Sweet potato leaves for family nutrition: Overview of research

A presentation by Lauren Howe
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About me

- My role in this Send a Cow Ethiopia project
- 2nd year Master’s student - International Agricultural Development at UC Davis
- Specializing in International and Community Nutrition
- Interested in gender-equity, climate resilience, and nutrition-sensitive agriculture by promoting fruits and vegetables as a foundation for sustainable diets
- Master’s thesis: Dehydrating fruits and vegetables using the chimney solar dryer with women farmers in Nepal w/ Helen Keller International
- Graduate Student Researcher at the Horticulture Innovation Lab, managing the Trellis Fund program
- Slow Food and school gardens background
Personal reflection on food - what did you eat yesterday?

- What did you eat for breakfast, lunch or dinner?
- Who did you eat with? Where did you eat?
- Did you enjoy the experience?
- What or who influenced your choices about the food you ate?
The basics of nutrition

- Nutrition is the study of:
  - what happens to nutrients in the body
  - how people can get the right types of food for good health and growth
- For your body to function, you need to eat a healthy diet
- A healthy diet:
  - meets a person’s daily nutritional requirements
  - Has the correct balance of macronutrients and micronutrients


https://www.flickr.com/photos/edsel_/32151290195
**Micronutrients**

- Grouped into vitamins and minerals
- Needed in smaller amounts
- Produce substances required for growth and health

**Macronutrients**

- Include carbohydrates, proteins, fats and oils
- Needed in larger amounts
- Provide energy for the body

**Nutrients:** Substances that are needed for healthy growth, development and functioning, usually found in the food a person eats.

What are food groups?

<table>
<thead>
<tr>
<th>Food group</th>
<th>Examples</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staples</td>
<td>Injera, maize, bread, rice, porridge</td>
<td>Provides energy for the body to move, breathe and perform daily activities (cook, work in the fields, etc.).</td>
</tr>
<tr>
<td>Fats</td>
<td>Vegetable oil, butter</td>
<td>Provides the body with energy and protects the organs (heart, liver, skin).</td>
</tr>
<tr>
<td>Fruits</td>
<td>Papayas, mangoes, bananas, avocados</td>
<td>Helps protect the body from diseases and illnesses.</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Pumpkins, potatoes, leafy greens, tomatoes</td>
<td>Helps protect the body from diseases and illnesses.</td>
</tr>
<tr>
<td>Legumes</td>
<td>Chickpeas, lentils, Cowpeas, kidney beans, lima beans, black beans</td>
<td>Helps strengthen the muscles, repairs wounds and protects against heart disease and diabetes</td>
</tr>
<tr>
<td>Meat and eggs</td>
<td>Chicken, beef, mutton, organ meats, eggs</td>
<td>Helps strengthen the muscles and repairs wounds</td>
</tr>
<tr>
<td>Dairy</td>
<td>Milk, yoghurt, cheese</td>
<td>Helps strengthen bones</td>
</tr>
</tbody>
</table>
Food-based Dietary Guidelines

- Provide science-based recommendations about the quantity, quality and diversity of foods that should be consumed.
- Depend on a person’s size, activity level and factors that make some people require more nutrients than others (e.g. breastfeeding).
- Different countries have developed food-based dietary guidelines that reflect the foods that are locally available and culturally preferred.

Food Guides

Dairy products
Fruits
Vegetables
Meat, fish, beans and other sources of protein
Cereals and tubers

Choose MyPlate.gov

Credit: Republic of Benin, 2015

What would a food guide for Ethiopia look like?
How does the diet of the project participants compare to the recommended diet in the food guides?

Nutritional needs

- Malnutrition occurs when a person eats too much or too little food (and nutrients) or is unable to use the nutrients in the food they eat.

- Nutritional needs are determined by:
  - Age.
  - Body make-up and size.
  - Activity level.
  - Physical state.

- **Nutritional status** is the physical state of a person that is a result of the relationship between how many nutrients that individual takes in, their nutritional requirements and the body’s ability to digest, absorb and use these nutrients.
Who is vulnerable to poor nutrition?

- Women of reproductive age
- Infants
- Young children
- Sick and elderly
- Poor households
- 1,000 most critical days is the period from pregnancy to a child’s second birthday.
  - This period is the window of opportunity in which good nutrition sets children on a path for strong growth and healthy, productive futures.
- But what about men?
Making better food choices

- There are several methods for influencing people’s food choices:
  - Nutrition education
  - Social and behavior change communication (SBCC)
  - Social marketing

- People will be more likely to change their food behaviours:
  - When they are supported by their social networks; and
  - When they have greater agency.

- **Agency**: The ability to act independently and make their own choices

## Factors affecting food choice

<table>
<thead>
<tr>
<th>Food availability</th>
<th>Accessibility</th>
<th>Affordability</th>
<th>Convenience</th>
<th>Desirability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many people will only choose food that is already available in their local markets</td>
<td>Most people tend to choose food that is easy to get at a manageable distance from their home or work</td>
<td>The price of food is a very important factor for food choice, especially in poor and subsistence communities</td>
<td>If a certain type of food is not easy to get or difficult to prepare, most people will rather choose a convenient alternative</td>
<td>Social and cultural backgrounds play an important role in what food a person will want to eat or not</td>
</tr>
</tbody>
</table>

Why are recommendations in development often not adopted?

- Cost/affordability
- Cultural or social issues
- Resistance to change or averse to risk
- Does not benefit the audience
- Maybe the intervention is unreliable, difficult to implement or sustain

What are the biggest barriers to sweet potato leaves being adopted in Wolaita?
Tips that will help you to change food habits in your community:

- Use simple language
- Focus on short-term benefits
- Give only the essential information
- Talk in a natural and friendly tone
- Always treat people with respect
- Always check whether your audience has understood your message

What strategies are being used in this project in Wolaita?

Why grow sweet potatoes?

- Why do farmers in Wolaita grow sweet potatoes?
- Grow well in many different climates and seasons, including hot, humid and even drought conditions [2]
- The leaves grow even better than some introduced western vegetables, which can suffer from high moisture, tropical pests and diseases [2]
- The leaves can grow quickly and can act as a mulch, covering the ground, protecting the soil, conserving moisture, preventing erosion [3] and reducing the need to weed and requiring minimal labor [2]
Why grow sweet potatoes (cont.)

- The vines can also be preserved as silage or hay and fed to livestock as a nutritious animal feed [3]
- With a yield much higher than many other green vegetables [4], farmers can sell both the leaves and roots to earn more income [5]
- Sometimes, local sweet potato varieties have leaves that are more nutritious than exotic varieties. [6]
Harvesting and handling the leaves

▶ Begin harvesting leaves 45-90 days after planting \([7][3]\), 1-2 times per month until the roots are harvested \([6]\)

▶ Don’t harvest the leaves too frequently or you may reduce the root growth \([2]\), or the leaves may be less nutritious \([8]\)

▶ If you are mainly growing sweet potatoes for their leaves, then don’t plant them too close. Try planting them on flat land with 30-40 cm spacing between plants and 40-50 cm spacing between rows \([7]\)
Harvesting and handling the leaves

- The best way to harvest multiple vines is to cut 1-2 of the longest branches of each plant, leaving about 10 cms for the plant to regrow [7]
- When harvesting, transporting or marketing the leaves, handle them carefully to reduce bruising, and store them in cool shady conditions [2]
- Sell the leaves or use them as soon as possible [2]
Sweet Potato Leaf Nutrition: Macronutrients

- **Carbohydrates**[^15] - first source of energy[^10] for the body to move, breathe and perform daily activities
- **Protein**[^9]
- **Fiber**[^11]
- Low in saturated fat and cholesterol[^12]
- Omega-3 fatty acids[^3], which contribute to all tissues in the body functioning normally[^13], including the heart, lungs, blood vessels, immune system, and hormone production[^14]
Macronutrient comparison: calories

Nutrient composition per 100 grams raw

But still a relatively “low calorie” food because 40 kcal per serving is only 2% of 2,000 kcal in a day.
Macronutrient comparison: protein

**Protein (gms)**

- Sweet potato leaves
- Cabbage
- Kale
- Lettuce, green leaf
- Spinach
- Swiss Chard

**Nutrient composition per 100 grams raw**


**Recommended daily intake** [18]:

Men & Women (ages 19-50) = .8 g of protein per kg of body weight

**Example:** A 60 kg person should consume 48 g of protein per day

Required for building muscle and repairing wounds, aids cell structure and function, and is another source of energy [10]
Macronutrient comparison: fiber

Fiber, total dietary (gms)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Sweet potato leaves</th>
<th>Cabbage</th>
<th>Kale</th>
<th>Lettuce, green leaf</th>
<th>Spinach</th>
<th>Swiss Chard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber, total dietary (gms)</td>
<td>5.6</td>
<td>2.5</td>
<td>4.4</td>
<td>1.8</td>
<td>2.3</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Important for digesting food [10]

Recommended daily intake [18]:
- Men (age 19-50) = 38 g
- Women (age 19-50) = 25 g

One serving would provide ~20% of a woman’s daily fiber intake and ~13% for men

Nutrient composition per 100 grams raw

Sweet Potato Leaf Micronutrients: Vitamins and Minerals

- **Vitamins:**
  - Help the body grow
  - Build a strong immune system, helping the body to fight disease fight illness,
  - Break down food into energy [1]

- **Minerals:**
  - Support bone growth
  - Regulate heartbeat
  - Help nerve function [1]
Micronutrient comparison: vitamin A

Vitamin A (μg RAE*)

<table>
<thead>
<tr>
<th>Food</th>
<th>Vitamin A (μg RAE*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet potato leaves</td>
<td>150</td>
</tr>
<tr>
<td>Cabbage</td>
<td>100</td>
</tr>
<tr>
<td>Kale</td>
<td>250</td>
</tr>
<tr>
<td>Lettuce, green leaf</td>
<td>300</td>
</tr>
<tr>
<td>Spinach</td>
<td>450</td>
</tr>
</tbody>
</table>

Foods with at least 100 μg RAE per 100 gms are considered good sources of vitamin A [3]

Recommended daily intake [18]:
Men (age 19-50) = 900 μg
Women (age 19-50) = 700 μg

Key for eye health and reducing illness [1], especially for pregnant women and young children [16]

Nutrient composition per 100 grams raw
*RAE means Retinol Activity Equivalent. Conversion rate of 12 units beta-carotene for 1 unit retinol used.[3]
Micronutrient comparison: vitamin C

Vitamin C, total ascorbic acid (mg)

Recommended daily intake: Men (age 19-50) = 90 mg
Women (age 19-50) = 75 mg

Sweet potato leaves
Cabbage
Kale
Lettuce, green leaf
Spinach
Swiss Chard

Maintains strong bones, teeth and gums, and helps with healing wounds

Nutrient composition per 100 grams raw

Micronutrient comparison: vitamin K

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Sweet potato leaves</th>
<th>Cabbage</th>
<th>Kale</th>
<th>Lettuce, green leaf</th>
<th>Spinach</th>
<th>Swiss Chard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin K (phylloquinone, μg)</td>
<td>65</td>
<td>10</td>
<td>200</td>
<td>20</td>
<td>80</td>
<td>400</td>
</tr>
</tbody>
</table>

**Recommended daily intake** [18]:
- Men (age 19-50) = 120 μg
- Women (age 19-50) = 90 μg

*Needed for blood clotting and may help bone health*[18]*

**Nutrient composition per 100 grams raw**

Sweet Potato Leaf Nutrition
Micronutrients: B Vitamins

- B-vitamins\(^{[2]}\) - help break down carbs, protein, and fat for energy\(^{[10]}\)

- Important for the growth, repair, and maintenance of cells in the body\(^{[10]}\)

- Sweet potato leaves contain B1, B2, B3, B6, B9
  - **Vitamin B6** is required for brain development and health of skin, red blood cells, immune system\(^{[23]}\)
Micronutrient comparison: vitamin B1 (Thiamin)

Thiamin (Vitamin B1) (mg)

Nutrient composition per 100 grams raw

For the cell growth, development, and functioning [19]

Recommended daily intake [18]:
Men (age 19-50) = 1.2 mg
Women (age 19-50) = 1.1 mg

One serving would provide ~14% of someone’s daily Thiamin intake
Micronutrient comparison: vitamin B2 (Riboflavin)

Nutrient composition per 100 grams raw

Recommended daily intake [18]:
Men (age 19-50) = 1.3 mg
Women (age 19-50) = 1.1 mg

For producing energy; cell function, growth and development; breaking down fats; and maintaining healthy blood [20]

One serving would provide ~29% of someone’s daily Riboflavin intake
Micronutrient comparison: vitamin B3 (Niacin)

Nutrient composition per 100 grams raw

Boosts brain and nervous system functions, contributes to healthy skin, helps with digestion \(^{[21]}\)

Recommended daily intake \(^{[18]}\):
Men (age 19-50) = 1.3 mg
Women (age 19-50) = 1.1 mg
Micronutrient comparison: vitamin B9 (Folate)

Folate (Vitamin B9) (µg)

Recommended daily intake for adults:
400 µg [18]
(one serving < 0.05% daily folate intake)

Nutrient composition per 100 grams raw
Nutrition comparison: calcium

Nutrient composition per 100 grams raw

Recommended daily intake: Men and women (age 19-50) = 1,000 mg

For strong bones and teeth [10]

One serving would provide ~7.5% of someone’s daily calcium intake
Nutrition comparison: iron

Iron (mg)

Recommended daily intake [18]:
Men (age 19-50) = 8 mg
Women (age 19-50) = 18 mg

One serving would provide ~12.5% of men’s daily iron intake and ~5.6% of women’s

Helps provide cells with oxygen and reduces illness [1]

Nutrient composition per 100 grams raw
Nutrition comparison: magnesium

Important for many processes in the body, including regulating muscle and nerve function, blood sugar levels, and blood pressure and making protein, bone, and DNA [24].

Low magnesium intake is less than 40 mg [18].

Nutrient composition per 100 grams raw
Nutrition comparison: phosphorus

Phosphorus (mg)

<table>
<thead>
<tr>
<th>Nutrient composition per 100 grams raw</th>
<th>Phosphorus (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet potato leaves</td>
<td>~80</td>
</tr>
<tr>
<td>Cabbage</td>
<td>~20</td>
</tr>
<tr>
<td>Kale</td>
<td>~50</td>
</tr>
<tr>
<td>Lettuce, green leaf</td>
<td>~30</td>
</tr>
<tr>
<td>Spinach</td>
<td>~40</td>
</tr>
<tr>
<td>Swiss Chard</td>
<td>~40</td>
</tr>
</tbody>
</table>

Recommended daily intake [18]:
Men and women (ages 19 and older) = 700 mg

One serving would provide ~11% of someone’s daily phosphorus intake.
Nutrition comparison: potassium

For normal cell function [26]:
Recommended daily intake [18]:
Men and women (ages 19 and older) = 4,700 mg

One serving would provide ~10.6% of someone’s daily potassium intake

Nutrient composition per 100 grams raw
Sweet Potato Leaf Nutrition: Other Minerals

- Zinc $^{[15]}$ for reducing illness, promoting physical growth and brain development $^{[16]}$
- Manganese $^{[15]}$ plays a role in many of the body’s processes $^{[27]}$
- Copper $^{[11]}$ which is necessary for the body to use iron $^{[28]}$
- Low in sodium $^{[12]}$
Sweet Potato Leaf Nutrition: Disease Prevention and Defense

- High in antioxidants [8], which can help prevent or delay damage to cells in the body [29]
- Consumption of the leaves can also help prevent some chronic diseases like inflammation, heart disease, hypertension, diabetes and some cancers [5]
Cooking Tips

- Try to prepare meals with a variety of food groups, including fruits and vegetables, staples, legumes, nuts, animal foods, and fats for a more nutritious diet \(^{[12]}\)

- For the most nutrients, choose sweet potatoes with deep green leaves and dark flesh \(^{[4]}\)

- The whole tips of the sweet potato are edible, including the leaves, stems, and leaf stalks.

- The leaves, however, are the most nutritious \(^{[2]}\)
Cooking Tips (continued)

- Use sweet potato leaves immediately for the best use and most nutrients.
- Otherwise, store the leaves properly:
  - If you have refrigeration, put them in a plastic bag with holes for ventilation \[^4\]
  - If you don’t have refrigeration, keep them moist in a cool, dark place, or put the stems in water \[^32\]
Cooking Tips (continued)

- Consume foods in proper combinations to help the body absorb more nutrients \[12\]. \textit{E.g. fat is important for the absorption of vitamin A}.

- Cook the leaves with some fat (e.g. small amounts of oil or butter) to help the body absorb vitamin A \[33\]. The amount of fat required can vary (2.4 to 5 g/meal) for cooked vegetables \[34\].

- If you consume the leaves raw as a salad, eat them with a dressing that has some fat (e.g. oil) \[34\].
Cooking Tips (continued)

- To make nutrients more available and to make the leaves taste better, cook the leaves with heat (e.g. lightly steam, blanching, stir-fry, boil, etc.) \[^{35}\] for short periods \[^{34}\]
- Cut them up into smaller pieces \[^{34}\]
- Don’t cook the leaves for too long or some nutrients may be lost \[^{36}\]
- In general, the smaller the food particle size, the better - so lightly cooked, pureed green leaves, or finely chopped cooked green leaves are better than raw, whole leaves \[^{37}\]
Cooking Tips: solar drying

- Dry the leaves in a solar dryer, rehydrate, and cook later as a boiled or fried vegetable [4] or crush into a powder [5].

- Blanching the leaves for 50 seconds first, followed by rubbing with salt and drying in an enclosed solar dryer can help retain more vitamin A [36].
Cooking Tips (continued)

- Consider cooking leaves with lemon to retain vitamins and minerals \[38\]

- Other preservation methods for the leaves, stems and stalks include canning, salting, pickling, \[2\] or juicing \[39\]

- Sometimes younger leaves are preferred for eating (e.g. top 10 cm) because they are more tender \[4\]. However, older leaves have more fiber \[2\].

- Consider substituting sweet potato leaves in any traditional recipe instead of another leafy green
  
  - What are some local examples?
Sweet potato leaves around the world

- Philippines: cook the leaves with rice in a dish called sinapaw \(^2\)
- Japan: boil the leaf stalks in soy sauce and batter and fry the tips \(^2\)
- Asia: blanched, stir-fried, added to salads or stews \(^{40}\)
- Tonga & Fiji: cooked with onion, marinated in coconut cream and eaten cold as a salad \(^2\)
- South Pacific: stir-fried \(^2\)
- Western Samoa: tops salad \(^2\)
- Taiwan: noodles \(^2\) \(^{36}\)
- Cameroon: popular vegetable sauce \(^{41}\)
- Nigeria: the vines are used in soup \(^{42}\)
- Malawi: juice \(^{39}\)
- Ghana: infant porridge, soup, relish, one pot meal, stew \(^{12}\)
- Cote D’Ivoire: leaf sauce \(^{43}\)
- Burkina Faso: groundnut sauce, and couscous with roots and leaves \(^{44}\)
- USA: sautéed and stir-fried \(^4\)
Sweet potato leaves in Ethiopia [45]

Ingredients
- Sweet potato leaves, chopped
- 1 large onion, chopped
- 4 tablespoons edible oil
- 1 clove garlic
- Red or green chillies as needed, chopped
- Herbs as needed
- Salt spices to taste

Directions
Remove sweet potato leaves from large stems, wash and chop. Slightly heat oil in a pan, add onions, garlic, herbs and salt and cook until tender. Add chopped sweet potato leaves and sauté for 2-3 minutes. Can be served to accompany any main dish.

CIP
International Potato Center
Department of Foreign Affairs
An Roinn Gnóthai Eachtracha

Irish Aid
My home kitchen

- August 5, 2018
- Found a local farm to harvest sweet potato leaves
- I made Doro wot, Shiro wot, Ye’abasha Gomen, and injera from scratch for dinner with my family.
- I was able to find Berbere spice mixture and tef flour at a shop here in Massachusetts, and I made my own niter kibbeh. It turned out quite tasty!
References


References


References


- [21] The Linus Pauling Institute Micronutrient Information Center at Oregon State University. (2017). Niacin. Retrieved from http://lpi.oregonstate.edu/mic/vitamins/niacin [This link leads to a website provided by the Linus Pauling Institute at Oregon State University. Lauren Howe is not affiliated or endorsed by the Linus Pauling Institute or Oregon State University.]


- [27] The Linus Pauling Institute Micronutrient Information Center at Oregon State University. (2010). Manganese. Retrieved from https://ods.od.nih.gov/factsheets/MVMS-HealthProfessional/ [This link leads to a website provided by the Linus Pauling Institute at Oregon State University. Lauren Howe is not affiliated or endorsed by the Linus Pauling Institute or Oregon State University.]
References


References


Thank You for your time and attention!
Any questions?

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