

FR*ui*TROP

English version

CLOSE-UP:
CITRUS

Prices of fruit juices
and pulps in Europe

Litchi from Madagascar
A very early season

The influence of climatic conditions

Citrus originated in south-east Asia. The climate there is equatorial, tropical or subtropical according to the latitude and always strongly marked by a monsoon regime. The year features a hot, humid season (the monsoon season) and a fairly rain-free, often cooler season. The developmental cycle of citrus is keyed into these seasons. The hot, humid period is one of intense physiological activity, with shoot and fruit growth. Vegetative growth halts in the cool, dry period, a feature all the more marked when drought is severe or temperatures low. A marked halting of vegetative growth is essential before any flowering of certain citrus such as mandarin, orange, grapefruit and shaddock. Others with repeat-flowering such as citron,

lemon and lime have less strict requirements but react to the same phenomena.

Temperatures between 21 and 30°C are optimum for physiological activity. This is strongly reduced when the temperature is lastingly and significantly higher than 35°C or lower than 13°C. Citrus growing is in fact limited by threshold and ceiling temperatures. Citrus trees are partially or totally destroyed at temperatures lower than 0°C. The extent of the damage depends firstly on frost duration and intensity and secondly on the susceptibility of plant parts and the type of citrus. Thus flowers, young leaves and fruits are more sensitive than branches and trunks. Citron, lime and lemon are more sensitive than mandarin, orange and grapefruit. Temperatures lower than -7°C are generally lethal for citrus trees. Temperatures higher than 50°C also cause damage.



Citrus pests and diseases

Pests and diseases are numerous and can have serious economic impacts, possibly requiring quarantine (material subject to regulations concerning movement) and the forbidding of exports to other production zones to avoid the spread of harmful organisms. The use of tolerant rootstocks is an effective measure in the control of several organisms but the choice of variety is often dictated by the market. In addition to the production of healthy plant material, the control of these pests and diseases generally combines genetic, biological and chemical components in an integrated control framework.



Citrus diseases	Tristeza Virus: <i>Citrus Tristeza Closterovirus</i>	Huanglongbing (greening) Phloem bacteria: <i>Liberibacter africanum</i> , <i>L. asiaticum</i>	Citrus canker Bacterium: <i>Xanthomonas axonopodis</i> pv. <i>citri</i>
Distribution	All regions except some Mediterranean countries.	Asia, subtropical and tropical Africa, Middle East.	Asia, South America, Florida, certain regions of Africa.
Symptoms	Dieback of varieties grafted on sour orange (except lemon trees), vein clearing and stem pitting.	Shoot yellowing, leaf mottling, small poorly coloured fruits.	Corky pustules on leaves and fruits.
Susceptible species	Lime, orange and grapefruit trees.	Broad host spectrum. Affects orange and mandarin above all.	Broad host spectrum. Above all grapefruit, orange, lime and some mandarins.
Transmission	Aphids (<i>Aphis gossypii</i> , <i>Toxoptera citricida</i>).	Psyllas (<i>Diaphorina citri</i> , <i>Trioza erytreae</i>)	By air and water.
Economic impact	Loss of trees and decreased production.	Tree dieback, shorter orchard life.	Harvest loss.
Quarantine organism	Present in the EU.	Not present in the EU.	Not present in the EU.

Strong insolation is also better supported when the water supply is satisfactory. Irrigation must be used in citrus growing in arid or very dry regions. Plant water requirements are directly correlated with the climatic parameter total radiation (the main feature) related to insolation, temperature, wind, relative humidity, etc. These parameters are used in water requirement models and irrigation management tools.

Temperature plays an important role in the changes of fruit pigmentation as maturity approaches. Temperatures lower than 15°C cause the disappearance of chlorophyll pigments from the epidermis. This reveals carotenoid pigments. The synthesis of carotenoids (yellow and orange) and lycopene (red, specific to shaddock and grapefruit) is enhanced by a temperature of between 15

and 35°C. Red anthocyanin pigments (blood oranges) require lower temperature but still higher than 12°C.

The synthesis and senescence of the various pigments are thus strongly affected by ambient temperature. In the tropics, the absence of low temperatures means that chlorophyll pigments do not disappear and the fruits remain green. Anthocyanin synthesis does not take place for the same reason and blood oranges remain blond. In contrast, the red pigmentation of grapefruit is more intense. The alternate high daytime temperatures and cool nights in Mediterranean zones create an optimum environment for the breakdown of green chlorophyll pigments and the synthesis of the yellow, orange and red pigments of the various types of orange, mandarin and lemon. The external colour of the fruits is thus very well expressed.



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Citrus pests	Fruitfly	Thrips	Diaspine
	Diptera Tephritidae: various species of the genera <i>Ceratitidis</i> , <i>Anastrepha</i> , <i>Dacus</i> , <i>Bactrocera</i> , etc.	Thysanoptera: thripidae. <i>Scirtothrips</i> spp. (<i>S. aurantii</i> , <i>S. citri</i> , <i>S. dorsalis</i>)	Hemiptera: Diaspididae. Genera <i>Aonidiella</i> , <i>Unaspis</i> , <i>Chrysomphalus</i> , <i>Cornuaspis</i> , etc.
Distribution	American continent: <i>Anastrepha</i> . Africa: <i>Ceratitidis</i> , <i>Dacus</i> . Asia-Pacific: <i>Bactrocera</i> .	Variable according to the species. Present in the Mediterranean area: <i>Tetranychus urticae</i> , <i>Panonychus citri</i> .	Variable according to the species. Present in the Mediterranean area: <i>Aonidiella aurantii</i> , <i>Cornuaspis beckii</i> , etc.
Symptoms	Pricking caused by females laying eggs in the fruits.	Greyish patches in a ring around the fruit stalk (thrips feeding on young fruits).	Scale on leaves, shoots and/or fruits, trees weakened in case of large populations.
Susceptible species	Mandarin, orange, grapefruit. Mandarins and thin-skinned oranges susceptible.	Orange, mandarin, tangor, tangelo, lemon, etc.	Broad host spectrum.
Economic impact	Harvest loss.	Deterioration of the outside appearance of fruits.	Deterioration of the outside appearance of fruits.
Quarantine organism	Not present in the EU.	Not present in the EU.	Not present in the EU.