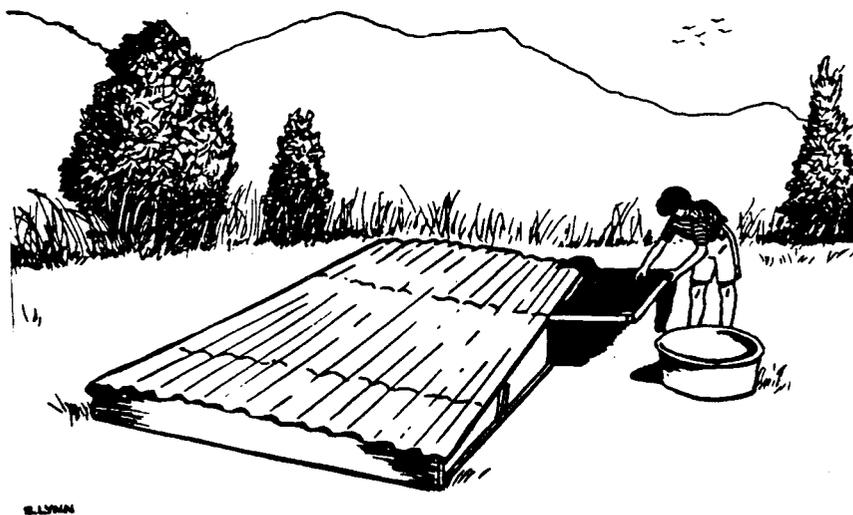


Drying Green Leaves in the Sun



By David Kennedy
Leaf for Life 1998

Eating for Good Health

Good health means having the mental and physical energy to do the things you want to do, and not suffering unnecessarily from illness. Keeping yourself and your family in good health requires getting enough rest, clean air and water, a cheerful outlook on life and eating well. Often, changing some of the foods we eat can improve our health dramatically.



Normally, staple foods like corn, wheat, rice, potatoes, and cassava provide most of the fuel we burn for **energy**. Meat, fish, milk products, eggs, and beans are primary sources of protein, which is basic to **building** and repairing muscle and other cells in the body. Vegetables and fruits contain a wide range of substances like vitamins, minerals, fiber and antioxidants, whose main role in your body is **protection** from disease.

Except when there is simply not enough food to eat due to extreme poverty, the main health problems related to diet come from choosing foods poorly. Prepared foods based on refined fats, sugars and starches that provide energy but few other nutrients have become popular around the world. When people eat too many of these “empty calorie” foods they tend to neglect eating protective vegetables and fruits.

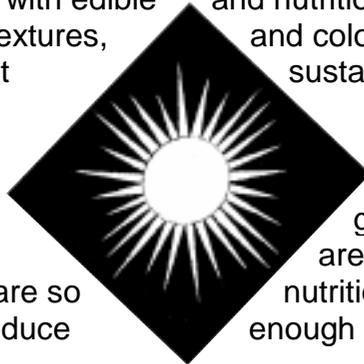
Most nutrition authorities recommend that we each eat between 5 and 8 servings of vegetables and fruits every day for maximum health. These compliment energy and protein foods well. Eating more vegetables and fruits helps assure that we take in enough iron, calcium, vitamin A, vitamin C, folic acid, and fiber. Our bodies are much more likely to become sick when one or more of these essential nutrients is in short supply.

Children benefit the most by improved nutrition. Well nourished children have more mental and physical energy and fewer, less frequent and less severe cases of diarrhea and respiratory infection than their malnourished neighbors. They have more fun playing, do better at school and become more productive workers as they grow up. While children benefit most, you are never too old to improve your health by making better food choices.



Why Eat Leaves?

Green leaves are a powerful force for improving your health. They transform the sun's energy into food we can eat. Eating green leaves is a way to share in Nature's abundance and diversity. There are over 1,000 species of both wild and cultivated plants with edible and nutritious leaves. The range and depth of natural flavors, textures, and colors in leaves can greatly enrich the daily bread that sustains us.



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Vitamins - Leaves are especially good sources of vitamin A, vitamin C, and folic acid, three of the vitamins most likely to be lacking in the diet.

Minerals - Leafy vegetables are rich in iron and calcium, needed for strong blood and bones. They also supply trace minerals that are essential to good health, but that are often not adequately supplied by processed foods.

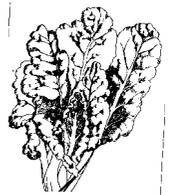
Antioxidants - Leaves are a good source of dozens of antioxidants which can reduce our risk of suffering from cancer, heart attacks, and several other diseases, by protecting our cells from premature oxidation.

Fiber - Green leaves have plenty of fiber, the indigestible parts of plant foods that are essential to your digestive tract. Fiber in the diet also reduces cholesterol and the risk of heart attacks and strokes. Too much fiber can hinder children's absorption of iron and zinc.

The Best Leaves

Are edible - Make sure leaves, especially wild ones, are safely eaten by humans. Be aware that some leaves that are eaten in small amounts as flavorings may not be safe when eaten in larger amounts. Most foods contain some antinutritional or toxic substances, such as the phytic acid in wheat. These are rarely a problem if your diet includes a wide variety of foods.

Have good flavor and texture - Avoid leaves with a strong bitter aftertaste, especially those with white sap. Leaves that are very dry and fibrous are usually difficult to digest properly. Many tree leaves and leaves on annual plants after they have flowered have this limitation.



Swiss chard



Dandelion

Are easy to grow or grow wild - Crops, like mustard, that quickly produce dense foliage from inexpensive seed without any special care are excellent. So are many common edible weeds and wild plants, such as nettles and lambsquarters, that don't require any planting or care at all.

Are easy to harvest - It is very time consuming harvesting leaves that grow high in trees, tangled in vines, or protected by thorns. Plants whose leaves run very close to the ground can also be slow to harvest and hard to clean. Time spent in harvest is often underestimated in considering costs of foods.



Nettles

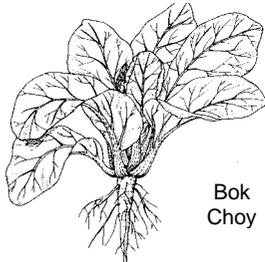
Are nutritious - Some leaves contain far more essential protein, vitamins, and minerals than others. For example, a serving of kale (*Brassica oleracea*) contains 4.5 times more protein, 4 time more iron, 9 times more calcium, 19 times more vitamin C, and 26 times more vitamin A than the same amount of iceberg lettuce. Obviously if your garden space is limited, kale is the better choice for improving your family's health.

Are grown in clean soil, air and water - Green leaves should not be eaten from plants grown in soil contaminated with trash dumping or burning, sewage, or paint scraped from buildings. Also avoid plants along busy roads.

Best Plant Families for Leaves

Cabbage

Mustard,
kale,
turnips,
radish,
collards



Bok Choy

Best overall greens for protein, vitamins and minerals. They have strong anti-cancer properties from sulphoraphane and isothiocyanates. These are cool weather plants, but some like Brassica carinata do well in the tropics.

Legumes

Beans, peas,
cowpeas,
alfalfa,
fenugreek



Cowpeas

Legumes improve soil by making nitrogen in the air available to plants. They are excellent for intercropping with corn, cassava, and fruit trees. Some tropical legume leaves are toxic so choose ones you know to be edible, like beans, cowpeas, peas, and pigeon peas.

Spinach

Swiss chard,
beet greens,
lambsquarters



Beets

These tolerate saline soil. They contain oxalates so try to mix with other greens.

Carrot

Parsley, cilantro,
carrot tops, dill

When dried they make a flavorful addition to many soups and sauces. Rich in iron and vitamins.



Cilantro

Pumpkin

Chayote, gourds,
squash



Pumpkin

Pinch off some young leaves to eat, but not too many or plants produce less fruit. Large young leaves can be used as a wrapper for steamed dishes.

Grains

Wheat, barley

Wheat and barley grass are rich in chlorophyll, protein, and minerals. Harvest before flowering when plants are 20-30 cm (8-12 ") tall. Mild flavor when dried and ground to fine powder.



Wheat

Other Leaf Crops

Multi Purpose Crops

Seeds: Beans, Cowpeas, Amaranth, Wheat

Fruits: Pumpkin, Peppers, Okra

Roots: Beets, Sweet Potatoes, Radishes, Onions

Many crops that are primarily grown for their seeds, fruits and roots, including those listed above, also have edible leaves. Often some leaves can be removed from the plant with little effect on the yield of the main crop. This involves timing the leaf harvest and understanding the growth pattern of the plant. For instance, onion leaves can be harvested after the fifth leaf forms and cowpea leaves can be taken from the lower part of the plant where they are shaded, with no loss of the main crop.



Hot Peppers



Okra

Tree Crops



Moringa

Most tree leaves are too fibrous to eat. Tropical tree leaves tend to vary genetically in the amount of alkaloids and other toxins they contain. Moringa oleifera (Horseradish or Drumstick Tree) is the best of all trees for edible and nutritious leaves. It is small, fast growing and pan-tropical .

Chaya and Cassava

Chaya (*Cnidoscolus chayamansa*), a low growing Central American tree, and Cassava, (*Manihot esculenta*) one of the world's most important root crops, have leaves eaten in some cultures. Both are rich in nutrients but also contain toxic hydrocyanic acid (HCN). These leaves should be ground to a pulp before drying to release as much HCN as possible. Select low HCN varieties and use the leaf powder in products that will be cooked, such as



Chaya

How to Grow Leaves

Grow Leaves Fast - Leaf crops usually taste best and yield the most greens when they are grown quickly in rich loose soil. An adequate supply of nitrogen is essential. Legumes will fix their own nitrogen from the air. Make sure their seed is inoculated if that species hasn't been grown on the land in the past three years. Other crops can obtain nitrogen from composted manure. A straw mulch can keep rain from splashing mud onto leaves. Most leaf crops need about 2.5 cm (1") of rain per week for rapid healthy growth. When it is very hot and dry more than that is needed. Make up for rainfall shortages by watering deeply once a week.



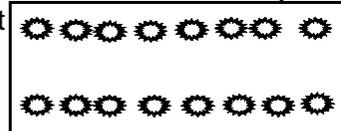
Amaranth



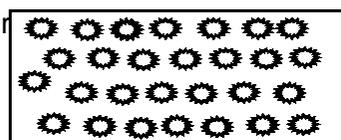
Avoid Poisons - Try not to use insecticides, herbicides, or fungicides on leaf crops. It is better to plant a bit more land to make up for moderate insect damage than to expose your family to agricultural poisons in their food. Drying the leaves and grinding them into a powder, eliminates concern over insect damage that might make the greens less marketable. If it is absolutely necessary to use insecticide to prevent losing a crop, use a safe short residual product like neem or rotenone and try to wait 15 days after spraying before harvest. Wash greens well in clean water before cooking them or drying .

Intercropping and Raised Beds - Intercropping is planting two crops in the same field at the same time for their mutual benefit. Leaf crops, especially leguminous ones like cowpeas, are often the ideal intercrop with corn, cassava, bananas, and other main food crops. Raised beds are garden beds usually about 120 cm (48") wide and c. 20 cm (8") high. The soil height can be raised by adding dirt dug from between the beds and by adding compost and manure. Raised beds allow better soil drainage and root penetration. The initial investment of labor is quickly repaid in easier cultivation and better yields. Both intercropping and raised beds greatly increase the number of plants that can be grown in a given area and can produce much better yields than traditional row crops.

Traditional Row Crops



Raised Bed



Why Dry Leaves?

Less Perishable - Fresh greens usually are between 75 -90% water. They wilt and become inedible in a day or two without refrigeration. When they are dried to less than 10 % water they remain good to eat for several months. Drying makes greens available year round.

Better Texture - Children and the elderly, in particular, often find the texture of greens to be stringy and difficult to chew. Drying the greens and grinding them to a powder eliminates this problem. Also, because the leaves are finely ground, digestive enzymes can work on far more leaf surface area resulting in better absorption of nutrients.



More Versatile - Fresh greens are difficult to use into most dishes and as a result their role in the diet is often as a minor addition to soups and stews. Dried green leaf powder can be incorporated into a much wider range of foods including candies, cookies, pasta, and some drinks.

****** Drying leaf crops takes work and some vitamins are lost no matter how ****** carefully the drying is done. The best strategy is to eat fresh greens when you can and use dried leaf powder to increase the total amount of leaves eaten.

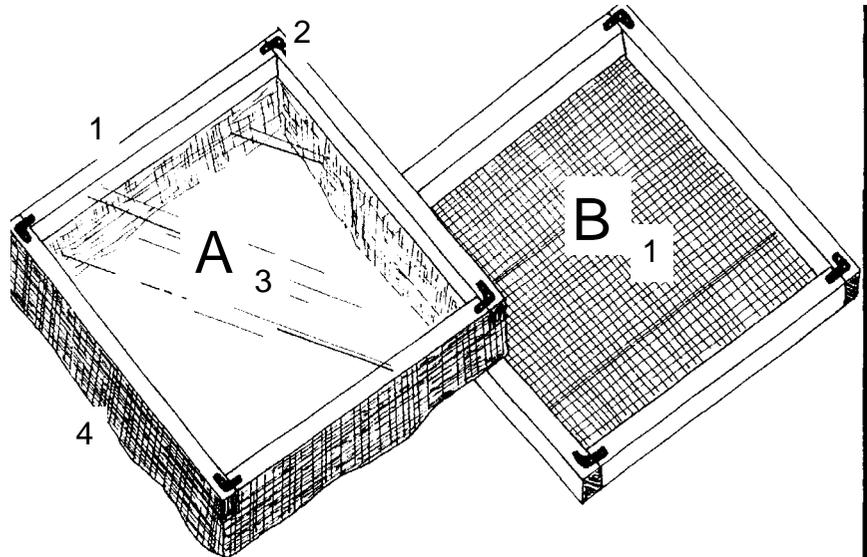
Basics of Food Drying

Protect Food - from dust, insects, rain, dew, and ultraviolet rays.

Dry Food Quickly - by increasing temperature (optimum for leaves is about 55° C [130° F]); increasing the airflow; and increasing the surface area of the food to be dried by cutting it into smaller pieces.

Blanch - foods that are being dried for long term storage. Leaf crops can be blanched for 3 minutes in steam or a microwave oven before drying to improve flavor and reduce risk of spoilage.

Making a Solar Leaf Dryer



A. Dryer Cover -

1. Make a square wooden frame one meter (39") on each side. Use rot resistant wood approximately 4 cm X 4 cm (1^{1/2}" X 1^{1/2}").

2. Reinforce the corners to make sure frame stays square.

3. Stretch UV treated 6 mil polyethylene or polyester film over the frame and staple securely. Double the plastic film over on the frame so staples hold better.

4. Staple a 10 cm (4 ") strip of dark colored open weave cloth around the outside of the cover frame. This will allow air flow but prevent insects and dust from entering the dryer.

B. Dryer Base -

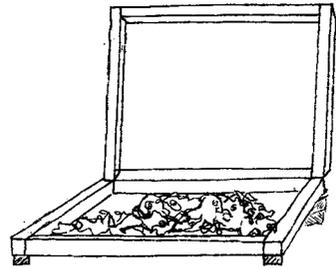
1. Make a square wooden frame identical to the cover frame. Stretch strong insect screen over the frame and staple securely. Double the screen over on the frame so staples hold better. Use plastic screen if possible as leaves won't stick to plastic as much as to metal screen.

How to Dry Leaves

1. Set up the Solar Dryer. Put the dryer where it will have full sunshine all day. Put a sheet of plastic on the ground below the dryer to block moisture rising from the soil. Raise the base of the dryer off the ground with bricks or sticks to make sure that air moves through the dryer. Some people prefer putting the dryer on a table or on a low roof to protect it from playing children and animals.

Raise the side of the dryer that faces away from the noon sun (north in the northern hemisphere) to give the sunlight a more direct angle. This will help the dryer reach the ideal temperature of about 55^o C (130^o F). If the air temperature is over 32^o C (90^o F) the dryer may get too hot.

Separating the dryer base and cover with small wooden blocks will create more air flow and reduce the temperature. Raising one side of the dryer should also allow it to drain unexpected rain.



2. Harvest and wash leaves in clean water.

3. Cut leaves into small pieces. Remove large stems.

4. Blanch leaves in steam or in a microwave oven for 3 minutes.

5. Spread leaves evenly in dryer in the morning so they can dry before reabsorbing moisture from cooler night air. Try to use between 1 -1.5 kg (2-3 lb.) of cut leaves per square meter of dryer. Too thick a layer of leaves will keep the dryer too cool and some leaves could spoil before they dry.

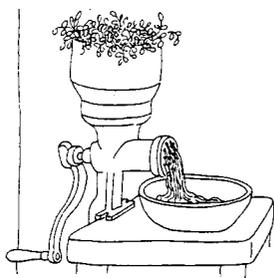
6. Check on the leaves in mid afternoon if possible. Reposition the leaves so they will dry evenly.

How to Use Dried Leaves

1. When leaves are brittle, remove coarse stems and grind to a fine powder. Dried leaves can be easily ground in a hand cranked corn mill, an electric grinder, a household blender, or a traditional stone metate grinder. Make sure leaves are very dry or they will clog the grinders.



Metate



Hand Corn Grinder

2. Add leaf powder to recipes.

About 20% of the flour in most recipes can be replaced with leaf powder. Experiment with how much leaf powder you can add to recipes without an unacceptable effect on flavor or texture.

3. Try to give about one tablespoon or more of leaf powder to each child most days. Most children will accept leaf powder better in their diet if it is introduced slowly and in a variety of dishes. If recipes are calculated by weight, figure one cup of leaf powder equals about 120 grams.

4. Cookies in the shape of dinosaurs, frogs, and Christmas trees, that are normally green are great ways to introduce children to leaf powder foods. Green birthday cakes have also been very well accepted.

5. Keep the leaf powder in a well sealed container, away from light and in a cool place.

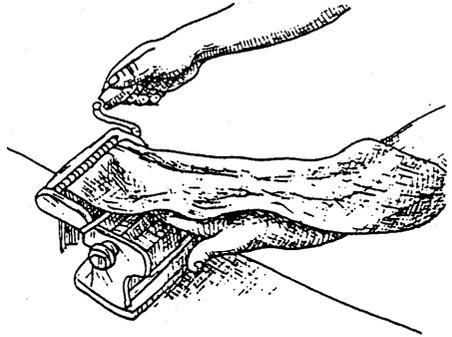
Use within 6 months.

Recipes

Pasta

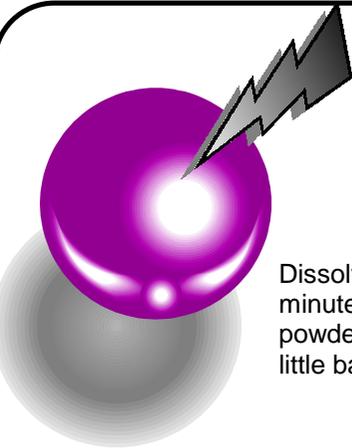
4 cups all purpose or bread flour (wheat)
1 cup dried green leaf powder
1 tablespoons salt

Mix flour and salt, then add leaf powder and a small amount of water. Knead for 10 minutes. Dough should be very heavy but elastic. Roll the dough out as thin as possible and cut into strips. These can be cooked as is or dried in a dark room, sealed in a plastic bag and cooked when convenient. This pasta cooks somewhat faster than commercial pasta.



** Hand operated stainless steel pasta rollers are available in some gourmet cook shops and department stores for about \$50 US. They make very uniform pasta. Machines made in Italy are far superior to the Chinese version.

Power Balls



1 cup flour
1 cup brown sugar
1/2cup dried green leaf powder
1/4 cup canola oil

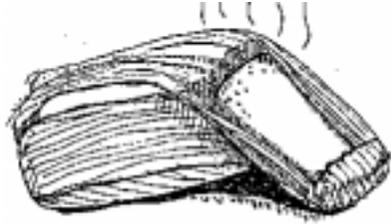
Dissolve the sugar in a little water; add the flour and oil. Cook for 15 minutes on medium heat, while stirring . Mix in the dried green leaf powder and let cool to near room temperature. Form the mixture into little balls. These can be rolled in coconut flakes or sugar if desired.

** Flavorings such as ginger or cinnamon can be added to taste; as can chopped nuts or dried fruit.

Recipes

Mexican Tamales

- 2 cups corn flour (masa harina)
- 1/3 cup dried green leaf powder
- 2 teaspoons baking powder
- 1 teaspoon salt
- 1/3 cup lard or vegetable shortening
- 1 1/2 cup soup stock or water



Combine dry ingredients. Beat the lard or shortening until creamy, then gradually beat in the dry ingredients. Slowly add the soup stock or water, stirring constantly. Spread about 1 tablespoon of this dough in the center of a clean corn leaf. Wrap the dough in the corn leaf by neatly folding in the edges. Repeat until all the dough is wrapped. This should make around 25 tamales, enough for 8 people. Steam the tamales for 40 -60 minutes. Serve hot. .

****** The tamale dough can be spiced with chili or other flavorings, or sweetened. A teaspoon of various types of fillings, such as cheese, can be enclosed by placing it on the center of the dough before it is wrapped.



Curried Potato Soup

- 3 lb. potatoes
- 1/2 cup dried green leaf powder
- 2 medium onions
- 1/4 cup butter or oil
- 3 tsp. curry powder
- 1 tsp. salt
- 1 tsp. dill seed

Peel or wash the potatoes well. Cut into cubes and boil in approximately 4 cups of water. Add onion to boiling water for about 5-10 minutes. Add leaf powder, butter, and spices. Blend until creamy, adding more water or milk if needed. Serve hot or cold. Different spices may be used for variations.

Recipes

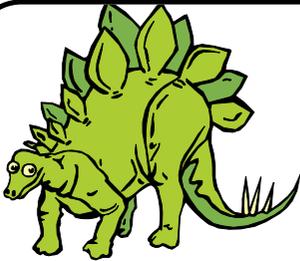


St. Patrick's Shake



1 glass apple juice
1/2 banana
1 tablespoon green leaf powder

Blend all ingredients together. Serve cold. Any fruit juice may be used, or water may be used with a teaspoon of sugar or honey.



Dinosaur Cookies

1 2/3 cup flour	3/4 cup sugar
1/3 cup leaf powder	1 egg
1/4 teaspoon salt	1 tsp. almond extract
3/4 cup butter or margarine	

Preheat oven to 160 ° C [325 ° F]. Combine flour, leaf powder, and salt. Beat butter and sugar until creamy in a separate bowl . Add egg and flavoring. Beat well. Add flour mixture. Gather dough into a ball. Refrigerate for 1 hour. Then roll dough until 6mm (1/4") thick. Cut out shapes and add candy eyes if desired.

Bake 13 - 15 minutes. Do not brown. Yields about 36 cookies.

Leaf Burger

1 1/2 cups dried bread crumbs
1/4 cup leaf powder
1 egg
1/4 wheat flour
1 tsp mustard
1 clove garlic chopped fine
1 tsp salt



Combine all ingredients. Form into patties and fry.
Makes 4 burgers.

Frequently Asked Questions

Q. Can I use regular polyethylene film or glass for the dryer cover?

A. *No. Both of these materials will allow ultraviolet rays to pass and destroy all the beta-carotene in the leaves. Beta-carotene is converted to vitamin A in your body. Also regular 4 mil poly will break down from sunlight in less than one year.*

Q. Where can I get the ultraviolet treated plastics?

A. *It is sold by greenhouse supply companies. Unfortunately they usually sell only very large sheets. Rough Bros in Cincinnati (1-800- 543-7351) sells a 25 ' X 100' sheet of 6 mil 3 year poly for US \$ 145.00 plus shipping. Leaf for Life will send a 10' X 4 ' sheet (enough for 3 dryers) for US \$10.00 postage paid in the US.*

Q. How long will a dryer last?

A. *It should last three years or more if kept out of the sun and rain when not in use.*

Q. What is the difference between dried green leaf powder and leaf concentrate?

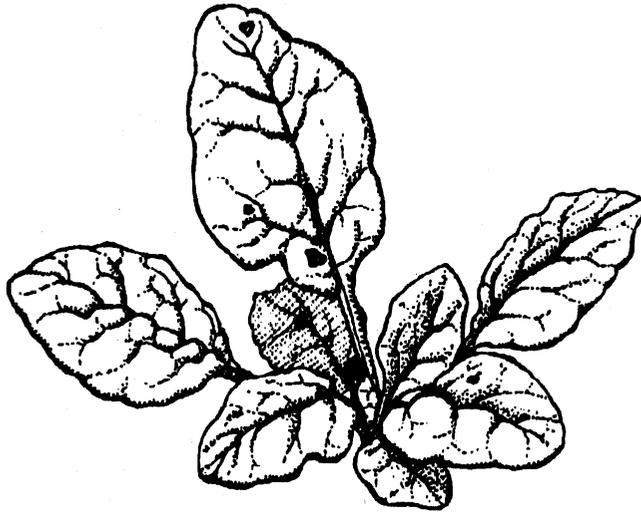
A. *Leaf powder is the whole leaf dried with the stems sifted out. Leaf concentrate is made by coagulating juice pressed from certain green leaves. All the fiber has been removed. Leaf concentrate is a more expensive product made by a more complex process. Leaf concentrate is excellent for rehabilitating malnourished children. Dried leaf powder is much easier to make at home and is intended for day to day use by people trying to maintain basically good health.*

Q. Is there a danger of getting too much fiber in the diet?

A. *A diet very high in fiber makes calcium, iron and zinc more difficult to absorb. This usually is a problem only when pregnant women and children have a marginal intake of these minerals combined with a very high intake of fiber. For adults 25 - 35 grams of fiber per day are recommended (Americans takes in just 11 grams of fiber per day on average). For children the recommendation is 5 grams of fiber plus an additional gram for each year of age. A typical serving of leaf powder contains about 1 -2 grams is fiber.*

Q. Can the body absorb iron from vegetables sources?

A. *While iron from meat and fish is better utilized, vegetable sources of iron can meet the body's requirements. Iron from vegetable sources is absorbed up to four times better when it is eaten with a source of vitamin C, such as fruit juice.*



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