



# Highly Nutritious Designed Soyaladoo Supplementation to Malnourished Preschool Children and it's Benefits on their Nutrient Intake

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## Abstract

Malnutrition among preschool children is now a global problem. Formulation of the food products of low cost and highly nutritioun is only the solution to overcome the problem hence the visionary design of the soyaladoo is done. Organoleptically high scored soyaladoo was taken for supplementation. The nutritional qualities likes major nutrients such as energy(470.0kcal), proteins (20.1 g) and fats (22.0 g) content found more in soyaladoo. The micro nutrients such as iron (6.3 mg), zinc (3.8 mg) and calcium (286.5 mg) were also observed higher range in soyaladoo. It also noted, very less antinutritional factors like phytate phosphorous (160mg), tannin (0.34 mg), trypsin inhibitor activity (5.5ml), acid detergent fiber (1.31g), cellulose (1.00g) and lignin (0.3ml) etc. Soyaladoo has also shown very low production cost. Hence, it found very cheap and affordable to the below poverty line group of malnourished children. Significant improvements in nutrients intake were seen after supplementation of soyaladoo for six months to preschool malnourished children. The supplementation was given at the @ 50gm/child/day.

**Keywords:** Nutrition intake, soyladoo and supplementary feeding.

## Introduction

Soyabean has high quality of amino acid, better protein digestibility. It also contents a better lipoxidase activity, lecithin and lipid profile. Due to these qualities in soybean and soya products are used in the dietary treatment of various deficiencies diseases<sup>1</sup>.

However, the processing techniques used in the preparation of these innovative soya products are tedious, complicated, high costing and require skill personals. Generally home based treatment has been recommended during the rehabilitation phase of treatment for malnutrition in areas where follow up is possible<sup>2</sup>. The traditional foods are most familiar in the community. It requires less skill for their preparations. Hence, such traditional and homemade based foods are chosen after the value addition and planned to use as a dietary treatment for the malnutrition in preschool children. Soyabean is referred as vegetarian meat due to its high quality amino acid profile. It is less expensive legume as well as oil seed crop locally available. Due to excellence source of macro and micro and other biological properties this can be use food formulation of high nutri mix weaning and supplementary foods to combat malnutrition and maintain good health and nutritional status of preschoolers. By keeping this view present research study has been designed.

## Material and Methods

The local varieties of soybean ie. MACH-58 and Bengal gram ie. pragati phule were procured from the market. It was cleaned,

washed, dried, coarsely grind, dehulled and make into flour separately by use of grinding machine. Soyladoo was prepared.

**Sensory evolution:** By the use of three different combination soychakali was prepared and evaluation by organoleptically with the help of trained panel of judges on a nine point Hedonic scale<sup>3</sup>.

**Chemical Analysis of Soyproducts:** High scored soyladoo in sensory evaluation was selected for chemical analyses. Such as moisture content, total ash, major nutrient like crude protein, fat, carbohydrates, B complex vitamins, minerals such as iron, calcium, zinc and crude fiber with the use of method described in<sup>4</sup>.

**Statistical Analysis:** The organoleptical qualities of soyladoo was carried out after it storage for 0 to 1 month and 1 to 2 month packed in polythene and high gauge packaging materials at room temperature. The differences noticed among this were calculated by statically and also nutrient intake before and after feeding with one month interval. data was analyzed statically procedure<sup>5</sup>.

## Results and Discussion

**Biochemical compositions and storage stability of soyladoo:** The data given in table 1 reveal the storage changes in proximate, biochemical compositions and sensory qualities in soyladoo kept in different packages for 0 to 1 and 1 to 2 months at room temperature. The changes in per cent of moisture and the content of B complex vitamins and  $\beta$  carotene in soyladoo were noticed at significant level after two months of storage.

The per cent of proximate compositions such as fat and protein were found decreased at highly significant level i.e. 31.34 to 28.15 and 27.89 to 25.02 respectively in the laddoo stored up to 2 months of period. Whereas the value of B complex vitamins such as vitamins B<sub>1</sub> (0.50 to 0.31 mg) vitamin B<sub>2</sub> (0.38 to 0.29 mg) and vitamin B<sub>3</sub> (2.51 to 2.09mg) were observed reduced significantly in the soyladdoo for 2 months. Non significant effect was noticed in the changes of mineral and crude fiber contents in the soyladdoo after 2 months of storage.

Average major nutrient like calorie, protein, fats and minor nutrients such as vitamins and minerals intake by experimental groups were expressed in table 2. The mean calorie intake by soyladdoo supplemented group of children was noted as 1144 ±11.4 Kcal (78.4per cent). The control group had lower calorie intake i.e. 634.2 ±5.3 Kcal (43.4per cent)<sup>6</sup>.

The protein intake by soyladdoo was noted as 17.4±4.3 g. (66.9per cent), The control group reported the protein intake

only 10.0±2.7g (38.5per cent), The mean fat intake by soyladdoo was found more 21.1±4.3g. (84.5per cent). Only 10.3±2.1g. average fat intake was found in control group of children which noted as poorly adequate i.e. (41.3per cent). Average intake of vitamin B<sub>1</sub> (thiamine) by group I recorded as highest i.e.0.65±0.1mg which was recorded as 78.7per cent. Control group found consumed vitamin B<sub>1</sub> as 0.31± 0.06mg which was reported only 41.3 per cent. Vitamin B<sub>2</sub> or riboflavin consumption recorded more i.e. 0.63±0.14mg (73.9per cent) in group I. The control group consumed only 0.33±0.1mg (38.8per cent) intake of riboflavin which reported as poorly adequate level. The mean intake of vitamin B<sub>3</sub> or niacin by group I again found in highest score i.e. 0.62±0.1mg. Minimum average intake of niacin was observed in control group 0.40±0.9mg. A similar average intake of vitamin C was noted by group I i.e. 27.2±1.7 mg and it was noticed below the moderate adequate level (68.0per cent) of each group.

**Table-1**  
**Proximate And Composition In Soyladdoo (Per 100g) With Its Storage Stability**

Sr.No.	Bio-Chemical Compositions	Proximate and storage period		
		Up to 1 Month	1 to 2 Months	't' test
1	Moisture (%)	14.60	13.92	2.278*
2	Ash (%)	3.11	3.05	0.912 NS
3	Fat (%)	31.34	28.15	2.6.11**
4	Protein (%)	27.89	25.02	2.659**
5	Vitamins B <sub>1</sub> (mg)	0.50	0.31	2.155*
6	Vitamins B <sub>2</sub> (mg)	0.38	0.29	1.981*
7	Vitamins B <sub>3</sub> (mg)	2.51	2.09	1.920*
8	B. carotene ( μ g)	239.00	237.10	1.992*
9	Iron (mg)	7.23	7.09	0.790 NS
10	Calcium (mg)	168.80	168.21	0.915 NS
11	Zinc (mg)	4.65	4.25	0.875 NS
12	Crude fiber (g).	1.85	1.82	0.048 NS

\*\* - significant at 1 % level , \* - Significant at 5% level, Non Significant

**Table-2**  
**Average Nutrients Intake of Experimental Groups**

Sr. No.	Nutrients	Group I Mean ± S.D.	Group II Mean ± S.D.
1	Calories (K.cal)	1144 ±11.6(78.4)	634.2± 5.3(43.4)
2	Protein (g)	17.4±4.3(66.9)	10.0±2.7(38.5)
3	Fat (g)	21.1±4.3(84.5)	10.3±2.1(41.3)
4	Vitamin B <sub>1</sub> (mg)	0.65±0.1(78.7)	0.31±0.1(41.3)
5	Vitamin B <sub>2</sub> (mg)	0.63 ±0.1(73.9)	0.33±0.07(38.8)
6	Vitamin B <sub>3</sub> (mg)	0.62±0.1(65.3)	0.40±0.9(42.0)
7	Vitamin C(mg)	27.2±1.7(68.0)	22.4±1.4(56.0)
8	β Carotene (μg)	1128±14.1(70.5)	757.1±7.9(47.3)
9	Iron (mg)	7.6 ±1.2(76.4)	5.6±2.2(56.1)
10	Calcium (mg)	262.8±7.6(65.0)	168.6±5.5(42.0)
11	Zinc (mg)	4.6±0.7(46.1)	3.8±0.6(38.0)

Group I - Experimental group supplemented with soyladdoo. Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage. \*significant at 5 per cent level, \*\*significant at 1 per cent level, NS Non Significant, BS – Before supplementation, AS – After supplementation.

Intake of vitamin C (i.e.22.4±1.4mg) was noticed in control group. In case of fat soluble vitamin like β carotene intake by The intake of β carotene in Group I, 1176± 8.5 µg and Very poor intake of β carotene was noted by control group i.e. 757.1±7.9 µg.

The average intake of calcium by the children who supplemented with soyaladoo i.e. group I was recorded as more i.e. 262.8±7.6 mg. None the control group consumed only 168.6±5.5 mg calcium, which was reported as poorly adequate.

The average iron intake by soyaladoo group I was found as 7.6± 1.20 mg (76.4per cent). The intake of iron by control group shown as 5.6±2.2 mg (56.1 per cent). They found as 46.1, zinc intake in group I, Very poor intake of zinc by control group was noticed as 3.8±0.6 mg (38.0per cent).

Average major nutrients intake like calories, protein and fat by experimental group was compared with their before supplementation intake level. The relevant data was presented in tables 3 to 5. Table 3 gives an idea about the comparison in average major nutrient intake like calorie, protein and fats before and after supplementation among experimental groups. Average calorie intake in group I was significantly increased after supplementation. It was found increased from 724±8.9 kcal to 1144±11.6 kcal after six months of experiment. Per cent calorie (78.4) intake of this i.e. group I found nearby moderate adequate level after supplementation. There was no significant change noticed in average calorie intake of control group. Group I found highly significant increased protein intake (17.4 g) after supplementation. Whereas the average intake of protein after supplementation was slightly found decreased in control group as compared with their intake before supplementation.

**Table-3**  
**Average Major Nutrients Intake of Experimental Groups with their before and after Supplementation**

Sr.No.	Nutrients	Group I Mean ± S.D.			Group II Mean ± S.D.		
		BS	AS	't' value	BS	After 6months	't' value
1	CaloriesK.cal)	724±9 (49.4)	1144±11.6 (78).	14.1**	634±86.6 (43.8)	635±86.5 (43.4)	0.15NS
2	Protein (g)	8.4±1.1 (32.2)	17.4±4.3 (66.9)	8.0*	9.0±1.3 (34.3)	10.0±2.7 (38.5)	0.70NS
3	Fat (g)	6.1± (24.5)	21.1±4.3 (84.5)	8.3**	10.00±1.3 (40.0)	10.3±2.1 (41.3)	1.10NS

Group I - Experimental group supplemented with soyaladoo. Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage. \*significant at 5 per cent level, \*\*significant at 1 per cent level, NS Non Significant, BS – Before supplementation, AS – After supplementation.

**Table-4**  
**Average Vitamins Intake of Experimental Groups with their before and after Supplementation**

Sr. No.	Vitamins	Group I Mean ± S.D.			Group II Mean ± S.D.		
		BS	AS	't' value	BS	After 6months	't' value
1	VitamiB <sub>1</sub> (mg)	0.4±0.1 (58.7)	0.65±0.1 (78.7)	3.8**	0.30±0.0 (40.0)	0.31±0.1 (41.3)	1.7NS
2	VitaminB <sub>2</sub> (mg)	0.6±0.1 (64.7)	0.63±0.1 (73.9)	3.1**	0.30±0.1 (36.8)	0.33±0.07 (38.8)	1.3 NS
3	VitaminB <sub>3</sub> (mg)	0.4±0.1 (44.2)	0.63±0.1 (65.3)	2.7*	0.40±0.1 (42.0)	0.40±0.9 (42.0)	0.0 NS
4	Vitamin C(mg)	27.2±1.7 (68.1)	27.2±1.7 (68.1)	0.0NS	22.0±3.0 (55.0)	22.14±1.4 (56.0)	0.10NS
5	βCarotene (µg)	500±3.7 (31.3)	1128±14.1 (70.5)	6.1**	326±4.5 (20.4)	757.1±7.9 (47.3)	2.8**

Group I - Experimental group supplemented with soyaladoo. Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage. \*significant at 5 per cent level, \*\*significant at 1 per cent level, NS Non Significant, BS – Before supplementation, AS – After supplementation

**Table-5**  
**Average Minerals Intake of Experimental Groups with their before and after Supplementation**

Sr No	Minerals	Group I Mean ± S.D.			Group II Mean ± S.D.		
		BS	AS	't' value	BS	After 6months	't' value
1	Calcium(mg)	82.0±1.220.5)	262.8±7.6(65.0)	6.7**	157.0±1.4(39.3)	168.6±5.5(42.0)	0.7 NS
2	Iron(mg)	5.1±0.7(51.1)	7.6±1.2(76.4)	3.8 **	5.6±2.2(56.1)	5.6±2.2(56.1)	0.2 NS
3	Zinc(mg)	1.3±0.2(12.9)	4.6±0.7(46.1)	4.1**	3.8±0.5(38.0)	3.8±0.6(38.0)	0.2 NS

Group I - Experimental group supplemented with soyaladoo. Group II - No supplementation i.e. control group. Figures in parantheses indicate percentage. \*significant at 5 per cent level, \*\* significant at 1 per cent level, NS Non Significant, BS – Before supplementation, AS – After supplementation.

Average fat consumption in group I noticed increased at highly significant level. It shown that, fat intake before supplementation 6.1g increased upto 21.1 g after supplementation. This fat intake was noted as moderately adequate (84.5 per cent) level in group I after supplementation. Whereas control group noted a non significant fat intake as compared between their before and after six months of experimental period.

The data about average vitamin intake including vitamin B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, vitamin c and β carotene by different experimental groups was recorded in table 4. It indicated that, highly significant increase in per cent intake of Vitamin B<sub>1</sub> (thiamin) was noticed in Group I. Control group was noted as non significant increase in consumption of vitamin B<sub>1</sub> (from 0.30 to 0.31 mg) after 6 months of experimental period. Average intake of vitamin B<sub>2</sub> or riboflavin was noted increases at highly significant level only in Group I. No significant difference was noticed in control group regarding intake vitamin B<sub>2</sub> before and after supplementation.

This increase in the intake of vitamin B<sub>3</sub> noted as highly significant level among group I. However, these increases level of vitamin B<sub>3</sub> intake in group I 41.0 before supplementation to 62.0 per cent after supplementation. Control group did not found any change in the intake of vitamin B<sub>3</sub> after 6 months experimental period.

β carotene intake was highly significant increased in a group I, after supplementation. I reported increased intake of β carotene from 1128 ±14.1 (70.5) Control group was also noted increase in β carotene intake at significant level (from 20.4 to 47.3 per cent) after experimental period.

The data about average intake of minerals namely calcium, iron and zinc by different experimental groups before and after supplementation was given in table 5. It revealed that, calcium intake was found increased at highly significant level groups i.e. group I. Group I scored highest intake of calcium (65.0 per cent), They reported near by fifty per cent deficient in calcium intake. No significant difference was reported in the intake of calcium after experimental period in control group.

Iron intake was noticed increased at highly significant level only in Group I. It was noted as increased from 51.1 to 76.4 per cent after supplementation. Whereas there was no significant difference noted in the intake of iron and control group after supplementation.

The average zinc intake in Group I reported as highest score experimental group. It found as increase in the intake of zinc level from 12.9 to 46.1 per cent after supplementation. Though it was highly significant, but noted as at below adequacy level. No significant change was noticed in control group regarding intake of zinc after experiment.

## Conclusion

On whole it can be concluded that the consumption of soyaladoo has positive and highly significant impact on nutrient intake of preschool malnourished children. The soyaladoo can be recommended for the treatment of malnutrition.

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