

In-vitro Iron Bioavailability in Sweet Potato Leaf Recipes as Affected by Processing Methods

By

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OUTLINE

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INTRODUCTION

The Problem

- Iron deficiency is a leading form of malnutrition in developing countries.
- Is associated with reduced physical capacity, reduced cognitive development and high morbidity.
- Traditional vegetable recipes are cheap source of iron, but are characterize by high levels of inhibitors, hence lowered iron bioavailability

Problem conts.

- The low iron bioavailability (IB) could be enhanced by right food combinations and appropriate food processing.
- But less is known on IB in relation to food processing in Tanzania.

Objectives

General objective

- To assess processing methods to increase iron bioavailability in leafy vegetables using sweet potato leaves as representative vegetable

Specific objectives

- To determine the effects of traditional processing methods on in-vitro iron bioavailability of sweet potato leaves (SPL)
- To modify the traditional methods and assess the effects of modification on in-vitro iron bioavailability

MATERIALS AND METHODS

Materials

- Fresh SPL produced from different sites were purchased from a local market
- Sample preparation done at AVRDC Nutrition laboratory, Shanhua, Taiwan.

Sample preparation

1. Traditional preparations

| Stage | State of vegetable | |
|-------------|---|---|
| Pre-cooking | Fresh Sun drained 30 minutes | Sun-dried Dried on sun, 36 hours, 25 – 26⁰C |
| Cooking | 30 minutes, With sunflower oil and Without oil | |
| Reheating | Cooked vegetables stored 24 hours and re-boiled | |

Modified preparations

| Stage | State of vegetable | |
|-------------|--|---|
| Pre-cooking | Fresh Drained under shade | Oven-dried Dried in oven at 50°C for 16 hours |
| Cooking | 10 min. Oil, oil + tomato, oil + lemon, soybean | 10 min. oil, oil + tomato |
| Reheating | Refrigerated at 4°C, re - boiled (Oil, oil + tomato) | |

Determination of in-vitro iron

- An in-vitro method for estimating iron availability was used by a modified calorimetric method as described in Miller and Schricker (1982) and modified by Kapanidis and Lee (1995).
- Iron bioavailability was expressed as percent of total non-heme in the original sample that is present in the dialysis bag at the end of the digestion.

Plate 1: Samples (20g) placed in 125ml flasks and covered



Plate 2: A dialysis bag added to 20g aliquot of pepsin digest



Plate 3: Dialysis bag washed thoroughly by distilled water



Plate 4: Dialysate for iron determination by BATHO method



Statistical analysis

- Statistical analysis was carried out using Statistical Analysis System (SAS) (SAS, 1991) for completely randomized design. Means were separated by Duncan multiple range test also in SAS computed at probability level of $P = 0.05$.

RESULTS AND DISCUSSION

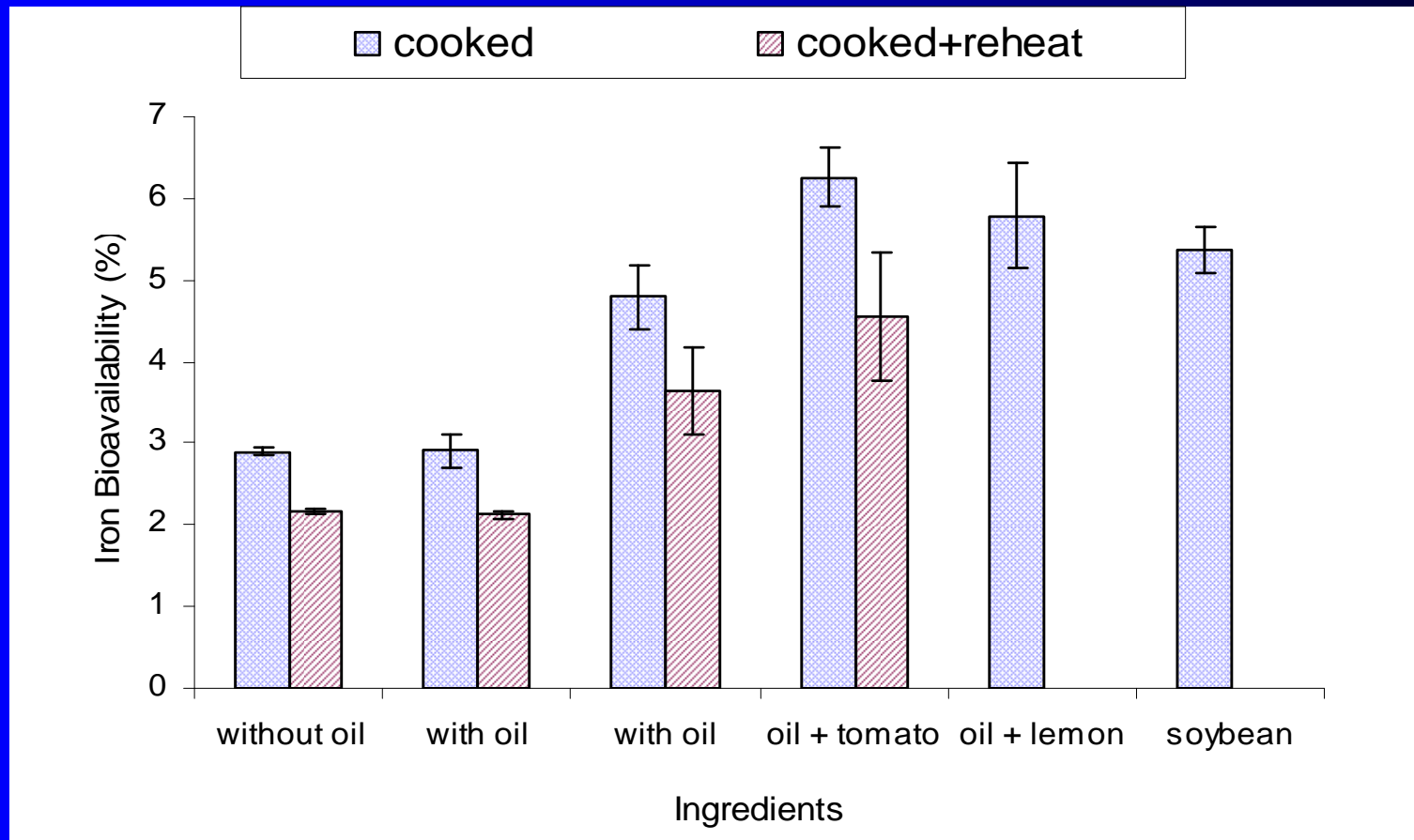
Table 1: Effects of traditional preparations

| Treat. | Fresh | | Sun-dried | |
|----------|-------------------|-------------------|-------------------|--------------------|
| | Without oil | With oil | Without oil | With oil |
| Cooked | 2.90 ^a | 2.91 ^a | 3.08 ^a | 3.19 ^a |
| Reheated | 2.17 ^b | 2.12 ^b | 3.78 ^a | 3.42 ^{ab} |

Table 2: Effects of modified preparations

| Treat | Fresh | | | | Oven-dried | |
|----------|-------------------|-------------------------------|-------------------|--------------------|--------------------|-------------------|
| | Oil | Oil + tomato | Oil + lemon | Soybean | Oil | Oil + tomato |
| Cooked | 4.79 ^c | 6.26 ^{b^a} | 5.79 ^b | 5.36 ^{bc} | 4.47 ^{ba} | 7.08 ^a |
| Reheated | 3.64 ^b | 4.55 ^{b^a} | - | - | 4.32 ^{ba} | 5.32 ^a |

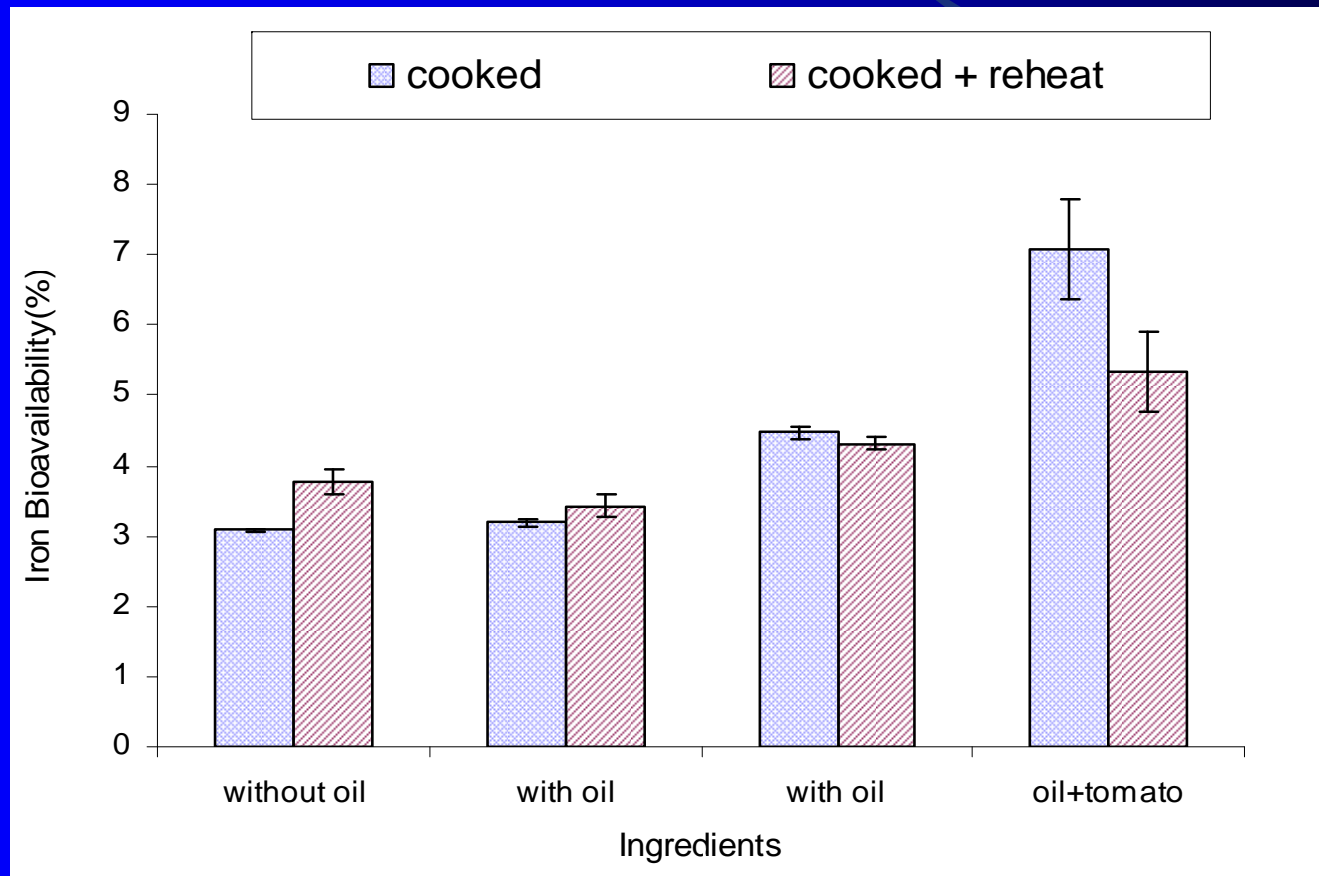
Fig. 1: IB in fresh recipes



TM

MM

Fig. 2: IB in dried recipes



SD

OV

Results and discu. Conts.

Effects of Traditional Methods

1. Significantly lower levels of IB, associated to:
 - Physical removal
 - High loss of ascorbic acid (Davidsson, 2001)
 - Increased effects of inhibitors such as polyphenols (Naidu, 2003).

Effects of modified methods

2. Highest levels of IB in oil + tomato recipes, followed by oil + lemon recipes

- Presence of ascorbic acid in tomato and lemon (Naidu, 2003 and Teucher, 2004)
- Beta-carotene in tomato enhance non-heme iron absorption (Manju et al, 2000; Graham and Rosser, 2000)

CONCLUSIONS & RECOM.

- In-vitro iron bioavailability is improved by 1.52% – 3.30% when vegetables are prepared by modified methods.
- Oil + tomato have highest potential for improving iron bioavailability in vegetable dishes

Concl. and recomm. conts.

- Oil + lemon dishes are second highest in iron bioavailability
- Oven-drying of vegetables is recommended as a better way of preserving vegetables than direct sun-drying.

Concl. and Recom. Conts.

- Simple improved preparations methods such as boiling for a shorter time, avoiding coiling and draining vegetables in the sun, washing before cutting and retaining boiled stock or soup are highly recommended.

And therefore.....

- These findings are useful in guiding households in identifying and utilizing traditional vegetable recipes that are of high nutritional quality, locally available and of low cost

Acknowledgements

Thanks to AVRDC, for financial support through PRONIVA.

● THANK YOU!