The nutritional value of selected canned vegetables, fruit and legumes within a balanced diet

NICUS
Commissioned by the South African Fruit & Vegetable Canners Association (SAFVCA)
2009
Overview of the presentation

• Background and introduction to NICUS
• International and national excerpts and reviews, and recommended goals for vegetable and fruit intake
• Available scientific data relating to the nutritional value of canned vegetables and fruit within a balanced diet
• Key findings regarding the role of selected canned vegetables, fruit and legumes and as compared with either fresh or frozen vegetables and fruit, based on the findings of the desktop review
• Dietary recommendations in line with the South African Food Based Dietary Guidelines and other authoritative bodies
The Team

• Prof Marietjie Herselman, Head of the Division of Human Nutrition
• Tani Lombard RD(SA), NICUS Manager
• Irene Labuschagne RD(SA), NICUS
• Charlene Villinger RD(SA), NICUS
NICUS
A SOURCE OF TRUTH FROM 1997

• The University of Stellenbosch's Department of Human Nutrition has established the Nutrition Information Centre (NICUS) to act as a reliable and independent source of nutrition information in South Africa.

• Backed by the University's Faculty of Medicine, NICUS provides the public, the media and health professionals with the most up-to-date, authoritative information on nutrition.
Services: Training

- HIV/AIDS
- TB
- Infant feeding
- Food safety
- Food fortification
- Nutritional therapy
- Diseases of the lifestyle
- Micro Nutrient Supplementation
Services: Public

- Provision of a hotline for nutritional campaigns
- Provision of information to the public on food and nutrition
- Web-site with free online nutrition information – public and health care professionals
- Organising and implementing workshops
- Assistance with press releases in accordance with the health calendar
The Centre has close ties with the media and a significant number of interviews and articles have been prepared for radio, television, newspapers and popular magazines.
Services: Health Professionals

• Continuous Professional Development
• Symposiums/Congresses
• Information Support
• Lectures and workshops
• Scientific articles
Services: Fact sheets and pamphlets:

- Compilation of nutrition pamphlets
- Compilation of fact sheets
- Updating of existing pamphlets
- Printing of pamphlets
- Development of posters
- Dissemination of pamphlets and fact sheets
- Collection, compilation and interpretation of the recent literature on a given topic
Services:
Consultancy and commissioned reports

- MRC AfroAidsInfo 2004, Editorial Support
- University of Cape Town 2005: Evaluation of the South African Primary School Nutrition Programme
- Merc 2003: Report on the role of zinc in health and defined clinical settings
- Other training and Ad Hoc Consultancy: Avroy Slain, Solutio, Cipla Med, Betavir, Ceres, Unilever, Nestle, Kelloggs, Pioneer
- Product development: Cipla Med, Avroy Shlain
Consultancy and commissioned reports

• **Department of Trade and Industry: NICUS** collaborated with the DTI since 2005 and submitted two reports as follows:

  - **The Evaluation of the Average Energy Consumption Data in South Africa.** June 2006
  - **An estimation of the average cost of a ‘typical food basket’, which is nutritionally adequate to feed a family of four, for a period of 7 days.** August 2006
Services: DOH

- Training and Collaboration with Department of Health, Nationally and Locally
  - Training of Nutrition Advisers and Health Promoters, Dietitians and other health professionals
NICUS publications

• DRI (Dietary Reference Intake) pocket guide for health professionals.
• Fact Sheets based on the latest scientific independent research and available free of charge to the media, public and health professionals
• Controversial issues (4 fact sheets)
• Infants and Children (9 fact sheets)
• Diseases of Lifestyle (6 fact sheets)
• Foods and Nutrients (6 fact sheets)
• Products (3 fact sheets)
• Diseases and Disorders (8 fact sheets)
Services: Research

- NICUS
- CNRC
- Food security
- Division of Human Nutrition
- For full detail regarding our research activities (past and current) please visit: [www.sun.ac.za/nutrition](http://www.sun.ac.za/nutrition)
International and National Excerpts and Reviews, and Recommended Goals for Vegetable and Fruit Intake
Goals for vegetable and fruit intake

- There is consensus that consumption of vegetables and fruit plays a vital role in providing a diversified and micronutrient dense diet.
- At least 5 portions of vegetables and fruit per day has been established as an optimum, minimum recommendation by international and national health promotion agencies, producers and retailers. (WHO/FAO, 2004; Health and Welfare Canada, 1992; Hunt et al., 1995; USDA, 1997; NTF, 1991).
- The consumption and the frequency of intake of vegetables and fruit by children in South Africa is poor, with intakes well below WHO guidelines nationally and provincially, and across the age range (Labadarios et al., 1999).
Very simply stated, the average level of intake of vegetables and fruit deemed adequate to prevent disease (theoretical minimum-risk distribution) was estimated to be 330 grams per day in children aged 0 - 4 years, 480 grams in children aged 5 - 14 years and 600 grams/day in adults. (Lock et al., 2004).
Are canned vegetables and fruit included in these goals?

• Canned vegetables and fruit are included in the WHO recommendations while potato and cassava is excluded.

• The WHO highlights the need for capacity building to improve technologies for post harvest nutrient loss reduction such as harvesting technologies, processing technologies, better storage, packaging and education of women to reduce household losses (WHO/FAO, 2004; WHO 2003).
Are canned vegetables and fruit included in these goals? cont.

- **MyPyramid**, the most recent USA guidelines issued by USA Department of Agriculture’s (USDA) food guide:
  - Any fruit or 100% fruit juice counts as part of the fruit group. Fruits may be fresh, canned, frozen, or dried, and may be whole, cut-up, or pureed. Vegetables may be raw or cooked; fresh, frozen, canned or dried/dehydrated; and may be whole, cut-up, or mashed.
Are canned vegetables and fruit included in these goals? cont.

• The Centres for Disease Control and Prevention state that ‘all fresh, frozen, dried or canned vegetables and fruit count towards the Five-A-Day goal, as long as they don’t have added sugars or fats (http://www.cdc.gov/nccdphp/dnpa/5aday/faq/types.htm).

• South African Food Based Dietary Guidelines:
  – Eat plenty of vegetables and fruit every day – for their fibre, micronutrient, antioxidant and other essential properties;
Challenge to industry

  - The overall aims of the Global Strategy are to limit the levels of saturated fats, trans-fatty acids, free sugars and salt in existing products and to continue to develop and provide affordable, healthy and nutritious choices to consumers.
During the Millennium Declarations in 2000 and once again in 2005, all United Nations Member States committed themselves to the development of a better world. To ensure a workable target, eight millennium goals have been developed to be achieved by 2015.
Millennium Goals for 2015, cont.

• These goals include the following:
  • Eradicate extreme poverty and hunger
  • Achieve universal primary education
  • Promote gender equality and empower women
  • Reduce child mortality
  • Improve maternal health
  • Combat HIV/AIDS, malaria and other diseases
  • Ensure environmental sustainability
  • Global partnership for development
Millennium Goals: *Reduce child mortality; Improve maternal health*

- Optimum *micronutrient intakes* are important in the reduction of child mortality and the improvement of maternal health.
- The *consumption* and the *frequency* of intake of vegetables and fruit by children in South Africa is poor, with intakes well below WHO guidelines nationally and provincially, and across the age range.
- South Africa will only be able to decrease the double burden of disease and reach the millennium goals if a conceived effort is given to eradicate these.
Available Scientific Data Relating to the Nutritional Value of Canned Vegetables and Fruit Within a Balanced Diet
Difficulties and complexity in understanding the nutrient differences between fresh and processed vegetables and fruit

• The nutrient content and retention of nutrients, which are dependent on the cultivar, area of production, ripeness, season and the processing conditions.

• Often a single cultivar is used from the same production location to limit variability, and therefore limiting the interpretation of the results to the effect of thermal processing only and it does not represent the choice consumers have in the supermarket.

• In some cases researchers procure products from supermarkets without adequate information about factors such as production location, degree of ripeness, different cultivars etc.

Rickman et al., 2007
Difficulties and complexity in understanding the nutrient differences between fresh and processed vegetables and fruit cont.

- Different cultivars are used for processed vegetables and fruit than for fresh consumption, and there are by default nutritional differences between these.

- Studies measuring the effects of processing on nutrient retention do not always study the effects of storage and additional cooking or home processing.

- Fresh products also undergo nutrient losses because of storage and oxidation. By the time fresh products are consumed, the nutrient content may be similar to processed products.

- Moisture content changes during processing and storage.

Rickman et al., 2007
International Studies

Selected findings
• Comparative analysis in 1995 of a variety of canned, fresh and frozen fruits and vegetables

  – They found that canned fruits and vegetables are as nutritious as their fresh and frozen counterparts.
A review on the nutritional content of canned, fresh and frozen foods

- Processing can have a preserving effect for some vegetables.

- Based on these results, canned vegetables and peaches can contribute significantly to the intake of folate, thiamine, riboflavin and vitamin B6 (Rickman et al., 2007).

- Canned products have vitamin A levels similar to their fresh and frozen counterparts. In some cases, such as canned pumpkin, the vitamin A levels actually are higher (University of Illinois, 1997).

- Mineral and fibre content are similar in fresh, canned and frozen vegetables and (Rickman et al., 2007).

- Canned vegetables and fruit can contribute significantly to the intake of carotenoids in a healthy diet.
Vitamin C

- 10-90% of vitamin C is lost during canning, however the nutrient changes little during storage of canned products and little is lost during reheating because the heating time is short.

- Canned foods such as tomatoes and pineapples can make significant contributions to the RDA for vitamin C.

- Canned products retain vitamin C very well, especially if the product needs to be stored for extended periods of time.
Losses of ascorbic acid (% wet weight) due to storage of fresh, frozen and canned vegetables

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Time (days)</th>
<th>°C</th>
<th>Loss (%)</th>
<th>Time (months)</th>
<th>Loss (%)</th>
<th>Time (months)</th>
<th>Loss (%)</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broccoli</td>
<td>21</td>
<td>4</td>
<td>13</td>
<td>12</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>Howard et al., 1999</td>
</tr>
<tr>
<td>Carrots</td>
<td>34</td>
<td>5</td>
<td></td>
<td>0</td>
<td>12</td>
<td>NS</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Green beans</td>
<td>16</td>
<td>90</td>
<td>-</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Weits et al., 1970</td>
</tr>
<tr>
<td>Green peas</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>21</td>
<td>4</td>
<td>75</td>
<td>1</td>
<td>NS</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>20</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>26</td>
<td>6</td>
<td>NS</td>
<td>Weits et al., 1970</td>
</tr>
</tbody>
</table>

*a* Results for two consecutive years.

*b* Authors reported an increase.

NS, not significant
The Australian Government Analytical Laboratories (AGAL): **Nutrient composition of both fresh and canned peaches.**

South African Analysis Data

Selected examples
South African Food Composition Data (SAFCoD)


• The data and tables presented in this section were obtained by means of the computer software programme, **Food Finder 3**. Food Finder 3 is a software program that was developed jointly by the **MRC** and WAMTechnology cc.

• Different samples of food were used for the different processing ways and therefore one cannot expect an absolute value when comparing them.
Based on this analysis comparison, 18% vitamin C is lost during canning of Cape Gooseberries (wet weight).

Consuming one 100g portion of canned gooseberries in syrup per can provides 12% of the DRIs (based on the RDA for a healthy adult female) of vitamin C per day.
Fruit analysis and comparisons: apricots

• Based on the analysis comparison, apricots canned in fruit juice have slightly higher levels of vitamins C, A, E K, carotenoids, lutein, biotin, boron, potassium, magnesium and fibre than apricots canned in syrup
  – Carotenoids are retained well in both products, but the fruit juice-canning medium adds to the nutritional content of canned apricots for several nutrients, such as carotenoids, boron, vitamin A, iodine, Vitamin B6, folate, Vitamin C, vitamin E, lycopene and lutein.
Fruit analysis and comparisons: guavas

- Forty three percent of vitamin C is lost in the canning of guavas, based on this analyses comparison.
- Consuming one 100g portion of canned guavas in syrup per can provide 264% of the DRI of vitamin C per day and 20% of the DRI for fibre per day (based on the RDA/AI for a healthy adult female).
Fruit analysis and comparisons: peaches

• Based on the analysis comparison, peaches canned in syrup have slightly higher levels of vitamins C, A, E, carotenoids, folate, Vitamin B6 and sodium than raw peaches.
Fibre content of selected fruit

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Raw Fibre (g)</th>
<th>CS Fibre (g)</th>
<th>CFJ Fibre (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pineapple</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Guava</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Gooseberry</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Apricots</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Peaches</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Vitamin C content per 100g of selected fruit

Vit C (mg)

Fruit Raw, Canned in Fruit Juice (CFJ) and Canned in Syrup (CS)
Comparison of the Nutrient Content of Available Canned and Fresh, Cooked Vegetables

Selected examples
Vegetable analysis and comparisons: carrots

- Frozen cooked carrots contained more vitamins than canned carrots with the **exception of vitamin A**.
- Only 50% of the vitamin C is lost during canning, which is lower than the 88% reported in international studies (Howard et al., 1999).
- Consuming 100g portion of canned carrots can provide **193%** of the DRI of vitamin A per day and **6%** of the DRI for fibre per day, **9.8%** of the DRI for sodium and **3%** of the DRI for potassium per day (based on the RDA/AI for a healthy adult female).
- Canned carrots are an excellent source of total carotenoids as well as a-carotene and b-carotene.
Vegetable analysis and comparisons: peas and green beans

- Based on the analysis comparison, canned peas are a good dietary source of fibre (14% of the DRI’s for an adult female per 100g portion).

- Based on the analysis comparison, canned beans are a dietary source of fibre (5% of the DRI’s for an adult female per 100g portion), folate (4.5% the DRI’s for an adult female per 100g portion) and vitamin K (33% the DRI’s for an adult female per 100g portion).
Vegetable analysis and comparisons: tomato and onion mix

• Based on the analysis comparison, canned tomato and onion are a superior dietary source of nutrients for all nutrients, but vitamin C and calcium compare to fresh, stewed tomato and onion.
• **Based on the analysis comparison**, canned baked beans in tomato sauce are an excellent dietary source of fibre (31% of the DRI’s for an adult female per 100g portion)
NICUS Recommendations for Canned Vegetables, Fruit and Legumes within a Healthy Varied Diet
1. Commercially obtained canned vegetables and fruit are a healthy substitute to fresh vegetables and fruit, provide a convenient and safe way to increase vegetable and fruit intake and can be consumed as part of the daily recommendation of a minimum of 400g of vegetables and fruit per day and add a greater variety to vegetable and fruit intake.
2. Consumers should try to buy canned products that are salt free or low in salt and are canned in water or fruit juice in order to limit added sugar and sodium in their total diets.
3. Canned products retain their nutrients during storage and very small or no additional losses occur. Canned products are therefore excellent alternative options (superior to fresh and frozen in certain conditions such as the lack of facilities to freeze or refrigerate products) if the products need to be stored for extended periods of time.
4. Canned vegetables and fruit can contribute significantly to the intake of carotenoids in a healthy diet. Some canned products offer a superior nutrient quality than their fresh counterparts. Canned tomato products are an excellent example since carotenes such as lycopene are very stable during the canning process.
5. Canned pineapple and peaches retain their vitamins very well and have higher levels of iron per 100g.
6. Canned products in general have lower levels of vitamin C than fresh or frozen products, but can still contribute significantly to the intake of this nutrient in a healthy diet. Canned products retain vitamin C very well, especially if the product needs to be stored for extended periods of time. Canned foods such as tomatoes and pineapples can make significant contributions to the RDA for vitamin C. Canned guavas are an exceptional dietary source of vitamin C.
7. Canned *vegetables and peaches* can contribute significantly to the intake of folate, thiamine, riboflavin and vitamin B6.
8. Canned carrots are an excellent source of total carotenoids as well as a-carotene and b-carotene. Canned products have vitamin A levels similar to their fresh and frozen counterparts. In some cases, such as canned pumpkin, the vitamin A levels actually are higher.
9. From a nutritional point of view, canned vegetables, fruit and baked beans in tomato sauce are an excellent source of dietary fibre and can make significant contributions to daily fibre intake of those individuals who consume them.
10. Using canned vegetables and beans in soups and stews provides similar nutritional value as the fresh ingredients likely would provide. Because canned foods are already cooked, they require only minimal further cooking time.
11. Legumes are rich and economical dietary sources of good quality protein, carbohydrates, soluble and insoluble dietary fibre components and a variety of minerals and vitamins. Canned baked beans in tomato sauce are a convenient and healthy way to increase legume intake.
Thank you for your time