

Mini data sheet on *Spiroplasma kunkelii*

Added in 2008 - Deleted in 2012

Reasons for deletion:

Spiroplasma kunkelii has been included in EPPO Alert List for more than 3 years and during this period no particular international action was requested by the EPPO member countries. In 2012, it was therefore considered that sufficient alert has been given and the pest was deleted from the Alert List.

Spiroplasma kunkelii (corn stunt spiroplasma)

Why	Corn stunt is considered a major disease of maize (<i>Zea mays</i>) in the Americas. Although it is probably caused by a complex of pathogens, <i>Spiroplasma kunkelii</i> seems to be the major component of this disease. <i>S. kunkelii</i> is transmitted by leafhoppers in the field (mainly by <i>Dalbulus maidis</i> , Homoptera: Cicadellidae). As the importance of corn stunt is increasing in several American countries, the EPPO Panel on Phytosanitary Measures suggested the addition of <i>S. kunkelii</i> to the EPPO Alert List.
Where	EPPO region: absent. North America: Mexico, USA (California, Louisiana, Mississippi, Texas). Central America: El Salvador, Honduras, Jamaica, Nicaragua. South America: Argentina, Bolivia, Brazil, Colombia, Paraguay, Peru, Venezuela. The main insect vector, <i>D. maidis</i> is a subtropical species which occurs throughout the Americas in all areas where maize is grown. <i>D. maidis</i> is not known to occur in the EPPO region.
On which plants	The main host of <i>S. kunkelii</i> is maize (<i>Zea mays</i>), but the pathogen has also been detected in teosintes (e.g. <i>Euchlaena mexicana</i> , <i>Z. perennis</i>). The insect vector, <i>D. maidis</i> feeds on cultivated or wild species of the genus <i>Zea</i> (and occasionally on species of the closely-related genus <i>Tripsacum</i>).
Damage	Infected maize plants are stunted and show chlorotic stripes on the leaves. They have much shorter internodes with a proliferation of secondary shoots, thus giving the plants a short and bushy appearance. Infected plants often show reddish purple leaf margins. Ears are small and poorly filled. Symptoms may vary according to climatic conditions, maize cultivar and the presence of other pathogens. Pictures of the symptoms can be viewed on the Internet: http://www.ipmimages.org/browse/bimages.cfm?SUB=10498&area=72 <i>S. kunkelii</i> is reported as a major disease limiting maize production and causing economic damage in Central and South America. In recent years, its incidence has increased in many tropical and sub-tropical maize-growing areas. For example studies carried out in Argentina from 1991 to 2001, showed that the disease has largely spread across the northern part of the country, since its initial discovery in the north-east. In the Tucumán province, it was showed that <i>S. kunkelii</i> caused yield reductions varying from 50% to 90% (with an average of 70%) and that infected plants produced 3 times less grain (in weight). In the USA where the disease was formerly considered sporadic, corn stunt has been observed every year in the central valley of California since 1996, and in 2001, an outbreak there was reported to have caused economic losses of more than 5 million USD.
Transmission	In maize fields, <i>S. kunkelii</i> is transmitted by leafhoppers, mainly by <i>D. maidis</i> but <i>D. elimatus</i> has also been reported as a vector. Other species have been found capable of transmitting the pathogen in experimental conditions (<i>D. tripsacoides</i> , <i>D. gelbus</i> , <i>D. guevarai</i> , <i>D. quinquenotatus</i> , <i>D. tripsaci</i> , <i>Exitianus exitiosus</i> , <i>E. obscurinervis</i> , <i>Graminella nigrifons</i> and <i>Stirellus bicolor</i>). Spiroplasmas overwinter within the adult leafhoppers, and when they emerge from overwintering in early spring, they can be infective. <i>S. kunkelii</i> is also pathogenic to its insect vectors, in particular it has been shown to shorten the longevity of <i>D. maidis</i> . It is important to note that <i>S. kunkelii</i> is not seed transmitted.

Pathway	Over long distances, pathways for introducing <i>S. kunkelii</i> into the EPPO region are very limited because <i>S. kunkelii</i> is not seed-transmitted, its insect vectors are not likely to be associated with plants other than maize, maize is not vegetatively multiplied (only grown from seeds) and not normally traded as plants for planting.
Possible risks	Maize is a major crop in many European countries and <i>S. kunkelii</i> causes significant economic damage in its area of origin. Disease control is difficult in the field, and there is little information about effective methods against the insect vector or about the availability of resistant/tolerant maize varieties. Data is also lacking on the potential of establishment of the pathogen and its vector in the EPPO region, as both of them occur in tropical and subtropical regions there may be some climatic constraints in more temperate areas. No data is available on the occurrence of potential insect vectors in the EPPO region (the main vector, <i>D. maidis</i> does not occur in Europe). Finally, data is also lacking on the possible pathways for the introduction of the pathogen via infected plants or insect vectors into the EPPO region.
Source(s)	<p>Ammar ED, Hogenhout SA (2005) Use of immunofluorescence confocal laser scanning microscopy to study distribution of the bacterium corn stunt spiroplasma in vector leafhoppers (Hemiptera: Cicadellidae) and in host plants. <i>Annals of the Entomological Society of America</i>, 98(6), 820-826.</p> <p>Barros TSL, Davis RE, Resende RO, Dally EL (2001) Design of a Polymerase Chain Reaction for specific detection of corn stunt spiroplasma. <i>Plant Disease</i> 85(5), 475-480.</p> <p>Bradbury JF (1991) IML descriptions of fungi and bacteria. <i>Spiroplasma kunkelii</i>. Set 105, no 1041, 2 pp. CABI, Wallingford (GB).</p> <p>CABI Crop Protection Compendium (Datasheets on <i>Spiroplasma kunkelii</i> (corn stunt spiroplasma) and <i>Dalbulus maidis</i>). http://www.cabicompendium.org/cpc/home.asp</p> <p>Carloni E, Virla E, Paradell S, Carpane P, Nome C, Laguna I, Giménez Pecci MP (2011) <i>Exitianus obscurinervis</i> (Hemiptera: Cicadellidae), a new experimental vector of <i>Spiroplasma kunkelii</i>. <i>Journal of Economic Entomology</i> 104(6), 1793-1799.</p> <p>Giménez Pecci MP, Laguna IG, Avila AO, de Remes Lenicov AMM, Virla E, Borgogno C, Nome CF, Paradell S (2002) [Diffusion of corn stunt spiroplasm (<i>Spiroplasma kunkelii</i>) and the vector (<i>Dalbulus maidis</i>) in Argentina.] <i>Revista de la Facultad de Agronomía, La Plata</i> 105(1), 1-8 (in Spanish). http://www.agro.unlp.edu.ar/revista/PDF/105_1_8.pdf</p> <p>Lenardon SL, Laguna IG, Gordon DT, Truol GA, Gomez J, Bradfute OE (1993) Identification of corn stunt spiroplasma in maize from Argentina. <i>Plant Disease</i> 77(1), p 100.</p> <p>Moya-Raygoza G, Palomera-Avalos V, Galaviz-Mejia C (2007) Field overwintering biology of <i>Spiroplasma kunkelii</i> (Mycoplasmatales: Spiroplasmataceae) and its vector <i>Dalbulus maidis</i> (Hemiptera: Cicadellidae). <i>Annals of Applied Biology</i> 151(3), 373-379.</p> <p>Tsai JH, Miller JW (1995) Corn Stunt Spiroplasma. Plant Pathology Circular no. 373, Florida. Department of Agriculture & Consumer Services (US). http://www.doacs.state.fl.us/pi/enpp/pathology/pathcirc/pp373.pdf</p> <p>Virla EG, Díaz CG, Carpane P, Laguna IG, Ramallo J, Gerónimo Gómez L, Giménez-Pecci MP (2004) [Preliminary evaluation about corn yield losses caused by 'Corn stunt spiroplasm' (CSS) in Tucumán, Argentina.] <i>Boletín de Sanidad Vegetal. Plagas</i> 30(2), 403-413.</p> <p>Wei W, Opgenorth DC, Davis RE, Chang CJ, Summers CG, Zhao Y (2006) Characterization of a novel adhesion-like gene and design of a real-time PCR for rapid, sensitive, and specific detection of <i>Spiroplasma kunkelii</i>. <i>Plant Disease</i> 90(9), 1233-1238.</p> <p>Whitcomb RF, Chen TA, Williamson DL, Liao C, Tully JG, Bové JM, Mouches C, Rose DL, Coan ME, Clark TB (1986) <i>Spiroplasma kunkelii</i> sp. nov.: characterization of the etiological agent of corn stunt disease. <i>International Journal of Systematic Bacteriology</i> 36(2), 170-178 (abst.).</p>