SCALE ROT TEST FOR HYBRID LILIES[1]

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Abstract

Isolates of Cylindrocarpon radicicola Wr., Colletotrichum dematium (Pers. ex Fr.) Duke and Rhizoctonia solani Kühn from bulb scales of hardy lilies caused scale rot and lowered bulblet production in a pot test. R. solani had less effect than the other fungi. Cultivar differences in susceptibility to scale rot, apparent in the field, were noted in the pot test. None of the 6 lily cultivars tested were resistant to rot. Wounding of scales did not markedly increase rot.

Introduction

A collection of 50 named, hardy, hybrid lily cultivars and many unnamed seedlings are maintained by the Department of Horticulture, University of Saskatchewan at Saskatoon. Twenty of the named cultivars and all of the seedlings originate from a program of the late Dr. C. F. Patterson of the University. When samples were lifted in early October of 1965 for multiplication by scaling, cultivars were noted to differ in the amount of root, bulb and scale rot. 'Enchantment', 'Dunkirk' and 'Apricot Glow' appeared particularly susceptible to root, bulb and scale rot (Figs. 1 and 2). In some cultivars, e. g, 'Apricot Glow' and 'Enchantment', disease was so severe that few healthy scales were available for bulblet production. In other cases although bulbs were apparently healthy when dug they showedmarked deterioration after storage.

Bulbs were examined for fungal pathogens and Rhizoctonia solani Kühn, several species of Fusarium, and Cylindrocarpon radicicola Wr. were common on diseased roots. On bulb bases and scales these pathogens and Colletotrichum dematium (Pers. ex Fr.) Duke (1) predominated. C. dematium was associated with a "pit" lesion and a general scale base and scale tip rot similar to that described by McWhorter (2), and Moore **(3).** Although mycelial strands of R. solani were common on the upper parts of the scales, that organism appeared to be causing little damage. Botrytis blight (Botrytis elliptica (Berk.) Cke.) was not found on lily foliage. After the bulbs had dried, Penicillium spp. developed on most of the cultivars examined. Mites, symphilids, staphylid beetles, fungus gnats and lesser bulb fly larvae were found on rotted bulbs.

Several years are required to appraise lily hybrids for disease reaction since they must be propagated as clones from scales. The cultivar differences in the amount of scale rot seen in the field suggested that lily scales might be used to screen cultivars for resistance to particular rot pathogens before field testing.

Laboratory moist-chamber tests for resistance to rotting proved unsatisfactory so a pot technique was developed. This paper outlines the method and the results obtained.

Materials and methods

Bulbs of six cultivars of lily were dug in the fall of 1965 and stored for 6 weeks at 4" C. From apparently healthy bulbs, samples were drawn and washed free of soil. The outer scales of these bulbs were discarded and the remaining scales carefully removed. The small inner scales were not used in tests. The scales were then rewashed, drained and placed in 10% Javex (active ingredient, 5% chlorine) for five minutes and washed again in runningwater for 2 hours. After draining, the scales were held at 20°C for 48 hours to suberize.

Isolates of R. solani, C. radicicola and C. dematium from lily scales were grown on autoclaved, moistened wheat bran in 500 ml Erlenmyer flasks for 21 days at 22°C. The cultures were air dried for 3 days and crumbled fine, sieved, and mixed by repeated sieving with autoclaved potting soil in the proportion of 1 to 200 by weight. An equivalent weight of autoclaved check soil was prepared from the same batch.

Six-inch clay pots were filled withpotting soil to 2 inches from the top andautoclaved for 1 hour. After cooling, 4 lots of 24 pots were topped off with soil inoculated with the appropriate pathogen or with the check soil and firmed.

Half of the scales of each cultivar, at random, were wounded once on the inner face, approximately one-third of the distance from the base, by pressing gently with a 4 mm glass rod with a 2 mm pip at the end. All scales were planted immediately after the wounding. In each pot, 6 scales of a cultivar were planted base down, inner surface to the centre of the pot, so that between half and two-thirds of the scale was buried. The pots were watered by sub-irrigating and placed on a bench in a greenhouse maintained at 18 ± 3°C. The pots were topwatered three times per week for the 11-week test period.

Three weeks after first leaf production, all scales were carefully lifted and scored for severity of rot on a scale 0 to 4, where 0 represented no visible rot and 4, complete rot. Bulblet production was also recorded on a 0 to 4 scale. The criteria used for rating rot and bulblet production are illustrated in Figs. 3 and 4. The individual scale ratings were converted to a pot index figure.

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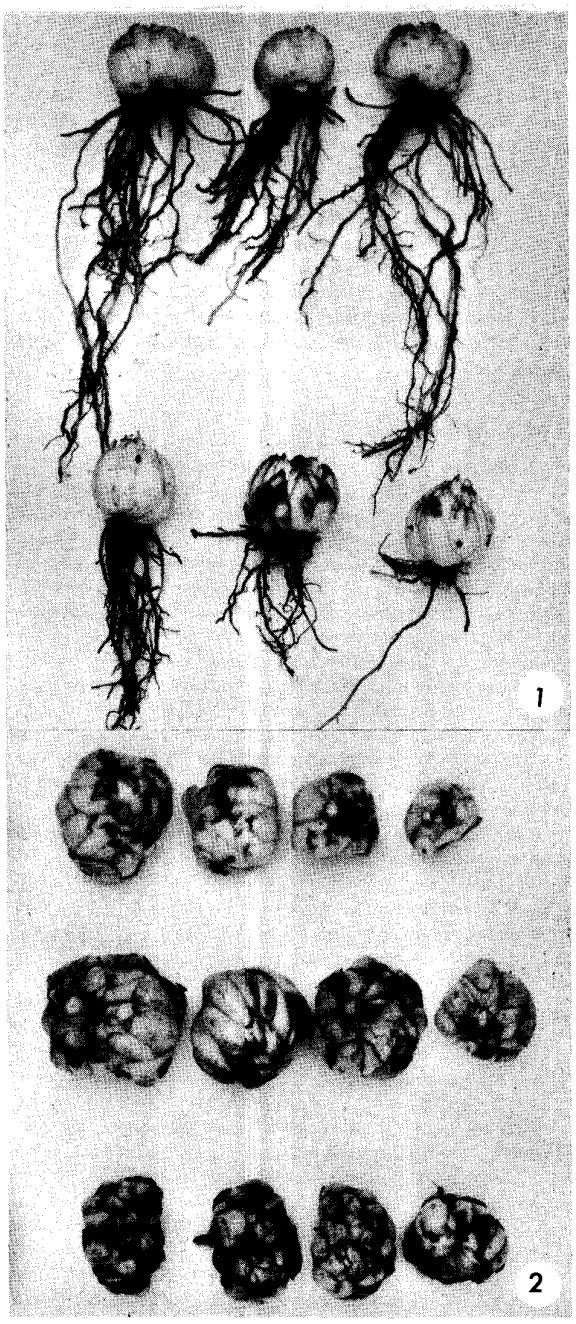

Fig. 1. Root, bulb and scale rot symptoms on 2 lily varieties. Top to bottom row – Dunkirk, Apricot Glow.

Fig.2. Bulb and scale rot symptoms on 3 lily varieties. Top to bottom row – Dunkirk, Apricot Glow, Enchantment.

Fig.3. Scale rot ratings. Examples of rating O (upper row) to 4 (lower row).

Fig.4. Bulblet production ratings. Examples of rating 1 (lower row) to 4 (upper raw). Zero rating not shown.

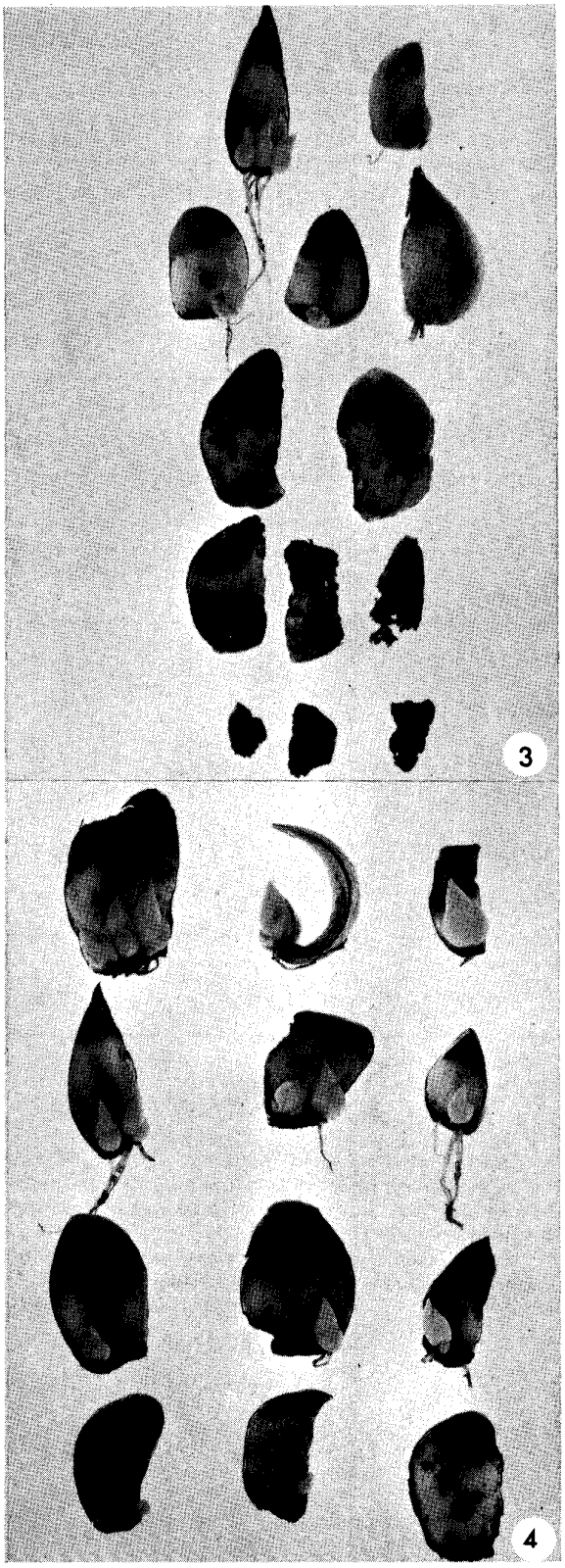

Table 1. The effect of inoculum (a) and cultivar (b) on rot and bulblet production.

Inoculum	Rot Mean	Bulblet Mean
Check	1.30	1.56
R. solani	1.67	1.18
C. radicicola	2.62	0.33
C. dematium	2.56	0.35
LSD 0.05	0.25	0.18
0.01	0.32	0.24

Cultivar	Rot Mean	Bulblet Mean
'Dunkirk'	2.63	0.34
'Jasper'	2.35	0.16
'Lilian Cummings'	2.06	0.55
'Crimson Queen'	1.81	0.31
'Apricot Glow'	1.73	0.72
'Burnished Rose'	1.65	0.55
LSD 0.05	0.30	0.22
0.01	0.39	0.29

Results

Most scales showed fungal rot and superficial blemishes occurred on unrotted scales. Afew scales were damaged by insect larvae; these were recorded as rotted.

Differences in the severity of rotting due to the three pathogens were highly significant over the check (Table 1a). However, R. solani caused much less rotting than C. radicicola or C. dematium which produced similar amounts of damage. Bulblet production was inversely proportional to rot severity (Table 1a) and differences between the inoculated pots and the check in bulblet production were highly significant. R. solani had much less effect on bulblet production than the two other pathogens.

Although none of the cultivars was very resistant to rot, differences between the least susceptible, 'Apricot Glow' and 'Burnished Rose', and the most susceptible, 'Dunkirk' and 'Jasper' were highly significant (Table 1b). There was no clear cut correlation between rot and bulblet production among cultivars. The effect of wounding on rot was not highly significant.

Discussion

Although all three fungi increased rotting in the test the isolate of R. solani was of low pathogenicity and this fungusmightbe omitted from further studies. On the other hand, further tests should include Fusarium spp. since several species were isolated from lily bulbs and some are known causes of bulb rot (2, 3, 4). 'Apricot Glow', which was one of the two cultivars less severely affected in the pot test but most severely damaged in the field, may be very susceptible to fusarium rot. Wounding introduced complications, perhaps reducing precision of the test in respect to cultivars and inocula.

Scale and bulb rots appear to be a limiting factor in the successful cultivation of hardy lilies. Thus, a scale test such as that outlined here would be useful in screening new hybrids before field testing and commercial introduction.

We are indebted to Dr. B. C. Sutton for advice on the nomenclature of Colletotrichum dematium and for confirmation of the identity of Cylindrocarpon radicicola.

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