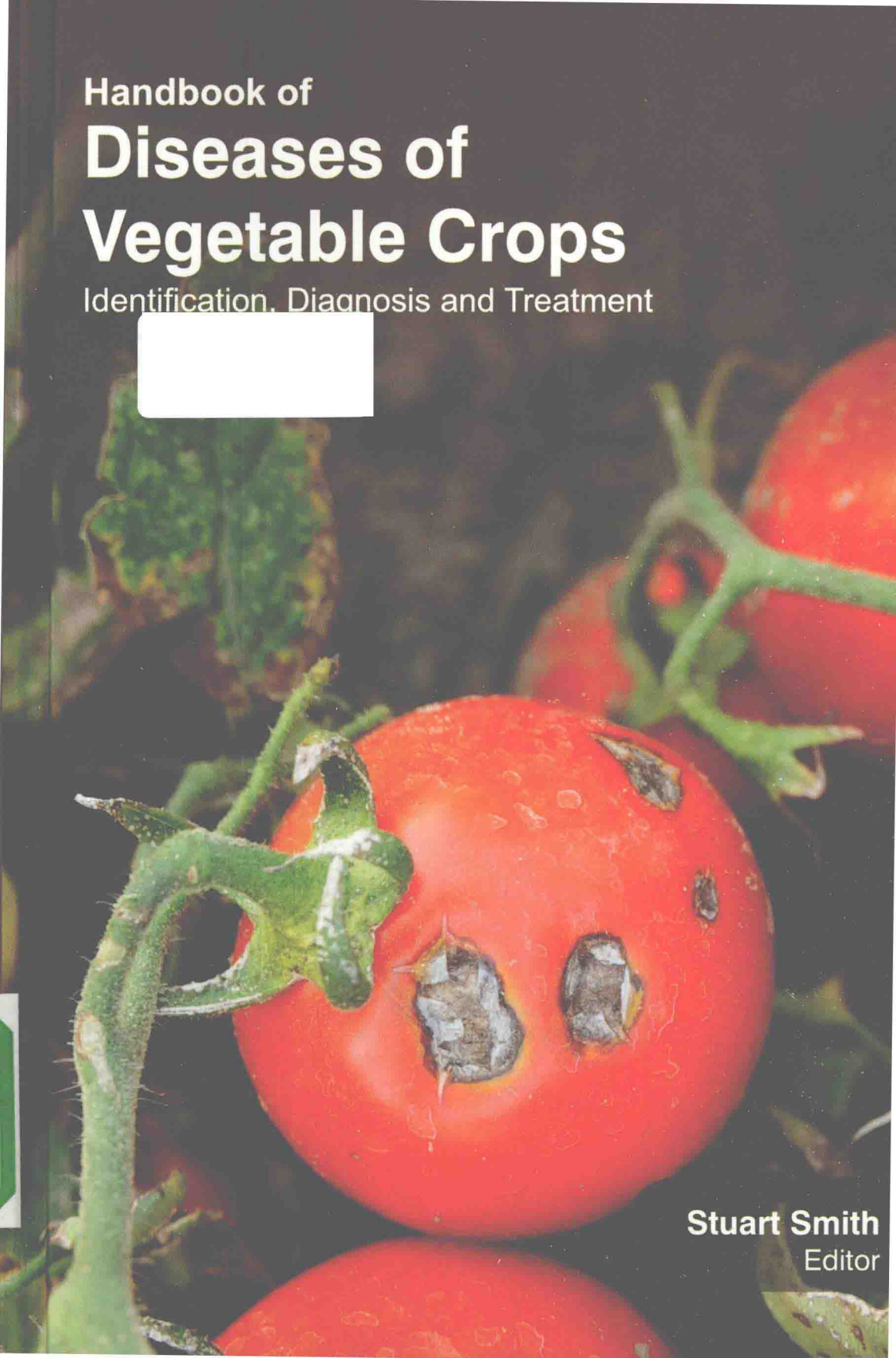
Handbook of

Diseases of Vegetable Crops

Identification, Diagnosis and Treatment



Stuart Smith
Editor

Handbook of Diseases of Vegetable Crops

Identification, Diagnosis and Treatment

VOLUME 2

Editor

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Handbook of Diseases of Vegetable Crops: Identification, Diagnosis and Treatment

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Handbook of Diseases of Vegetable Crops

Identification, Diagnosis and Treatment

Preface

Plants are vulnerable to many diseases. These diseases are mostly caused by fungi and viruses. There are also a few bacterial infections that attack plants and produce similar symptoms to those of fungi. Their is a long list of ways plant diseases can sneak into a garden and attack the plants. They can already be present in the seeds you sow. They could be in the soil around the roots of a plant, or carried in the soil on the soles of your shoes. They may also come in on new plants or plant material from the nursery or garden store where you purchased them. They can even arrive in the garden on a wind. Here is a list of some very common plant disease, what they infect, symptoms and how to prevent and control them. Mildew affects peas, onions, lettuce, spinach and cabbage. The powdery and downy mildew produce a white or gray mold, it is often found in round patches. Downey mildew appears on the undersides of leaves in cool, damp conditions. Powdery mildew forms on the top in dry conditions. To prevent this disease do not overcrowd plants or over water them. Look for mildew resistant varieties. Remove any plant debris promptly. To chemically control them you will use green and yellow sulphur for powdery mildew and for down mildew you will use the chemical mancozeb.

Blight disease affects potatoes and tomatoes. Blight favours warm, wet weather. It progresses rapidly on potatoes. The first signs are dark blotches on the leaves, followed by rapid wilting and yellowing of the foliage and stems. Then the plant will usually collapse in a few days. Blight is less dramatic on tomatoes, but is still serious. The leaves start collapsing and the fruit develop brown rotting patches. A different organism is responsible for early blight, which causes brown spots on the leaves it is much less serious. Warnings are often given when the right combination of humidity and temperature are present. To prevent further damage when you spot the disease on potato foliage remove and burn the top growth. If you harvest the crop right away the tubers may be unaffected. Destroy infected crop remains

by burning them. Planting tomatoes in greenhouse are less likely to be attacked by this disease. There are a few different types of chemicals you can use on this disease they are mancozeb, copper sulphate and copper oxychloride. Botrytis disease affects many different crops, especially lettuce and tomatoes. It produces a fluffy gray mold growth, under this growth the plant tissue rots. This fungus starts on dead tissue but spreads quickly to live parts. It is found quite often in greenhouses. It prefers cool, damp places. To help prevent this disease keep greenhouses well ventilated. Make sure your plants are not overcrowded, water early in the day and do not splash water. When you spot any of this disease clear all the dead and dying plant debris away. Cut out and destroy any affected parts. Wilt disease affects tomato and cabbage family. Fusarium wilt is the most common type. Young plants become pale and stunted, lower leaves yellow and wilt. The symptoms move upward and plants may die. Verticillium wilt causes similar symptoms but without one-sided effects. Wilt diseases are worse in the hot weather. To prevent this disease grow only disease resistant plants. Clear away any infected plant debris and rotate crops. Their are no chemicals to use on this disease.

The book will be an indispensable source for all professionals, researchers and students in this subject and for anyone working in the related areas for acquiring an up-to-date overviews.

—Editor

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Chapter 7

Onion Garlic Leeks and Shallots

The onion (*Allium cepa*) (Latin 'cepa' = onion), also known as the bulb onion or common onion, is used as a vegetable and is the most widely cultivated species of the genus *Allium*.

This genus also contains several other species variously referred to as onions and cultivated for food, such as the Japanese bunching onion (*A. fistulosum*), Egyptian onion (*A. ×proliferum*), and Canada onion (*A. canadense*). The name "wild onion" is applied to a number of *Allium* species but *A. cepa* is exclusively known from cultivation and its wild original form is not known. The onion is most frequently a biennial or a perennial plant, but is usually treated as an annual and harvested in its first growing season.

The onion plant has a fan of hollow, bluish-green leaves and the bulb at the base of the plant begins to swell when a certain day-length is reached. In the autumn the foliage dies down and the outer layers of the bulb become dry and brittle.

The crop is harvested and dried and the onions are ready for use or storage. The crop is prone to attack by a number of pests and diseases, particularly the onion fly, the onion eelworm and various fungi that cause rotting. Some varieties of *A. cepa* such as shallots and potato onions produce multiple bulbs.

Onions are cultivated and used around the world. As a foodstuff they are usually served cooked, as a vegetable or part of a prepared savoury dish, but can also be eaten raw or used to make pickles or chutneys. They are pungent when chopped and contain certain chemical substances which irritate the eyes. Onions contain phenolics and flavonoids that have potential anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties.

Figure: Roots, leaves and developing bulb

Taxonomy and Etymology

The onion (*Allium cepa*), also known as the bulb onion or common onion, is the most widely cultivated species of the genus *Allium*. It was first officially described by Carolus Linnaeus in his 1753 work *Species Plantarum*. A number of synonyms have appeared in its taxonomic history:

- *Allium cepa* var. *aggregatum* - G. Don
- *Allium cepa* var. *bulbiferum* - Regel
- *Allium cepa* var. *cepa* - Linnaeus
- *Allium cepa* var. *multiplicans* - L.H. Bailey
- *Allium cepa* var. *proliferum* - (Moench) Regel
- *Allium cepa* var. *solaninum* - Alef
- *Allium cepa* var. *viviparum* - (Metz) Mansf.

Allium cepa is known exclusively from cultivation, but related wild species occur in Central Asia. The most closely related species include *Allium vavilovii* (Popov & Vved.) and *Allium asarense* (R.M. Fritsch & Matin) from Iran. However, Zohary and Hopf state that "there are doubts whether the *A. vavilovii* collections tested represent genuine wild material or only feral derivatives of the crop."

The vast majority of cultivars of *A. cepa* belong to the "common onion group" (*A. cepa* var. *cepa*) and are usually referred to simply as "onions". The Aggregatum Group of cultivars (*A. cepa* var. *aggregatum*) includes both shallots and potato onions.

The genus *Allium* also contains a number of other species variously referred to as onions and cultivated for food, such as the Japanese bunching onion (*A. fistulosum*), Egyptian onion (*A. ×proliferum*), and Canada onion (*A. canadense*).

Description

The onion plant (*Allium cepa*) is unknown in the wild but has been grown and selectively bred in cultivation for at least 7,000 years. It is a biennial plant but is usually grown as an annual. Modern varieties typically grow to a height of 15 to 45 cm (6 to 18 in). The leaves are blueish-green and grow alternately in a flattened, fan-shaped swathe. They are fleshy, hollow and cylindrical, with one flattened side. They are at their broadest about a quarter of the way up beyond which they taper towards a blunt tip. The base of each leaf is a flattened, usually white sheath that grows out of a basal disc. From the underside of the disc, a bundle of fibrous roots extends for a short way into the soil. As the onion matures, food reserves begin to accumulate in the leaf bases and the bulb of the onion swells.

In the autumn the leaves die back and the outer scales of the bulb become dry and brittle, and this is the time at which the crop is normally harvested. If left in the soil over winter, the growing point in the middle of the bulb begins to develop in the spring. New leaves appear and a long, stout, hollow stem expands, topped by a bract protecting a developing inflorescence. The flower-head takes the form of a globular umbel of white flowers with parts in sixes. The seeds are glossy black and triangular in cross section.

Uses

Historical Use: Bulbs from the onion family are thought to have been used as a food source for millennia. In Bronze Age settlements, traces of onion remains were found alongside date stones and figure remains that date back to 5000 BC.

However, it is not clear if these were cultivated onions. Archaeological and literary evidence such as the Book of Numbers 11:5 suggests that onions were probably being cultivated around two thousand years later in ancient Egypt, at the same time that leeks and garlic were cultivated. Workers who built the Egyptian pyramids may have been fed radishes and onions.

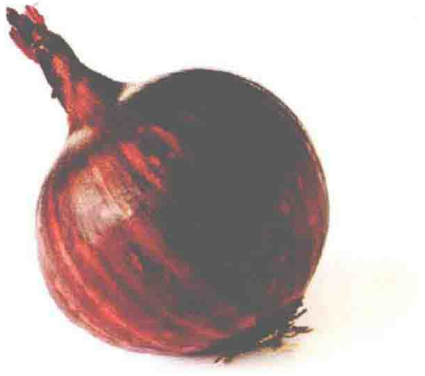

Figure: *A red onion.*

The onion is easily propagated, transported and stored. The ancient Egyptians worshipped it, believing its spherical shape and concentric rings symbolized eternal life. Onions were even used in Egyptian burials, as evidenced by onion traces being found in the eye sockets of Ramesses IV. In ancient Greece, athletes ate large quantities of onion because it was believed to lighten the balance of the blood. Roman gladiators were rubbed down with onions to firm up their muscles.

In the Middle Ages, onions were such an important food that people would pay their rent with onions, and even give them as gifts. Doctors were known to prescribe onions to facilitate bowel movements and erections, and to relieve headaches, coughs, snakebite and hair loss.

Onions were taken by the first settlers to North America, where the Native Americans were already using wild onions in a number of ways, eating them raw or cooked in a variety of foods. They also used them to make into syrups, to form poultices and in the preparation of dyes. According to diaries kept by the colonists, bulb onions were one of the first things planted by the Pilgrim Fathers when they cleared the land for cropping in 1648.

Onions were also prescribed by doctors in the early 16th century to help with infertility in women. They were similarly used to raise fertility levels in dogs, cats and cattle, but this was an error as recent evidence has shown that onions are toxic to dogs, cats, guinea pigs and many other animals.

Culinary Uses

Onions are often chopped and used as an ingredient in various hearty warm dishes, and may also be used as a main ingredient in

their own right, for example in French onion soup or onion chutney. They are very versatile and can be baked, boiled, braised, fried, roasted, sautéed or eaten raw in salads. Onions are also used as a thickening agent for curries providing bulk.

Figure: *Sauteeing onions*

Onions pickled in vinegar are eaten as a snack. These are often served as a side serving in pubs and fish and chip shops throughout the United Kingdom and Australia, often served with cheese and/or ale in the United Kingdom. In North America, sliced onions are battered and deep fried and served as onion rings.

Onion Types and Products

Figure: *Sliced Red Onions*

Figure: *Jar of pickled onions*

Common onions are normally available in three colours: yellow, red, and white. Yellow onions, also called brown onions, are full-flavoured and are the onions of choice for everyday use. Yellow onions turn a rich, dark brown when caramelized and give French onion soup its sweet flavour. The red onion is a good choice for fresh use when its colour livens up the dish. It is also used in grilling and char-broiling. White onions are the traditional onions that are used in classic Mexican cuisine. They have a golden colour when cooked and a particularly sweet flavour when sautéed.

While the large mature onion bulb is the onion most often eaten, onions can be eaten at immature stages. Young plants may be harvested before bulbing occurs and used whole as scallions. When an onion is harvested after bulbing has begun but the onion is not yet mature, the plants are sometimes referred to as summer onions.

Additionally, onions may be bred and grown to mature at smaller sizes. Depending on the mature size and the purpose for which the onion is used, these may be referred to as pearl, boiler, or pickler onions, but differ from true pearl onions which are a different species. Pearl and boiler onions may be cooked as a vegetable rather than as an ingredient and pickler onions are often preserved in vinegar as a long-lasting relish.

Onions are available in fresh, frozen, canned, caramelized, pickled and chopped forms. The dehydrated product is available as kibbled, sliced, rings, minced, chopped, granulated and powder forms. Onion powder is a spice widely used when the fresh ingredient is not available. It is made from finely ground, dehydrated onions, mainly the pungent varieties of bulb onions, and has a strong odour. Being dehydrated, it has a long shelf life and comes in several varieties: white, yellow and red.

Non-Culinary Uses

Onions have particularly large cells that are readily observed by the human eye at low magnification; consequently, onion tissue is frequently used in science education for demonstrating microscope usage and for learning about the structure of cells.

The pungent juice of onions has been used as a moth repellent and can be rubbed on the skin to prevent insect bites. When applied to the scalp it is said to promote growth of hair and on the face to reduce freckling. It has been used to polish glass and copperware and to prevent rust on iron. If boiling water is poured onto chopped onions and left to cool, the resulting liquor can be sprayed onto plants to increase their resistance to pests, and the onion plants when growing are reputed to keep away moles and insects. Onion skins have been used to produce a yellow-brown dye.

Nutrition and Health

Most onion cultivars are about 89% water, 4% sugar, 1% protein, 2% fibre and 0.1% fat. They contain vitamin C, vitamin B_6, folic acid and numerous other nutrients in small amounts. They are low in fats and in sodium, and with an energy value of 166kJ (40 kcal) per 100 g (3.5 oz) serving, they can contribute their flavour to savoury dishes without raising caloric content appreciably.

Onions contain chemical compounds such as phenolics and flavonoids that basic research shows to have potential anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties.

These include quercetin and its glycosides quercetin 3,4'-diglucoside and quercetin-4'-glucoside. There are considerable differences between different varieties in potential antioxidant content. Shallots have the highest level, six times the amount found in Vidalia onions, the variety with the smallest amount.

Some people suffer from allergic reactions after handling onions. Symptoms can include contact dermatitis, intense itching, rhinoconjunctivitis, blurred vision, bronchial asthma, sweating and anaphylaxis. There may be no allergic reaction in these individuals to the consumption of onions, perhaps because of the denaturing of the proteins involved during the cooking process.

While onions and other members of the genus *Allium* are commonly consumed by humans, they can be deadly for dogs, cats, guinea pigs, monkeys and other animals. The toxicity is caused by the sulfoxides present in raw and cooked onions which many animals are unable to digest. Ingestion results in anaemia caused by the distortion and rupture of red blood cells. Sick pets are sometimes fed with tinned baby foods and any that contain onion should be avoided. Nor is it good for pets to be fed onion-containing leftovers such as pizza, canned spaghetti, Chinese dishes and onion rings. The typical toxic doses are 5 g (0.2 oz) per kg (2.2 lb) bodyweight for cats and 15 to 30 g (0.5 to 1.1 oz) per kg for dogs.

In India, some sects do not eat onions as they believe them to be an aphrodisiac. Various schools of Buddhism also advise against the consumption of onions and garlic because they increase desire when eaten cooked and anger when eaten raw.

Eye Irritation

Chopping an onion causes damage to cells which allows enzymes called alliinases to break down amino acid sulfoxides and generate sulfenic acids. A specific sulfenic acid, 1-propenesulfenic acid, is rapidly acted on by a second enzyme, the lachrymatory factor synthase (LFS), giving syn-propanethial-S-oxide, a volatile gas known as the onion lachrymatory factor or LF. This gas diffuses through the air and soon reaches the eye, where it activates sensory neurons, creating a stinging sensation. Tear glands produce tears in order to dilute and flush out the irritant.

Eye irritation can be avoided by cutting onions under running water or submerged in a basin of water. Leaving the root end intact also reduces irritation as the onion base has a higher concentration