

New races of *Bremia lactucae* on lettuce in Australia

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Abstract Three distinct patterns of virulence in *Bremia lactucae* were identified in samples of lettuce downy mildew collected between 2005 and 2010 in Australia. These are unique to Australia and it is proposed they be named AUS4, AUS5 and AUS6.

Keywords *Bremia lactucae* · Dm genes · Races · Sextet codes

The previous report on the development of a new race (previously pathotype) of *B. lactucae* on lettuce (*Lactuca sativa*) in Australia was published in 2004 (Trimboli 2004) in which the current races were listed as AUS1-3. Since 2004, several reports were received indicating that cultivars possessing the *Dm18* resistance gene may no longer be resistant to the isolates of *B. lactucae* present in Australia and New Zealand. In spring 2004, the first observation that *Dm 18* had definitely been overcome, was made in the field in Pukekohe, New Zealand where a range of crisphead (iceberg) cultivars with several resistance genes was being trialled (Trimboli unpublished). Subsequently a number of samples was collected from varying types of lettuce affected by downy mildew between 2005 and 2010 from south-east Queensland, southern & eastern Victoria, South

Australia and coastal and inland New South Wales. The avirulence/virulence pattern of each sample was determined using the identical differential set of varieties proposed by the International Bremia Evaluation Board (IBEB). Recently, this differential set has been extended to include five new cultivars (Anon. 2009, 2010).

Analysis of the results of downy mildew samples on the differential set identified three new patterns of virulence (Table 1). It is proposed to designate isolates with these new patterns of virulence, races AUS4, AUS5 and AUS6. Each proposed race is distinct and its virulence pattern on the lettuce differential set does not resemble any of the patterns (and therefore the sextet codes) of races, Bl:1–27 or those of California CaIIa-VIII (Anon. 2009, 2010). Hence there remains a requirement for distinct Australian nomenclature. Table 1 lists the patterns of virulence and the sextet codes for all six races of *Bremia* in Australia. Although AUS4–6 have somewhat similar virulence patterns to Bl:24 and Bl:25, this does not mean that cultivars with resistance to these two European races will be resistant to AUS4–6. *Dm6* is not broken by the Australian races whereas *Dm14* and 15 are. The converse is true for the two European races. Table 2 lists the frequency of isolation and location for each of the new races. The three patterns of virulence were found in samples collected during consecutive years which is

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Table 1 The races of *Bremia lactucae* in Australia

Variety	Cobham Lednicky Green	UC DM2	Dandie UC	R4T57D	Válmaine	Sabine	LSE 57-15	UC DM10	Capitan II	Hilde II	Penmlake	UC DM 1309	PIVTT -18	LSE 102	Colorado	Ninja	Discovery	Argeles	Silvanas	Murai	Bedford	Balesta	Bellisimo		
<i>Dm</i> nr - R nr 0	1	2	3	4	5	6	7	10	11	12	13	14	15	16	17	18	36	37	38	19	20	21	22	23	24
Sextet nr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Sextet value	1	2	4	8	16	32	1	2	4	8	16	32	1	2	4	8	16	32	1	2	4	8	16	32	
Sextet code																									
Race	AUS1	AUS2	AUS3	AUS4	AUS5	AUS6																			
	17/27/00/00	31/31/00/01	31/31/02/01	27/63/43/00	25/63/11/00	18/63/43/00																			

+ = Susceptible reaction - = Resistant reaction

Table 2 Collection data for the new races of *Bremia lactucae* in Australia

Race:	AUS4	AUS5	AUS6
Location:			
NSW	Camden—September, 2005 Werombi—June, 2006 Werombi—October, 2006	Wallacia—May, 2007 Cobbity—July, 2008 Luddenham—July, 2008	Cowra—June, 2008
VIC	Rosebud—May, 2008 Werribee #1—June, 2008 Werribee #2—June, 2008	Lindenow—April, 2006 Lindenow—August, 2006 Lindenow—November, 2006 Rosebud—January, 2006 Rosebud—March, 2009 Rosebud—February, 2010 Rosebud—March, 2010 Werribee—November, 2008 Werribee—May, 2009 Werribee—December, 2009	Geelong—August, 2006 Rosebud—May, 2007 Rosebud—May, 2008 Cranbourne—April, 2010 Werribee—May, 2010 Werribee—June, 2010
QLD	Gympie—July, 2008	Lockyer Valley—July, 2007 Lockyer Valley—July, 2010 Gympie—July, 2008	Toowoomba—April, 2008 Lockyer Valley—August, 2008
SA			Virginia—June, 2008

necessary to designate a new race under the European system of identification (Anon. 2010). The results indicate that cultivars possessing the *Dm18* gene will not provide resistance to the new races, AUS4-6. However there is a number of *Dm* genes, individually or in combination that will provide resistance to AUS4-6 (Table 1).

It should be noted that races AUS1-3 (mainly AUS2 and AUS3) may occasionally be present in field populations of *B. lactucae*, therefore the previous publication should be noted in conjunction to ensure which *Dm* gene(s) would be resistant to all six races (Trimboli 2004).

References

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