



First report of *Rhizoctonia solani* AG1-IB on *Rosmarinus officinalis* in the United Kingdom

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In 2015, six-month-old rosemary plants (*Rosmarinus officinalis*), were received by the Fera Plant Clinic for diagnosis. Web blight symptoms were present, including necrotic areas on stems and leaves. To determine the causal agent, plants were washed and symptom-bearing stems and leaves were excised and placed on potato dextrose agar (PDA) containing penicillin and streptomycin. After three days, colonies morphologically resembling *Rhizoctonia* were transferred onto PDA. After a further seven days, DNA was extracted from the resulting *Rhizoctonia* isolate using previously described methods (Woodhall *et al.*, 2013). The rDNA ITS region was sequenced (GenBank Accession No. KU216129) and found to have 99% similarity with other AG1-IB sequences present in GenBank.

The pathogenicity of the isolate was confirmed by inoculating *R. officinalis* plants with fully colonised PDA plugs (10 x 10 mm). Plants were approximately 30 cm high and 6 months old at time of inoculation and grown in 250 ml pots containing compost (John Innes No. 3). Four plants were inoculated with a colonised agar plug placed at the stem base just above the soil line, another four plants were inoculated with a colonised plug placed at approximately half way up the stem, and another four plants were inoculated with two agar plugs, one placed on the underside of a leaf and the second one on top of a different leaf. Stems and leaves of four additional plants were mock inoculated with sterile plugs approximately half way up each plant. Plastic bags were placed on top of each plant which was supported by a cane. Plants were placed in a glasshouse at 21°C, 18h/6h light/dark and watered as required. After ten days, plants were removed from the soil and assessed for the presence of symptoms (Fig. 1). Symptoms were present on all the inoculated plants. The presence of necrotic regions on stem and leaves of each plant was scored as follows: 0 = symptomless, 1 = up to 10% of the assessed region, 2 = between 11 to 25% of the assessed region, 3 = between 26 to 50% of the assessed region, 4 = over 51% of the assessed region (Table 1). Sclerotia were found on the stem bases of four of the twelve inoculated plants (two leaf-inoculated and two stem-inoculated; Fig. 2). No symptoms were present on the leaves of

control plants but one stem showed a small lesion. However, this lesion was different in appearance to those on the inoculated plants. Symptoms were significantly greater ($p < 0.05$) in *Rhizoctonia*-inoculated plants.

Isolations on tap water agar from stem and leaf material from the four inoculated and symptomatic plants was attempted. *Rhizoctonia solani* AG1-IB (as confirmed by sequencing) was isolated from the symptomatic plants thereby fulfilling Koch's postulates. No *Rhizoctonia* isolates were recovered from attempted isolations taken from nine separate leaf and stem pieces from the mock-inoculated material, including from the atypical lesion.

Web blight of rosemary caused by *R. solani* has been reported previously in the United States, India, Brazil, Italy and Korea (Garibaldi *et al.*, 2013; Aktaruzzaman *et al.*, 2015). Here, for the first time we report *R. solani* AG1-IB as the causal agent of web blight of rosemary in the UK. To the best of our knowledge this is the first report of *R. solani* AG1-IB in the UK and growers should consider its potential impact in rosemary production.

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Figure 1

Figure 2

Table 1. Average disease index of stems and leaves of 16 *Rosmarinus officinalis* plants inoculated with *Rhizoctonia solani* AG1-IB on the stem, leaf or base of the stem, plus mock inoculated plants. Numbers which share the same letters are not statistically significant at $p < 0.05$. Genstat 17th edition was used for statistical analysis (general ANOVA).

Average disease index	Stems	Leaves
Control	0.25 ^a	0.00 ^a
Stem	3.25 ^b	3.00 ^b
Leaf	2.75 ^b	2.25 ^b
Stem Base	2.75 ^b	1.75 ^b
L.s.d.	1.334	1.508
S.e.d.	0.612	0.692
%sev	38.5	55.9

Figure 3

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