Potentially Important Food Plants of Pakistan




FOOD PLANT SOLUTIONS
ROTARIAN ACTION GROUP

Solutions to Malnutrition and Food Security

A Project of the Rotary Club of Devonport North, District 9830 & Food Plants International

www.foodplantsolutions.org

Food Plant Solutions Field Guide for Pakistan

Although it has declined in recent years as a percentage of the country's gross domestic product (GDP), the agricultural sector sustains the livelihoods of 45 percent of Pakistan's population (FAO 2012). Wheat, rice, maize, sugarcane, oilseeds and horticultural crops are major source of food and food products for masses in Pakistan. Despite the growth in production of staple crops, Pakistan has experienced a sharp decline in food security in recent years due to economic instability, natural disasters and militant activities etc. Pakistan's rural population faces particular challenges, with two-thirds of the total population and 80 percent of the poor population living in rural areas (IFAD 2012). Poverty is particularly widespread in the country's many mountainous areas where isolated communities, rugged terrain, and ecological fragility make agricultural production difficult and where a lack of access to markets and services contribute to widespread chronic poverty.

Unluckily, Pakistan has not so far evolved a comprehensive National Food Security Strategy that can put the masses to food security threats. Rural masses in the northern hilly areas and southern deserts often face severe food shortages during past few years. Promotion of the neglected and underutilized species (NUS) and nutrition could be the very crucial strategy to enhance smallholders' ability to produce more nutritious food at minimal cost while preserving key farmer biodiversity and reducing inputs. Based upon these basic ideas, both of us in our personal capacities are privileged to be a partner with Food Plant Solutions in the creation of this guide. We hope that current exercise will help policy makers and researchers to identify, multiply and promotes minor plants of more food and nutrient security importance and thus ensure their improved livelihood in these food deficient areas while also protecting the natures very precious biodiversity assets.

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Dedication

This book is dedicated to the 3 billion hard working farmers and families around the world who cultivate these, and other, food plants for their own subsistence, and who help conserve them in their rich diversity for other people to enjoy.

Food Plant Solutions Field Guide – Pakistan, Version 4, December 2015

Preface

This guide is based on information from the Food Plants International (FPI) database developed by Tasmanian agricultural scientist Bruce French. The source material and guidance for the preparation of the book has been made possible through the support of Food Plants International, the Rotary Clubs of District 9830, particularly the Rotary Club of Devonport North who founded Food Plant Solutions, (previously the Learn♦Grow project), and many volunteers who have assisted in various ways.

The selection of plants included in this guide has been developed by Neal Fogarty working in a voluntary capacity using the selection criteria developed by Food Plant Solutions. These selection criteria focus on the local plants from each of the main food groups with the highest levels of nutrients important to human nutrition and alleviation of malnutrition. It is intended as a **Draft Guide only** to indicate some important food plants that serve as examples for this purpose. Other important nutritious plants may be equally useful, and it is recommended that the FPI database be used to source information on the full range of plants known to occur in Pakistan. This guide has been developed with the best intention to create interest and improve understanding of the important local food plants of Pakistan, and on the understanding that it will be further edited and augmented by local specialists with appropriate knowledge and understanding of local food plants.

Food Plant Solutions was initiated by the Rotary Club of Devonport North to assist in creating awareness of the edible plant database developed by Food Plants International, and its potential in addressing malnutrition and food security in any country of the world. In June 2007, Food Plant Solutions was established as a project of Rotary District 9830, the Rotary Club of Devonport North and Food Plants International. The primary objective of the project is to increase awareness and understanding of the vast food resource that exists in the form of local plants, well adapted to the prevailing conditions where they naturally occur, and how this resource may be used to address hunger, malnutrition and food security. For more information, visit the website www.foodplantsolutions.org. More detailed or specific information on plants, including references to material by other authors, is available on DVD on request.

Disclaimer: This Field Guide has been produced using information from the "Edible Plants of the World" database compiled by Bruce French of Food Plants International. Although great care has been taken by Food Plants International and Food Plant Solutions, neither organisation, or the people involved in the compilation of the database or this Field Guide:

- makes any expressed or implied representation as to the accuracy of the information contained in the database or the Field Guide, and cannot be held legally responsible or accept liability for any errors or omissions
- can be held responsible for claims arising from the mistaken identity of plants or their inappropriate use
- assume responsibility for sickness, death or other harmful effects resulting from eating or using any plant described in the database or this Field Guide

Always be sure you have the correct plant, and undertake proper preparation methods, by consulting with specialist scientists or local users of the plant. The Food Plants International database, from which the information in this Field Guide is drawn, is a work in progress and is regularly being amended and updated.

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Introduction

This book is designed as a simple introduction to useful, and sometimes under-utilised, food plants of Pakistan. It is hoped people will take greater pride and interest in these plants and become confident and informed about how to grow and use them. Many of the local food plants that occur in every country are very good quality foods. Unfortunately, people often reject traditional food plants in favour of introduced varieties. The principle behind Food Plant Solutions is to encourage the use of these local plants.

Local food plants are often very good

People sometimes think that local food plants are not very special and that any food plant that is new or comes from another country must be a lot better. While this is sometimes true, it is often not the case. Many of the newer or introduced food plants, such as the round or ballhead cabbages and lettuce, have very little food value. Many traditional tropical green, leafy vegetables and ferns have 10 times or more food value as ballhead cabbage or lettuce. It is important to find out more information about the food value of different foods if we want to eat well. Citrus fruit, such as lemons and oranges, are often grown for vitamin C that helps keep people healthy. These fruits do not grow well in the tropics - the common guava fruit has three times as much vitamin C and is loved by children. This is just one example showing there are often much better choices of local foods with higher levels of important nutrients.

Growing food

Growing food to feed a family is, without doubt, one of the most important things anyone can do. The more interest you take in your garden and the more you learn about plants and how to grow them well, the more interesting and fun food gardening becomes.

A country with very special plants

The local food plants of most countries have not been promoted and highlighted in the way they deserve. Visiting a local food market will quickly show what a rich variety of food plants can be grown in this country. Good information about these plants is often still in the minds and experience of local farmers, and has not been written down in books. This can make it hard for the next generation of young people to find out how to grow them.

In many countries, some of the traditional food plants are only harvested from the wild and others are only known in small local regions. Others have hundreds of varieties and are the main food for people in different regions. Information on these plants, and in many cases, their food value and the pest and diseases that damage them, is available in the Food Plants International database.

Getting to know plants

People who spend time in gardens and with their food plants get to know them very well. It is a good idea to learn from someone who grows plants well. Each plant grows

best in certain conditions and there are often special techniques in getting it to grow well. For example, sweet potato will not form tubers if the soil is too wet, but it may still grow lots of green leaves. Taro will grow in light shade, but sweet potato will not. Ginger can grow in fairly heavy shade. Pruning the tips of betel leaf or pepper vines will cause more side branches to grow and therefore, produce more fruit. Stored yam tubers need special treatment if you want them to put out shoots early. Potatoes should be grown from new seed pieces each year to prevent build-up of virus diseases. Tomatoes will yield fewer but larger fruit if lower branches are pruned. There are lots of unique things about every plant and learning about these helps a good gardener produce more food.

Naming of plants

Many food plants have local names, as well as a common English name. Every type of plant also has its own scientific name. Although the scientific name might not be widely recognised, this is the link by which people in different countries and with different languages can recognise the same plant. We know that many plants are grown in many different countries, but relying on local or common names, we might not recognise the same plant grown in different places. By using scientific names to accurately identify plants, we can get useful information from people in other countries. Wherever possible, plants in this book are named by their common English name and their scientific name.

An Important Note

As noted above, a guiding principle behind Food Plant Solutions is to encourage the use of local plants. It is acknowledged that some of these may be major agricultural crops that are already well known, such as:

- Rice
- Wheat
- Oats
- Maize/corn
- Mango
- Banana

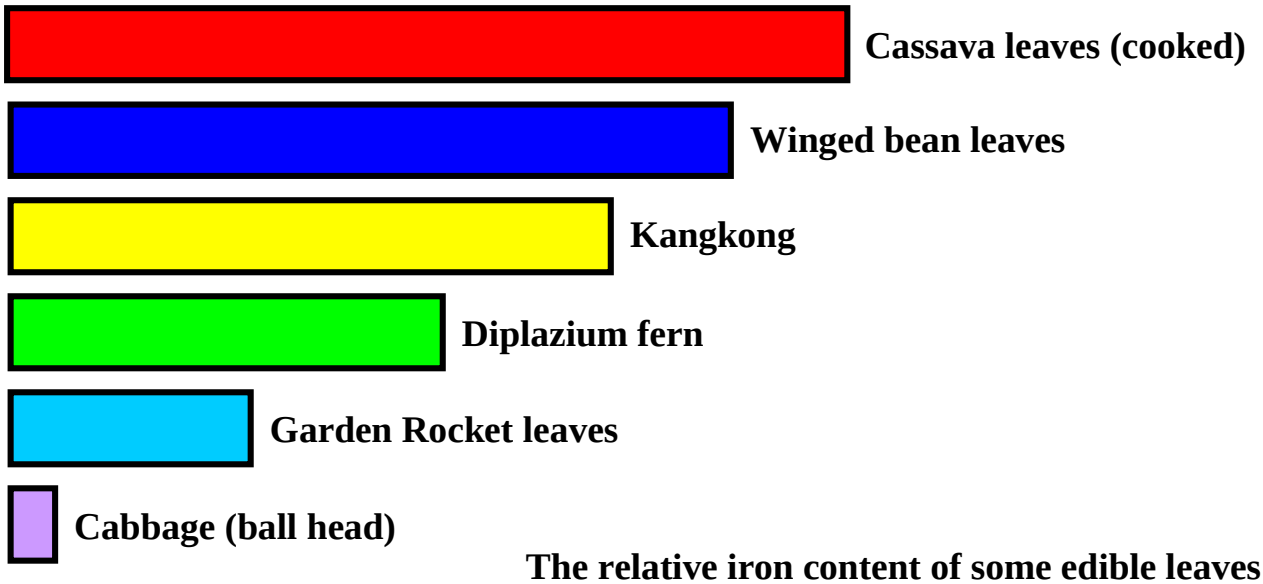
There are others, but these serve as examples.

As a general principle, these types of plants are not included in a field guide, as they are well known, and in some cases (e.g. corn), can be relatively high input crops. However, if they are particularly important in a country, such as rice in many Asian countries, they may still be included. The main purpose of the Food Plants Solution project is to look beyond these types of crops, and focus on plants that are less well known and, as noted above, often have superior food value and lower input requirements.

It is also important to note that while some plants have extremely high levels of some nutrients, many of these are used as flavouring foods (condiments), and are generally used only in small amounts. Therefore, the nutritional contribution they make to the diet will be relatively small. Typical of these types of plants are coriander, parsley etc. Once again, these should not be considered as major food sources. A few may be included in the *Nuts, Seeds, Herbs and other foods* section of the field guide.

Nutrient Value

Our bodies need a variety of food plants to enable us to grow, stay healthy and have enough energy to work. Different foods are needed to provide energy, protein, vitamins and minerals. The following diagram highlights the iron content value of some traditional edible, tropical plant leaves, compared with cabbage. Iron is a nutrient that is very important for our bodies and especially our blood. People who are short of iron become anaemic and lack energy.



The relative iron content of some edible leaves

A healthy balanced diet

Good nutrition, or eating a healthy balanced diet, is really very simple. If people eat a wide range of food plants, their bodies will normally get a balanced amount of all the different nutrients they require. If a nutrient is lacking in one food plant, then they are likely to get it from another plant if they are eating a range of food plants. For this reason, everybody should eat a range of different food plants every day. The food group that is especially important for young people is the dark green leaves. Everyone should eat a good serving of dark green leaves every day. They have many vitamins and minerals, as well as protein. There are many spices or flavouring plants that can improve the taste of foods, but taste should be considered separately from food value.

Learning to cook well

Even though some nutrients in food can lose some of their value during cooking, it is normally much safer to cook all food plants, at least for a short time. Bacteria, which cause diarrhoea, can occur in gardens and on food plants. These are killed during cooking. Some plants contain cyanide, a chemical that makes them bitter and poisonous. This happens often with cassava (tapioca, manioc) and beans, but can also occur in many other plants. Boiling the food for two minutes normally destroys cyanide and makes the food safe to eat. Some of the nutrients our bodies need (such as vitamin A for good eyesight) becomes more readily available when food is cooked in oil.

Learning to grow “wild” food plants

Many plants grow wild in the bush and are not cultivated by people. We can normally find someone who has taken an interest in them and has learned to grow them. This may be people from a different region. It may be that in their area they have found better types than the ones that simply grow wild.

Saving better types of plants

If we simply allow plants to grow from seed, the improvements that have been made in finding sweeter or better types may get lost. Some fruit trees are like this and the fruit produced may not be sweet at all. It is often necessary to take cuttings from a tree to be sure the new plant is exactly the same as the old one. If the plants won't easily grow from cuttings simply by sticking a piece of the branch in the ground, (and keeping it watered), there are other ways of helping these plants to form roots and start to grow. One good way is to make a small cut in the bark of a young branch and then wrap soil around the cut and cover it with plastic. With some plants (like guava), new roots will start to grow from this cut and grow into the soil wrapped around the branch. It can then be cut off and planted. This is called air-layering. A similar method is used with the roots of breadfruit. A shallow root is uncovered and a small cut made from which a new sucker will start to grow. This can be cut off and replanted.

Growing from cuttings and suckers

Many food plants are grown from cuttings and suckers. This is very important, as it allows all the different kinds of yams, taros, bananas, sweet potato and sugarcane to be continually grown and ensures the varieties are preserved. Each plant has its own special propagation method. It is important to use healthy planting material, as diseases can be spread in planting material. In many cases, small tubers of yams, taro etc. are stored for planting for the next crop. This is not always good practice, as the small tubers could be the result of diseases (such as viruses) in the plant. A good rule is to take cuttings or save tubers from the best plants for re-planting.

Saving seed

Some food plants are grown from seed. Sometimes this is very easy as the seeds are large, store well, grow easily and grow the same as the original plant. It is more difficult with other plants. Many large fleshy seeds, such as breadfruit, need to be planted while still fresh as they do not store easily. Other seeds do not "breed true" or do not grow into new plants that are the same as the original plants. With many of these plants, it may be necessary to find ways of growing them from cuttings or other methods such as grafting. Some plants "inbreed" and get smaller or poorer. This happens when a plant self-pollinates or receives pollen from a close relative. Corn grown in small plots normally does this and the plants grown from seed grown in this situation get smaller and smaller each year. The seed needs to be saved from several different plants with different history and then mixed together before sowing. All the seeds on one cob are related and will inbreed. Some seeds develop a hard seed coat and need to be scratched, soaked in water, or even put into hot water, before they will start to grow. Saving local seeds is often a good idea as they are already adapted to local conditions. For example, seed saved from pumpkins grown locally will produce plants with less pest and disease damage than those grown from imported seed. This

is not to say that imported varieties might not be better, but it is worth checking that the new plant will perform as well as, or better than, those currently grown, before going to the trouble of importing seed. *If you can't get seeds or planting material from local gardens, it is probably not a suitable local plant! Once again saving seed from the better plants helps ensure that you have better crops the next time you plant.*

Growing a garden of mixed plants

In nature, one variety of one plant never grows alone. There are always lots of different plants of different kinds and sizes, all growing together. Anyone who has ever walked into a tropical jungle will know this very well. Growing plants in a food garden in a way similar to how they grow in nature, as a mixed group of plants, is very good agriculture. Mixing plants in a garden usually gives more reliable food production, as any disease from one plant will wash off in the rain onto a different plant, where it cannot survive. Small plants fill the gaps and reduce the need for weeding.

Different types of plants for food security

There is another reason for growing a range of food plants in a local garden or around a village. If something goes wrong, like extreme insect damage to plants, some disease occurring in the garden, or a poor growing season, some plants will be more damaged than others. With a variety of plants, there will still be some food to eat until the other plants recover and grow again. Also, a wide variety of plants will mean that different ones will be maturing at different times, which helps ensure a continuous supply of food. There are shrubs that can be planted as edible hedges around houses, and fruit and nut trees that need to be planted as a gift for your children, several years before they will be able to enjoy them. Some nuts can be stored and eaten when other foods are not available. Most tubers will store well for a few months in the right conditions.

Crop rotation

Crop rotation involves planting different crops in succession to improve soil fertility and reduce the impact of insect pests and diseases. The crops in the rotation should be selected to reduce the risk of carry-over pests and diseases from one crop to the next. A three-year rotation would normally involve growing a legume to increase soil nitrogen levels, and then two different crops before a legume is planted again. Maximum suppression of diseases and insects should be achieved if the non-legume crops are alternated between grass and broad-leafed plant families. Crops planted in a mixture of two or more species will provide greater diversity, and hence reduce losses due to pests and diseases.

Looking after the soil

Gardeners in traditional tropical agriculture usually move their gardens often by shifting to a new piece of land. There are usually three reasons for this:

- In the tropical lowlands, weeds can become a very big problem. There are usually a lot fewer weeds in the first year or two after clearing and burning the land, but weeds increase in the following years.

- Some of the nutrients in the soil are used each year and the soil becomes poorer and plants do not grow as well. There are ways of reducing this loss of nutrients.
- Very small worms called nematodes build up in the soil after a few years and get into the roots, especially of annual vegetable plants, and stop their roots working properly. For example, root knot nematode will cause the roots of plants like tomatoes and beans to become twisted resulting in poor growth of the plant.

Control of soil erosion

Erosion, or loss of soil, occurs when wind or running water carries soil away from cultivated areas. If erosion continues year after year, the land will become unproductive. Trees and shrubs can be planted in strips across the direction of the dominant wind to reduce wind erosion, or across the slope to help slow water that flows over cultivated soils. Growing crops with good leaf cover, or leaving crop residues to cover the soil surface, will significantly reduce soil loss during windy or wet seasons. When possible, any soil disturbance, such as tillage, should occur after the risk of windy weather or wet weather run-off has passed. In steep areas, tillage should be on the contours around hills, rather than up and down the slope. Various techniques can be used to leave ridges or terraces in the tilled soil to help slow water, or reduce the effects of wind, and hence reduce soil loss. Always reduce tillage to the minimum amount possible while still achieving a successful crop.

Building up the soil

When a new garden has been cleared, it has lots of leaf mulch and other old plant material. This provides plant nutrients for new plants to grow. There is a simple rule for growing plants and improving the soil - "If it has lived once, it can live again." Any old plant material can provide nutrients for new plants to grow, but it must be allowed to rot into mulch or compost for this to happen. If this plant material is burnt, some nutrients, especially phosphorus and potassium ("potash"), get left behind in the ashes for new plants to use, although it also allows these important nutrients to be lost by being washed away by rain. But with burning, other important nutrients, such as nitrogen and sulphur, get lost in the smoke and disappear from the garden and soil. These last two plant nutrients are especially important for growing green leaves and when their levels are low, plants grow small or pale green. When nitrogen is lacking, the old leaves of the plant go pale and fall off early, and when sulphur is lacking, the young leaves go pale. Wherever possible, old plant material should be covered with some soil to allow it to rot down and not simply dry out or get burnt. Cutting it into small pieces will help it break down more quickly into usable compost.

Poor soils where crops won't grow
When soils are very acid (or sour), plants cannot get the necessary nutrients. Natural chemicals in the soil that are toxic to plants when present at higher levels become soluble, get into plants, and stop them growing. Adding limestone to these soils can improve them. Using compost will not make them less acid, but will keep the plant nutrients in the soil in a more readily available form that plants can use.

Soil nutrients
Plants need 16 different kinds of plant food or nutrients in different amounts to grow properly. A plant that has already been growing will have these nutrients in them and probably even have them in a balanced amount. That is why composting old plant material is so important. Plants usually show some signs or symptoms if any of these nutrients is running out.

One of the most common and important nutrients for plant growth is nitrogen, which actually comes from the air, but gets into plants through the soil. When plants are short of nitrogen, their older leaves often become yellow or pale. When grass family plants, like corn, are short of nitrogen, the centre of the oldest (lowest) leaves starts to develop a dry or dead V-shape. The plant cannot find enough nitrogen in the soil so it gets it from an old leaf to grow a new leaf. This causes the old leaf to die, forming a characteristic V-shape in the centre of the leaf. The plant does not get any bigger as an old leaf dies each time a new leaf is produced. Village farmers often walk through grassland before they clear it for gardens, looking to see if the grass leaves are dry and dead, because they know gardens on this soil won't grow well. It is necessary to use compost or legumes (such as beans) to put nitrogen back into the soil. Growing plants from the bean family (legumes) is an efficient way to increase the level of nitrogen in the soil.

Corn is a good plant for indicating which nutrients are running short in the soil. If the older leaves go dry along the edges, the soil is running out of potash. If leaves that are normally green develop a bluish colour, the soil is short of phosphorus. Generally, leafy crops need lots of nitrogen, and root crops need lots of potash.

Making compost
Compost is old plant material that has been allowed to rot down into a fine, sweet smelling mulch that is full of nutrients that can be put back on the soil to grow new plants. Compost returns nutrients to the soil, improves the soil's ability to retain moisture and also helps improve soils that are acid or saline.

Making good compost is very simple. A simple heap of plant material can be made in the corner of a garden or near a house. Cutting the plant material (especially stems), into small pieces no longer than about the width of a finger, will help it break down quicker. If possible, make layers of plant material, then a small layer of soil, and then scatter fire ash on top. Keep repeating this process to make a heap. A good compost heap should be warm inside. Be careful with diseased plant material. This should be burnt, otherwise the disease may be spread when you use the compost at a later date.

The composting process is carried out by small bacteria that live in the soil and feed on decaying plants. They break down old plant material into compost. These bacteria are living, so they need air, water and food. A good compost heap must have air, so don't cover it with plastic or put it in a container. This makes a foul smelling compost, as different bacteria that don't need air turn it into an acid mixture that preserves it. Good compost must have moisture, so keep the heap damp, but not too wet. The compost bacteria like a balanced diet, which means that both green material and dried material is needed to balance the carbon and nitrogen in the compost pile. If the compost material gets too dry and brown, it will not break down, and if it gets too green, it will go slimy. Using a little bit of compost from an old heap will make sure the right bacteria are there to start the whole process off.

As soon as the plant material is broken down to a fine mulch it can be put onto the garden. It is best if it is dug in, but if it is regularly put onto the surface of the garden, worms will mix it into the soil. A handful of compost placed at the base of each plant can be beneficial.

Pests

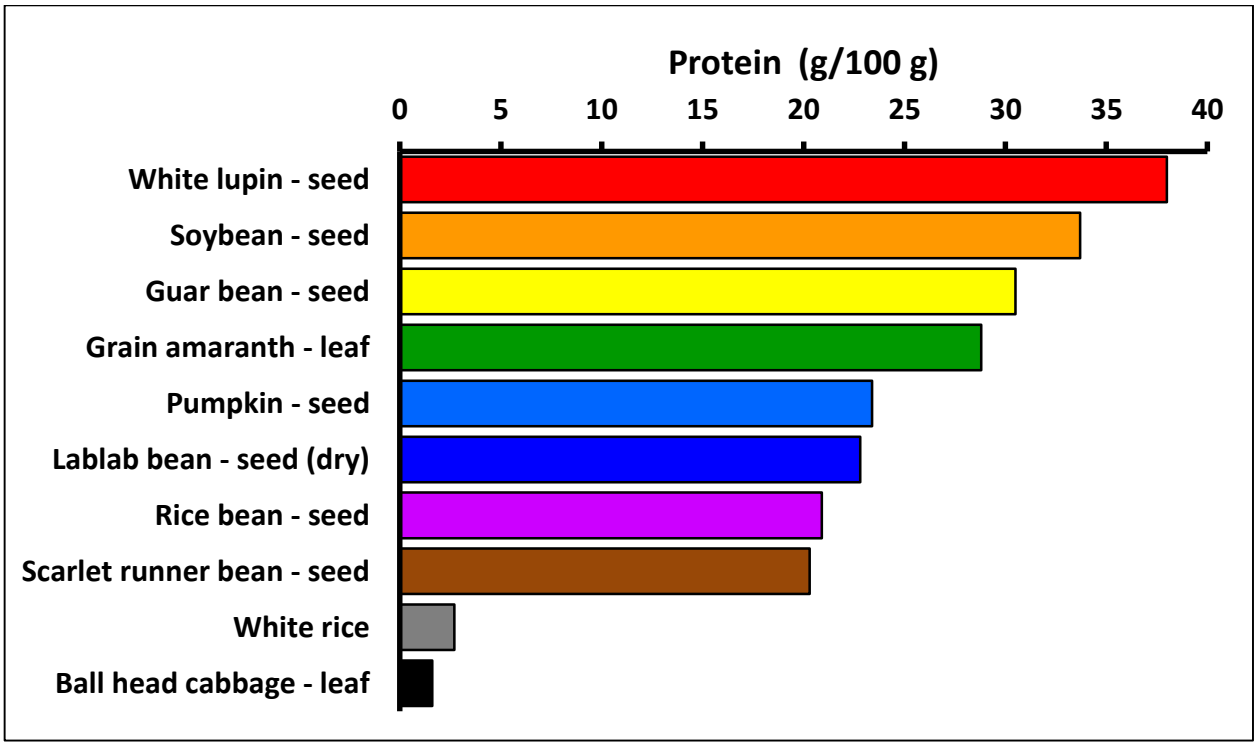
There are a large number of insects that enjoy sharing our food with us! We should not try to kill all these insects as they have an important role to play in keeping everything in nature in balance. What we need to do is to learn to manage these insects so we can all get some food to eat! Some insects are attracted to lights, and if the garden is near village lights some insects can cause a lot of damage. If large areas of one particular crop are planted, insects can breed more quickly and cause a lot of damage. As an example, insects called armyworms can breed up in large numbers on the shade trees of cacao and then move "like an army" into gardens. Some insects are large and breed slowly and can be picked off and removed. The large, green grubs with pointy tips that hide under taro leaves are best controlled by simply picking them off. Some insects, like taro beetles, can be a serious problem, but the young curl grubs of this insect are tasty if you catch and cook them. Some insects do not like sunlight. The very small moth that damages banana fruit is like this. Simply pulling off the leafy bracts over the banana fruit reduces the damage, as this lets sunlight in and the insect flies away. The best rule for reducing pest damage is to grow healthy plants, as they suffer less damage. Spiders, ladybirds, hover flies and many other insects also feed off the insect pests that attack our crops and should be encouraged.

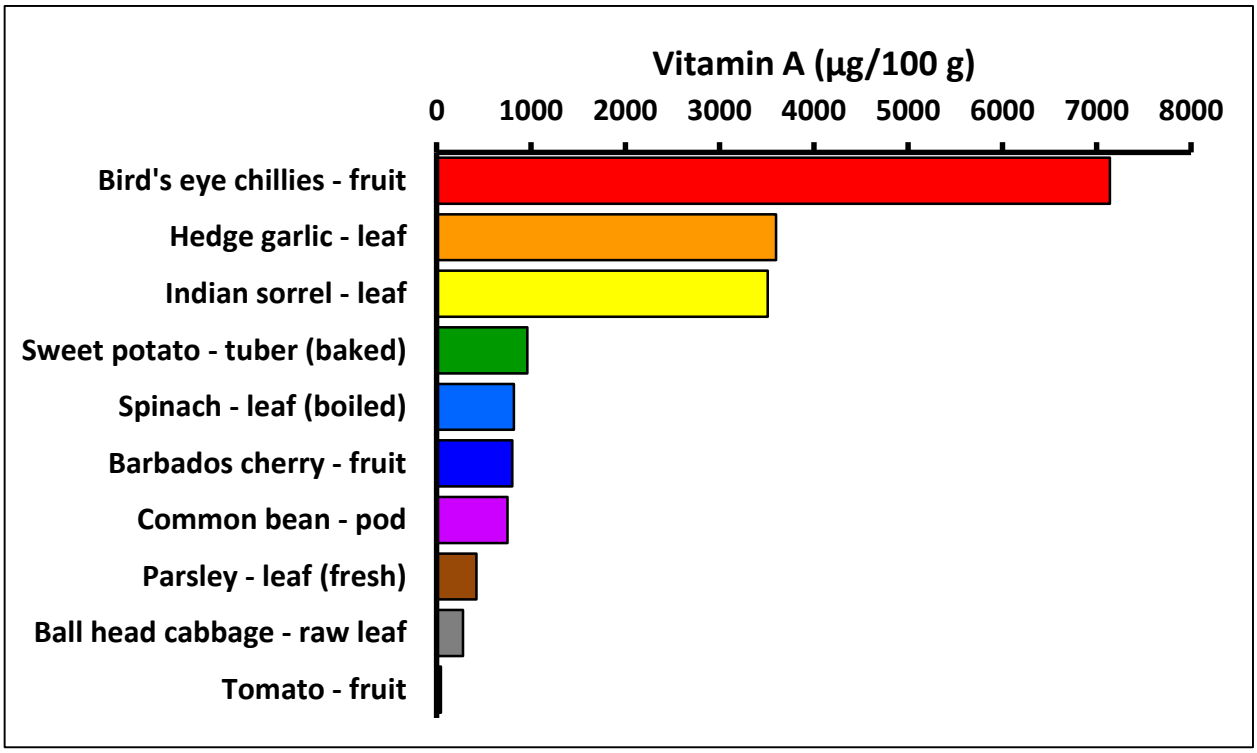
Diseases

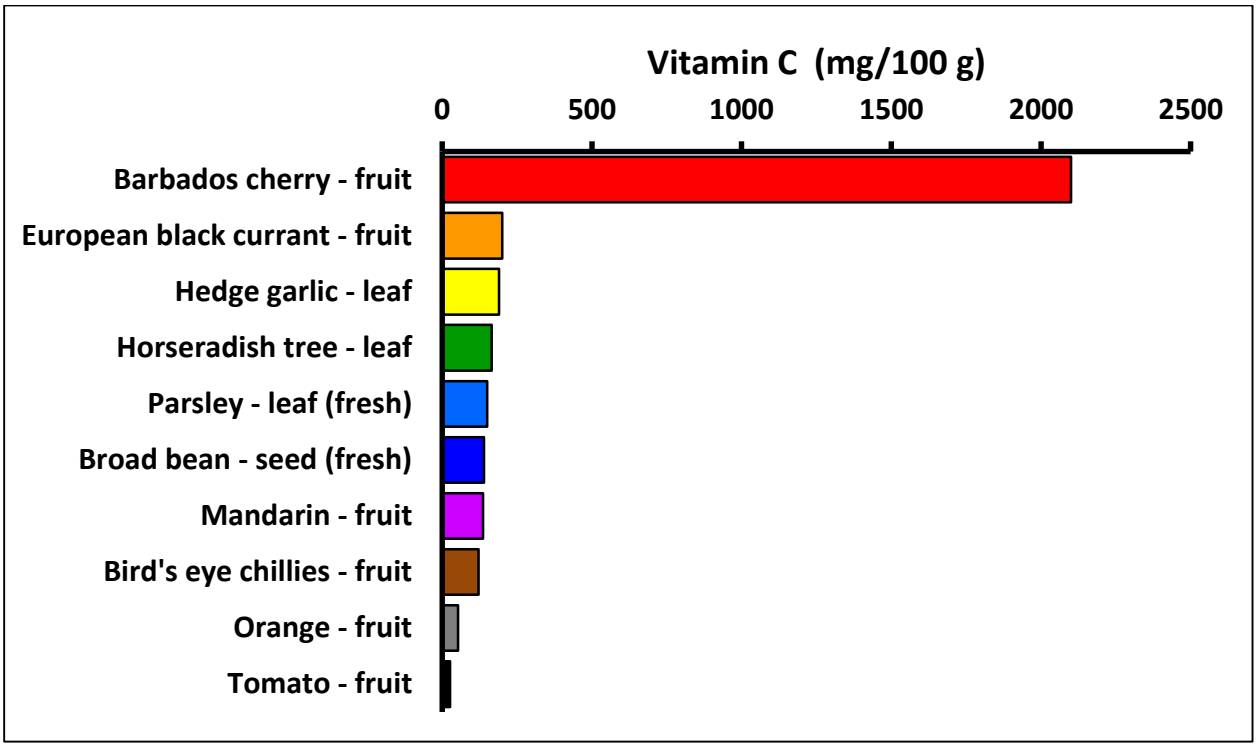
The living organisms that cause disease are much smaller than insects. These disease organisms can often only be seen with a microscope. There are three main kinds of disease organisms - fungi, bacteria and viruses. Fungi are like the mushrooms we eat, only very much smaller. They usually make distinct dry spots on leaves and other plant parts. Fungi have spores that often blow in the wind. Bacteria are often smaller and live in damp places. They usually make plants go soft and squashy, and they may cause a smell. Bacteria are mostly spread with rain and in water. Viruses are very, very small and usually make irregular stripes and patterns on leaves and other plant

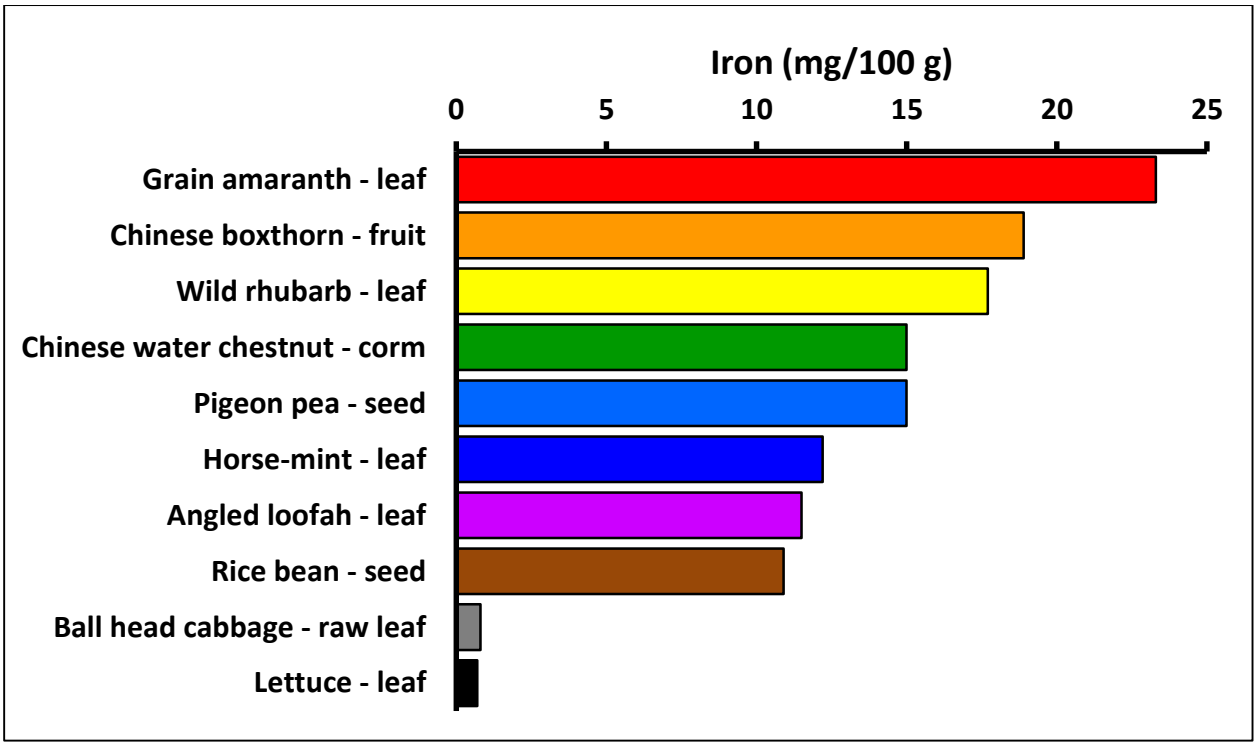
parts. Viruses usually spread in planting material or in the mouths of small sucking insects. Plants infected by viruses are often yellow, and may be stunted, or have curled or unusual shaped leaves. One common fungus disease on sweet potato causes the leaves to become wrinkled and twisted. It usually gets worse in old gardens and where soils are running out of nutrients. It doesn't affect all kinds of sweet potato to the same extent. The answer is not to stop the disease, but to improve the soil. The general rule is that healthy plants that are growing well will suffer less damage from disease.

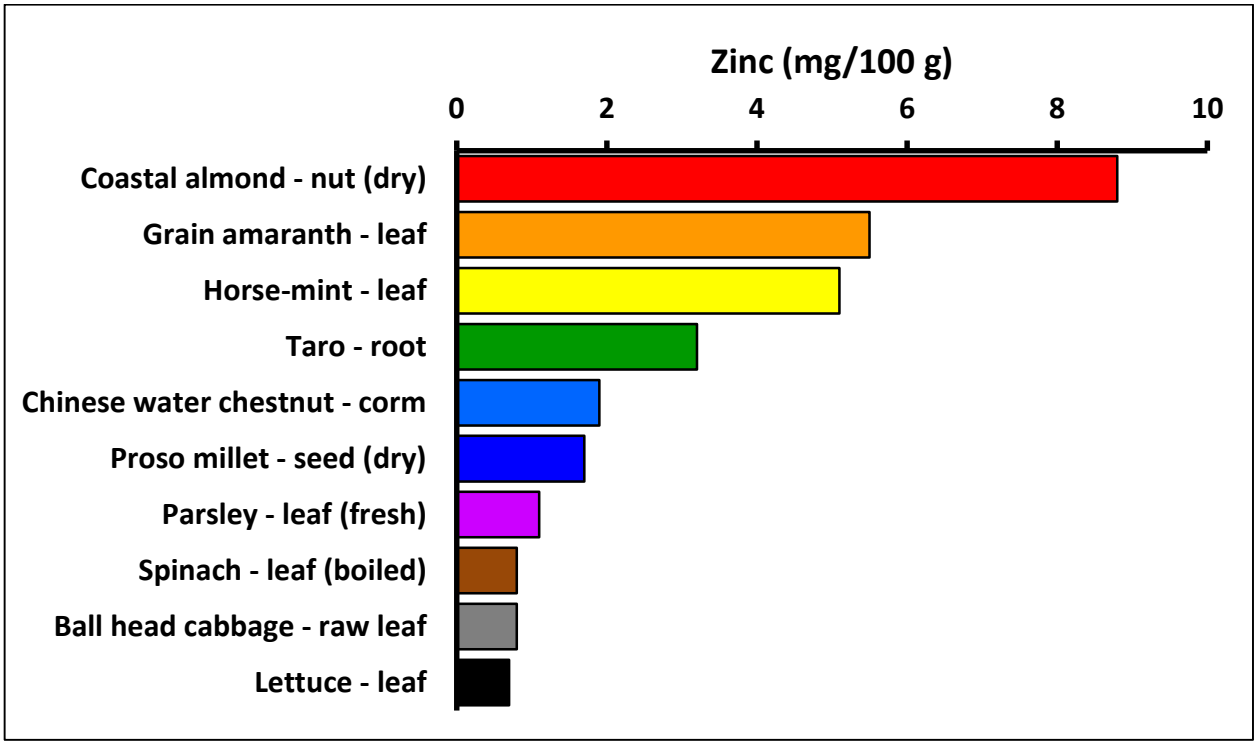
Food value charts for a selection of plants from Pakistan






Vitamin C (mg/100 g)
0
500
1000
1500
2000
2500
Barbados cherry - fruit
European black currant - fruit
Hedge garlic - leaf
Horseradish tree - leaf
Parsley - leaf (fresh)
Broad bean - seed (fresh)
Mandarin - fruit
Bird's eye chillies - fruit
Orange - fruit
Tomato - fruit


Iron (mg/100 g)
0
5
10
15
20
25
Grain amaranth - leaf
Chinese boxthorn - fruit
Wild rhubarb - leaf
Chinese water chestnut - corm
Pigeon pea - seed
Horse-mint - leaf
Angled loofah - leaf
Rice bean - seed
Ball head cabbage - raw leaf
Lettuce - leaf



Note regarding plant selection: In compiling these field guides, we acknowledge that some staple foods and commercial crops which are grown widely in the target country may be omitted. Such foods are often in the starchy staple category (e.g. rice, corn). This does not mean that they are not useful, but merely reflects a desire for the Food Plant Solutions project to concentrate on plants that are less well known and / or underutilised.

Starchy staples

English: Taro
Local (Urdu): Arvi/Eddoe

Scientific name: *Colocasia esculenta*
Plant family: ARACEAE

Description: This plant has large flat leaves on the end of upright leaf stalks. It grows up to 1 m high. The leaf stalk or petiole joins the leaf towards the centre of the leaf. The leaves are 20 - 50 cm long. Near the ground a thickened rounded corm is produced. Around this plant there is normally a ring of small plants called suckers. Many different varieties occur. If left to maturity, a lily type flower is produced in the centre of the plant. It has a spathe 15 - 30 cm long which is rolled inwards. The flowers are yellow and fused along the stalk. There are many named cultivated varieties. Taro comes in two basic forms. The Dasheen type *Colocasia esculenta* var. *esculenta* and *Colocasia esculenta* var. *antiquorum* or the Eddoe type. The basic difference is the adaptation of the Eddoe type to storage and survival in seasonally dry places, while the dasheen type needs to be maintained in a more or less continuously growing vegetative stage.

Distribution: It is a tropical plant. Taro grows from sea level up to about 2,300 m altitude in the tropics. It grows well in humid places. It can stand damp soil and grow under light shade. It suits hardiness zones 9 - 12.

Use: The corms, petioles and leaves are all edible after cooking. The leaves are also dried and stored. Fresh leaves can be stored for 4 - 5 days. **Caution:** Some varieties burn the throat due to oxalate crystals.

Cultivation: Taro can be planted from cormels or from the top of the central corm. Other sections of the corm could also be used but this is not commonly done. Flowering of taro and seed production can lead to new cultivars. Flowering can be promoted by the use of gibberellic acid. The general growth pattern is for an increase in top growth, in terms of leaf number, leaf area and petiole length, to continue for about 6 months under tropical lowland conditions then for each of these to decrease and tuber storage to continue to increase. Corm weight increases significantly from 5 - 11 months. Starch content also increases with time but protein content declines over the corm development period.

Taro can be grown under flooded conditions but root rots develop if the water becomes stagnant. For flooded cultivation, the land is cleared, ploughed, cultivated and puddled. The aim is to get a field that is flat with embankments allowing the impounding of water. Planting is done into 2 - 5 cm of standing water.

For dryland taro, the soil is prepared by digging, unless a fresh bush fallow is used where the natural friability of the soil allows plants to be put into the undug soil in a small hole that is prepared. Plants are put into a hole 5 - 7 cm deep or deeper. Mulching to conserve moisture and reduce weed growth in beneficial. Setts from corms normally give higher yield than that from cormels. The greater leaf area and root production may be responsible for this. Setts of about 150 g are optimum.

The time of planting is primarily determined by the availability of moisture. Planting is done shortly after the rainfall has become regular, if seasonally distinct wet and dry occur. Higher rainfall, higher temperatures, and higher hours of sunlight, enhance production and determine seasonality of production.

Evapotranspiration for flooded taro averages about 4 mm per day, ranging from 1.5 - 7.2 mm, with a total of about 1,200 mm for the crop. Intermittent moisture can result in irregular shaped corms. Flooding has been found to be more effective than sprinkler irrigation, or furrow irrigation. Increased suckering, giving greater leaf area, seems to be the reason for this.

Taro is sensitive to weed competition throughout most of its growth, but it is more critical during early growth up to 3 - 4 months. About 7 - 9 weedings are required, to keep the crop clean under tropical lowland conditions, where flooding is not used. Due to the decrease in height and leaf area towards the end of the growth cycle when starch accumulation in the corms is maximum, weed competition and weed control are again significant. Mechanical weeding needs to be shallow to avoid damaging the superficial taro roots. A range of herbicides have been recommended in various situations.

Taro produces the highest dry matter yield under full sunlight, but it can still grow under moderate shade. Under shaded conditions it grows more slowly and develops fewer cormels. They require good moisture conditions and have little tolerance for drought. Taro residue has an allelopathic factor which can reduce the germination and growth of other plants, for example, beans.

Taro tends to demand high fertility, and is responsive to additional NPK fertiliser. Higher doses of K increases starch content and higher doses of N increases protein content. Both N and K applications increase oxalic acid content of the tubers.

Spacing affects total yield, and marketable, harvestable yield, of corms. Close spacing increases the corm yield per area, and the shoot yield per area, but decreases the corm yield per plant, and the contribution of sucker corms, to the yield. Where spacings of 30 cm x 30 cm are used, giving about 110,000 plants per hectare, a very large amount of planting material is required, which reduces the net return per unit of planting material. A spacing of 60 cm x 60 cm in more common. Wider spacings of 90 cm x 90 cm reduces overall yield.

Production: Crops mature in 6 - 18 months. Yields of 5 - 15 tonnes per hectare are probably average.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
root	66.8	1231	1.96	3	5	0.68	3.2
leaf	85.0	210	5.0	57	90	0.62	0.7
leaf stalk	93.0	101	0.5	180	13	0.9	-
leaf (cooked)	92.2	92.2	2.7	424	35.5	1.2	0.2

Starchy staples

English: Oats
Local (Urdu): Javi/Jayi

Scientific name: *Avena sativa*
Plant family: POACEAE

Description: An annual grass plant and cereal with an open spreading flower head. It can grow up to 1 or 1.5 m tall. The stalks are moderately stout. The leaves are narrow and sword shaped. They are flat and 45 cm long by 25 cm wide. The flower arrangement is an open panicle. This is in a head 50 cm long. The flowers are held to one side of the stem. The fruit is a grain tightly enclosed by the glume.

Distribution: It would suit some highland areas in the tropics. In Nepal it grows to about 1,300 m altitude. It will grow in slightly colder areas than wheat.

Use: The seeds are used as food after the outer layer is removed. They are used as rolled oats, porridge, breakfast foods and in cakes and biscuits. The young seedlings are juiced or dried and used as a food supplement. Sprouted seeds are used in salads.

Cultivation: Plants are grown from seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	11.0	1563	13.1	-	-	4.6	-

Starchy staples

English: Proso millet
Local (Urdu): Varai

Scientific name: *Panicum miliaceum*
Plant family: POACEAE

Description: An annual grass which grows up to 1 m high. It spreads to 15 cm across. It has a fibrous root system. The stalks are tufted. They are hairy at the base and on the nodes. The leaves are 30 - 50 cm long by 1 - 5 cm wide. They are narrow and flat. The edge is slightly rough with a few long hairs near the base. The seed head is much branched. The flower is yellow. The fruit is a grain. There are several races.

Distribution: It requires a moderately fertile well-drained soil in full sunlight. Once established it can tolerate heat and drought. It suits warm temperate and subtropical climates. Plants are frost sensitive. It can grow in arid places. It suits hardiness zones 5 - 9.

Use: The seeds can be cooked and eaten whole or ground into flour. They can be used in bread, pasta or dumplings. They are often browned in a skillet before using in casseroles, stews and for stuffings. It suits people with Coeliacs disease because it contains no glutin. It has a high alkaline content that makes it easily digested. The seed can be sprouted and added to soups and salads. They are fermented into *tempeh* or *miso*.

Cultivation: It is grown from seed which take one week to germinate.

Production: Seeds for harvest can be produced in 10 weeks.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	9	1582	11	0	0	3.0	1.7

Starchy staples

English: Foxtail millet
Local (Urdu): Kangni/Gangavi booti

Scientific name: *Setaria italica*
Plant family: POACEAE

Description: An annual grass. It grows 1 - 1.5 m tall. It can be tinged with purple colour. The stalks are upright and the section between the nodes is hollow. It develops tillers from the base. It has along leaf sheath. The leaf blade is 30 - 45 cm long by 1.2 - 2.5 cm wide. It has a prominent midrib and tapers towards the tip. The flower is a spike-like branching flower 7.5 - 25 cm long by 1.2 - 5 cm wide. The side branches carry 6 - 12 small spikes each with 1 - 3 bristles. The mature grain is 2 mm long. There are many named cultivated varieties.

Distribution: A warm temperate plant. It suits regions of low rainfall. It is grown from sea level to 2000 m altitude. It can tolerate a wide range of soil conditions. It cannot tolerate waterlogging or long periods of drought. It can grow in arid places.

Use: It can be cooked and eaten like rice. The seeds can be parched, popped, added to soups and sauces or made into porridge, cakes, puddings, and dumplings. The sprouted seeds can be used as a vegetable. The seeds can be used for making beer. The seeds can also be made into syrup.

Cultivation: Plants are grown by seed. Seed can be broadcast or drilled. Pure stands require 8-10 kg/ha of seed. Plants are harvested by cutting off the ears.

Production: It grows quickly. Plants mature in 80 - 120 days. Flowering occurs over 10 - 15 days. Plants can be self or cross pollinated. Yields of 800 - 900 kg/ha are common and straw yields for livestock feed can be up to 2500 kg/ha.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.5	1425	9.5	-	-	5.5	-

Starchy staples

English: Bullrush millet
Local (Urdu): Bajra/Bajri

Scientific name: *Pennisetum glaucum*
Plant family: POACEAE

Description: An annual grass that grows to 3 m tall. The leaf blades are 20 - 100 cm long by 2 - 5 cm wide. The flower is dense and 40 -5 0 cm long by 1.2 - 1.5 cm wide. They also vary in shape and size. Plants that tiller produce smaller heads. The species varies a lot. There are 13 cultivated, 15 weed and 6 wild races of this grass. It has a cylindrical ear like a bullrush. The grains are small and round and have a shiny grey colour like pearls. There are thousands of cultivated varieties.

Distribution: A tropical plant that suits regions with a short growing season. It grows in areas with less than 600 mm of rainfall. It is replaced with sorghum between 600 – 1,200 mm rainfall and then by finger millet or maize above 1,200 mm rainfall. It is important in the drier areas of India and Pakistan. It can grow in arid places.

Use: The seeds are eaten like rice. They are also ground into flour and made into bread and cakes. They are used to make alcoholic drinks. They are mixed with other grains and seeds to make fermented foods. Some kinds have sweet stalks that are chewed. The young ears can be roasted and eaten like sweet corn.

Cultivation: Plants are grown from seed. It is usually sown directly into the field. The plant density is adjusted to suit rainfall and soil fertility. The spacing is 45 cm apart up to 200 cm apart. It is also intercropped with other crops such as cowpea, sorghum and peanut. Crops are normally weeded 2 or 3 times.

Production: It takes from 75 - 180 days to maturity. The heads can be picked by hand or the plant removed. Some types need to be picked 2 or 3 times as heads mature.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.5	1363	12.7	-	-	3.5	-

Starchy staples

English: Sorghum
Local (Urdu): Juar

Scientific name: *Sorghum bicolor*
Plant family: POACEAE

Description: Sorghum is a millet grass. A mature sorghum plant resembles maize in its stature. Plants vary in height from 45 cm to 4 m. It is an annual grass with erect solid stems. The stems can be 3 cm across at the base. Prop roots occur at the base of the plant. There are numerous sorghum varieties. Some have one main stem while others produce multiple tillers. More tillers are produced when plants are widely spaced. The nodes on the stem are slightly thickened. Short tyrpes have up to 7 leaves while tall late varieties may have up to 24 leaves. The leaf blade can be 30 - 135 cm long. Leaves are bluish green and waxy. They have a prominent midrib. The large flower panicle can be 20 - 40 cm long. The flower occurs at the top of the plant. It can stick upright or bend over. The flower can be open or compact. Over 1,000 cultivated varieties occur in China.

Distribution: Sorghum is a tropical plant. It suits the savannah zones in the tropics and can tolerate heat and drought. It can recover from drought even as a seedling. It can tolerate water-logging. It can be grown on heavy or light soils. Sorghum requires short daylengths to flower. Many kinds are adapted to specific daylength and rainfall patterns. It suits hardiness zones 9 - 12.

Use: Sorghum seeds are eaten as a cereal. Flour can be made from the grain and then used for porridge or other dishes. It is used for dumplings, fried cakes and drinks. It cannot be used for bread as it contains no gluten. The stems of some kinds are sweet and can be chewed. The grains can be popped and eaten. The sprouted seeds can also be eaten.

Cultivation: Sorghum seeds will germinate soon after harvest. The seeds also store well if kept dry and protected from insects.

Production: Grain is ready for harvest 4 - 8 weeks after flowering.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	-	1459	11.1	0	-	-	-

Legumes

English: Soybean
Local (Urdu): Soyabean

Scientific name: *Glycine max*
Plant family: FABACEAE

Description: A small erect bean growing up to 60 cm tall. It grows each year from seed. Straggling kinds can occur. Stems, leaves and pods are softly hairy. The leaves have 3 leaflets. The leaflets have stalks. Flowers are small and white or blue. They occur in groups in the axils of leaves. The pods are broad, flat and hairy. Pods have 2 - 4 seeds. The seeds can be yellow to black.

Distribution: It is a temperate plant that suits lowland areas. It can be grown from sea level to 2,000 m altitude. Many varieties will not flower in the tropics (short days). It needs fertile soil. The best soil acidity is pH 5.5 - 7.0. It is damaged by frost.

Use: The young pods and ripe seeds are eaten. They are used for flour. The dried seeds are boiled or baked and used in soups, stews and casseroles. The seeds are used for oil. Toasted seeds are eaten like a snack. Strongly roasted seeds are used for coffee. Soy flour is used for noodles, and confectionary. The beans are fermented and used in a range of foods. Sometimes the young leaves are eaten. The seeds are also used for sprouts and for making cooking oil and soya sauce etc. Because soybean contains a trypsin inhibitor they should be cooked and even the sprouts should be lightly cooked.

Cultivation: It is grown from seed. Seeds need to be inoculated with bacteria before planting. Plants need to be about 20 cm apart.

Production: Plants flower about 8 weeks after sowing and pods mature about 16 weeks after sowing. Often plants are pulled up and hung up before threshing out the seed.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.0	1701	33.7	55	-	6.1	-

Legumes

English: Pigeon pea
Local (Urdu): Arhar

Scientific name: *Cajanus cajan*
Plant family: FABACEAE

Description: An upright perennial shrubby legume that can live for 3 - 4 years. They can grow up to 4 m tall and spread to 1.5 m wide. It has a bushy appearance and a strong deep taproot. The root nodules are round and sometimes lobed. The leaf consists of 3 narrow, green leaflets which are silvery-green underneath. The end leaflet is larger with a longer leaf stalk. The pea shaped flowers are red and yellow and occur on branched flower stalks which stick upwards in the axils of leaves. Pods are long, straight and narrow, often with 4 - 8 seeds. Seeds vary in shape, size and colour. The pods are slightly hairy. Pods are often 4 - 8 cm long and have a beak at the end. Pods are constricted between the seeds. Many varieties of pigeon pea occur. Some are dwarf and day length neutral.

Distribution: A tropical plant that requires a tropical or subtropical climate. Plants grow from sea level up to about 1,800 m in the tropics. They can tolerate drought and are suited to a drier climate. They can grow in places with less than 600 mm rainfall per year. They do less well in the wet tropics. They suffer in waterlogged soils and are damaged by frost. It can also tolerate heat. It will grow on poor soils cannot grow on salty soils. It can grow in arid places and suits hardiness zones 10 - 12.

Use: Young leaves, shoots and pods are eaten. The pods can be used in curries. The leaves and shoots as potherbs. Young seeds are cooked and eaten like peas. Ripe seeds are also cooked and eaten in soups and curries. Bean sprouts can be produced and eaten. Preparation of the seeds for dahl is somewhat complicated.

Cultivation: They are grown from seeds. It is best to sow seeds where the plants are to grow. Seeds normally germinate easily and well. Before sowing seed it helps to soak them in cold water for one day. Seeds store well if kept cool and dry. A spacing of 1.5 m x 1.5 m is suitable. Plants can be cut back and allowed to re-grow. Plants can also be grown from cuttings.

Production: Plants are fast growing. Pods are ready after 5 months. Mature seeds take about 8 months. Plants will often live for 3 - 4 years. Plants are cross pollinated by insects, or self pollinated.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	10.0	1449	19.5	55	-	15.0	-
pod (young)	64.4	477	8.7	-	-	2.0	-
seed (young, boiled)	71.8	464	6.0	2	28.1	1.6	0.8

Legumes

English: Rice bean
Local (Urdu): Rawaan

Scientific name: *Vigna umbellata*
Plant family: FABACEAE

Description: An annual twining, climbing bean plant with a slender hairy vine. It grows from seed each year. It grows to 1.5 - 3 m long. Leaves have 3 leaflets which can vary in shape. They are mostly oval and 3 - 13 cm long by 1.5 - 7 cm wide. They taper towards the tip and are rounded at the base. Usually they are hairy. The leaf stalks are 3 - 16 cm long. Flowers are about 1.5 cm long in dense cone shaped clusters. These flowering stalks can be 3 - 10 cm long. The flowers are yellow. The fruit are straight pods about 10 cm long and 5 mm wide. Seeds are small (5 - 8 mm long) and yellow to brown. The pods split open easily. The seeds can be yellow, green, brown, red, black or mottled.

Distribution: A tropical plant that grows to 1,800 m altitude in the tropics. It suits wet climates. It occasionally becomes self sown in coastal grasslands. It needs a sunny potected position and is drought and frost tender. It can grow in arid places.

Use: The young pods and ripe seeds are eaten cooked. The dried seeds are boiled and served with rice or used in soups and stews. The young leaves can be eaten. The seeds are used in bean sprouts. Seeds should be cooked or crushed if fed to pigs.

Cultivation: It is grown from seeds. Seed collection is easy. Seeds often have a hard skin which must be broken (e.g. by scraping) to help germination.

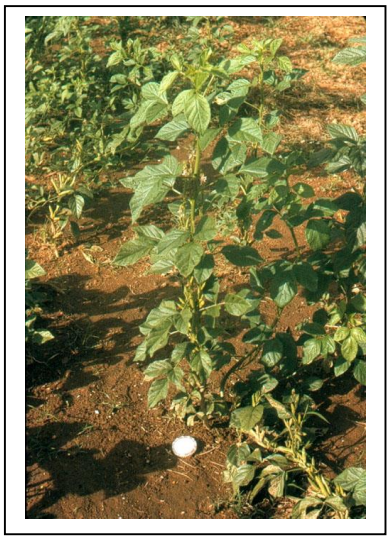
Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	13.0	1373	20.9	-	-	10.9	-

Legumes

English: Guar bean
Local (Urdu): Guar/Guara

Scientific name: *Cyamopsis tetragonolobus*
Plant family: FABACEAE



Description: An upright bushy plant often only 1 m tall. Some kinds grow to 3 m. The branches are stiff and usually with white hairs. The branches stick upwards and are angled and with grooves. The leaves are produced alternately and have 3 leaflets. The leaflets are oval and with slight saw teeth around the edge. The leaf stalks have grooves. The flowers are small in clusters in the axils of leaves. The flowers are white with pink wings. It produces clusters of thick fleshy pods. They are stiff and straight. There is a double ridge along the top of the pod and a single one below. There are also 2 ridges along the flat sides. The pods have a beak at the end. There are 8 - 10 small oval seeds inside.

Distribution: A tropical plant. It is a hardy, drought resistant plant that suits dry areas. It grows well on alluvial and sandy soils and in areas with high summer temperatures and low rainfall. It can tolerate an alkaline soil with pH 7.5 - 8.

Use: The green immature pods are eaten cooked. They are added to curries. They can be fried in oil, salted or dried for later use. The seeds are eaten. The seeds contain a gum used as a thickening agent. It is used in ice cream, baked goods, gluten free foods and salad dressing. The sprouted seeds are also eaten.

Cultivation: They are grown from seed, often in mixed cropping situations. It requires 15 - 24 kg of seed to sow a hectare. Seeds are sown 2 - 3 cm deep. They are often put 20 - 30 cm apart in rows 65 cm apart. Seeds germinate within one week.

Production: Plants mature in 3 - 3.5 months.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	9.9	1452	30.5	-	-	-	-
pod (fresh)	82.0	-	3.7	198	49	5.8	-

Legumes

English: Lablab bean
Local (Urdu): Lubia

Scientific name: *Lablab purpureus*
Plant family: FABACEAE

Description: A climbing bean which can have vines 1 - 5 m long. It keeps growing from year to year. The stems can be smooth or hairy. Leaves are made up of 3 almost triangular leaflets. The leaflets are 5 - 15 cm long and 3 - 14 cm wide. The side leaflets are somewhat asymmetrical. Often the plants are flushed purple. The flowering clusters are 5 - 20 cm long. Flowers are often white but can vary from red to blue. The pods are flattened, pointed and up to 12 cm long and 2 cm wide. They can be green, purple or white. Inside there are 3 - 5 white or dark seeds. Seed pods have a wavy margin. The seeds are 0.5 - 1.5 cm long. (This bean is similar to Lima bean but the keel of the flower in not spirally twisted, the pod ends more bluntly with a long thin style at the end and the hilum on the seed is longer.)

Distribution: It is a tropical and subtropical plant. It mostly grows between 750 and 2175 m altitude in the tropics. It is drought resistant and can grow in quite low rainfall areas. Some varieties are short day and some are long day kinds. It suits hardiness zones 9 - 12.

Use: The young pods, ripe seeds and young leaves are edible, cooked. Flowers can be eaten raw, steamed or added to soups and stews. Dried seeds can be cooked as a vegetable. The seeds can also be sprouted then crushed and cooked. The large starchy root is edible. **Caution:** Many types can be poisonous. They should be boiled and the cooking water thrown away.

Cultivation: Seeds are sown at 30 x 60 cm spacing near stakes or trees. About 20 kg of seed per hectare are required. Fertilising with nitrogen and potash until flowering is recommended.

Production: Young pods are ready 4 - 6 months after planting and seeds 6 - 8 months. Pods are often harvested over 2 or 3 years. Pollination and seed setting are reduced in cold weather.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1428	22.8	-	-	9.0	-
seed (young)	86.9	209	3.0	14	5.1	0.8	0.4
pod (fresh)	86.7	203	3.9	-	1	2.4	-

Legumes

English: White lupin
Local (Urdu): Sufaid lobia

Scientific name: *Lupinus albus*
Plant family: FABACEAE

Description: An erect annual herb. It grows 1.2 m tall. The leaves have leaflets spread out like fingers on a hand. The flowers are white and in clusters. The pods are 60 - 100 mm long. The pods are hairy and turn yellow when ripe. The seeds are usually white.

Distribution: It grows in temperate places. It is grown at higher altitudes in the tropics. It grows where temperatures are 15 - 25°C. It will tolerate cold but not high temperatures. It can tolerate frost. It grows in areas with an annual rainfall of 360 - 500 mm and 1,800 - 3,000 m above sea level in tropical zones. It can grow in acid, neutral or alkaline soils. It can grow in salty soils. It is a long day plant. It can grow in arid places.

Use: The seeds are used as food. They are soaked for about 3 days in salted water then cooked and eaten or used in soups. The toasted seeds are eaten as a snack. The flower stalks are pickled and eaten. The ground seeds are mixed with bread flour. The roasted seeds are used as a coffee substitute. **Caution:** The seeds contain a toxic element which is removed by soaking or boiling. There are sweet lupin varieties that can be eaten without treatment due to their low alkaloid content.

Cultivation:

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	8.9	1555	38.0	-	-	-	-

Image accessed from: http://ernest.orgfree.com/plantes/Papilionaceae/Lupinus%20albus6.jpg

Legumes

English: Scarlet runner bean **Scientific name:** *Phaseolus coccineus subsp. coccineus*
Local (Urdu): Lobia **Plant family: FABACEAE**

Description: A climbing bean. It is a robust plant and keeps growing from year to year by re-growing from the fattened root. The stems are often hairy. It grows 1.8 - 2.4 m high. It can spread 1.8 - 2.4 m wide. It twines around a trellis. The leaves are compound and have three leaflets. The flowers are bright red. They are in clusters 2.5 cm long. The pods are long (30 cm) and with a wavy edge. The seeds are large and can be several different colours. It sometimes has a root tuber.

Distribution: A tropical plant. It grows naturally in the mountain regions from Mexico to Panama. It is grown in the highlands in the tropics. On the tropical coast seedlings die and pods are not formed. It is damaged by frost. It suits hardiness zones 8 - 10.

Use: The very young pods can be eaten. They are boiled, steamed, baked etc. The seeds are edible. They are dried then soaked. The flowers have a bean like flavour and are used in salads. Young leaves can be used as a potherb. The tubers can be eaten after they are cooked and the cooking water thrown away.

Cultivation: It is grown from seeds. Seed are planted 2.5 cm deep. Plants are spaced 20 cm apart. It needs sticks to climb up. It can be allowed to re-grow from the tubers or the tubers re-planted.

Production: It grows quickly.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	12.0	1419	20.3	-	7	9.0	-

Legumes

English: Common bean
Local (Urdu): Surkh lobia

Scientific name: *Phaseolus vulgaris*
Plant family: FABACEAE

Description: There are many bush and climbing varieties of this bean. Climbing forms can be 2 - 3 m tall. Bush types are 20 - 60 cm tall. The leaves have three leaflets, one after another along the stem. The leaf stalk has a groove on the top. The side leaflets are unequal in shape, and can be 8 - 15 cm by 5 - 10 cm. The flowers are in the axils of leaves (where the leaves join the stem) and occur in a loose form. Flowers are white to purple. Pods are smooth, slender and 8 - 20 cm long by 1 - 1.5 cm wide. They are straight or slightly curved with a beak at the end and often have 10 - 12 coloured, kidney-shaped and seeds.

Distribution: It is a temperate plant that grows in many temperate and subtropical countries, including Solomon Islands. It mostly grows from 700 – 2,000 m altitude in the tropics. It suffers from pest and disease damage in the lowlands, but can be grown to sea level. It is not suited to the wet tropics. It is shallow-rooted and damaged by excess moisture near the roots. A crop lifecycle needs about 350 mm of water. It is sensitive to frost and high temperatures. Flowers will not form below 9.5°C. Night temperatures above 37°C cause flowers to drop. The best temperature range is 15 - 21°C. It does not suit very acid soils. It suits hardiness zones 8 - 11.

Use: The young pods, leaves and mature seeds are edible. Dry seeds are soaked in water and boiled until soft.

Cultivation: Plants are grown from seed, preferably sown in raised beds. Seeds remain viable for 2 years. Germination is normally good if seed has been well stored. Climbing types need stakes. Plants are self-fertilised. These beans are intercropped with other plants in many places. If grown on their own, bush types can be spaced at 25 cm x 25 cm. They can be sown closer together in rows wider apart to make weeding and harvesting easier. For dried beans, once the pods are mature and turning yellow, the whole plants are pulled, then dried and threshed. About 50 - 75 kg of seed will sow a hectare. Flowering in most French bean varieties is not affected by day length.

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1386	25.0	10	1	8.0	2.8
seed (young)	92.0	142	3.0		20	0.8	0.2
pod	88.0	151	2.5	750	27	1.4	0.2
sprout	90.7	121	4.2	0	38.7	0.8	0.4

Legumes

English: Mung bean
Local (Urdu): Moong/Moongi

Scientific name: *Vigna radiata*
Plant family: FABACEAE

Description: An upright hairy bean plant which can grow to 1 m tall. It has many branches. The leaves have 3 leaflets, are dark green and grow on long leaf stalks. There are oval stipules at the base of the leaf. Flowers are pale yellow and small. They occur in bunches of 10 - 20 on the ends of long hairy flower stalks. Pods are black and straight. They do not have a beak. Pods contain 10 - 20 seeds which are usually green or golden yellow. They are smaller than black gram. The beans can be black. They have a flat white hilum. There are 2,000 varieties.

Distribution: A tropical and subtropical plant. The plant will grow from sea level up to about 2000 m in the tropics. It is drought resistant but can't stand water-logging. Plants are damaged by frost. They cannot stand salinity. Rainfall at flowering is detrimental. It requires a deep soil. Both short day and long day varieties occur. It can grow where annual temperatures are from 8 - 28°C. It can tolerate a pH from 4.3 - 8.1. It suits a drier climate and can grow in arid places. It suits hardiness zones 10 - 11.

Use: Seeds are eaten ripe, raw or roasted. They are added to soups and stews. They are also fermented. Young pods and leaves can be eaten. The seeds can be germinated for sprouts and used in salads and stir-fried dishes. The seeds are ground and used for starch to make noodles.

Cultivation: Plants are grown from seed. In some areas these are broadcast while for small plots often 2 - 3 seeds are sown in holes 50 - 60 cm apart. Seeding rates of 6 - 22 kg per ha are used in different locations. It normally requires phosphorus fertiliser for adequate growth. Seeds germinate in 3 - 5 days.

Production: Green pods are ready after about 2 months and ripe pods may take another 1 - 2 months. For ripe beans the whole plant is harvested and dried before threshing. Yields of 450 - 560 kg/ha of seeds are common.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	11.0	1432	22.9	55	4	7.1	-
seed (cooked)	-	439	7.0	2.4	1.0	1.4	-
seed (sprouted)	90.4	126	3.0	2	13.2	0.9	0.4

Leafy greens

English: Wild rhubarb
Local (Urdu): Tandla

Scientific name: *Digera muricata*
Plant family: AMARANTHACEAE

Description: An annual herb. It grows 20 - 50 cm tall. The leaf blade lies over and is narrowly oval. It is branched from the base. The leaves are alternate. They are 2 - 6 cm long by 6- 30 mm wide. The flowers are white or pink. They are on small and long slender flower stalks. The fruit have one seed.

Distribution: A tropical plant. In Pakistan it grows up to 1,500 m altitude. It can grow in dry savannah and semi-desert and moist locations.

Use: Leaves are boiled and eaten as a vegetable. They are seasoned with salt and chilli or used in curries. The nectar is sucked out of the flowers.

Cultivation:

Production:

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	83.8		4.3	-	-	17.7	0.6

Image accessed from: https://c1.staticflickr.com/7/6111/6317370731_689b2e0dbb_b.jpg

Leafy greens

English: Spinach
Local (Urdu): Palak

Scientific name: *Spinacia oleracea*
Plant family: AMARANTHACEAE

Description: An annual leafy vegetable. It grows 60 - 90 cm high and spreads 30 - 45 cm wide. The broad leaves are produced in a clump on short stalks. The leaves at the base are large and leaves on the stalk are smaller. Plants are separately male and female. Both types are needed if seed is to be produced. Flowers are greenish in spikes.

Distribution: It is a temperate plant. It does not suit the tropical lowlands and grows best where the temperature varies between 10°C and 20°C or above 2,000 m altitude. The kind with very prickly seeds is frost resistant. Plants need a deep well drained soil. It is a cool season, short day plant. In Nepal it grows to about 1,400 m altitude. It suits hardiness zones 6 - 9.

Use: Leaves are cooked in a small amount of water. They are also used in soups and salads. Young leaves are eaten raw and older leaves are cooked. The sprouted seeds can be used in salads. **Caution**: Spinach can contain oxalates which affects calcium absorption.

Cultivation: It is normally sown directly from seeds. Plants need to be 25 cm apart.

Production: The older leaves are picked off. They can be harvested starting at 8 weeks.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	91.6	61	2.9	32	52	2.71	0.5
leaf (boiled)	92.9	57	2.4	819	29	2.9	0.8

Leafy greens

English: Grain amaranth
Local (Urdu): Cholaie

Scientific name: *Amaranthus caudatus*
Plant family: AMARANTHACEAE

Description: An annual plant which can be 2 m high and 45 cm across. The stems are angular and it can have a single stem or be branched. It is often limp in the upper parts. Plants are hairy at first but become smooth. Often they are tinged purple. Leaves are 2 - 4 cm long by 0.7 - 1.6 cm wide on a leaf stalk 0.5 - 1.5 cm long. Leaves can taper to a tip at the end. They can also thin towards the base. The veins are pale underneath. The flower clusters are in spikes on the side or top branches. The flowers are sometimes branched and can droop over. They can be 45 cm long. The fruit is oval. Seed are 1 - 1.3 mm across.

Distribution: A tropical plant. It can grow in warm temperate places. It cannot tolerate frost. Plants do best under high light, warm conditions and dry conditions. They need a well-drained soil. Some varieties can tolerate pH up to 8.5 and there is some salt tolerance. It can grow in arid places. In the Andes it grows between 500 - 3,000 m above sea level. It suits hardiness zones 8 - 11.

Use: The leaves and young plant are eaten cooked. They are also used in stir fries and added to soups. The seeds are ground into flour and used to make bread. **Caution:** This plant can accumulate nitrates if grown with high nitrogen inorganic fertilisers and these are poisonous.

Cultivation: Plants can be grown from seed if the soil is warm. Seeds are small and grow easily. Cuttings of growing plants root easily. Amaranths are mostly grown from seeds. The seeds are collected from a mature dry seed head of an old plant. These dry flower stalks are stored and then the flowers rubbed between the hands over the garden site. Collecting the seeds is fairly easy by banging flower heads on a mat or piece of cloth then the rubbish can be blown out of this mixture by dropping it and blowing gently as it falls. The very small seeds of these plants are scattered over the ashes or fine soil in fertile ground. Some types are self-sown.

Amaranthus seeds are very small. A thousand seeds weigh about 0.3 g. It is very difficult to sow such small seeds evenly over the ground. So there are a few different methods you can use to try and get the plants well-spaced. One way is to mix the seeds with some sand and then when you sprinkle this along a row it will only contain a few seeds among the sand. The other way is to throw the seeds over a small plot of ground which will be a nursery. After 2 or 3 weeks the seedlings can be transplanted into the garden bed where they are to grow. If the seeds are just scattered over the garden, the small seedlings can be thinned out and either eaten or transplanted to a different spot. Seedlings are transplanted when about 5 - 7 cm tall. Plants can be harvested when small by thinning out and either transplanted or eaten cooked. Plants can be harvested whole or have top leaves harvested several times. Harvesting begins after 4 - 7 weeks and can continue over 2 months.

A spacing of about 8 cm x 8 cm is used if the plants are to be harvested by pulling up the whole plant. If the harvesting is to be done by picking off the top leaves, a wider spacing is normally used. When the tops are picked out 3 or 4 times over the life of the one plant, a spacing of about 30 cm x 30 cm is used.

As far as producing a large amount of food is concerned, the spacing is not very important. Having between 200 and 1,000 plants per square metre gives about the same total amount of food. The main thing that varies is the size of the leaves. Mostly people like larger leaves so a wider spacing of 8 cm

to 10 cm for plants to be pulled out is suitable. For plants to be harvested by picking out the tops, they can be picked down to about 15 cm high. Picking lower makes the plant flower later, but it also recovers more slowly from picking.

Amaranths grow quickly. Seedlings come up above the ground in 3 - 5 days. They are 5 - 7 cm high and big enough for transplanting after about 20 days. The plants can be pulled out and used after 6 weeks. If they are harvested by picking out the tops, this can be started at 5 - 7 weeks and continued 3 - 4 times over the next 2 months.

Amaranths eventually stop producing leaves and grow flowers. Flowering occurs after about 3 months and seed can be recollected about a month later. Amaranths are called day-length neutral plants because they still produce flowers at about the same stage, irrespective of whether there are many or few hours of daylight. Because flowering stops harvesting of leaves, it is a problem, but there does not seem to be any easy way of slowing down flowering. Flowering can be delayed a little by picking out the tops down to a lower level. Also it is made a little later if plants are grown in the shade. But lower picking and growing in the shade mean the plants produce less food, so there is no point. Plants need to be harvested and used when they are ready. If plants are left growing the amount of harvestable leaf gets less and the quality gets poorer.

Nitrogen deficiency shows as the oldest leaves near the bottom of the plant going yellow. This is because the plant needs more nitrogen to grow more new leaves at the top and there is not enough nitrogen in the soil for it to get it from there. So it reuses the nitrogen it used in the oldest leaves. These leaves therefore go yellow. Potassium deficiency shows as the edges of the oldest leaves going yellow. These shortages of nutrients could be corrected by adding some nitrogen or potash fertiliser but it is most likely too late for the current crop.

Production: Plants take 4 - 6 months from sowing to harvesting the seed, but up to 10 months in some Andean highland regions. Yields from 1-5 tonnes per hectare of seed are common. Yields of up to one kilogram of edible leaves have been harvested by pulling out plants from an area of one square metre. The young leaves or whole plants are eaten cooked. If plants are picked 3 or 4 times over 6-8 weeks then two kilograms of edible leaves can be harvested. From a plant that grows so quickly and is such good quality food this is a very high production.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	6.0	1034	28.8	33	-	23.3	5.5

Leafy greens

English: Parsley
Local (Urdu): Petersili/Kharf

Scientific name: *Petroselinum crispum*
Plant family: APIACEAE

Description: A short lived perennial plant that often grows and flowers over two years. It forms clumps and is a hairless plant with grooved, upright, branching stems up to 50 cm long. Several stems come from the top of the fattened taproot. It spreads to 50 cm across. The feather-like, dark green leaflets are finely divided. They are triangular and divided 3 times. They are divided into toothed segments about 3 cm long. They have a strong smell. The flowers are greenish white and star shaped and occur at the ends of branches. The flowers are flat topped and up to 4 cm across. There are about 30 variations of curled parsley. Some are more tightly curled than others. Wild parsley also occurs in some temperate places. It can be cooked and eaten.

Distribution: A temperate plant that can be grown from sea level up to 2,400 m altitude in the tropics. It grows best in moderately cool, shady and humid conditions. It can grow well in full sunlight but also in slight shade. Young plants can be damaged by frost. It grows best in soils with a pH of 5.0 - 6.0.

Use: The leaves are used for flavouring in salads, sauces, stews, stuffings, and other cooked dishes. The leaves can be dried or used fresh for tea. Parsley oil from the leaves or seeds is used in foods.

Cultivation: It is grown from seed and transplanted. Seeds are slow to germinate, taking 3 - 4 weeks. They can be sown directly where they are to grow. Seeds are collected by cutting flowers before they ripen then shaking the seeds out onto a cloth. It is best to soak the seed in water for one day before sowing. Seedlings are transplanted and spaced at 45 cm.

Production: Leaves are picked throughout the first growing season. The plant becomes bitter after flowering. The outer and larger leaves are harvested first.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf (dry)	9.0	1156	22.4	97	122	22	5.4
leaf (fresh)	78.7	151	3.0	421	150	6.2	1.1

Fruit

English: Mandarin
Local (Urdu): Kinno

Scientific name: *Citrus reticulata*
Plant family: RUTACEAE

Description: A small, evergreen tree that grows 4 - 8 m tall and 2 m across. The stem is erect, branching and thorny. The leaves are dark green, and long and narrow in shape. They are 3 - 4 cm long. There is only a narrow wing on the leaf stalk. It has a few or no spines. The flowers are white and star-shaped. They are 2.5 - 4 cm across and have a scent. Fruit are almost round and the skin peels off easily. The fruit are 4 - 8 cm long. The flesh is red, juicy and sweet.

Distribution: It is grown in many tropical countries. It is the hardiest of the citrus. It grows from sea level up to 2,300 m altitude in the tropics. It does best between 800 m and 1,200 m altitude. A well-drained soil is needed. It also prefers a drier climate. It is drought and frost resistant. It needs a temperature above 3 - 5°C. It suits hardiness zones 9 - 11.

Use: The fruit are eaten fresh.

Cultivation: Trees are often grown from seed. Some breed true from seed. Seedling trees take a long time to start producing fruit. Budded trees are best. A spacing of about 8 m between trees is suitable. Several seedlings can grow from one seed. Using seedlings of seeds with three or more shoots helps produce trees true to type. Cuttings or layering can also be used.

Production: Fruit tend to be produced seasonally. The season is often from April to August in the southern hemisphere.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	87.6	184	1.5	42	136	0.8	

Fruit

English: Java plum
Local (Urdu): Jaman/Jamoo

Scientific name: *Syzygium cumini*
Plant family: MYRTACEAE

Description: A medium sized evergreen tree that grows 10 - 30 m tall. The stem is erect and branching. The leaves are opposite and smooth. They are shiny, leathery and somewhat oval shaped. The leaves are 4.5 - 16.5 cm long by 2 - 8 cm wide. The flowers are pink or nearly white and occur on compound flower arrangements below the leaves. The fruit is oval with dark purple flesh and is green but develops a nearly black skin when ripe. Fruit can be 2.5 cm long or more. The pulp is purplish-white and juicy. They are fleshy and have a large greenish seed. The fruit is edible.

Distribution: It is a lowland tropical plant that is common and widely distributed throughout the Philippines, India and Indonesia. The plant prefers a well composted soil which is moist and well drained. It needs a protected position and prefers part shade. It is drought and frost tender. In valleys in the Himalayas trees grow up to 1,300 m above sea level. In the tropics they grow to 2,000 m altitude. Trees can tolerate some flooding. It requires a good rainfall or adequate watering. It can grow on alkaline soils, saline soils and marshy lands. Once established trees can stand strong winds.

Use: The ripe fruit are eaten raw. Rubbing with salt, or soaking in salt water, is sometimes used for poorer fruit. Fruit are also used for vinegar (unripe fruit) and for wine (ripe fruit). They can be used for making jelly or jam. The young leaves are eaten.

Cultivation: It is grown from fresh seed. Seeds normally germinate within 2 - 3 weeks. Seed can only be stored for about a month. It can also be grown from tip cuttings. Trees can be cut back and will regrow or they can be heavily pruned into a hedge. It is best to select better quality fruit then grow them from cuttings or by air layering. For air layering, using growth substances is recommended. Budding can also be used. Seedlings vary in fruit quality. Almost seedless fruit can be selected. Seeds should be sown 4 - 5 cm deep and putting them in pots makes transplanting easier. Some seeds produce several shoots or seedlings and the ones produced by cell tissue breed more true. Trees are planted 10 m apart. Budded trees are smaller and can be 8 m apart. Trees can be pruned to give one main stem and 4 - 5 main branches. Flowers are cross pollinated by honey bees so keeping bee hives in the orchard helps fruit set.

Production: It grows quickly after the first year and can reach 12 m tall in 12 years. Trees start bearing fruit when 4 - 6 years old. Trees can last for 70 years. There is usually one main flowering period in the spring, but there can be minor times of flowering. Several months are taken between flowering and ripe fruit being ready. It is normally 120 - 150 days. The fruit does not ripen after being harvested so fruit need to be picked when ripe. Flower and fruit drop can be reduced with sprays of Giberellic acid. A tree can yield 60 - 70 kg of fruit.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	84.8	213	0.6	30	27	1.4	-

Image sourced from: https://pixabay.com/en/blackberry-jamun-syzygium-cumini-173374/

Fruit

English: Barbados cherry
Local (Urdu):

Scientific name: *Malpighia glabra*
Plant family: MALPIGHIACEAE

Description: A small evergreen tree or shrub that grows 5 - 7 m tall. It often has several trunks. The branches are spreading and often drooping. The leaves are opposite and oval to sword shaped. They are 2 - 8 cm long by 1 - 4 cm wide. They are dark green and glossy and can be wavy along the edge. The leaf stalk is short. The flowers have both sexes. The flowering stalks are short with 3 - 5 pinkish-red flowers that are 1 - 2 cm across. The fruit is bright red. And 1 - 2 cm across with has several small triangular seeds. The fruit resemble a common cherry, but is has 3 grooves and 3 seeds. The fruit are carried on the outside of the tree.

Distribution: A tropical and sub-tropical plant that suits the hot, tropical lowlands. It grows on sandy soils and in seasonally drier regions. Rainfall during flowering and fruiting improves fruit quantity and size. They do best in a frost free site and need a well-drained soil. They can tolerate frost and drought. They do best in warm to hot climates with temperatures of 30 - 32°C. It can grow in arid places and suits hardiness zones 9 - 12.

Use: The fruit are eaten fresh or used in juice. They can be used for wine. They can be used in jellies, jams and preserves. The sauce or puree can be used as a topping for cakes, puddings, ice cream or sliced bananas. **Caution:** Acerola can produce an allergic reaction similar to that of latex.

Cultivation: They can be grown from hardwood cuttings or budded onto seedlings. They can also be grown by ground layering or from seed, although seed germinate poorly. A spacing of 3 - 4 m is suitable. Cross pollination is needed for good fruit production.

Production: Trees bear in 3 - 4 years and can continue for 15 years. Flowering normally follows periods of rainfall. There can be several flowering and fruiting periods per year. Flowers are pollinated by insects and fruit can ripen in 3 - 4 weeks. Fruit lose their flavour and nutritional value rapidly after harvest. They should be picked and eaten within a few hours. Individual trees can yield 15 - 30 kg of fruit per year.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	83.2	163	1.8	800	2100	0.8	-

Fruit

English: Mango
Local (Urdu): Aam

Scientific name: *Mangifera indica*
Plant family: **ANACARDIACEAE**

Description: An erect, branched evergreen tree. It can grow to 10 - 40 m high and is long lived. (Trees grown by vegetative means are smaller and more compact.) Trees spread to 15 m across. It has strong deep roots. The trunk is thick. The bark is greyish-brown. The leaves are simple and shaped like a spear. Some kinds of mangoes have leaves with a wavy edge. They can be 10 - 30 cm long and 2 - 10 cm wide. They are arranged in spirals. The leaf stalk is 1 - 10 cm long and flattened. Leaves are often brightly coloured and brownish-red when young. These tender leaves which are produced in flushes become stiff and dark-green when mature. The flower stalks are at the ends of branches. They are 10 - 50 cm long and branching. Up to 6,000 flowers can occur on a stalk. Most of these are male and up to 35% have both male and female flower parts. Fruit are green, yellow or red and 2.5 - 30 cm long. The fruit hang down on long stalks. The outside layer of the seed is hard and fibrous and there is one seed inside. Several embryos can develop from one seed by asexual reproduction. The fruit shape and colour vary as well as the amount of fibre and the flavour. India has many varieties and they cannot tolerate humidity.

Distribution: A tropical and subtropical plant. It grows in the lowlands. It grows from sea level up to 1300 m altitude in the tropics. It does best in areas below 700 m and with a dry season. Rain and high humidity at flowering reduces fruit set. It thrives best where temperatures are about 25°C but will grow with temperatures from 10 - 42°C. Temperatures of 0°C will damage young trees and flowers. Low temperatures (10 - 20°C) at flowering time will reduce fruiting. As temperatures get lower due to latitude or altitude, fruit maturity is later and trees become more likely to only have good crops every second year. Mangoes can grow on a range of soils. In wetter areas soils with less clay are better. They can withstand occasional flooding. A soil pH of 5.5 - 6.5 is best. Soils with pH above 7.5 cause plants to develop iron deficiency. It grows in the Sahel. It can grow in arid places. It suits hardiness zones 11 - 12.

Use: Ripe fruit are eaten raw. Unripe fruit is pickled. Seeds can be eaten cooked. They are boiled or roasted. They are made into meal by powdering. Young leaves can be eaten raw or cooked. Amchur is made from the dried unripe fruit. This is used in curries, and pickles and chutneys. The seed kernels are used for famine food in India. They are boiled, roasted or soaked to remove the bitterness. **Caution:** The sap from the tree or fruit can cause skin problems with some people.

Cultivation: Trees are grown by planting fresh seed and they can be transplanted. Mangoes vary in their ability to breed true from seed. When more than one seedling emerges from the seed some of these are asexual and breed true. Clean seed germinate best if they are treated at 50°C for 20 minutes, then planted on their edge with the round bulge upwards and near the soil surface. The husk around the seed should be removed. Seeds germinate in 3 - 6 weeks. The strongest growing seedlings from this seed are used and the others thrown away. The seedlings from the folds of the seed are vegetative while the seedling from the centre of the seedling near the stalk end may be sexual and show variation from type. Other seeds only produce one seedling and these normally vary and can be different from the parent tree. Plants can be propagated by budding, or by grafting using in-arching. This is not easy and care is required. In wetter places, flowers need to be protected with fungicides to enable fruit to form. If organic manure is used this should not be directly in the planting hole nor immediately against the new plant. Young transplanted seedlings need regular watering. A spacing of 6 - 12 m between plants is used. Wind protection is advisable to prevent fruit rubbing and getting

damaged. Trees should only ever be lightly pruned as fruit develop on new growth and heavy pruning can reduce flowering. Flowering can be brought about by foliar sprays of potassium nitrate.

Production: Seeds germinate after about 20 days. Seedling trees produce after 4 - 6 years and increase in production up to 20 years. Trees often bear better each second year. Rain at flowering reduces fruit setting. Fruiting is at the end of the year. Fruit take 4 - 5 months to mature. Fruit vary in weight from 200 - 1,000 g. Trees can produce one million flowers but only 500 fruit. Trees last for many years.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	83.0	253	0.5	54	30	0.5	0.04
leaf	82.1	226	3.9	-	60	2.8	-

Fruit

English: European black currant
Local (Urdu): Shumloo

Scientific name: *Ribes nigrum*
Plant family: **GROSSULARIACEAE**

Description: A small shrub. It grows 2 m high and spreads 1.8 m wide. It loses its leaves during the year. It grows as a group of canes. The young stems are downy. The leaves have 3-5 lobes. These are downy underneath. The flowers are yellow-green with red centres. They hang down and are downy. The fruit hang in loose bunches.

Distribution: It needs a cool temperate climate. It can stand moderate frosts. It requires constant moisture. In the Himalayas it grows between 2,300-4,300 m altitude. It suits hardiness zones 5-9.

Use: Fruit are used for jam and drinks. They can also be used in sauces and pies. The buds are used for flavouring. The fresh leaves are eaten in soups. They are also used as a spice in sauerkraut. The fruit are used to make wine. The flowers are used in ice cream and liqueurs. The seeds are the source of high omega-6 oil used in salad dressings. It is mostly used as a food supplement.

Cultivation: Plants are easily grown from cuttings of 2 year old canes. The 3 year old canes are cut off at two buds above soil level.

Production: Plants fruit 2 years after planting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.4	121	0.9	200	200	1.3	0.3
fruit (stewed)	80.7	103	0.8	170	150	1.1	-

Fruit

English: Apricot
Local (Urdu): Khobani

Scientific name: *Prunus armeniaca*
Plant family: ROSACEAE

Description: A medium sized deciduous tree. It grows to 10 m tall. It is a broad spreading shape. The bark is dark red-brown and smooth and shiny. The leaves have stalks. The leaves are broadly oval. They are 10 cm long by 6 cm wide. They are rounded at the base and taper to the tip. They have shallow round teeth along the edge. The leaves are glossy and dark green. The flowers are 2.5 cm across and pale pink or white. They are almost without stalks and have 5 petals. They occur singly on old shoots. The fruit is fleshy and rounded. It is yellow and can be flushed with red. There is a hard covering over the seed. This stone is smooth. The seeds are oval. The flesh is edible. The seeds are edible (but contains toxins).

Distribution: It is native to C. Asia and N. China. It grows in cool areas with hot dry summers. They do best on a free draining soil. In Nepal, plants grow from 2,500 – 3,500 m altitude. It does well in areas with 100 cm rainfall, cool winters with 300 - 900 chilling hours below 7°C and a frost free spring. A soil pH of 6 - 6.8 is suitable. It needs good sunlight. It suits hardiness zones 5 - 10.

Use: The ripe fruit are eaten. The kernels can be eaten. If sweet they are eaten fresh and if bitter they are roasted. The seed oil is used for cooking. The fruit are also used for juice and are dried and eaten dry. They are also used for jam, and in pastries, pies, cakes, and picked. **Caution:** The bitter kinds of apricot kernels contain amygdalin which releases cyanide and is poisonous unless removed by cooking.

Cultivation: Plants can be grown from seed but are often grafted onto rootstocks. The flowers are self fertile. Plants require some winter chilling.

Production: Trees fruit in 3 - 4 years. Fruit are picked by hand.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (raw)	86	201	0.6	96	10	0.4	0.2
fruit (boiled)	82.6	92	0.4	59	5	0.3	0.1

Fruit

English: Jujube
Local (Urdu): Sehu ber

Scientific name: *Ziziphus jujuba*
Plant family: RHAMNACEAE

Description: A small deciduous tree that can grow to 13 m tall. It has drooping branches with thorns on the branches. The plant sends up thorny suckers often at a distance from the tree. These need to be cut off. The leaves are small and oval. They are 2 - 5 cm long and bright shiny green. The leaves turn bright yellow before falling. During the growing season, each node of a woody branch produces one to 10 small branches. These fall off later. The flowers are small and 0.5 cm across. They are white to green and produced in large numbers in the angles of leaves. The fruit are round of long and vary from cherry to plum size. They are 2 - 3 cm long. They have a single hard stone with two seeds. The fruit changes from green to yellow with red spots as it ripens. When fully red and ripe it softens and wrinkles. There are many named varieties.

Distribution: A subtropical plant. It can stand high temperatures in summer then due to winter dormancy can tolerate very cold temperatures. It only requires a small winter chill to enable it to fruit. They do best in warm sunny positions. They cannot grow in shade. They do best in sandy well drained soils. They can grow in soils with high salinity or alkalinity. It can tolerate drought but fruits best with adequate rainfall. It suits hardiness zones 7 - 10.

Use: The fruit are eaten fresh, dried or preserved in sugar. They can be stewed, baked, pickled, or used in puddings, cakes, breads, jellies, soups and sweetmeats. The ripe fruit are powdered and cooked with millet or rice. The kernels are edible.

Cultivation: Plants can be grown from seed but these do not breed true. Grafting, budding or cuttings can be used. Root suckers can be used. Although cross pollination is not required for fruit production it is needed for producing viable seed. A spacing of 3 - 4 m is suitable.

Production: Fruit are produced 4 - 5 years after planting. Fruit do not ripen at the same time so fruit can be picked from the one tree over several weeks. Fruit need to be picked when ripe. Ripe fruit can be stored at room temperature for about one week. Tree dried fruit stores for a long time.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit (dried)	19.7	1201	3.7	-	13	1.8	0.2
fruit (raw)	77.9	331	1.2	2	69	0.5	0.05

Fruit

English: Indian jujube
Local (Urdu): Ber

Scientific name: *Ziziphus mauritiana*
Plant family: RHAMNACEAE

Description: A medium sized thorny tree that loses many of its leaves during the year. It grows up to 12 m tall. The bark is grey, brown or pale red. Branches and the under surface of the leaves are densely hairy when young. The thorns arise from the base of the leaves. The leaves are alternate and simple. They are finely toothed. They can be oval or round and 8 cm long by 5 cm wide. The flowers are green and have a scent. They occur as 3 - 5 flowers together. The flowers are 1 - 2 cm long and on slender branches. The sweet fruit are small, oval and yellow or brown. They are 2 - 5 cm long and 2.5 cm wide. The fruit are green when young and turn yellow or brown when ripe. The pulp is fleshy, acid and edible. The fruit have one seed imbedded in the flesh in a hard stone. The fruit wrinkle on drying. Many varieties exist.

Distribution: A tropical plant that grows well on sandy soils. It can survive droughts. It grows rapidly in dry places such as the Sahel. It can tolerate temperatures up to 44°C as well as periodic frosts once the trees are mature. It grows best when the mean annual temperature is 22 - 30°C. It thrives in hot dry climates. It needs adequate water during the fruiting season. It can grow at elevations up to 1,000 m in the tropics but does best below 600 m. It grows in areas with annual rainfall of 150 - 900 mm and is most common where annual rainfall is 300 - 500 mm. It does not like excessive humidity for fruiting. It will grow on a range of soils but deep sandy loams with a pH of 7 or slightly higher are best. It can tolerate some salinity and waterlogging and can grow in arid places. It grows in most tropical and sub-tropical countries.

Use: The fruit is eaten fresh, dried, in jelly or candied. They can be used in jellies, preserves, chutney, sauces, and drinks. The unripe fruit are pickled. Young leaves are cooked and eaten. They are also used in soups. Seed kernels are eaten. The roasted seeds are used as a coffee substitute. The fruit are used to make an alcoholic drink.

Cultivation: Plants are grown from seed. The hard seed coat makes them difficult to germinate. The shell can be carefully cracked and seed should be sown fresh. They can be soaked for 50 hours or put in concentrated sulphuric acid for 6 minutes to improve germination. Seed can be sown in plastic bags then transplanted after 18 - 24 weeks. It does not transplant easily so direct planting is best. Grafting can be used. It is also budded onto the rootstocks of wild species. Light pruning during the dry dormant season is recommended to train the tree. Regular pruning in the hot dry season encourages new growth. A spacing of 6 - 12 m is recommended. For larger fruit better varieties are grafted into rootstocks of *Ziziphus nummularia* or *Ziziphus jujuba*.

Production: A budded tree fruits after 4 years and produces for 50 years. Seedling trees take a year longer to fruit. Yields of 80 - 130 kg of fruit per tree per year occur. Fruit development takes 4 - 6 months. As fruit does not all ripen at once several harvests are needed. Unripe fruit do not ripen after picking.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	77.0	360	0.8	21	71	0.4	0.4

Vegetables

English: Hedge garlic
Local (Urdu): Lehsan

Scientific name: *Alliaria petiolata*
Plant family: BRASSICACEAE

Description: A cabbage family herb. It is a biennial plant as it takes 2 years to complete its life cycle. It grows 1 m high and 40 cm across. It gives off a strong smell of garlic. The leaves are bright green and the lower leaves are kidney shaped. The upper leaves are oval. The edges are wavy and can have rounded teeth. They are 5 - 15 cm across. The flowers are small and white. They are 5 - 10 mm across. They are in clusters at the tips of the stems and at the leaf bases. The fruit are slender pods 5 cm long. They are cylinder shaped and upright. There are many very small seeds.

Distribution: It is a temperate and Mediterranean plant. It grows naturally in damp shady places on basic soils in Britain. It is resistant to frost but sensitive to drought. It grows best on alkaline soils but can grow in a range of soils.

Use: The young leaves are eaten raw or cooked. It tastes like mustard seed. It is finely chopped and used in salads. They can be mixed with mint leaves and made into a sauce with lamb dishes. The flowers and young seeds pods are eaten raw as a flavouring.

Cultivation: Plants are grown from seed sown where plants are to grow. They can be grown from cuttings.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	-	-		3600	190	-	-

Image sourced from: www.nps.gov

Vegetables

English: Indian mustard
Local (Urdu): Toria

Scientific name: *Brassica juncea*
Plant family: BRASSICACEAE

Description: It is an erect leafy annual cabbage plant. It grows to about 1 m high. The plant can vary a lot. The dark green leaves are elliptical and deeply divided. The end segment of the leaves is oval. The leaves taper towards the stem and have a strong mustard flavour. The flowers are pale yellow. They have 4 petals. It produces a flower and seed pods at the top. The seed pod is 3 - 5 cm long and narrow. The seeds are reddish-brown.

Distribution: A warm temperate plant. It is grown in some highland areas in the tropics. It is often grown as a cool season crop. Most varieties are not frost tolerant. It needs a fertile, well-drained soil. A pH of 5.5 - 6.8 is suitable. It can tolerate poor soils. It can grow in arid places. It suits hardiness zones 9 - 11.

Use: The leaves are cooked and eaten. They have a bitter taste, so the cooking water needs changing. They can be stir-fried, or added to soups and stews. They can be eaten crystallised in vinegar or salt. They can be used in salads. The seeds can be fried then used as a spice. They also yield an edible oil. They can be sprouted. The leaves are also pickled.

Cultivation: The seed is broadcast. They can be put in a nursery and transplanted. A spacing of 25 cm x 25 cm is suitable. Seed germinate in 5 days at 20 - 25°C.

Production: Plants grow rapidly. Leaves can be harvested one month after planting. Leaves can be harvested several times. Whole plants can be harvested in about 45 days from transplanting.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	6.9	1964	24.9	-	3	10.0	-
leaf	92.0	108	2.4	31	73	2.7	-

Vegetables

English: Sweet potato
Local (Urdu): Shakarkandi

Scientific name: *Ipomoea batatas*
Plant family: CONVOLVULACEAE

Description: This is a root crop which produces long creeping vines. The leaves are carried singly along the vine. Leaves can vary considerably from divided like fingers on a hand to being entire and rounded or heart shaped. Purple trumpet shaped flowers grow at the end of the vine. Under the ground fattened tubers are produced. There are a large number of varieties which vary in leaf shape and colour, tuber shape, colour, texture and in several other ways.

Distribution: A tropical and subtropical plant. They grow from sea level up to about 2,700 m altitude in the tropics. Plants can grow with a wide range of rainfall patterns and in different soils. Plants are killed by frost and can't stand water-logging. Plants grow well with temperatures between 21 - 26°C. It can grow with a pH between 5.2 - 6.8. Sweet potato are not tolerant to shading. Under shaded conditions, both foliage growth and storage root production are decreased. Some cultivated varieties can be selected for increased production under mild shade but not heavy shade. The survival of cuttings at planting is also reduced under shaded conditions. Under shaded conditions plant become more climbing and with fewer leaves which are however larger. With increasing shade less tubers are produced and these grow more slowly. Sweet potato tends to be responsive to potassium fertiliser. cultivated varieties are often selected for yield under low fertility conditions. Under lowland conditions in the tropics sweet potato tubers undergo active tuber enlargement from 6 - 16 weeks. Weed control is essential especially during early stages of growth. The rate of ground coverage by foliage varies greatly with growing conditions and cultivar but once ground coverage has occurred weed control is less of a problem. Sweet potato tuber initiation is subject to aeration in the soil. Either heavy clay soils, waterlogged conditions or other factors reducing aeration can result in poor tuber production. For this reason sweet potatoes are often grown on mounded beds. It suits hardiness zones 9 - 12.

Use: Tubers are boiled or baked. They can be steamed, fried, mashed or dried. They can be fermented into alcoholic drinks. They can also be used in pies, cakes, puddings and candies and jams. They can be used in noodles. The chopped and dried tubers can be boiled with rice or ground into flour and mixed with wheat flour to make cakes or bread. The young leaves are edible.

Cultivation: Vine cuttings are used for planting. In grassland soils it is grown in mounds, ridges or other raised beds. In bush fallow, it is mostly planted in undug loose soils. It needs a sunny position. Tubers won't form if the ground is waterlogged when tubers start to develop. Sweet potato is grown by cuttings of the vine. About 33,000 cuttings are required per hectare. These weigh about 500 kg. Vine lengths of about 30 cm are optimum. As long as the vine is adequately inserted in the soil, the length of vine inserted does not significantly affect yield. Fresh sweet potato seeds germinate relatively easily and lead to continuous production of new cultivars under tropical conditions. Excess nitrogen restricts storage root initiation and therefore excess leaves are produced without significant tuber yield. Dry matter percentage increases with increasing age of the crop. Higher dry matter tubers are normally preferred.

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Production: The time to maturity ranges from 5 months to 12 months depending on the variety planted and the altitude at which it is being grown. Yields range from 6 - 23 t/ha.

Food Value: Per 100 g edible portion

Edible part	**Moisture %**	**Energy kJ**	**Protein g**	**proVit A µg**	**proVit C mg**	**Iron mg**	**Zinc mg**
tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3
tuber (raw)	70.0	387	1.2	709	25	0.7	0.4
tuber (boiled)	72.0	363	1.1	787	15	0.6	0.3
leaf	86.3	168	3.9	105	58	2.9	-

Vegetables

English: Pumpkin
Local (Urdu): Halwa kaddoo

Scientific name: *Cucurbita moschata*
Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is a creeping plant with long creeping stems and softly hairy but without prickly hairs. The stems are rounded or 5 angled and moderately hard. They can grow 15 - 20 m long. The leaves are large and shallowly lobed and divided like fingers on a hand. Occasionally the leaves have white blotches. They have rounded lobes. They are 20 cm by 30 cm. The leaf stalk is 12 - 30 cm long. The flowers have male and female flowers separately on the same plant. The fruit stalk is distinctly expanded where it joins the fruit. The fruit are not hard shelled and are dull in colour. The flesh is yellow and often has fibres through it. The seeds are plump and white to brown. They separate easily from the pulp of the fruit. The edge of the seed is scalloped and irregular in outline. There are a large number of cultivated varieties.

Distribution: A tropical plant that suits the wet tropics. It will thrive in humid as well as in very hot climates. A temperature of 18 - 30°C is best. It can tolerate some shade. It can grow in soils with a pH of 5.5 - 6.9. It suits hardiness zones 8 - 11.

Use: The fruit are eaten cooked. They are boiled, fried or baked. They can be mashed and used in pies, soups, bread and cakes. They can be dried, ground into flour and used for bread. The young leaves and flowers are edible. They can also be dried and stored. The seeds are eaten roasted. They can also be roasted in salt.

Cultivation: Plants are grown from seed. Seeds can be put in a nursery and transplanted.

Production: Fruit mature in 70 - 180 days after sowing depending on variety.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed	5.5	2331	23.4	-	-	2.8	-
leaf	93.6	88	3.0	95	10	2.1	-
fruit	95.0	35	0.7	-	14	0.4	-

Vegetables

English: Bottle gourd
Local (Urdu): Loki

Scientific name: *Lagenaria siceraria*
Plant family: CUCURBITACEAE

Description: A pumpkin family plant. It is an annual vine with large leaves. It can grow 3 - 9 m long and spread 3 - 6 m wide. The thick stems have furrows along them. It can climb over logs by attaching the tendrils which grow out of the stem near the leaf. The leaves are large and have soft hairs especially underneath. Flowers of both sexes are borne in the same plant. The plant produces male flowers first and these are on long stalks. Next it produces female flowers on short stalks. Flowers are large and white. They can be 10 cm across. They are mainly pollinated by insects. Fruit vary in shape and can be 8 - 90 cm long. They have brown seeds in a whitish green pulp. There are several varieties.

Distribution: A tropical plant that grows from sea level up to 2,700 m altitude in the tropics. It grows best in a warm humid climate. It is sensitive to frost and prefers full sunlight. It grows best with a night temperature of 17 - 23°C and day temperatures of 28 - 36°C.

Use: The young fruit are boiled as a vegetable. The skin and seeds are removed and can also be steamed, fried or pickled. Young tips and leaves are edible. They are often cooked with milk or coconut milk to improve the flavour. They are also mixed with other edible leaves. The seeds are sometimes eaten and provide an edible oil. Old fruit are used as containers, and the seeds are not normally edible.

Cultivation: To achieve fast and uniform emergence, seed should be soaked overnight. Seeds are best sown in raised beds. Seedlings emerge in 5 - 7 days. Seedlings can be transplanted is required. Because plants cross pollinate, plant and fruit types vary. Removing the young fruit to use as a vegetable will prolong the life of the plant. Large fruit can be obtained by removing some of the small fruit. A spacing of 1 - 2 m is suitable. It prefers a trellis to climb. Because it is shallow rooted, weeding needs to be done carefully.

Production: It is fast growing and flowers 2 months after seeding.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
bean (dry)	3.2	2399	28.2	-	-	5.3	-
leaf	83.0	180	4.4	66	-	7.4	-
fruit	93.0	88	0.5	25	10	2.4	-

Vegetables

English: Indian sorrel
Local (Urdu): Jangli palak

Scientific name: *Rumex dentatus*
Plant family: POLYGONACEAE

Description: An erect annual herb. It grows to about 70 cm high. The lower leaves are stalked. They are 3 - 20 cm long by 0.6 - 5 cm wide. They are oblong and rounded or heart shaped at the base. The upper leaves are smaller. The flowers are greenish yellow. They occur in distinct leafy rings in the axils of leaves. The fruit is a nut. It is 3 sided.

Distribution: In Nepal it grows between 1,200 - 1,400 m altitude. It grows in moist, neglected ground.

Use: The tender leaves are cooked as a vegetable.

Cultivation: Plants are grown from seed or thickened roots.

Food Value: Per 100 g edible portion

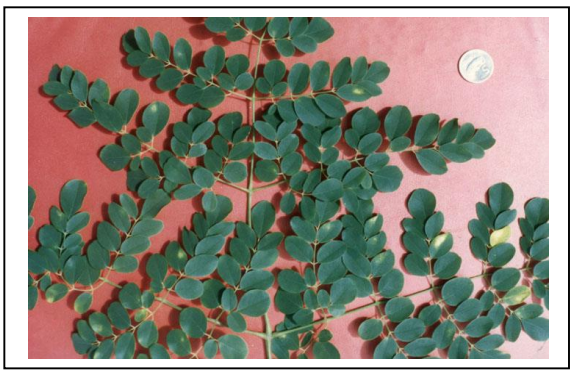
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	89.4	30	3.2	3510	115	3.4	-

Image sourced from: www.thomala.com

Vegetables

English: Horseradish tree
Local (Urdu): Sohanjna

Scientific name: *Moringa oleifera*
Plant family: MORINGACEAE



Description: A small, soft-wooded tree that grows 9 - 12 m tall. The tree loses its leaves during the year. The bark is grey, thick, corky and peels off in patches. The leaves are pale green and the leaf is divided 3 times. The whole leaf is 30 - 60 cm long and the leaflets are usually oval and 1 - 2 cm long. The leaflets are jointed with a gland near the joint. The flowers are pale yellow. They occur in long sprays 30 cm long. Each flower has 5 petals and of these one is erect and 4 are bent backwards. The fruit is a long capsule 30 - 100 cm long by 2 cm wide. The seed capsules are up to 45 cm long. They are roughly triangular in shape. The seeds have 3 wings. Often the fruiting kinds are grown as annual plants.

Distribution: A tropical and subtropical plant. They suit the dry lowland areas and grow up to 1,350 m altitude in the tropics. They are not hardy to frost. They cannot tolerate water-logging. A pH of 6 - 7.5 is suitable. It can grow in arid places. It suits hardiness zones 9 - 12.

Use: The young tops and leaves are eaten cooked. They are eaten as potherbs or used in soups and curries. They can be dried and stored for later use. The very young long pods are eaten cooked, especially in curries and soup. They are also pickled. The young seeds are eaten roasted or fried. Sometimes the roots are used as a horseradish substitute. A gum from the bark is used as seasoning. The bark is used for tea. The roots, leaves, flowers and fruits are eaten cooked in water and mixed with salt and chili peppers. The oil expressed from the seeds is used in salads.

Cultivation: It is best to grow plants from 1 metre long cuttings but they can be grown from seed. They can be used as a hedge and pruned regularly to produce more leaves. Properly dried seed can be stored for a long time in sealed containers in a cool place. Normally perennial types are grown from cuttings and annual types are grown from seed.

Production: Trees are fast growing. They can be pruned or topped. With one variety the tree flowers and fruits continuously while with the other variety there are flowers and fruit once per year. The fruit ripens 3 months after flowering. Annual types produce fruit 6 months after planting. Leaves are best dried in the shade to retain more of their Vitamin A.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	76.4	302	5.0	197	165	3.6	-
flower	84.2	205	3.3	-	-	5.2	-
leaf (boiled)	87	189	4.7	40	31.0	2.0	0.2
pod (raw)	88.2	155	2.1	4	141	0.4	0.5
seed	6.5	-	46.6	-	-	-	-

Vegetables

English: Broad bean
Local (Urdu): Jangli mattar

Scientific name: *Vicia faba*
Plant family: FABACEAE

Description: An upright plant up to 1 m tall. Plants vary in height from 30 - 180 cm. It has a well-developed taproot. It has square stems which are hollow and have wings at the angles. There can be 1 - 7 branches from near the base of the plant. The leaves have leaflets along the leaf stalk and end in a short point. There are 2 - 6 leaflets. These are 5 - 10 cm long. Flowers occur in the axils of leaves and there are 1 - 6 flowers on a stalk. The flowers are white with black spots. Pods are large and fat and contain several large beans inside. The pods are 5 - 10 cm long in field varieties and can be 30 cm long in garden varieties. They are fleshy with a white velvety lining. They become tough and hard at maturity. The seeds can vary a lot in shape and size. They can be flat or rounded and white, green, brown, purple or black. They are 1 - 2.6 cm long. The hilum along the seeds is prominent.

Distribution: A temperate plant only suitable for the highlands over about 1,200 m. in the tropics. It mainly occurs from 1,900 - 2,700 m altitude in equatorial zones. It is frost tolerant and is resistant to drought. It can grow with temperatures down to 4°C. In the lowland hot tropics it often flowers but does not set seed. It requires fertile soils. It does best with adequate lime needing a soil pH of 6.4 - 7.2. It can tolerate some salinity.

Use: It is mostly the young beans that are eaten. The ripe beans and leaves are also edible. The dried beans can be boiled, ground into flour and added to soups or used for making tofu. Sprouted seeds are cooked and eaten. The tender pods are eaten as a vegetable. **Caution:** Some people, mainly of Mediterranean origin can get a disease called Favism from these beans. The beans should be well cooked. They can react with some people using some antidepressant drugs.

Cultivation: The crop is grown from seed which are sown at 15 - 40 cm spacing. If the seed pod formation is poor, it can be improved by pinching out the tops of the plants when in flower. Hand pollination also helps. Plants are self-pollinated but also cross pollinated by insects.

Production: Time to maturity is 12 - 16 weeks. Yields in the cool tropics vary from 1 - 2 tons per hectare.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
seed (dry)	10.0	1448	26.2	130	16	6.7	-
seed (fresh, raw)	76.0	315	7.1	35	140	1.9	0.6
seed (fresh, boiled)	83.7	259	4.8	27	20	1.5	0.5

Nuts, seeds, herbs and other foods

English: Chinese boxthorn
Local (Urdu): Rasout

Scientific name: *Lycium chinense*
Plant family: SOLANACEAE

Description: A spiny deciduous shrub. It grows 4.5 m high. The branches are stiff, straight and un-branched. The branches have long thorns. These are where the leaves sprout from the stem. There are only a few leaves. The leaves are oval and vary between 2 - 6 cm long. They are dark green. The flowers are purplish. They are tube shaped and held in clusters of 1 to 4. The fruit are reddish-orange berries. They hang down. The fruit are 25 mm long.

Distribution: A Mediterranean climate plant. It will grow in the highlands in warm tropical countries. It suits hardiness zones 6 - 10.

Use: The berries make a sweet addition to any dish. The ripe fruit are eaten fresh. They taste like liquorice. They can be added to soups or braised dishes. The young soft leaves are eaten in salads. The leaves are cooked with pork or added to soup. Ginger, pepper and a little sugar can help counter the bitter flavour in soups. The roasted seeds are used for coffee. Dried leaves are used for tea.

Cultivation: Plants can be grown from seed or by using cuttings. They often sprout by suckers.

Production: For leaves the tips are cut off creating a hedge. For fruit the branches are left and the fruit picked.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	89.6	121	4.1	59	-	5.4	-
fruit	19.6	1411	16.3	-	-	18.9	-

Nuts, seeds, herbs and other foods

English: Horse-mint, Biblical mint
Local (Urdu): Podina

Scientific name: *Mentha longifolia*
Plant family: LAMIACEAE

Description: A herb which keeps growing from year to year. It has rhizomes or underground stems. The above ground stems are erect, or creeping and 1 m high. There are many branches. The branches are white with lines along them. The leaf blade is oval to oblong and 6 cm long by 1.5 cm wide. The leaves have teeth along the edge. The flowers are purplish and in spikes 3 - 8 cm long.

Distribution: It grows in damp locations. It can grow in light shade and in arid places. It suits hardiness zones 6 - 9.

Use: The leaves are eaten in chutneys. They are also used for seasonings. The leaves and flowers yield an oil used for flavouring. The leaves are candied or used as a tea. The leaves are dried and used for flavouring.

Cultivation:

Production:

Food Value: Per 100 g edible portion

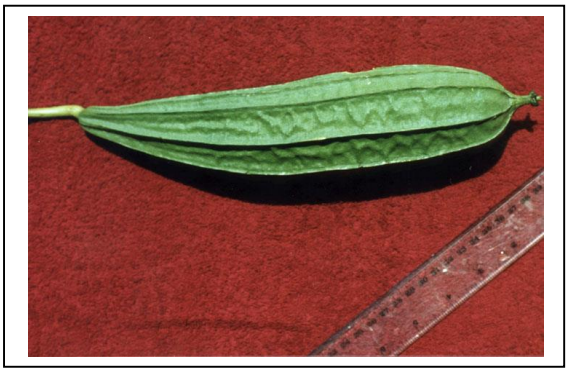
Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
leaf	8.2	1056	8.4	-	-	12.2	5.1

Nuts, seeds, herbs and other foods

English: Angled loofah
Local (Urdu): Kali tori

Scientific name: *Luffa acutangula*
Plant family: CUCURBITACEAE

Description: A herb of the pumpkin family plant. It is an annual climber with square stems. They have 4 - 7 branched tendrils which attach to objects helping the plant to have a climbing habit. Leaves are pale green, hairy and shallowly five lobed. The leaves have a bad smell when rubbed. Male and female flowers are separate. Male flowers are in clusters, female flowers singly (ratio 43:1) Flowers open late in the afternoon and stay open during the night. The flowers are yellow. Fruit can be up to 40 cm long and with 10 long ridges. It is green-brown outside and white inside. Three varieties have been distinguished.



Distribution: A tropical plant. It grows from sea level to 500 m altitude in the hot humid tropics. It won't tolerate excessive rainfall so does best in drier areas or in the dry season in wetter areas. Day temperatures above 25°C are suitable. Some varieties require short day length. Adding additional nitrogen fertiliser can stimulate female flower formation in short day varieties. In Nepal it grows from 1,000 - 1,600 m altitude. It can grow in arid places.

Use: The immature fruit are cooked and eaten as a vegetable. The ridges are removed with a vegetable peeler. The fruit are boiled, steamed or stir-fried. They can be added to soups, stews and curries. The leaves are edible. They can be eaten in salads or cooked as a vegetable. The flower buds are dipped in batter and sauteed. Mature seeds are roasted, salted and eaten as a snack.

Cultivation: Seeds are sown direct at 40 cm by 80 cm spacing and need stakes to climb. Because seeds can have a hard coating, soaking seed in water for 24 hours before planting can assist germination. 5 kg of seed per hectare are required. The plant benefits from full sunlight. Good soil fertility is beneficial. The soil needs to be well drained and adequate organic matter helps. Pinching out the growing tips when plants are 1.5 - 2 ms long can promote fruit development. Hand pollination once female flowers develop helps fruit set. This is best done in the evening.

Production: Immature fruit are ready 6 - 10 weeks after planting. On maturity the fruit become bitter and inedible. Fruit do not store well so are harvested when they are to be used.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	94.6	71	0.7	-	-	0.5	-
leaf	89.0	-	5.1	-	98	11.5	-

Nuts, seeds, herbs and other foods

English: Bird's eye chillies
Local (Urdu): Lal mirch

Scientific name: *Capsicum frutescens*
Plant family: SOLANACEAE

Description: It is a shrubby, perennial plant growing about 1 m tall. The leaves are smaller than round capsicums or bell peppers. Two or more flowers occur together in the axils of leaves. They have small pointed fruit about 1 - 2 cm long and they are red when ripe. They have a very hot taste when eaten or touched on the lips.

Distribution: It is grown in most tropical countries. It grows from sea level up to about 1,800 m altitude in the equatorial tropics. It can't tolerate water-logging or frost. It tolerates high temperatures and a wide range of rainfall. Very high rainfall leads to poor fruit set and rotting of fruit. Soil needs to be well-drained and, preferably, fertile with adequate organic material. Light, loamy soils rich in lime are best. It suits hardiness zones 10 - 12.

Use: The leaves are eaten for their mild, spicy taste. The leaves are eaten cooked. The fruit can be used in very small quantities to spice food. The small, red fruit are very hot to eat due to a chemical called capsaicin. They are used to add spice and flavour to other foods. It would not be appropriate to eat sufficient of Bird's eye chilli fruit to significantly affect nutrition.

Cultivation: The seeds are dried in the sun. They are small. For large-scale plantings, 1.8 - 2.3 kg/ha of seed is needed. Seed is best sown in nurseries and the seedlings transplanted when they have 4 - 5 leaves (after 3 - 4 weeks). They can be transplanted at about 0.8 m spacing. Pruning out the tops can increase branching. This is often done 10 days before transplanting. Excessive nitrogen can reduce fruit setting.

Production: The first picking of fruit can occur 3 months after planting and continue about every two weeks. Plants continue to be harvested for about 4 - 5 years before replanting. For dried chillies, the fruit are dried in the sun for 3 - 15 days. The fresh weight is reduced by about two thirds during drying. Yields of dry chillies can be from 300 – 2,500 kg/ha depending on growing conditions, irrigation, etc.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
fruit	74.0	395	4.1	7140	121	2.9	

Nuts, seeds, herbs and other foods

English: Chinese water chestnut
Local (Urdu): Singarha

Scientific name: *Eleocharis dulcis*
Plant family: CYPERACEAE

Description: A herb which grows in water. It is a tufted sedge with round green stems. The bases are covered with brown sheaths. The stem is about a metre high and 1 cm across. It grows 30 - 200 cm high. From the top of each planted corm, several slender horizontal rhizomes radiate out into the mud, each terminating in a corm. The edible part consists of a flattened corm. The rhizome is short. Under the ground there are stolons bearing tubers. The tubers are almost round and have 4 - 6 distinct rings. They are usuallu about 1 cm across but can be up to 4 cm across. They are dark brown. The stems are tufted and slender. There are fine lines along the stems. The purplish leaves are reduced to thin tube like sheaths. Each plant produces these long tubular leaves that project above the water surface. The flower spike is on the end of the plant. There are many flowers, 1.5 - 6 cm long by 3 - 6 mm wide. The fruit is a nut 1.5 - 2 mm long.

Distribution: It suits humid, monsoonal, tropical and subtropical locations. It is found in open wet places and shallow water. It grows in fresh water swampy grounds or in shallow water. It is also found in rice fields. It needs at least 220 frost free days. It needs a soil temperature above 15.5°C for germination of the corms. It needs a pH of 6.9 - 7.3. It can be grown up to 1,200 m altitude and suits plant hardiness zones 9 - 12.

Use: The tubers are cooked and eaten. The corms can be eaten raw, roasted or boiled after they have been peeled. Normally, they are cut into small slices and added to soup or to fish and meat dishes. They can be sweetened for desserts.

Cultivation: Plants can be grown by division or tubers. They are put in holes 20 -3 0 cm deep. Fields are flooded after planting then allowed to drain. When top growth is 20 - 30 cm high fields are flooded to at least 10 - 12.5 cm. A spacing of 75 cm x 75 cm is suitable. 500 kg of corms per hectare are required for planting.

Production: Corms mature after 7 - 8 months. Yields of 20 - 40 t per ha are possible.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
corm	50.8	635	3.7	-	52	15	1.9
fruit	79.6	268	1.4	0	5	0.7	0.5

Nuts, seeds, herbs and other foods

English: Coastal almond
Local (Urdu): Jangli badam

Scientific name: *Terminalia catappa*
Plant family: COMBRETACEAE

Description: A large tree, up to 25 - 40 m tall. It loses its leaves during the year. The trunk can be straight or twisted. There can be buttresses up to 3 m tall. The branches lie horizontally and come out in layers. The leaves are long, smooth and shiny, with an abrupt point at the tip and a rounded base. Leaves tend to be near the ends of branches. Leaves can be 17 - 29 cm long and 10 - 15 cm wide. Young leaves have soft hairs. The leaves turn red and fall off twice a year. Flowers are greenish-white and in a spike at the end of the branches. The lower flowers on a spike are female, and the others are male. The fruit is about 6 cm long by 3 - 4 cm wide, thick and flattened, with a flange around the edge. The fruit are green and turn red when ripe. The pulp is edible.

Distribution: It grows on beaches in almost all tropical countries in the world, including Solomon Islands. It is a tropical plant, and sometimes cultivated as a shade tree. The tree is common in lowland areas particularly on sandy or rocky beaches. Seeds are spread by bats and sea water, as well as being planted by people. It is common along streets in coastal towns. It will grow from sea level up to about 800 m altitude. Plants are frost-susceptible. It can tolerate drought. It suits hardiness zones 11 - 12.

Use: The kernel of the fruit is eaten raw. An edible oil can also be extracted.

Cultivation: Plants can be grown from seed. Seeds can be stored dry for a year or more. Seeds germinate freely and most seeds grow. Insects can badly damage the leaves of young seedlings.

Production: It is fast growing. Nut production is seasonal.

Food Value: Per 100 g edible portion

Edible part	Moisture %	Energy kJ	Protein g	proVit A µg	proVit C mg	Iron mg	Zinc mg
nut (fresh)	31	1810	15.9	-	4	4.6	4.9
nut (dry)	4.2	2987	20.0	-	2	6.3	8.8

Nutritional values of food plants by plant Family

Plant Family	Scientific name	Common name	Local name (Urdu)	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
AMARANTHACEAE	*Amaranthus caudatus*	Grain amaranth	Cholaie	leaf	6.0	1034	28.8	33	-	23.3	5.5	31
AMARANTHACEAE	*Digera muricata*	Wild rhubarb	Tandla	leaf	83.8		4.3	-	-	17.7	0.6	29
AMARANTHACEAE	*Spinacia oleracea*	Spinach	Palak	leaf (boiled)	92.9	57	2.4	819	29	2.9	0.8	30
ANACARDIACEAE	*Mangifera indica*	Mango	Aam	fruit	83.0	253	0.5	54	30	0.5	0.04	37
APIACEAE	*Petroselinum crispum*	Parsley	Petersili / Kharf	leaf (fresh)	78.7	151	3.0	421	150	6.2	1.1	33
ARACEAE	*Colocasia esculenta*	Taro	Arvi / Eddoe	root	66.8	1231	1.96	3	5	0.68	3.2	13
BRASSICACEAE	*Alliaria petiolata*	Hedge garlic	Lehsan	leaf	-	-		3600	190	-	-	43
BRASSICACEAE	*Brassica juncea*	Indian mustard	Toria	leaf	92.0	108	2.4	31	73	2.7	-	44
COMBRETACEAE	*Terminalia catappa*	Coastal almond	Jangli badam	nut (dry)	4.2	2987	20.0	-	2	6.3	8.8	57
CONVOLVULACEAE	*Ipomoea batatas*	Sweet potato	Shakarkandi	tuber (baked)	72.9	431	1.7	961	24.6	0.5	0.3	45
CUCURBITACEAE	*Cucurbita moschata*	Pumpkin	Halwa kaddoo	seed	5.5	2331	23.4	-	-	2.8	-	47
CUCURBITACEAE	*Lagenaria siceraria*	Bottle gourd	Loki	leaf	83.0	180	4.4	66	-	7.4	-	48
CUCURBITACEAE	*Luffa acutangula*	Angled loofah	Kali tori	leaf	89.0	-	5.1	-	98	11.5	-	54
CYPERACEAE	*Eleocharis dulcis*	Chinese water chestnut	Singarha	corm	50.8	635	3.7	-	52	15	1.9	56
FABACEAE	*Cajanus cajan*	Pigeon pea	Arhar	seed	10.0	1449	19.5	55	-	15.0	-	21
FABACEAE	*Cyamopsis tetragonolobus*	Guar bean	Guar / Guara	seed	9.9	1452	30.5	-	-	-	-	23
FABACEAE	*Glycine max*	Soybean	Soyabean	seed	9.0	1701	33.7	55	-	6.1	-	20
FABACEAE	*Lablab purpureus*	Lablab bean	Lubia	seed (dry)	10.0	1428	22.8	-	-	9.0	-	24
FABACEAE	*Lupinus albus*	White lupin	Sufaid lobia	seed	8.9	1555	38.0	-	-	-	-	25
FABACEAE	*Phaseolus coccineus subsp. coccineus*	Scarlet runner bean	Lobia	seed	12.0	1419	20.3	-	7	9.0	-	26
FABACEAE	*Phaseolus vulgaris*	Common bean	Surkh lobia	pod	88.0	151	2.5	750	27	1.4	0.2	27
FABACEAE	*Vicia faba*	Broad bean	Jangli mattar	seed (fresh)	76.0	315	7.1	35	140	1.9	0.6	51
FABACEAE	*Vigna radiata*	Mung bean	Moong / Moongi	seed (sprouted)	90.4	126	3.0	2	13.2	0.9	0.4	28
FABACEAE	*Vigna umbellata*	Rice bean	Rawaan	seed	13.0	1373	20.9	-	-	10.9	-	22
GROSSULARIACEAE	*Ribes nigrum*	European black currant	Shumloo	fruit	77.4	121	0.9	200	200	1.3	0.3	39
LAMIACEAE	*Mentha longifolia*	Horse-mint	Podina	leaf	8.2	1056	8.4	-	-	12.2	5.1	53
MALPIGHIACEAE	*Malpighia glabra*	Barbados cherry		fruit	83.2	163	1.8	800	2100	0.8	-	36
MORINGACEAE	*Moringa oleifera*	Horseradish tree	Sohanjna	leaf	76.4	302	5.0	197	165	3.6	-	50
MYRTACEAE	*Syzygium cumini*	Java plum	Jaman / Jamoo	fruit	84.8	213	0.6	30	27	1.4	-	35
POACEAE	*Avena sativa*	Oats	Javi / Jayi	seed	11.0	1563	13.1	-	-	4.6	-	15
POACEAE	*Panicum miliaceum*	Proso millet	Varai	seed (dry)	9	1582	11	0	0	3.0	1.7	16
POACEAE	*Pennisetum glaucum*	Bullrush millet	Bajra / Bajri	seed	13.5	1363	12.7	-	-	3.5	-	18
POACEAE	*Setaria italica*	Foxtail millet	Kangni / Gangavi booti	seed	13.5	1425	9.5	-	-	5.5	-	17
POACEAE	*Sorghum bicolor*	Sorghum	Juar	seed	-	1459	11.1	0	-	-	-	19
POLYGONACEAE	*Rumex dentatus*	Indian sorrel	Jangli palak	leaf	89.4	30	3.2	3510	115	3.4	-	49

Plant Family	Scientific name	Common name	Local name (Urdu)	Edible part	Moisture %	Energy kJ	Protein g	Vit A µg	Vit C mg	Iron mg	Zinc mg	Page
RHAMNACEAE	*Ziziphus jujuba*	Jujube	Sehu ber	fruit (dried)	19.7	1201	3.7	-	13	1.8	0.2	41
RHAMNACEAE	*Ziziphus mauritiana*	Indian jujube	Ber	fruit	77.0	360	0.8	21	71	0.4	0.4	42
ROSACEAE	*Prunus armeniaca*	Apricot	Khobani	fruit (raw)	86	201	0.6	96	10	0.4	0.2	40
RUTACEAE	*Citrus reticulata*	Mandarin	Kinno	fruit	87.6	184	1.5	42	136	0.8	-	34
SOLANACEAE	*Capsicum frutescens*	Bird's eye chillies	Lal mirch	fruit	74.0	395	4.1	7140	121	2.9	-	55
SOLANACEAE	*Lycium chinense*	Chinese boxthorn	Rasout	fruit	19.6	1411	16.3	-	-	18.9	-	52

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