RESEARCH PAPER — FOOD SCIENCE RESEARCH JOURNAL
e ISSN-2230-9403 ■ Visit us : *www.researchjournal.co.in*
Volume 5 | Issue 2 | October, 2014 | 139-142
DOI : 10.15740/HAS/FSRJ/5.2/139-142

Impact of soya products supplementations on vitamin intake of malnourished pre-school children

N.S. GHATGE

Protein calorie malnutrition is major nutritional problem of the world. To treat malnutrition among the pre-school children the formulation of locally based protein rich product is must, hence, attempt was made to formulate soyabased food products such as soyaladoo, soyachakali and soyaflakes chiwada. These products were evaluated for its minor and major nutrients. The status of vitamins like vitamin B_1, vitamin B_2, vitamin C, niacin and β-carotene etc. consumption significantly increased after supplementation of these soya products to pre-school malnourished children for six months, respectively. The malnourished pre-school children were classified as grade II and III. These products were given to preschool malnourished children @50 g product / day /child. It provides energy, protein and fat as per ICMR recommendation.

Key Words : Soyladoo, Soyachakali, Soyaflakes chiwada, Supplementary feeding

How to cite this article : Ghatge, N.S. (2014). Impact of soya products supplementations on vitamin intake of malnourished pre-school children. *Food Sci. Res. J.*, **5**(2): 139-142.

INTRODUCTION

Soybean is oilseed legume group getting its importance as cash crop as well as legume crop. It contain 40 per cent of protein. Among all legume it is only the cheapest legume having nutracetical properties. It content almost all nutrients and plenty of antioxidantive properties (Ghatge, 2013 a and b). It content isoflavonoids. The amino acid pattern of the soyabean is similar to cow milk. The proteins are alkaline in nature. Due to its high biological value it content good number of essential amino acids. Hence, it can be used to prevent protein calorie malnutrition among vulnerable group of community. The regular intake of traditional soya foods help to prevent – breast cancer, postrate cancer, color cancer and menopausal problem of women Kaushik and Jaiswal (2010). Regular intake of soybean also prevent hyper cholesterol level in the blood; by preventing atherosclerosis Messina (1997) Consumption of soybean daily suitable for diabetic patients. It also prevents osteoporosis in elderly person. It contains emulsifier and helps in dispose of fatty material from vital organs.

AUTHOR FOR CORRESPONDENCE
N.S. GHATGE, Pravara Rural Education Society's, Home Science and B.C.A. College, Loni, Rahata, AHMEDNAGAR (M.S.) INDIA
Email: nalinihemangi26@rediffmail.com

METHODOLOGY

The present study was carried out at soyaladoo, soyachakali and soyaflakes chiwada :

Formulation :

Formulation and preparation of soyaladoo, soyachakali and soyaflakes chiwada was done by using standard method by Thangamms and Phillips (1971).

Sensory evaluation :

Soya products were prepared and evaluated organoleptically by hedonic scale (Amerine *et al.,* 1965).

Nutritional evaluation :

Nutritional quality analysis. Moisture content, total ash, major nutrient like crude protein, fat, carbohydrates, B complex vitamins including vitamin B_1, B_2 and B_3, minerals such as iron, calcium, zinc and crude fibre were analyzed by use of methods described by (AOAC, 1984 and Raghunramula *et al.,* 1983).

Statistical analysis :

The analysis for significance at p < 0. 05 level, S.E. and C.D. at 5 per cent level was carried out by the procedure given by Gomez and Gomez (1984).

OBSERVATIONS AND ASSESSMENT

Fig. 1 expressed the month wise intake of thiamine (vitamin B_1) by experimental groups during entire period of supplementation. It shown that, only group-I which provided soya *ladoo* as a supplementary food observed a moderate adequate per cent of intake of thiamine. In the initial level it was noticed as 79.2 per cent thiamine intake and found increased up to 85.0 per cent in the last month of period. The ranging in per cent of thiamine intake of group-II reported as 74.0, 75.6, 76.7, 77.5, 78.1 and 80.0 per cent month of I, II, III, IV, V and VI, respectively. group-III noticed in IIIrd position according to their month wise thiamine intake very low per cent intake of thiamine was shown in control group.

Fig. 2 gives an idea about the month wise intake of riboflavin (vitamin B_2) by experimental groups during the supplemented period. It revealed that, there was slightly difference noticed in month wise intake of riboflavin among group-I, II and III. However, the remarkable change was reported as compared between the intakes of riboflavin in group-I, II and III with control group. A steady intake of riboflavin was found in all the months (Ist to VIth) in control group during entire period of supplementation.

A similar observations were noted in the month wise intake of niacin (vitamin B_3) among group Ist, IInd, IIrd and control *i.e.* IVth shown in Fig. 3. Month wise intake of niacin group-I slightly found at upper per cent level than that of group-II and III. Whereas the intake of niacin ranging as 41.0 to 44.0 Per cent from Ist to VIth months, respectively.

Month wise intake of vitamin C among different experimental groups were given in Fig. 4. It shown that, at beginning Ist to II nd months intake of vitamin C was noted more in Group-II. It was found decreased from 67.1 per cent in II nd month to 65.4 per cent in IIrd month. However, vitamin C intake in the month of Ist noted as 62.5 per cent and increases to 75.9 per cent in VIth month in Group I. There was no remarkable change observed in vitamin C intake in the months of I, II and III among groups II and III. Control group found lower intake of vitamin C during the entire period experiment.

From the beginning month group IInd pre-school going children who were supplemented with soya *chakali* reported higher intake of β-carotene during entire period of supplementation shown in Fig. 5. This group noted β-carotene intake Ist month was only 41.0 per cent and found increases to 56. Per cent in VIth month of experiment. Group-I and III observed IInd and IIIrd position according to their month intake of ß-carotene at decreasing level as increasing the months of experimental period. Intake of β-carotene in group IV *i.e.*

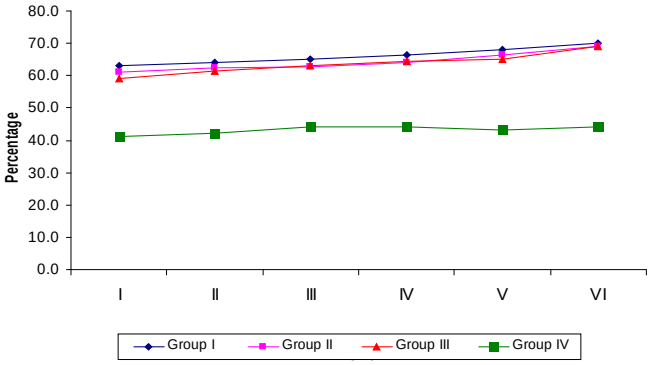

Fig. 1 : Thiamine intake of different experimental groups of pre-school children

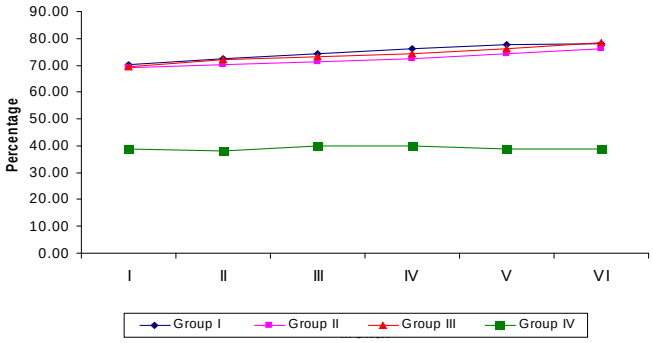

Fig. 2 : Riboflavin intake of different experimental groups of pre-school children

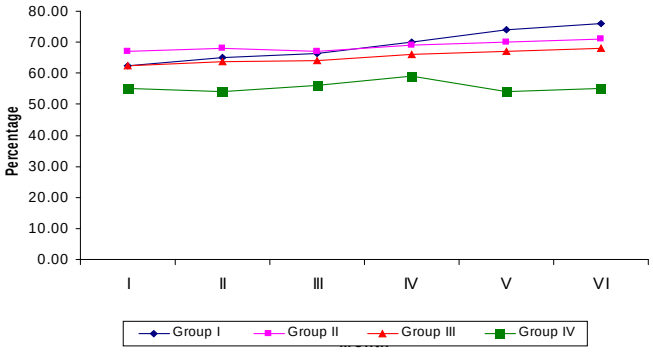

Fig. 3 : Niacin intake of different experimental groups of pre-school

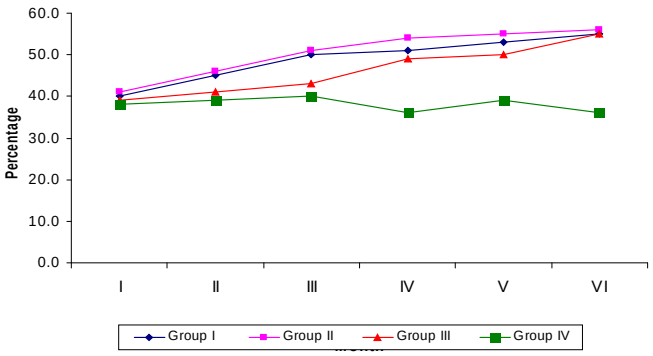

Fig. 4 : A ascorbic acid intake of different experimental groups of pre-school children

control noted 38.0 per cent and found decreased as 36.0 per cent in last month of experiment.

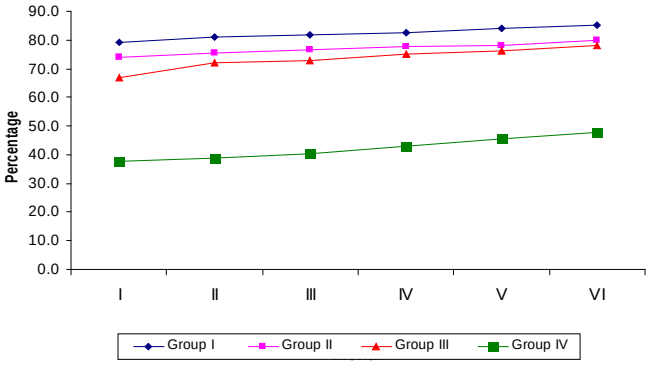

Fig. 5 : -carotene intake of different experimental groups of pre-school children

Average the B complex vitamin composition show in Table 1 group of vitamins, intake of thiamine by group I was recorded as highest *i.e.* 0.65 mg which recorded as 78.7per cent. Followed by group II it was noted as 0.60(mg)±0.1 and group III who observed as 0.54(mg)±0.1 intake of thiamine. Control group found to consumed vitamin B_1 as 0.31(mg) 0.06 which was reported as only (41.3) per cent. Vitamin B_2 or riboflavin consumption of group I recorded more *i.e.* 0.63(mg)±0.14 and (72.9%) which was higher than soya *chakali* group II and soya flakes chiwada group *i.e.* III. The control group consumed only 0.33(mg)±0.1 and (38.8 %) intake of riboflavin which reported as poorly adequate level. The mean intake of vitamin B_3 or niacin by group I again found as highest score *i.e.* 0.62(mg)±0.11 it was noted in II rank in group II and III position in the average intake of niacin reported in group III. Minimum average in niacin intake was observed in control group 0.40(mg)±0.9. A similar average intake of vitamin C was noted by group I and II *i.e.* 27.2(mg)±1.7 and it was noticed below the moderate adequate level (68.0%). Whereas group III shown vitamin C intake as 25.8(mg)±0.9 which was reported as be low the adequate level (*i.e.* 62.5%). Very low per cent in vitamin C intake (*i.e.* 56.0) was noticed in control group. In case of fat soluble vitamin like β carotene intake by all supplemented groups was noticed higher than control group. Among all, group II had highest intake of β carotene as compared with group I and III. The intake of β carotene intake in group I, II and III was recorded as 1128(µg)±40.1, 1176 (µg) ± 8.5 and 1080(µg) ±7.3 respectively. Very poor intake of ß carotene was noted by control group *i.e.* 757.1(µg)±7.9. Which was observed as below the adequate level *i.e.* 47.3 per cent.

The data about average β carotene intake by different experimental groups was recorded in Table 2. It indicated that, highly significant increase in per cent intake of thiamin was noticed in group IO (78.0) and group III (76.0) after supplementation group III found significant increase form 58.7 to 69.3 per cent in thiamin intake after supplementation. Control group was also noted a significant increase in consumption of vitamin B_1 (from 03 to 0.4 mg) after 6 months of experimental period. Average intake of vitamin B_2 or riboflavin was noted increases at highly significant level only in group I. It was noticed as increased from 64.7 to 74.0 per cent after supplementation. Group III scored in 2nd position, as it found increased vitamin B_2 intake from 60.0 to 73.9 per cent. Whereas group II recorded in IIIrd position in the per cent intake of vitamin B_2 (71.8) after supplementation. No significant difference was noticed in control group regarding intake vitamin B_2 before and after supplementation.

In case of vitamin B_3 average intake, group III and II secured Ist and IInd rank. It noted that, group III found increased the intake of vitamin B_3 from 410 to 61.0 per cent, group II reported increasing of vitamin B_3 intake from 42.0 to 64.2 per cent These increase in the intake of vitamin B_3 noted as highly significant level among group III and II. However, the per cent of vitamin B_3 was not shown at adequate level. Group I reported as significant increase in per cent of vitamin B_3 intake from 44.2 before supplementation to 65.3 per cent after supplementation. Control group did not found any change in the intake of vitamin B_3 after 6 months experimental period.

The average intake of vitamin C was not reported any difference among all the experimental groups as in before and after supplementation period.

β carotene intake was highly significant increased is a group I, II and III after supplementation. Group I, II and III reported as increased its intake of β carotene from 31.3 to 78.5, 36.0 to 73.5 and 20.4 to 67.5 per cent, respectively. Control group was also noted increase in β carotene intake at

Table 1 : Average nutrients intake of experimental groups

1.	Vitamin B_1(mg)	0.65±0.1(78.7)	0.60±0.1(76.5)	0.54±0.1(72.0)	0.31±0.1(41.3)
2.	Vitamin B_2(mg)	0.63±0.1(72.9)	0.61±0.1(71.8)	0.62±0.1(72.9)	0.33±0.07(38.8)
3.	Vitamin B(mg)	0.62±0.1(65.3)	0.61±0.1(63.0)	0.60±0.1(62.0)	0.40±0.9(42.0)
4.	Vitamin C(mg)	27.2±1.7(68.0)	27.2±1.5(68.0)	25.8±0.9(62.5)	22.4±1.4(56.0)
5.	β–Caroten(µg)	1128±14.1(70.5)	1176±8.5(73.5)	1080±7.3(67.5)	757.1±7.9(47.3)

Group I - Experimental group with supplementation of soya *ladoo*. Group II - Experimental group with supplementation of soya *chakali*.
Group II - Experimental group with supplementation of soya flakes *chiwada*. Group IV - No supplementation *i.e.* control group.
Figures in parentheses indicate percentage.

Table 2 : 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.			Group-III Mean ± S.D.			Group-IV Mean ± S.D.		
		BS	AS	't' value	BS	AS	't' value	BS	AS	't' value	BS	After 6 months	't' value
1.	$VitaminB_1$ (mg)	0.4±0.1 (58.7)	0.7±0.1 (78.0)	3.8**	0.4±0.1 (57.6)	0.7±0.1 (76.0)	3.2**	0.4±0.1 (58.7)	0.5±0.1 (69.3)	2.7 *	0.3±0.0 (41.3)	0.4±0.1 (58.7)	2.7*
2.	$VitaminB_2$ (mg)	0.6±0.1 (64.7)	0.7±0.1 (74.0)	3.1**	0.5±0.1 (63.5)	0.6±0.1 (71.8)	2.8*	0.5±0.1 (60.0)	0.6±0.1 (73.9)	2.6*	0.3±0.1 (38.8)	0.3±0.1 (40.0)	1.3 NS
3.	Vitamin B (mg)	0.4±0.1 (44.2)	0.6±0.1 (65.3)	2.7*	0.4±0.1 (42.0)	0.6±0.1 (64.2)	3.4**	0.4±0.1 (41.0)	0.6±0.1 (63.1)	3.5**	0.4±0.1 (42.1)	0.4±0.1 (42.1)	0.0 NS
4.	Vitamin C (mg)	27.2±3.7 (68.1)	27.2±3.7 (68.1)	0.0 NS	27.0±3.7 (67.5)	27.2±3.7 (68.0)	0.70NS	24.3±3.3 (60.8)	25.8±3.5 (64.5)	0.12 NS	22.0±3.0 (55.0)	22.04±3.0 (55.1)	0.10 NS
5.	β–Carotene (µg)	500±3.7 (31.3)	1128±15.0 (78.5)	6.1**	576±6.7 36.0)	1176±16.6 (73.5)	3.9**	326±14.5 (20.4)	1080±14.5 (67.5)	4.2**	326±4.5 (20.4)	757.1±10.4 (47.3)	2.8**

Group-I = Experimental group with supplementation of soya *ladoo*, Group-II = Experimental group with supplementation of soya *chakali*,
Group-III = Experimental group with supplementation of soya flakes *chiwada*, Group-IV = No supplementation *i.e.* control group, Figures in paren theses indicate percentage,
***, ** and * indicates of significance of values at P=0.01, 0.05 and 0.1, respectively, NS = Non - significant, BS = Before supplementation, AS= After supplementation
Average vitamins intake of experimental groups with their before and after supplementation.

significant level (from 20.4 to 47.3%) after experimental period. However, none of the experimental group found its intake of ß carotene at adequate level after supplementation (Ghatge, 2012).

Conclusion :

On whole it can be concluded that the supplementation of soya products to pre-school malnourished children have seen significantly increased in their B complex vitamins and ß carotene except vitamin C.

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Received : *07.03.2014;* **Revised:** *07.09.2014;* **Accepted :** *22.09.2014*