

## Mini datasheet on *Acidovorax citrulli*

*Acidovorax citrulli* was added to the EPPO A1 List in 2014. A full datasheet is being prepared, in the meantime you can view here the data which was previously available from the EPPO Alert List (added to the EPPO Alert List in 2009-deleted in 2014).

### *Acidovorax citrulli* (bacterial fruit blotch of cucurbits)

- Why** Bacterial fruit blotch of cucurbits is caused by *Acidovorax citrulli* (syn: *Acidovorax avenae* subsp. *citrulli*, *Pseudomonas pseudoalcaligenes* subsp. *citrulli*). Recent taxonomic studies (Schaad *et al.*, 2008) on the different subspecies of *Acidovorax avenae* concluded that *Acidovorax avenae* subsp. *citrulli* should be reclassified and elevated to species rank as *Acidovorax citrulli* comb. nov. In the USA, the first outbreaks and crop losses caused by bacterial fruit blotch started to be reported in 1989 in commercial fields of watermelons in Florida, South Carolina and Indiana. Although similar symptoms of a bacterial disease had already been reported in the 1960s, the identity of the causal agent could not be ascertained at that time. The disease which is seed-transmitted was then also reported from other parts of the world. Because *A. citrulli* can be a serious threat to cucurbit crops (in particular melon and watermelon), the EPPO Panel on bacterial diseases considered that it should be added to the EPPO Alert List.
- Where** **EPPO region:** Greece (first outbreaks in 2005), Hungary (first found in 2007 on watermelon crops in Southern Hungary), Israel (first outbreaks observed in 2000/2003 on melon and watermelon crops), Italy (1 outbreak was found in Emilia-Romagna in 2009 but eradicated in 2012 - another was found in Sardegna in 2010, still under eradication), Turkey (first found in 1995 in Edirne province (Marmara region) on watermelon crops, reported in 2005 in Adana Province (Mediterranean region)). In Israel, *A. citrulli* is a quarantine pest and in 2006, the NPPO declared that the disease was present only in a limited number of production sites and was under eradication (EPPO RS 2006/012). In Hungary, the disease was observed on 20-30 ha of watermelons in July 2007 during a hot summer period (mean maximum daytime temperature > 32°C). The source of infection could not be determined, but it was noted that grafted watermelon transplants had been imported from Turkey.
- Asia:** China (Anhui, Fujian, Gansu, Guangdong, Hainan, Hebei, Jilin, Neimenggu, Shandong, Xinjiang, Yunnan, Zhejiang), Japan (Honshu), Korea (Republic of), Taiwan, Thailand. There is an isolated record of *A. avenae* subsp. *citrulli* on *Paliurus spina-christi* (Rhamnaceae) from Iran.
- North America:** USA (Alabama, Arkansas, California, Delaware, Florida, Georgia, Iowa, Illinois, Indiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, Oregon, South Carolina, Texas). In a paper from Latin and Hopkins (1995), it is stated that that in some US states (Delaware, Iowa and Maryland) the disease was seen in 1989 but has not been found later on (at least until 1995, no more recent data could be found).
- South America:** Brazil (Ceará, Pernambuco, Minas Gerais, Rio Grande do Norte, Rio Grande do Sul, Roraima).
- Central America:** Costa Rica. In Nicaragua, *A. citrulli* was reported on crops which had been grown from seeds imported from Costa Rica in 1997, but it was subsequently declared eradicated.
- Oceania:** Australia (Queensland), Guam, Northern Mariana Islands.
- On which plants** The most susceptible hosts are watermelons (*Citrullus lanatus*) and melons (*Cucumis melo*) which develop symptoms on fruit and leaves. Other cucurbits such as *Cucumis sativus* (cucumber), *Cucurbita pepo* (squash), and *C. moschata* only develop foliar symptoms. Wild cucurbits such as *Citrullus lanatus* var. *citroides*) can host *A. citrulli* and probably act as reservoirs for the bacterium. In artificial inoculation studies, solanaceous plant species (i.e. *Capsicum* spp., *Lycopersicon esculentum*, *Solanum melongena*) could develop foliar symptoms.

Damage	<p>There is also one record of the bacterium causing leaf blight on <i>Piper betle</i> (Piperaceae) in Taiwan.</p> <p>Symptoms on fruits appear as dark olive green stain (or blotch) on the upper side of the fruit. Lesions usually become apparent shortly before fruit ripening. The epidermis of the rind can then rupture and frequently bacterial ooze is produced. On leaves, small dark brown, somewhat angular and water-soaked lesions can appear, but they are generally inconspicuous. On seedlings, water-soaked areas on the underside of cotyledons can be seen and lesions on the hypocotyl cause collapse of the emerging plants. Some seedlings may remain symptomless until fruit set.</p> <p>In the USA, the disease usually occurs in relatively few fields but under favourable conditions (warm and wet weather) fruit losses of up to 90-100% have been observed in some commercial fields of watermelons. In Brazil, the disease is causing severe losses in the Nordeste (mainly Rio Grande do Norte and Ceará) on melon crops. In 2000, crop losses in Rio Grande do Norte were estimated at 40-50%, reaching 100% in some melon crops. In a survey carried out in 2001 in 18 melon fields, the disease was present in all fields with an incidence varying from 4% to 47%.</p>
Transmission	<p><i>A. citrulli</i> is mainly transmitted through seeds. In the field or transplant units, the bacterium can also be spread by water, in particular by overhead irrigation. Volunteer seedlings from infected seeds, buried infected rinds, and weed host plants can also act as inoculum sources. In US watermelon crops, it is now considered that the disease cycle usually begins with contaminated seeds which then result in infected seedlings. Overhead irrigation disperses the pathogen throughout transplant facilities and infected seedlings with inconspicuous lesions are transplanted to the field where the bacteria can spread to neighbouring plants. Diseased fruits often decay in the field and their seeds may then remain in the soil and eventually start a new disease cycle. Over long distances, trade of infected seed lots or transplants of <i>Citrullus lanatus</i> and <i>Cucumis melo</i> is probably the most important pathway for spreading the disease.</p>
Pathway	<p>Seeds, plants for planting, fruits of <i>Citrullus lanatus</i> and <i>Cucumis melo</i>.</p>
Possible risks	<p>Cucurbit crops such as melons and watermelons are widely grown in Southern Europe and around the Mediterranean Basin. <i>A. citrulli</i> has already been reported in the EPPO region (Israel, Hungary, and Turkey) and more details would be needed on its current economic impact in these countries. In Israel and Turkey, <i>A. citrulli</i> is listed as a quarantine pest. In most countries where it occurs, <i>A. citrulli</i> seems to appear sporadically but it can lead to very severe losses (probably when climatic and cropping conditions are favourable). Management strategies have been developed in the USA and are based on the use of uncontaminated seed lots (seed treatments are not considered effective), careful inspection of transplants and destruction of all symptomatic plants, standard glasshouse sanitation procedures when growing transplants, control of volunteer or wild cucurbit plants in the field, ploughing to eliminate plant debris, use of resistant/tolerant cultivars, application of copper-containing fungicides, and crop rotation. Although more data would be needed on the climatic requirements of <i>A. citrulli</i> to better understand its potential of establishment across the EPPO region, it seems highly desirable to avoid any further spread of this bacterium, in particular via infected melon and watermelon seed lots or transplants.</p>
Source(s)	<p>Burdman S, Kots N, Kritzman G, Kopelowitz J (2005) Molecular, physiological, and host-range characterization of <i>Acidovorax avenae</i> subsp. <i>citrulli</i> isolates from watermelon and melon in Israel. <i>Plant Disease</i> 89(12), 1339-1347.</p> <p>CABI Crop Protection Compendium. <i>Acidovorax avenae</i> subsp. <i>citrulli</i> (fruit blotch). <a href="http://www.cabicompendium.org">http://www.cabicompendium.org</a></p> <p>Cai XueQing, Huang YueYing, Yang JianZhen, Chen Jun, Cai GuoLong, Hu FangPing (2005) Pathogen identification of bacterial fruit blotch of watermelon in Fujian. <i>Journal of Fujian Agriculture and Forestry University (Natural Science Edition)</i> 34(4), 434-437 (abst.).</p> <p>Demir G (1996) A new bacterial disease of watermelon in Turkiye: bacterial fruit blotch of watermelon (<i>Acidovorax avenae</i> subsp. <i>citrulli</i> (Schaad et al.) Willems et al.). <i>Journal of Turkish Phytopathology</i> 25(1/2), 43-49 (abst.).</p> <p>Deng WL, Huang TC, Tsai YC (2010) First report of <i>Acidovorax avenae</i> subsp. <i>citrulli</i> as the causal agent of bacterial leaf blight of betelvine in Taiwan. <i>Plant Disease</i> 94(8), 1065-1065.</p>

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