ALLELISM TEST FOR RESISTANCE TO RACE 38 OF ANTHRACNOSE IN COMMON BEAN DIFFERENTIAL CULTIVAR, 'WIDUSA'.

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Widusa is one of the twelve differential cultivars proposed by Pastor Corrales (1991) for the characterization of the pathogenic diversity of *Colletotrichum lindemuthianum* (Sacc.& Magnus) Lambs.-Scrib, causing anthracnose. Although the genetic characterization for anthracnose resistance of these differential cultivars is of major importance, not all have been extensively studied.

In this report we present the results of an allelism test addressed to identify the gene(s) conferring resistance to race 38 present in Widusa. The results obtained strongly support that Widusa has two resistance genes against this race, one of them dominant and the other, recessive.

Race 38 of *C. lindemuthianum* is among the most common races found in Northern Spain (Ferreira et al, 1998). The inoculations were carried out in a climate chamber on 8 to 10-days-old seedlings. The seedlings were sprayed with an aqueous conidial suspension derived from monosporic cultures containing 10^6 spores per ml and maintained at 20-22ºC, 95-100% humidity and 12 h photoperiod. The responses of the plants were evaluated after 7-9 days.

Apart from 'Widusa', the plant materials used in this study were the differential cultivars 'Michelite', 'Mexico 222', 'TO', 'TU', 'AB 136' and 'PI 207262', all of them resistant to race 38, 'Andecha', a susceptible to race 38 white seeded cultivar, proceeding from a selection of Asturian (Spain) landraces, 'Xana', a susceptible to race 38 cultivar derived from 'Andecha', and 'A1183', a resistant to race 38 line obtained through a backcross breeding program in which Andecha was the recurrent parental and 'Sanilac' the resistance donor. 'A1183' has the dominant resistance gene, Co-2, proceeding from 'Cornell 49-242' via 'Sanilac' (Mendez de Vigo, 2001).

Table 1 shows the segregations for resistance to race 38 in F2 populations derived from crosses between different materials. The segregation in the F2 population derived from the cross 'Widusa' x 'Xana' (R x S) shows a good fit only to a 13R : 3S ratio. This suggests that two independent genes, one of them dominant and the other recessive, are involved in the resistance to race 38 present in 'Widusa'. The segregations of F2 populations derived from 'PI 207262' (R) x 'Andecha' (S), 'Mexico 222' (R) x 'Andecha' (S), and 'PI 207262' (R) x 'A1183' (R) indicate that the resistant parentals involved in these crosses have a single dominant gene conferring resistance to race 38. Therefore, the fit to a 61R : 3S ratio observed in the F2 populations derived from 'Widusa' x 'PI 207262', 'Widusa' x 'A1183', 'Widusa' x 'Mex 222' and 'Widusa' x 'TU', agrees with the hypothesis of two resistance genes (dominant + recessive) being present in 'Widusa'.

On the other hand, the lack of segregation in the F2 populations derived from crosses between 'Widusa' and 'Michelite', 'TO' and 'AB136' indicates that these three differential cultivars share at least one resistance gene with 'Widusa'. The segregation observed in the F2 population derived from the cross 'AB 136' (R) x 'Xana' (S) fit either a 15R : 1S ratio or a 61R : 3S ratio. This indicates that 'AB 136' has at least two independent dominant genes conferring resistance to race 38 and opens the possibility of a third recessive gene being also present in this material. Unfortunately, we have not yet F2 populations derived from crosses between materials susceptible to race 38 and differential cultivars 'TO' or 'Michelite'.

Table 1.- Allelism test for genetic characterization of the resistance to race 38 of *C. lindemuthianum* in Widusa.

F2 population	Reaction	Observed values		Expected values			χ^2	prob.
		Res.	Sus.	Ratio	Res.	Sus.		
Widusa x Xana	R x S	277	64	13:3	277.1	63.9	0.0001	0.99
PI 207262 x Andecha	R x S	197	54	3:1	188.3	62.8	1.627	0.20
Mexico 222 x Andecha	R x S	76	20	3:1	72.0	24.0	0.889	0.35
PI 207262 x A1183	R x R	252	23	15:1	257.8	17.2	2.09	0.15
Widusa x PI 207262	R x R	303	12	61:3	300.2	14.8	0.544	0.46
Widusa x A1183	R x R	142	8	61:3	143.0	7.0	0.140	0.71
Widusa x Mex 222	R x R	153	6	61:3	151.5	7.5	0.297	0.59
Widusa x TU	R x R	145	12	61:3	149.6	7.4	3.070	0.08
Widusa x TO	R x R	114	0	-	-	-	-	-
Widusa x Michelite	R x R	116	0	-	-	-	-	-
Widusa x AB136	R x R	286	0	-	-	-	-	-
AB136 x Xana	R x S	170	9	15:1	167.8	11.2	0.456	0.50
AB136 x Xana	R x S	170	9	61:3	170.6	8.4	0.046	0.83

In order to confirm the 13 : 3 (resistant : susceptible) segregation in the F2 population derived from Widusa x Xana, 78 F2:3 families proceeding from this F2 progeny (a minimum of 16 individuals per F2:3 family) were evaluated for resistance to race 38. The results obtained (Table 2) agree with the expected segregation under this hypothesis.

Table 2.- Characterization of F2:3 families of Widusa x Xana for their resistance to race 38 of *C. lindemuthianum.*

	Observed values[a]				Expected values[a] (7:6:2:1)				χ^2	prob.
	R	DS	RS	S	R	DS	RS	S		
F2:3 families	34	33	5	6	34.1	29.3	9.8	4.9	3.055	0.38

a: R= F2:3 families with all plants resistant; DS= F2:3 families showing "dominant" segregation for resistance (13R:3S or 3R:1S) ; RS= F2:3 families showing recessive segregation for resistance (1R:3S); S= F2:3 families with all plants susceptible.

Using anthracnose race 65, Alzate Marin et al. (2001, 2002) concluded that 'Widusa' has a single dominant resistance gene, also present in 'PI 207262' and different to the gene(s) conferring resistance in 'TO' and 'SEL 1308'. The results obtained in the present study would indicate the presence of two additional independent genes conferring resistance to race 38 in this differential cultivar.

References

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