

# FOLATE CONCENTRATION IN SOME COMMON FOOD ARTICLES

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## ABSTRACT

In this study, folate concentrations were analysed in food articles that are likely to be the major folate contributors, prepared by different methods. Folate levels were assessed using a microbiological technique.

In the food articles that were studied, the highest folate concentration was seen in green leafy vegetables, especially Katurumurunga. The folate was destroyed on heating. However, the loss is minimized if lime is added. Eating green leaves fresh as a sambol minimized the losses incurred during cooking. Green gram contained high amounts of folate and germinating the seeds increased the folate concentration markedly. A day's requirement can be met by consuming just 14 g of bean sprouts a day.

## INTRODUCTION

Folic acid is a B group vitamin, which is found in a variety of foods, especially fresh leafy vegetables, fruits, other vegetables, mushroom, legumes, whole grain cereals, yeast, and liver.

The principal function of the folate co-enzymes is the transfer of single-carbon atoms in reactions essential to the metabolism of several amino acids, and to nucleic acid synthesis and hence, in cell division. Thereby, its deficiency is clinically expressed in tissues with high rates of cell turnover (Goodhart and Shils 1980; Garrow and James 1996; Wickramanayake 1998).

Folate deficiency is known to cause serious health problems such as birth defects, low birth weight, pre-term delivery, growth retardation, macrocytic anaemia, ischaemic heart disease, etc. (Morrison, Schaubel, Desmeules and Wigle, 1996 ; Kandegedera, 1997). While most foods are rich in folate, as much as 50-90% can be destroyed by improper processing and storage (Wickramanayake 1998). Adding lime to food during storage will also increase the availability of folate since lime contains ascorbic acid (Vitamin C) which makes folate more stable, by protecting it from oxidative destruction (Goodhart and Shils 1980).

In the recent years, the role of folic acid in human nutrition has received increased interest because folate deficiency is known to cause serious health problems. Very little work has been done on Sri Lankan food folate and its relationship to food processing.

Therefore, the objective of this study was to determine the folate levels in common food articles that are likely to be the major folate contributors and to determine the effects of processing and storage on food folate.

## MATERIALS AND METHODS

Food belonging to the following categories have been studied so far: cereals, pulses, green leafy vegetables and other vegetables. In addition the supplementary foods "Thripasha" and "Samapasha" were also analyzed.

**Preparation of samples:** 1g of raw food was homogenized in 50ml of 0.05M phosphate buffer with Ascorbic acid and then centrifuged for 10 minutes. The supernatant was then obtained and stored frozen until the assay.

**Determination of folate:** Folate concentration was assessed using a microbiological assay with the organism *Lactobacillus casei* (Waters and Molin 1961; Hurdle, Barton and Searles 1968).

## RESULTS

The results obtained on analysis for folate in different categories of foods are shown in Tables 1 and 2.

**Table 1. The average folate concentration in each category of food studied**

Category of food	Average folate concentration
Cereals	10.8 µg/100g
Pulses	124 µg/100g
Green leaves	132 µg/100g
Other vegetables	22.9 µg/100g

**Table 2. The highest folate contributors among the foods studied**

Category of food	Highest folate contributors
Cereals	Wheat flour, Ata flour, Raw red rice
Pulses	Red cowpea, Yellow cowpea
Green leaves	Agathi, Knol khol leaves and Mukunuwenna
Other vegetables	Winged Bean, Beetroot and Beans

Heating was found to destroy 20 – 78% of food folate. In contrast, fresh green leaves when prepared as a sambol and mallun, with grated coconut and lime juice, helped to minimize the losses incurred during cooking.

The folate concentration increased fourteen fold (1400 mg/100g) when seeds were germinated for 48 hours

## DISCUSSION

Folic acid is found in a variety of foods, especially fresh leafy vegetables (from which it gets its name - Latin: folium - leaf) and is stored in these in the form of polyglutamates. The deconjugating enzyme conjugase which is found in plants and the human intestine, cleaves the polyglutamates to give the 'free folate' (mono-, di- and tri- glutamates) which can be used by the cell (Colman and Herbert 1979).

Folate gets oxidized when heated and when stored at room temperature for long periods, rendering it inactive. Hence, eating foods as fresh as possible gives the maximum availability of folate. Ascorbic acid, being a strong reducing agent, minimizes this destruction by getting oxidized instead and by providing the slightly acidic pH, which makes the folate stable.

During germination, the polyglutamates that are stored in the seed gets converted to the free form by the conjugases present, rapidly. This increases the free form markedly.

In conclusion, it could be stated that green leaves and pulses are good sources of folate whilst eating food as fresh as possible or with minimal heating gives the maximum availability of folate. Addition of lime minimises the loss during heating and storing. Germination of pulses increases the folate concentration markedly.

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