

## Consumption pattern of green leafy vegetables among selected urban households in Bangalore, India

R. PRABHA, KAMAL G. NATH AND B.S. RAMYA

Accepted : October, 2008

### ABSTRACT

The study was carried out to understand the consumption pattern of green leafy vegetables among the selected households. The sample size included 100 women each from employed and unemployed groups. A schedule was formulated to obtain data and was pretested on a sub sample of 10 per cent. A list of all recipes commonly prepared incorporating green leafy vegetables was collected from respondents. The recipes were standardized in the laboratory. Nutritive value (Ca, Fe, Fibre,  $\beta$ -carotene) of green leafy vegetables consumed by the respondents was calculated by taking an average of all the commonly consumed greens. Curry and coriander leaves were mainly used daily as the ingredients for seasoning and also in chutney powder etc. Amaranth, spinach were also used by 90 per cent of the respondents. Majority of the respondents (51%) consumed greens twice a week and immediately after purchase or within one day. Only 10 per cent of respondents stored greens for more than a day and used polythene bags with refrigeration as common and major method of storage. Per capita consumption of greens ranged between 48-66 g for the adult and adolescents as against a figure of 100 g recommended by ICMR. The prevalence of nutritional deficiencies like anemia among women in reproductive age vitamin 'A' deficiency among pre-school children may easily be prevented by incorporating a handful of greens in their daily diets. One of the methods of combating these deficiencies is through non formal nutrition education to all the members of the family and specially of the women folk, who are mainly involved in managerial aspects of household; purchase and preparation of food for the family.

See end of the article for authors' affiliations

Correspondence to:  
**KAMAL G. NATH**  
Department of Food  
Science and Nutrition,  
University of Agricultural  
Science, GKVK,  
BANGALORE  
(KARNATAKA) INDIA

**Key words :** Consumption pattern, Green leafy vegetables, Per capita consumption cooking practices, Storage.

Many types of greens are rich source of vitamins such as vitamin 'C' carotene, calcium, iron, riboflavin, folic acid, crude fibre and bulk required for growth and maintenance of health. Even the greens are liked for their flavour and taste for human palate. Very important factor to be considered is that the greens are least expensive and are easily grown and can be made available throughout the year from small plot of land. Hence, green leafy vegetables must form a part of everybody's diet specially the vulnerable group which includes children, adolescents, pregnant, nursing and aged people where in their requirements for vitamins and minerals are higher. As the information on consumption pattern of the green leafy vegetables specifically is scanty, the study aims at understanding the consumption pattern of green leafy vegetables within the families of employed and unemployed women.

### METHODOLOGY

The sample size included 100 women each from both the groups that is, employed and unemployed. A schedule was formulated to obtain data on general and socio-economic background and general practices involved in consumption of green leafy vegetables (Thimamyamma

and Rau, 1987). A list of all recipes commonly prepared incorporating green leafy vegetables was collected from respondents. The recipes were standardized in the laboratory. Nutritive value (Ca, Fe, Fibre, Beta-carotene) of green leafy vegetables consumed by the respondents was calculated by taking an average of all the commonly consumed greens (Gopalan *et al.*, 2000). Categories pertaining to characters *viz.* income and family size were made using  $\pm$  standard deviation. The data were analyzed using 't' test to test the significant difference between the groups and chi-square test to measure association between groups.

### RESULTS AND DISCUSSION

The study was conducted on 200 women comprising of 100 employed and 100 unemployed women. The reason for the consumption of greens was obtained from the respondents. Table 1 reveals that 24.5 % of the respondents were of opinion that, green leafy vegetables are good for health. 21% answered that they prevent anemia etc. and 15.5 % expressed as rich source of nutrients. The occupational status of the respondents had no influence on the knowledge and use of green leafy vegetables.

**Table 1 : Reasons for consumption of green leafy vegetables by respondents**

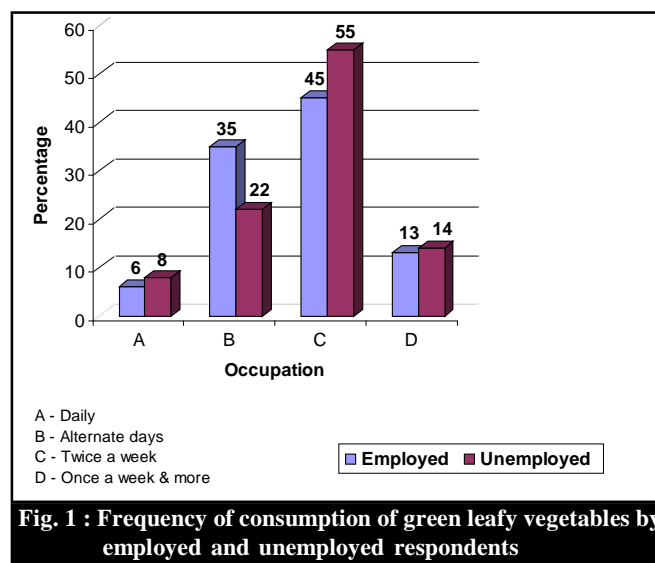
Reasons for consumption	Per cent of respondents
General health	24.5 (49)
General health and economical	6.0 (12)
Presence of nutrients	15.5 (31)
Presence of nutrients and economical	9.5 (19)
Presence of nutrients, economical and easy availability	9.0 (18)
Specific health	21.0 (42)
Specific health, presence of nutrients and economical	14.5 (29)
Total	100.0 (200)

Among all the greens coriander and curry leaves were used by one hundred per cent of the respondents regularly (Table 2). No difference was observed between the two groups (employed and unemployed) in the variety of greens consumed. Amaranthus, mint, fenugreek and spinach were also used by more than 90 % of the respondents. Least (5.5%) of the women included gogu (*Hibiscus cannabinus*) in their diet. Not only the varieties

**Table 2 : Varieties of green leafy vegetables consumed by respondents**

Varieties of green leafy vegetables	Employed (n = 100)	Unemployed (n = 100)	Combined percentage
Coriander Leaves ( <i>Coriandrum sativum</i> )	100	100	100.00
Curry leaves ( <i>Murraya koenigii</i> )	100	100	100.00
Amaranth Tender ( <i>Amaranthus gangeticus</i> )	100	95	97.50
Mint ( <i>Mentha spicata</i> )	99	94	96.50
Fenugreek leaves ( <i>Trigonella foenum – graceum</i> )	99	94	96.50
Spinach ( <i>Spinacia oleracea</i> )	96	88	92.00
Shepu ( <i>Peucedanum graveolens</i> )	79	46	62.50
Ambat Chuka ( <i>Rumex vesicarius</i> )	34	48	41.00
Ponnanganni ( <i>Alternanthera sessilis</i> )	24	26	25.00
Drumstick Leaves ( <i>Moringa oelifera</i> )	22	27	24.50
Basale ( <i>Basella rubra</i> )	18	21	19.50
Radish leaves ( <i>Raphanus sativus</i> )	17	11	14.00
Colocasia Leaves ( <i>Colocasia anti-quorum</i> )	11	10	10.50
Agathi ( <i>Sesbania grandiflora</i> )	8	9	8.50
Tamarind Leaves ( <i>Tamarindus indica</i> )	8	7	7.50
Gogu ( <i>Hibiscus cannabins</i> )	5	6	5.50

of greens consumed matters nutritionally, but also the frequency of consumption is an important consideration. Only 7 % consumed green leafy vegetables daily (Fig. 1). Majority (51.1%) consumed greens twice a week. Statistically no association was observed between, occupation and frequency of usage of greens ( $X^2 - 4.31$ ).

**Fig. 1 : Frequency of consumption of green leafy vegetables by employed and unemployed respondents**

Greens were consumed twice or thrice a week in majority of the population, irrespective of the occupation. Impact of family income, age group and educational level influence their consumption (Table 3). Majority of women (50%) of all the age groups, all the monthly income groups and educational level consumed vegetables twice a week. Family income and education had no impact on their consumption. Bruhn and Pangborn (2001) have also reported similar observations.

Important factors affecting nutrient loss in fresh greens between harvest and use on table include duration of time they are stored and also the method of storage. Impact of occupation and educational level of respondents on duration of storage has been indicated in Fig. 2a, 2b and 3, thirty eight per cent of employed and fifty five per cent of unemployed respondents consumed greens immediately after purchase while fifty one and thirty six per cent of respondents belonging to employed and unemployed categories consumed greens soon after purchase. Statistically no significant impact of occupation was observed on storage and usage practice. Statistically no significant impact of educational level was observed on duration of storage and usage of greens by the respondents (Fig. 3). These observations were at par with the observations made by Ramachander *et al.* (1983).

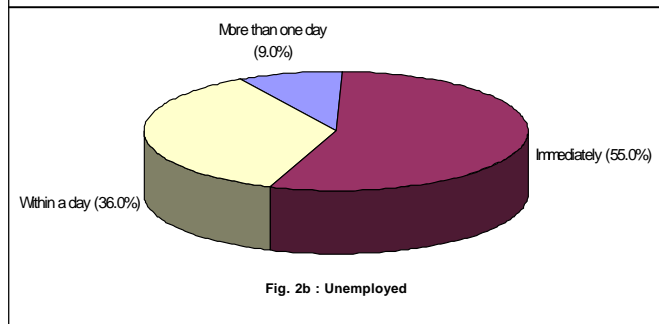
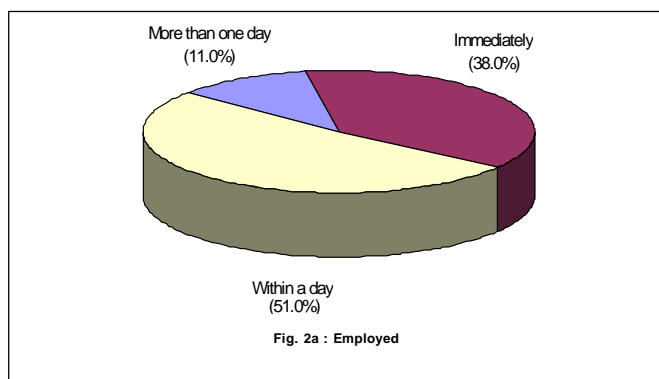
After purchase, few 10% stored the greens for more than one day before use. Even the respondents 4305% who

**Table 3 : Impact of age, monthly family income and educational level of respondents on frequency of consumption of green leafy vegetables**

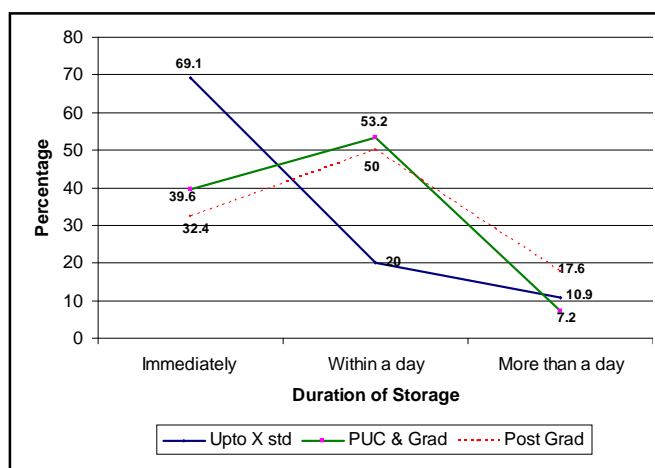
Characters		Frequency of consumption				total	X <sup>2</sup> values
		Daily	Alternate days	Twice a week	Once a week and others		
Age group	Less than 30	0 (0.0)	8 (27.5)	16 (55.2)	5 (17.2)	29 (100.0)	5.51 <sup>NS</sup>
	30 – 40	8 (8.5)	27 (28.7)	43 (55.8)	16 (17.0)	94 (100.0)	
	40 and above	6 (7.8)	22 (28.6)	43 (55.8)	6 (7.8)	77 (100.0)	
Monthly family income (Rs.)	Upto 3920	4 (14.3)	5 (17.8)	15 (53.6)	4 (14.3)	28 (100.0)	10.11 <sup>NS</sup>
	3920 – 7220	2 (2.5)	29 (35.8)	41 (50.6)	9 (11.1)	81 (100.0)	
	7220 – 10,520	6 (8.2)	18 (24.6)	39 (53.4)	10 (13.7)	73 (100.0)	
Educational level	Upto Xth Standard	7 (12.7)	18 (32.7)	23 (41.8)	7 (12.7)	55(100.0)	6.05 <sup>NS</sup>
	PUC and Graduation	5 (4.5)	30 (27.0)	62 (55.8)	14 (12.6)	111 (100.0)	
	Post graduation	2 (5.9)	9 (26.5)	17 (50.0)	6 (17.6)	34 (100.0)	
Combined number		14 (7.0)	57 (28.5)	102 (51.0)	27 (13.5)	200(100.0)	

Figures in the parenthesis indicate percentage.

NS- non significance



**Fig. 2a & 2b : Duration of storage of green leafy vegetables before use by employed and unemployed respondents**



**Fig. 3 : Impact of educational level of respondents on duration of storage of green leafy vegetables**

used within one day also stored the greens. Use of polythene bag with refrigeration was the most popular method followed by other indigenous methods like root dipped in water, wrapping wet cloth, use of only polythene bags without refrigeration as shown in Fig. 4a and b. The trend observed that the higher the educational level better was the method of storage used by respondents. It is observed from Fig. 5a and Fig. b that 46.5 per cent of the respondents washed the greens in the running water and

then chopped them which is nutritionally an ideal practice. About 37.5 % cut the greens and then washed. There was no significant difference between employed and unemployed respondents in method of washing. Educational level had no significant impact on method of washing and thus nutrition education or awareness must become a component in the nutritional frame work to follow better or ideal procedure. Fig. 6.

It is observed that occupation had no impact on special inclusion of greens during pregnancy and lactation. Thirty five respondents included greens especially shepu (peucedanum graveolens) and 7 of them included all the greens, specially during lactation. The study did not show any impact of educational level of respondents on inclusion of greens during pregnancy or lactation (Fig. 7). During cooking most of the water soluble nutrients are lost. Hence, proper care must be taken during cooking in

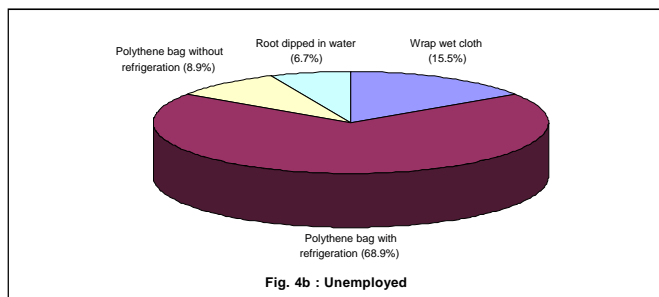
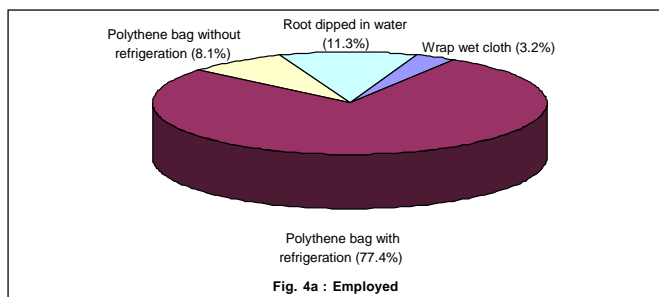


Fig. 4a & 4b : Method of storage of green leafy vegetables followed by employed and unemployed respondents

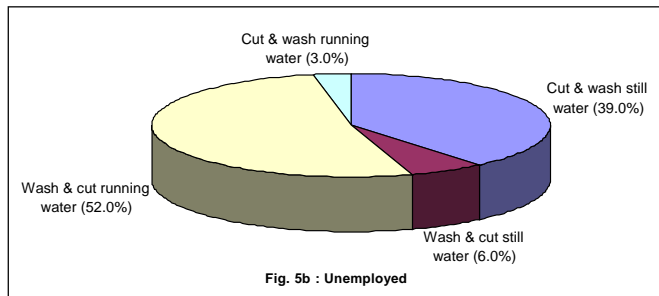
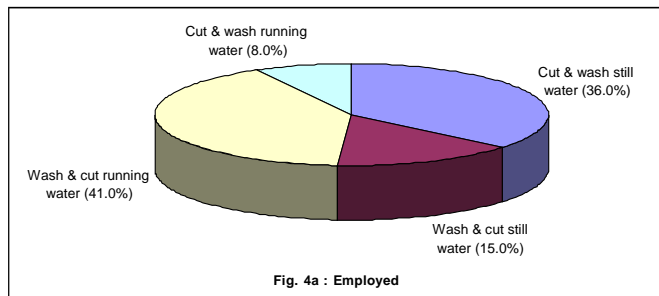


Fig. 5a & 5b : Method of washing of green leafy vegetables followed by employed and unemployed respondents

preserving the nutrients. Observations made by Oten-Gyang and Mbachu (1997) were found to be similar to the present study. Green leafy vegetables which are considered as an important protective food must also be properly distributed among family members for the normal maintenance of health. It is observed from Table 4 that irrespective of the family income, family size and educational level of respondents, the per capita consumption of greens ranged from 48 – 66 g. Monthly family income and family size had no significant difference in per capita consumption of greens. Respondents with under graduation and graduation showed low intake of greens (48.5 g) as compared to respondents having school

education and below. The average per capita consumption of greens was 55.8 g.

Table 5 shows the consumption pattern among the family members. Adults of employed category consumed more greens (69.2 g.) than unemployed category (55.5 g.) and showed statistically significant difference among these two categories ( $t = 4.23$ ). Statistically significant difference was noticed between per capita consumption of adult and adolescent of employed category consumption of green leafy vegetables by adults, adolescents and children was calculated. The actual consumption of greens was compared by RDA which showed significant

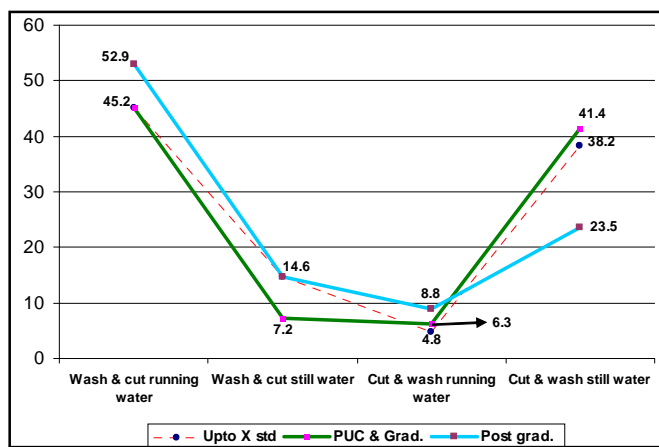


Fig. 6 : Impact of educational level of respondents on method of washing of green leafy vegetables

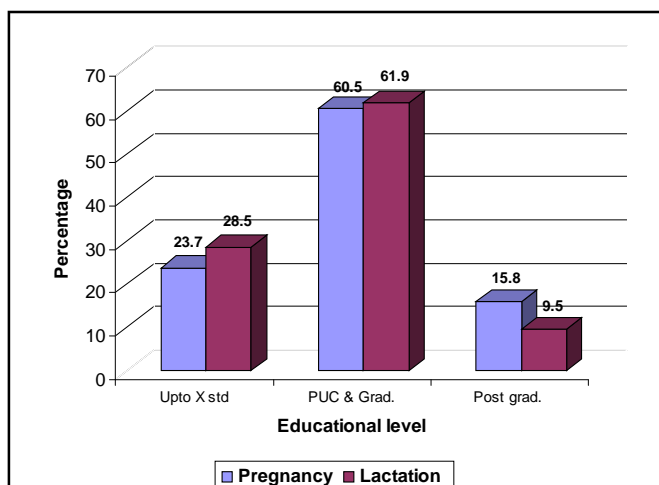


Fig. 7 : Impact of educational level of respondents on special inclusion of green leafy vegetables during pregnancy and lactation

**Table 4 : Impact of monthly income, family size and educational level of respondents on per capita consumption of green leafy vegetables**

Characters	Category	No. of households	Percapita consumption (g.)
Age group	Less than 30	28	55.5
	30 – 40	81	50.1
	40 and above	73	59.3
Monthly family income (Rs.)	Upto 3920	18	56.5
	3920 – 7220	66	52.0
	7220 – 10,520	106	53.6
	More than 10,520	28	65.0
Educational level	Upto Xth Standard	55	65.5
	PUC and Graduation	111	48.5
	Post graduation	34	60.8
Combined number		200	55.8

Common letters indicate non significant within the groups.

**Table 5 : Intrafamily distribution of green leafy vegetables**

Family members	Employed		Unemployed		Combined		't' value between employed and unemployed
	No.	Consumption (g.)	No.	Consumption (g.)	No.	Consumption (g.)	
Adults	395	69.2 <sup>a</sup>	306	55.5 <sup>a</sup>	701	63.2 <sup>a</sup>	4.23 <sup>a</sup>
Adolescents	25	34.4 <sup>b</sup>	26	46.7 <sup>a</sup>	51	40.6 <sup>b</sup>	1.18 <sup>NS</sup>
Children	101	36.7	102	26.3	203	31.5	1.14 <sup>NS</sup>
Overall	521	61.2	434	48.1	955	55.8	4.62*

Common letters indicate non significant within the groups. NS- non significant \* Significance of values at P = 0.05

**Table 6 : Comparison of percapita consumption of green leafy vegetables with recommended daily allowances**

Family members	No.	Percapita consumption (g.)	Calculated nutrients for percapita consumption				't' value between percapita consumption with RDA
			Calcium (mg.)	Iron (mg.)	-carotene (mg.)	Fibre (g.)	
Adults	701	63.2 (100)	216.1 (400)	2.8 (30)	2,801.6 (2400)	0.76 (40)	20.2*
Adolescents	51	40.6 (100)	138.8 (500-600)	1.8 (20-30)	1,799.8 (2400)	0.49 (40)	12.3*
Children	203	31.5 (50)	107.7 (400)	1.4 (18-25)	1,396.4 (1600-2400)	0.38	8.3*

**Table 7 : Per cent of nutrients contributed by green leafy vegetables compared to RDA**

Family members	No.	Percapita consumption (g.)	Deficit in consumption of greens compared to RDA	Nutrients contribution by greens in percentage in relation to RDA			
				Calcium	Iron	-carotene	Fibre
Adults	701	63.2	36.8	54.0	9.3	116.7	1.9
Adolescents	51	40.6	59.4	27.7	9.0	75.0	1.2
Children	203	31.5	18.5	26.9	7.8	87.3	0.9

differences among all the groups at 5 % level. There was about 36.8 g and 59.4 g deficit in the consumption of greens among the adults and adolescents, respectively (Table 6). The mentioned nutrients in Table 8 are the average of some of the commonly used varieties of greens.

Table 7 indicates the deficit in consumption of greens by adults, adolescents and children. The deficit was higher among adolescents as compared to adults and children.  $\beta$ -carotene supplied by greens is more than RDA in case

of adults (116.7%) but less in adolescents (75 %) and children (87.3 %), due to deficit intake of greens in their diets. Only 54.0, 27.7, 26.9 per cent of calcium; 9.3, 9.0 and 7.8 per cent of iron and 1.9, 1.2 and 0.90 per cent of fibre were contributed by greens consumed by adults, adolescents and children, respectively. Lower intake of greens by all the family members in the present study indicates a definite need for nutrition education so that they are made to understand the importance of greens in

the diet and gradually increase their consumption of greens.

---

Authors' affiliations:

**R. PRABHA AND B.S. RAMYA**, Department of Food Science and Nutrition, University of Agricultural Science, GKVK, BANGALORE (KARNATAKA) INDIA

---

## REFERENCES

- Bruhn, C.M.**, and Pangborn, R.M. (2001). Food habits of migrant farm workers in California, *J. American Dietet. Assn.* **59** : 347.
- Cronin, F.J.**, Krebs-Smith, S.M., Wyse, B.W. and Light, C. (2002). Characterizing food usage by demographic variables, *J. American Dietet. Assn.*, **81**: 661.
- Gopalan, C.**, Ramasastri, B.V. and Balasubramanian, S.G. (2000). Nutritive value of Indian Foods, NIN, ICMR, Hyderabad.
- Oteng-Gyang, K.** and Mbachu, J.I. (1997). Changes in the ascorbic acid content of some tropical leafy vegetables during traditional cooking and local processing. *Food Chemistry*, **23** (1) : 9-17.
- Ramachander, P.R.**, Biswas, S.R. and Srinivasan, V.R. (1983). Consumption pattern of vegetables by salaried class in India- A preliminary report, *Indian J. Nutr. Dietet.*, **20** : 350.
- Thimmayamma, B.V.S.** and Rau, P. (1987)**Bruhn, C.M.**, and Pangborn, R.M. (2001). Food habits of migrant farm workers in California, *J. American Dietet. Assn.* **59** : 347.

\*\*\*\*\*  
\*\*\*\*\*