights of the Child of 1989, which applies to all individuals below 18 years of age. The period of gradual transition from childhood to adulthood that normally begins with the onset of signs of puberty, is characterized by important psychological and social changes.

Adolescents are far from being a homogeneous group, in terms of development, maturity and lifestyle. Adolescence may be divided into three developmental stages based on physical, psychological and social changes.

Early adolescence, 10/13-14/15 years;

Mid adolescence, 14/15-17 Years;

Late adolescence, between 17-21 years, but variable.

Being in transition, adolescents may no longer benefit from the attention and care that usually go to children, but they may not get the protections associated with adulthood either. In developing countries, adolescents have an even higher demographic weight, for instance, roughly 26% in Salvador, compared to 14% in USA (Burt 1996). Similarly, in the Philippines, it is estimated that adolescents represent one quarter of the total population (Bouis *et al.*, 1998). In 1995, there were 914 million adolescents living in the developing world, that is, 85% of the total (United Nations 1997). Their number is expected to reach 1.13 billion by the year 2025. Adolescence is a period of rapid growth: up to 45% of skeletal growth takes place and 15 to 25% of adult height is achieved during adolescence (Rees and Christine, 1989). Nutrition influences growth and development throughout infancy, childhood and adolescence. It is, however, during the period of adolescence that nutrient needs are the greatest (Lifshitz, Tarim and Smith, 1993). Psychological and social aspects of adolescents development are less often described in connection with adolescent health than their physical growth and maturation characteristics (Gillespie 1997). However, recent studies have shown that the prevalence of malnutrition and anaemia is high in these age groups. Menarche is a

complex of growing up. From both medical and social perspectives, it is often considered as the central event of female puberty, as it suggests the possibility of fertility. Menarche further calls for special attention because of the physical and emotional problems associated with it. Though the menstrual cycle is a normal monthly function of a healthy female body, the main concern is delayed menstruation, irregular cycles pertaining to hormonal fluctuations and pain during menses which is felt in uterus and stomach. Since the International Youth Year of 1985 with its focus on adolescent issues in general and in the area of health in particular, has grown dramatically. Unfortunately, the assessment of the nutritional status of adolescent girls has been the least explored area of research, particularly in rural India. Hence, the present study was done with the objective of development of therapeutic food for the adolescent age group in India which fulfils the deficiencies and decreases nutritional problems of this segment.

Identification of nutritive problems in adolescent girls

In Adolescent Girls so many problems is prevented. Mainly In adolescent girls 80-90% suffering some of the problems undertaken are following.

Stomach pain
Back pain
Nerves weakness
Lack of blood (Anemia)
Eye sight
under weight
Obesity.

Stomach pain

It is caused due to lack of vitamin deficiency like niacin, B12 and Mineral deficiency caused due to potassium, Magnesium.

Back pain

It is caused due to lack of vitamin and minerals like Vitamin D and magnesium.

Nerves weakness

It is caused due to lack of vitamin deficiency in vitamin E, vitamin B12 and some of the mineral deficiency caused by magnesium and minor quantities of potassium, vitamin D.

Low blood levels

It is due to lack of Iron, magnesium, B12, Folate, Zinc.

Eyesight

It is due to lack of Vitamin A, Vitamin D and Minerals due to Magnesium, B12.

Obesity

It is due to lack of vitamin D, vitamin A. minerals due to magnesium, B12, Iodine

Underweight

It is due to lack of vitamin D and B12 mineral deficiency.

Materials and Methods

The following procedure/process is followed for development of Therapeutic food.

Selection of raw ingredients

The following raw materials were selected for preparing therapeutic food for adolescent girls.

Green gram
Barley
Bengal gram

Soya bean
Ragi
Wheat
Sugar
Refined Palmolein Oil (RPO)
Vitamin premix
Iron
Magnesium
Zinc
Niacin
Vitamin B
Vitamin D
Vitamin E

The nutritive values of raw materials are tabulated as follows.

Cleaning

In the cleaning machine, dust and extraneous material are removed by sieving by graded screens. Stones are also separated manually. All the raw materials are cleaned thoroughly.

Roasting

The raw materials are roasted at a temp of 110⁰ C in order to increase the aroma. Roasting imparts brown colour to raw material due to browning reactions. It also adds increase in acceptability. Roasting decreases the moisture content which helps in increasing the shelf life food product. Flavour changes due to roasting also increases its overall acceptability.

Nutritive values of roasted raw materials

The Nutritive values of roasted raw materials are given in the table 3.

Milling

All the roasted raw materials are grinded to a size of 0.01 mm using disc mill. It consists of no. discs which revolve along vertical axis.

The sharp periphery of discs helps in cutting or grinding the raw material. The raw material is fed at the head of the disc mill. The finely ground flours are received from the front cylindrical like opening attached the body of disc mill.

Formulation for preparation of therapeutic food samples

As per the RDA (Required Dietary Allowances) norms the following are the requirements prescribed for adolescent girls in view of their nutrition. The recommended requirements are tabulated as follows. Hence, the total calories required per day for an adolescent girl is 2368 kcal/day and energy supplied due to protein should be 10- 30 % i.e. 236- 710 kcal. Energy supplied due to carbohydrates should be 40 -65%. i.e. 1065 – 1539 kcal. Energy supplied due to fat should be 20-34% i.e. 473- 805 kcal. The energy levels supplied is divided by factor of 5 so that the food on consumption to 5 times the required energy levels will be attained. So, as 1gram of protein give 4 kilo calories and 1 gram of carbohydrate gives 4 kilo calories on dividing the energy supplied due to protein and carbohydrates by 4 we will get the required protein and carbohydrate ranges in 11-35grams and carbohydrates 42 -65grams. Similarly, as 1 gram of fat supplies 9 kilo calories of energy, on dividing the energy supplied due to fat by 9 we will get the no. of grams of fat to be supplied. It will be in the range of 10-17 grams.

Hence, required ranges of protein, carbohydrates and fat are

Protein: 11-35 grams
Carbohydrates: 40-65 grams
Fat: 10 -17 grams

So to standardize the nutritive contents, we have taken the middle values in the ranges

mentioned above. Hence the nutritive proportion maintained is as follows

Protein: 18grams
Carbohydrates: 63 grams
Fat: 14 grams

According to RDA recommendations, any such proportion in the above ranges is suitable for adolescent girls. So there will be a many such proportions which can be developed.

Now, keeping these nutritive values constant for all our samples, we developed equations in order to determine the composition of the sample (Fig. 1–6).

For the preparation of sample 1, the following ingredients were selected.

1. Soya bean
2. Barley
3. Green gram
4. Refined Palmolein oil
5. Sugar
6. Vitamin Premix

Formulas to figure out amount of ingredients required are as follows

$$0.44 x + 0.12 y + 0.26 z = 18\text{g(Protein)}\dots(1)$$

$$0.20 x + 0.01 y + 0.01 z = 4\text{g (Fat)}\dots(2)$$

$$0.21 x + 0.76 y + 0.64 z = 38\text{g (Carbohydrates)}\dots(3)$$

Where x is Soya bean, y is Barley and z is green gram

On solving the above equations the amount of ingredients required are found as follows

$$x = 17.49\text{g}, y = 18.34\text{g and } z = 30.50\text{g.}$$

The composition of sample 1 is given below

For the preparation of sample 2, the following ingredients were selected.

Soya bean
Bengal gram
Green gram
Refined Palmolein oil
Sugar
Vitamin premix

Formulas to figure out amount of ingredients required are as follows

$$0.23 x + 0.44 y + 0.26 z = 18g \text{ (Protein)...(1)}$$

$$0.05 x + 0.20 y + 0.01 z = 4g \text{ (Fat)...(2)}$$

$$0.61 x + 0.21 y + 0.64 z = 38g \text{ (Carbohydrates)...(3)}$$

Where x is Soya bean, y is Bengal gram and Z is green gram

On solving the above equations the amount of ingredients required are found as follows

$$x = 39.42g, y = 9.20g, \text{ and } z = 18.17g$$

The composition of sample -2 is given below

For the preparation of sample 3, the following ingredients were selected.

Soya bean
Wheat
Green gram
Refined Palmolein oil
Sugar
Vitamin premix

Formulas to figure out amount of ingredients required are as follows

$$0.44 x + 0.12 y + 0.26 z = 18g \text{ (Protien)...(1)}$$

$$0.20 x + 0.01 y + 0.01 z = 4g \text{ (Fat)...(2)}$$

$$0.21 x + 0.82 y + 0.64 z = 38g \text{ (Carbohydrates)...(3)}$$

Where x is Soyabean, y is wheat and z is green gram

On solving the above equations the amount of ingredients required are found as follows

$$x = 17.56g, y = 17.20g, \text{ and } z = 31.57g.$$

The composition of sample -3 is given below

For the preparation of sample 4, the following ingredients were selected.

Soya bean
Ragi
Green gram
Vitamin premix
Refined palmolein oil

Formulas to figure out amount of ingredients required are as follows

$$0.23 x + 0.44 y + 0.26 z = 18g... (1)$$

$$0.05 x + 0.20 y + 0.01 z = 4g... (2)$$

$$0.61 x + 0.21 y + 0.64 z = 38g... (3)$$

Where x is Soyabean, y is raghi and z is green gram

On solving the above equations the amount of ingredients required are found as follows X = 39.42g, Y = 9.20g, and Z = 18.17g

The composition of sample -4 is given below

Blending

All the flours prepared from roasted raw materials are now well mixed manually. Refined palmolein oil is used for proper mixing of flours. All the flours are blended

according to the developed formulas in small quantities.

Final product

Finally, the final products (Four samples) were obtained by uniformly blending all the flours to an extent up to which all the raw materials are uniformly distributed (Fig. 7).

Analysis of quality parameters

Determination of moisture content

5-10 grams of samples were taken Petri-dishes and kept in hot air oven at $105 \pm 1^{\circ}\text{C}$ for 4 hours. Then allowed sample to cool in a desiccator and weighed it.

Calculation

$$\% \text{ Moisture} = \frac{(W_2 - W_3)}{(W_2 - W_1)} \times 100$$

Where

W_1 - Wt of empty Petri dish.

W_2 - Wt of Petri dish cum sample before drying.

W_3 - Wt of Petri dish cum sample after drying

Determination of protein content

Protein estimation of sample was carried out using kjeldhal method.

Calculation

$$\text{Protein contain} = \frac{\text{TV} \times 1.4007 \times 6.25 \times \text{N}}{\text{Weight of the sample}}$$

Where

6.25 - Conversation factor

N - Normality of NaoH Solution

TV - Titration value

Determination of fat

Fat was estimated by Soxhlet apparatus method. Take an empty thimble weight. Weigh the empty thimble with logos of 5 grams of sample and weigh the thimble. Difference in weight gives sample weight. Weight the empty Soxhlet flask with boiling stone. Keep the thimble in Soxhlet flask. Pour the solvent (150 ml of hexane) into the Soxhlet flask. Fix the Soxhlet flask in Soxhlet extraction apparatus with a reflux condenser. Keep the total arrangement of process for at least 4-5 hours. After 4 hours take out the solvent from hexane and thimble from extraction apparatus. Keep the Soxhlet flask in the hot air oven for 10 minutes to evaporate the solvent and cool it in desiccator. Then weigh the flask with extracted fat.

$$\% \text{ Fat content} = \frac{(W_3 - W_2)}{(W_1 - W)} \times 100$$

Where:

W - Weight of empty thimble

W_1 - Weight of thimble with sample

W_2 - Weight of empty Soxhlet flask

W_3 - Weight of Soxhlet flask with extracted fat

Estimation of carbohydrate content (Anthrone method)

Procedure

1. Weigh 100mg of sample and place it in boiling test tube.

2. Hydrolyze by keeping it in a boiling water bath for 3hrs with 5ml of 5N HCl and cooled to room temperature.

3. Neutralize it with solid Na₂CO₃ until the effervescence ceases.
4. Make up the volume to 100ml and then centrifuge.
5. Collect the supernatant and take 0.5ml and 1ml aliquots.
6. Prepare the standards by taking 0.2ml, 0.4ml, 0.6ml, 0.8ml, 1ml and run a blank.
7. Make up the volume in all the tubes to 1ml with distilled water.
8. Then add 4ml of Anthrone reagent and heat for 8min in a boiling water bath.
9. Cool the tubes under tap water and read the green color at wave length 630nm.
10. Draw a standard curve by plotting concentration of standard on X-axis and absorbance on Y - axis.
11. From the graph calculate the amount of carbohydrates present in the sample tube.

Calculation

$$\text{Amount of carbohydrates present in 100g of sample} = \frac{\text{mg of glucose}}{\text{volume of sample taken}} \times 100$$

Sensory analysis

The sensory evaluation was carried out on nine point Hedonic scale as shown in Appendix with '1' being lowest possible value and '9' being highest possible value.

It includes evaluating product quality based on colour, texture, flavour and overall acceptability of the product.

Nine point Hedonic scale was used for quality evaluation on the basis of colour, texture, flavour and overall acceptability.

Statistical analysis- Student's t-test

Any statistical test that uses the t-distribution can be called a t-test. One of the most common is Student's t-test, named after "Student," the pseudonym that William Gosset used to hide his employment by the Guinness brewery in the early 1900's (they didn't want their competitors to know that they were making better beer with statistics). Student's t-test is used to compare the means of two samples, even if they have different numbers of replicates. In simple terms, the *t*-test compares the actual difference between two means in relation to the variation in the data (expressed as the standard deviation of the difference between the means).

Procedure

1. List the data for sample (or treatment) 1.
2. List the data for sample (or treatment) 2.
3. Record the number (*n*) of replicates for each sample (the number of replicates for sample 1 being termed *n*₁ and the number for sample 2 being termed *n*₂)
4. Calculate mean of each sample (\bar{x}_1 and \bar{x}_2).
5. Calculate standard deviation of each sample (*s*₁ and *s*₂)
6. Calculate the *t*-value as follows
$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \sqrt{\frac{[(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2]}{(n_1 + n_2 - 2)}}}$$
7. Calculate degree of freedom as follows
DF = (*n*₁ + *n*₂ - 2)
8. Enter the *t*-table at degrees of freedom; choose the level of significance required and read the tabulated *t* value.

9. If the *calculated t* value *exceeds* the tabulated value we say that the means are *significantly different* at that level of probability

10. Statistical tests allow us to make statements with a degree of precision, but cannot actually prove or disprove anything.

A significant result at the 95% probability level tells us that our data are good enough to support a conclusion with 95% confidence. In biological work we accept this level of significance as being reasonable.

Results and Discussion

Analysis of quality parameters

During the evaluation of following parameters, each sample was analyzed for three times and average value was considered as final.

Moisture content

The moisture contents of all samples were found as 2.93, 2.95, 2.92, 2.967 % for sample -1, sample -2, sample -3 and sample-4 respectively.

The moisture content for therapeutic food for adolescent girls should not be more than 3% in order to maintain a good shelf life.

Protein content

The average protein contents of sample 1, sample 2, sample 3, and sample 4 after analyzing were found to be 17.932, 17.89, 17.83, 17.98 grams respectively whereas theoretically, they were estimated to be 17.933, 17.939, 18.075, 18.001grams respectively. The protein content for therapeutic food for adolescent girls should be 18 gram in order to maintain a good

metabolism in adolescents. The protein contents of different samples were plotted graphically in a bar graph for in-depth watch of variations (Fig. 8).

Theoretically, an attempt was made to maximize the protein content to 18 grams during the development of product.

There was no significant difference found in between theoretical and practical values for protein content which was found by the student t-test.

Fat content

The fat contents of sample 1, sample 2, sample 3 and sample 4 after analyzing were found to be 13.78, 13.87, 13.874, 13.923g respectively whereas theoretically, they were estimated to be 14.192, 14.196, 14.259, 14.094g respectively. The fat content for therapeutic food for adolescent girls should be 14g in order to maintain good digestive life. The fat contents of different samples were plotted graphically in a bar graph for in-depth watch of variations among the four samples which are formulated with different ingredients.

The least value was obtained for sample 3, (13.874g). The variations of Fat contents of various samples were shown in Figure 9.

Theoretically, in the designed product the fat content was controlled to 14 g. Practically it was almost achieved. Among the four samples, sample 4 obtained the maximum value (13.923g) and sample 3 was the least (13.78g). Practically, among the four samples, we obtained the maximum value for sample 4, (13.92g). There was no significant difference found in between theoretical and practical values for fat content which was found by the student t-test. The student t-test was done according to standard procedure.

Table.1 Vitamin & mineral deficiencies for various health problems

Sl. No	Health problem	Vitamins	Minerals
1.	Stomach pain	Niacin, B12	Potassium, Magnesium
2.	Back pain	Vitamin D	Magnesium
3.	Anemia	B12	Magnesium, Folate,Zn,iron
4.	Nerves weakness	Vitamin E, Vitamin B12	Magnesium
5.	Underweight	Vitamin D, B12	----
6.	Obesity	Vitamin D, Vitamin A, B12	Magnesium, Iodine.
7.	Eyesight	Vitamin A, Vitamin D	Magnesium

Table.2 Nutritive values of raw materials per 100g

Raw materials	Moisture (%)	Protein (g)	Fat (g)	Carbohydrates (g)	Fibre (g)	Minerals (g)
Bengal Gram	7	23	5	61	1	2
Soya bean	5	44	20	21	4	5
Barley	5	12	1	76	4	1
Wheat	4	12	1	82	0	1
Green gram	4	26	1	64	1	3
Ragi	5	11	2	78	2.12	2.12
Sugar	5	11	2	100	2.12	2.12
RPO	-	-	100	-	-	-

Table.3 Nutritive values of roasted raw materials

Raw materials	Moisture (%)	Protein, (gms)	Fat, (gms)	Carbohydrates, (gms)	Fibre, (gms)	Minerals, (gms)
Bengal Gram	7	23	5	61	1	2
Soya bean	5	44	20	21	4	5
Barley	5	12	1	76	4	1
Wheat	4	12	1	82	0	1
Green gram	4	26	1	64	1	3
Ragi	5	11	2	78	2.12	2.12
Sugar	5	11	2	100	2.12	2.12
Rpo	-	-	100	-	-	-

Table.4 Required Dietary Allowances (RDA) for adolescent girls:

RDA requirements for Adolescent girls	
Protein	46 g/day
CHO	130 g/day
Fat	22 g/day
Calories	2368 kcal/day Energy supplied due to Protein: 10% to 30%. Carbohydrates: 45% 65%. Fat: between 25% and 34%. Calcium: 1,300 milligrams. Fiber: 26 grams. Sodium: no more than 1,500 milligrams.
Niacin	14mcg
Vitamin b12	2.4mcg
Vitamin d	15mcg(600IU)
Vitamin E	15mcg
Iron	15mcg
Potassium	4700mg
Magnesium	360mg/day
Zinc	9mg/day

Table.5 Composition of sample – 1

Material	Composition
Soyabean	17g
Barley	18g
Green gram	30g
Refined Palmolein oil	9g
Sugar	25g
Vitamin premix	1g
Total	100g

Table.6 Composition of sample - 2

Material	Composition
Soyabean	09g
Bengal gram	38g
Green gram	18g
Refined Palmolein oil	9g
Sugar	25g
Vitamin premix	1g
Total	100g

Table.7 Composition of sample - 3

Material	Composition
Soyabean	17g
Wheat	17g
Green gram	31g
Refined Palmolein oil	9g
Sugar	25g
Vitamin premix	1g
Total	100g

Table.8 Composition of sample - 4

Material	Composition
Soyabean	16g
Ragi	18g
Green gram	30g
Refined Palmolein oil	9g
Sugar	25g
Vitamin premix	1g
Total	100g

Note: In all samples, sugar and refined palmolein oil are kept constant to get good sweetens, taste and proper blending.

Fig.1 Flow chart of procedure of making of food product

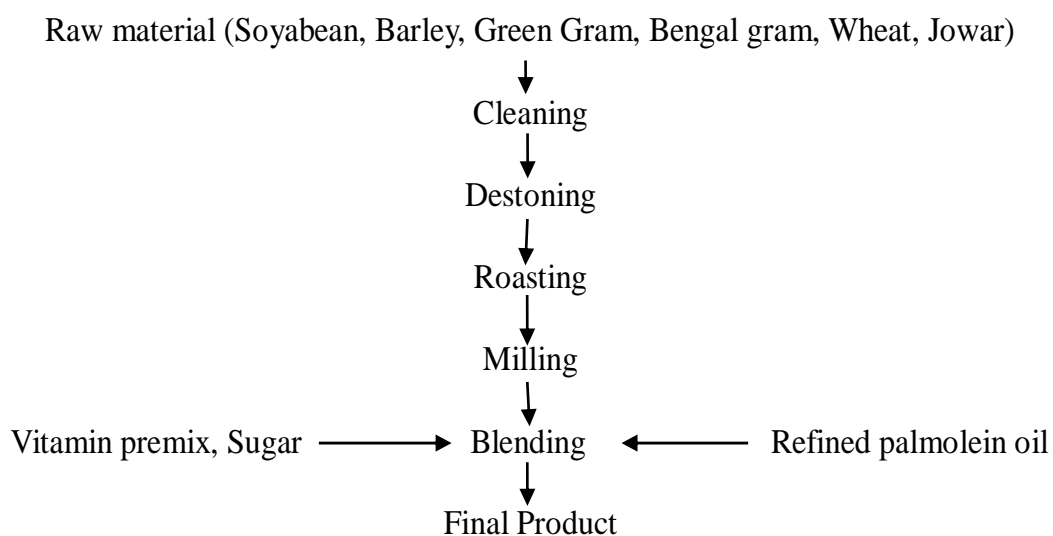


Fig.2 Cleaning of raw materials



Fig.3 Roasting of raw materials



Fig.4 Disc mill



Fig.5 Milling of roasted samples



Fig.6 Blending



Fig.7 Four Therapeutic food samples



Fig.8 Variations of protein values in different samples

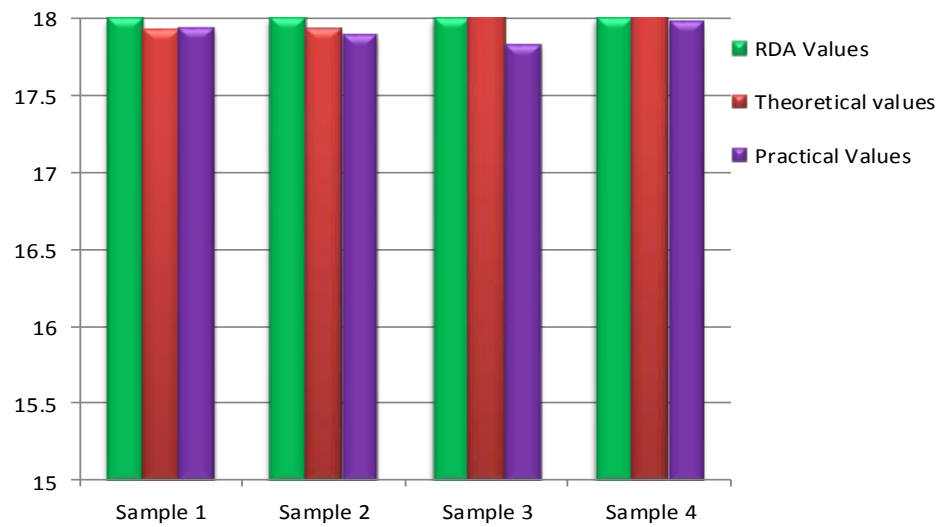


Fig.9 Variations of Fat values in different samples

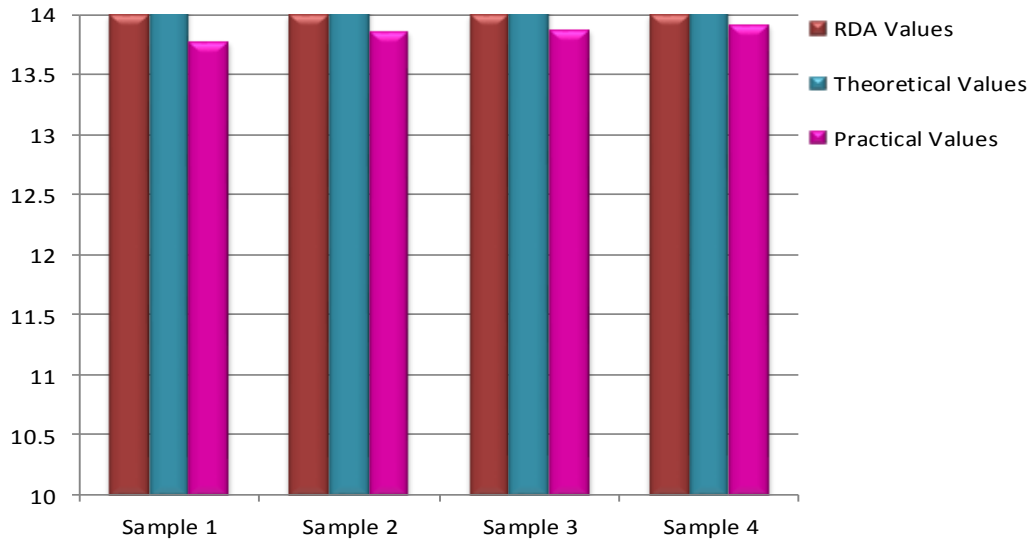


Fig.10 Variations of Carbohydrate values in different sample

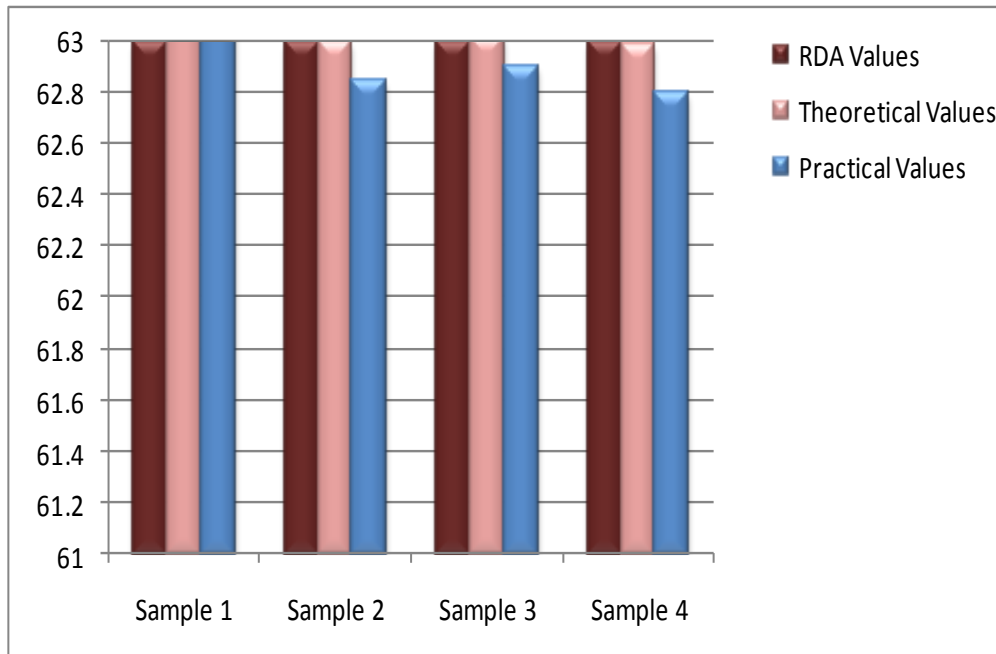


Fig.11 Variations of energy values in different samples

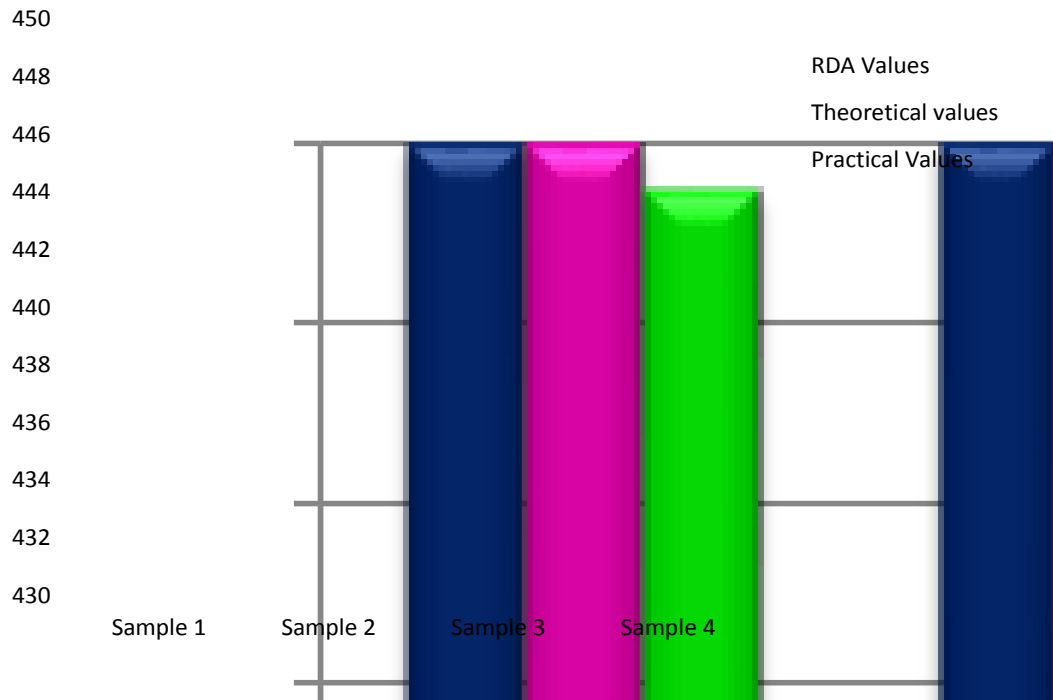
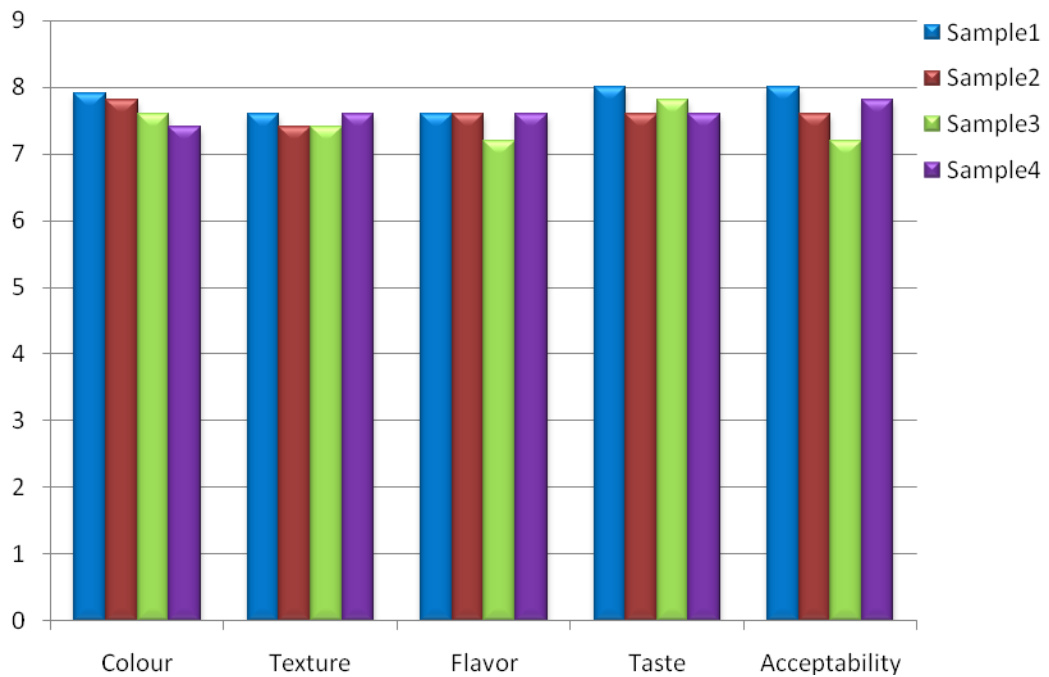


Fig.12 Sensory evaluation in Therapeutic Food Samples



Carbohydrates content

The carbohydrates contents of sample 1, sample 2, sample 3, sample 4 after analyzing were found to be 63.15, 62.85, 62.9, 62.83grams respectively whereas theoretically they were estimated to be 63.2, 63.703, 63.018, and 62.992g respectively.

The carbohydrates content for therapeutic food for adolescent girls should be 63g for which helps in active release of enzymes for required growth. Theoretically, we have tried to the maximum to keep the Carbohydrates content to 63g. We obtained almost closely to 63g. Among the four samples, sample 3 obtained the maximum value, 63.7g and sample 3 was the least, 62.992g. Practically, among the four samples, we obtained the maximum value for sample 3, (62.9g).we obtained the least value for sample 4, (62.83g). The variations of carbohydrates content of various samples is shown in Figure 10. There was no significant difference found in between theoretical and practical values for moisture content which was found by the student t-test.

Energy content

The energy contents of sample 1, sample 2, sample 3, sample 4 after analyzing were found to be 447.3, 446.6, 447, 447.9kcal respectively whereas theoretically they were estimated to be 452.56, 454.332, 452.703, 451.214 kcal respectively. The recommended energy content for therapeutic food for adolescent girls is 450 kcal. The energy contents of different samples were plotted graphically in a bar graph for in-depth watch of variations among the four samples which are formulated with different ingredients. Theoretically, we have tried to the maximum to keep the energy content to 450 kcal. We obtained almost closely to 450 kcal. Theoretically, among the four samples,

sample 4 obtained the maximum value 452 kcal and sample 2 was the least (450.332 kcal). Practically, among the four samples, we obtained the maximum value for sample 4, (447.9). We obtained the least value for sample 2, (446.6 kcal). The variations of energy levels of various samples are shown in Figure 11.

There was no significant difference found in between theoretical and practical values for moisture content which was found by the student t-test.

Sensory analysis

Sensory Analysis is generally done to test sensory parameters like taste, colour, texture, flavor and overall acceptability. We tested all these sensory attributes by a panel of 5 members in College of Agricultural Engineering, Madakasira, Anantapur Dist. The average values were considered as the final values. The opinions were pictorially depicted with the help of a bar graph (Fig. 12).

Sample 1 was found highly acceptable on grounds of colour. In terms of taste also, sample 1 acceptability was found to be good after sample 1. All the samples were almost equivalent in flavor.

Summary and Conclusions are as follows:

The present study was undertaken for the preparation and evaluation of a therapeutic food for Adolescent girls formulated with Bengal gram, Soya bean, Barley, Green gram, wheat and Ragi. Experiments were carried out in the Quality control lab, Andhra Pradesh Foods Pvt. Ltd. The therapeutic food was prepared from Soya bean, Bengal gram, Barley, green gram, wheat and Ragi in different compositions. Therapeutic food Samples were prepared according to the RDA

requirements for adolescent girls. These samples prepared were analysed to study their chemical composition and overall acceptability. The formulation with Soya bean, Ragi and Green gram of 16g, 18g, 30g respectively (sample 4) has attained the high levels of nutritional properties values but its organoleptic properties values were lower. The formulation with composition of 17g of soya bean, 18g of barley and 30g of green gram (sample1) has attained highest acceptability in terms of hedonic rating (Sensory evaluation). The overall acceptability of Sample1 was found to be high among all samples. This formulated therapeutic food (sample-1) is highly preferable to adolescent girls suffering from anemia, stomach pain and nerves weakness patients as the food contains high amount of protein and the soya bean acts as the nutritional supplement to the growing adolescents.

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