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Comparative study of feeding soyladoo and soychakali to malnourished pre-school children and its impact on their biochemical analysis

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Malnutrition is a worldwide health issue. It imposes a toll on child mortality, 53 per cent of deaths in children under 5 years in age are nutrition related in worldwide. It may be due to the role of nutrients in disease and immunity. To treat malnutrition among the preschool children the formulation of locally based protein rich product is must hence attempt was made to formulate soybased food products such as soyladoo and soychakali. These soyabased food products formulated and prepared by standard methods. Organoleptically selected soya products were analyzed for its chemical composition such as protein, fat, vitamins, minerals, and ant nutritional factors. These products were supplemented to pre-school malnourished children @ 40 g/head/day for six months. Pre-school malnourished children were graded according to grade of malnutrition. Their biochemical parameter such as serum iron (µg/dl) serum proteins (gl/dl), serum vitamin A (IO/dl), serum zinc (µg ml), blood glucose mg/dl and Haemoglobin g/dl had done monthly for six months. It had shown highly significant changes on blood glucose level, haemoglobin, serum protein, serum vitamin A, serum iron and serum zinc states of pre-school children after supplementation of soyaproducts.

Key Words : Soyladoo, Soychakali, Supplementary feeding

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INTRODUCTION

Soybean is very much popular food crop in most of the countries of the world whereas large number of people is found of soya products are prepared from soya seeds. Soybean is now getting wide acceptance in India. The soybean have the potentially to become industrial raw material in dairy products and agricultural stuff. Soybean is higher in protein than other legumes and many animal products. The protein derived near by 40 per cent by soybean. However, the quality of soya protein that is most remarkable health care professionals across the global recognizes. The superiority in quality of soya protein considers equivalent to that of the other high quality protein sources. It has been also significant that the amino acids of the protein of soybean are much similar to those of cow milk protein Carrington (2008).

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METHODOLOGY

Formulation:

Formulation and preparation of soyladoo, soychakali and soyflakes chiwada was done by using standard method by Thangamms (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 in AOAC (1984).

Statistical analysis :

The analysis significant at $p < 0.05$ level, S. E. and CD. at 5 per cent level by the procedure given by Gomez and Gomez (1984).

Biochemical analysis:

The nutritional status of the preschool children before and after the experimental period was evaluated through biochemical analysis method. The parameters such as haemoglobin g/dl, serum protein g/dl, blood glucose level mg/dl, serum vitamin A µ/dl, serum iron µg/dl and serum zinc µg/dl were analyzed by using methods given by Raghunramula *et al.* (1983).

OBSERVATIONS AND ASSESSMENT

Table 1 represent the precise picture of average major nutrients content in content different soya by products. It revealed that, the values of major nutrients like carbohydrate (95.4 g), energy (1070 k.cal), total protein (32.1g) and crude fat (24.0g) noticed more in soyladoo than other soya by products. In soychakali the values of carbohydrate (93.1), energy (1065 k.cal), and total protein (30.8 g) were shown in soychakali. Major nutrients content between soyladoo and soychakali did not found significantly by different.

Biochemical analysis of experimental groups of pre-school children :

This utilization of food depends on the conversion of food into functional nutrients after its absorption. This relevance is any essential to study the facts and significance of food after consumption. Biochemical analysis is one of best and very relevant scientific method for assessment of nutritional status of the community. In this method biochemical parameters like blood, serum, plasma etc are used for the study.

The constituents in the blood such as blood glucose level, hemoglobin content serum protein, serum vitamin A, serum iron and serum zinc analyze experimental groups of children before and after supplementation.

The data of average in biochemical analysis of experimental group was given in Table 2. It explained that, Group I children found more average values of blood glucose *i.e.* 72.1 mg/dl, haemoglobin 10.2 g/dl, serum protein 6.2 g/dl, serum vitamin A 126.0 IU/dl and zinc 1.09 µg/m. When these values contents into per cent it shown average as 88.1, 83.6, 82.6, 91.9, 94.3 and 77.9 as blood glucose haemoglobin, serum protein, serum vitamin A, serum iron and serum zinc, respectively (Ghatge, 2013a).

There was no major difference noticed in the average values of blood glucose level, serum protein, serum vitamin A, serum iron and serum zinc of group II and III children after supplementation. Haemoglobin level in group II children noticed as 8.6 g/dl, *i.e.* 68.8 per cent. Serum vitamin A observed in group II children as 112.3 IU/dl *i.e.* 74.7 per cent. All the average values of biochemical parameters were noted below the standard level in control group of children. Serum vitamin A (36.0 IU/dl) and zinc (0.54 µg/ml) level found drastically poor in this group of children.

The biochemical parameters which were analyzed after supplementation were compared with their previous *i.e.* before supplementation values. The relevant data was presented in Table 3 and 4.

Lementation :

Table 3 represents the data regarding average biochemical assessment in particularly blood glucose and haemoglobin level before and after supplementation. It shown that, group I children had highly significant difference in their blood glucose level in before supplementation (66.5 mg/dl) and after supplementation (72.1 mg/dl). Whereas group II increased from 60.4 to 65.7 mg/dl blood glucose level after supplementation. There was no significant difference noted group I blood glucose level before and after experimental period in control of group of children.

A similar observation were recorded about haemoglobin level of these experimental groups of children. From 7.7 to 10.2 g/dl increased in haemoglobin level was reported by group I children after

supplementation. It has shown highly significant increase from 61.7 to 85.6 in per cent in this group. Group II children shown increase of haemoglobin from 8.1 to 8.6 g/dl (*i.e.* 64.4 to 68.0 %). Control group children did not

Table 1 : Average major nutrients content in soya by products

Sr. No.	Major nutrients (per 100g)	Soya by products		
		Soyladoo Mean ± SD (a)	Soychakali Mean ± SD (b)	't' Test
1.	Moisture (%)	11.6±2.2	11.4±1.2	a vs b (0.06) NS
				b vs c (1.10) NS
				c vs a (0.07) NS
2.	Ash (%)	3.1±1.7	2.9±0.9	a vs b (1.23) NS
				a vs b (1.61) NS
				c vs a (0.91) NS
3.	Carbohydrate (g)	95.4±1.9	93.1±0.7	a vs b (1.77) NS
				b vs c (2.65) *
				c vs a (2.81) *
4.	Energy (k.cal)	1070.0±1.8	1065.0±1.4	a vs b (1.22) NS
				b vs c (2.78) *
				c vs a (2.86) *
5.	Total protein (g)	32.1±1.7	30.8±1.5	a vs b (1.07) NS
				b vs c (1.23) NS
				c vs a (2.61) *
6.	Crude fat (g)	24.0±1.3	22.8±1.7	a vs b (0.92) NS
				b vs c (0.03) NS
				c vs a (1.13) NS

* indicates significance of value at P=0.05 NS = Non-significant

Table 2 : Average in biochemical analysis of experimental groups

Sr. No.	Biochemical analysis	Group I Mean ± S.D.	Group II Mean ± S.D.	Group III Mean ± S.D.
1.	Blood glucose (mg/dL)	72.1±2.7(88.1)	65.7 ± 2.9 (72.9)	66.0 ± 9.0(73.3)
2.	Haemoglobin (g/dl)	10.2±1.0(83.6)	8.6 ± 1.1 (68.8)	7.6 ± 1.02(60.7)
3.	Serum protein(g/dl)	6.28 ±0.9(91.9)	5.8 ± 0.8 (86.6)	4.3±0.7(65.5)
4.	Serum vitamin A (IU/dl)	126.0±4.1(87.0)	112.3±2.9 (74.7)	36.0±1.1(24.0)
5.	Serum iron (µg/dl)	139.7 ± 1.9(82.2)	69.7±9.5 (66.4)	105.4±6.8(48.2)
6.	Serum zinc (µg/ml)	1.09±2.1(77.9)	1.05±2.0(75.0)	0.54±0.9(24.0)

Group I - Experimental group with supplementation of soyladoo.
Group II - Experimental group with supplementation of soychakali.
Group III - No supplementation i.e. control group.
Figures in parantheses indicate percentage.

Table 3 : Average of blood glucose and haemoglobin level of experimental groups before and after supplementation

Sr. No.	Biochemical analysis	Group I Mean ± S.D.			Group II Mean ± S.D.			Group III Mean ± S.D.		
		BS	AS	't' value	BS	AS	't' value	BS	AS	't' value
1.	Blood glucose (mg/dl)	66.5±2.7 (72.9)	72.1±2.9 (88.1)	3.7**	60.4±2.2 (60.4)	65.7±2.9 (72.9)	3.2*	60.9±1.9 (65.9)	66.0±1.8 (72.4)	1.5NS
2.	Haemoglobin (g/dl)	7.7±1.1 (61.7)	10.2±1.4 (85.6)	3.8**	8.1±1.1 (64.4)	8.6±1.2 (68.8)	1.4 NS	7.6±1.0 (60.0)	7.8±1.1 (61.3)	-0.90 NS

Group I - Experimental group with supplementation of soyladoo.
Group II - Experimental group with supplementation of soychakali.
Group III - No supplementation *i.e.* control group.
Figures in Parantheses indicate percentage.
* and ** indicate significance of values at P=0.05 and 0.01, respectively
NS=Non-significant BS – Before supplementation AS – After supp

Table 4 : Average of serum protein, vitamin A, iron and zinc status of experimental groups before and after supplementation

Sr. No.	Biochemical analysis	Group I Mean ± S.D.			Group II Mean ± S.D.			Group III Mean ± S.D.		
		BS	AS	't' value	BS	AS	't' value	BS	AS	't' value
1.	Serum iron	50.7±6.9	79.6±10.9	5.40**	50.06±6.8	69.7±9.5	2.50*	50.5±6.8	52.5±6.8	0.47
	(µg/dl)	(48.3)	(75.9)		(47.7)	(66.3)		(48.2)	(50.2)	NS
2.	Serum protein	4.1±0.6	6.1 ±0.8		4.2 ±0.6	5.8±0.8	2.7*	4.4 ±0.7	4.9 ±0.5	1.24
	(gl/dl)	(61.1)	(91.0	4.41**	(62.7)	(86.5)		(67.7)	(69.7)	NS
3.	Serum vitamin	8.65±1.2	30.0 ±4.0		8.28±1.1	28.4 ±3.9	3.71**	8.21±1.1	8.4±1.4	0.71
	A (IU/dl)	(25.1)	(87.0)	4.24**	(24.0)	(81.9)		(23.7)	(25.7)	NS
4.	Serum zinc	9.19 ±1.3	15.5 ±2.1		11.65±1.6	14.8±2.0	3.18**	7.27±1.0	7.8±1.8	0.64
	(µg/ml)	(48.3)	(81.7)	3.73**	(61.3)	(76.7)		(38.2)	(40.2)	NS

Group I - Experimental group with supplementation of soyladoo.
Group II - Experimental group with supplementation of soychakali.
Group III - No supplementation *i.e.* control group.
Figures in Parantheses indicate percentage.
* and ** indicate significance of values at P=0.05 and 0.01, respectively
NS=Non-significant BS – Before supplementation AS – After supplementation

shown any significant difference in the haemoglobin level after experimentation.

The data regarding average values of serum protein, vitamin A, iron and zinc of experimental group of children compared with before and after supplementation was given in Table 4. It indicated that, among these group of children. Group I score more increased serum protein level from 4.1 to 6.2 g/dl, which recorded as a normal protein level (91.0 %). In groups children also recorded increase of serum protein status at moderate level. Whereas group II reported as increased from 4.2 to 5.8 g/dl serum protein after experimentation. There was slight increased in serum protein level from 4.1 to 4.3 g/dl, but not shown significant difference between before and after supplementation in control group of children.

Average value of serum vitamin A was noted higher in group I children. It was highly significant more after supplementation (126.0IU/dl) than before supplementation (38.6 IU/dl). This increased per cent of serum vitamin A level in group I children noted in moderate normal level of their standard value group II children also noticed increased the; level of serum vitamin A from 8.28 to 28.0 IU/dl after supplementation. However, this increased per cent of serum vitamin A level recorded in below the moderate level of their standard value. No significant change was observed on serum vitamin A level after experimentation among control group children.

Serum iron status found highly significant increased by 47.6 to 82.2 per cent in group I children. Control group of children reported a significant increased in serum iron level from 81.9 to 105.4 µg/dl (*i.e.* 48.2 to 62.0 %) after supplementation.

Highly significant increase was reported in the value of serum zinc among group I children. It found increased from 0.68 to 1.09 µg/ml. which recorded as 77.9 per cent increased after supplementation followed by group I children, they increased serum zinc level from 61.3 to 76.7 per cent after supplementation. Control group of children recorded a non-significant increase in serum zinc level after supplementation (Ghatge, 2013b)

Conclusion:

On the whole, it can be concluded that, the supplementary feeding through soybyproducts found positive impact on improving the biochemical parameters of preschool malnourished children. Among the soyabyproducts supplementation of soyladoo shown a highly significant effects on increasing blood glucose level, blood haemoglobin, serum protein, serum vitamin A, serum iron and serum zinc status of preschool children. All the analyzed biochemical parameters noted increased moderate to normal standard level. It indicated that soyabyproducts have effectively worked. These products have capacity in improving the nutritional status of malnourished pre-school children.

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