

RESPONSE OF PEPPER TO THE INTRAVARIETAL SELECTION FOR RESISTANCE TO

PHYTOPHTHORA CAPSICI (1)

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Abstract

When pepper line PI201232, resistant to Phytophthora capsici, was inoculated with zoospores of Bl, a sufficiently aggressive isolate of that parasite, it was possible to cause some mortality of plantlets almost invariably. Progenies of the surviving plantlets displayed higher levels of resistance in comparison to the source material, line PI201232. On the other hand, line Serrano Criollo de Morelos-334 was not attacked by isolate Bl, while it was partially infected by isolate 8303 of Mexican origin. It seems that resistant lines display variability when inoculated with a sufficiently aggressive isolate. That variability was also displayed when susceptible pepper lines were inoculated with isolate Ca, - less aggressive than Bl. The implications of these results in the analysis on the genetics of the character are discussed.

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Research efforts have long been made in pepper breeding for resistance to Phytophthora capsici. It was in 1960 when Kimble and Grogan reported PI123469, PI201232 and PI201234 as resistant materials. Later on, Smith *et al.* (1967) and Pochard and Chambonnet (1972) suggested that resistance was governed by one or two major genes, although the presence of other modifying genes was necessary to explain some aspects of that mechanism. In Mexico, Guerrero and Laborde (1980), using autoctonous isolates of P. capsici, did not find any resistance on the material considered by the above mentioned authors. However, Guerrero and Laborde (1980) reported a new source of resistance controlled by two independent, recessive genes in the variety Serrano Criollo de Morelos. Consequently, there is a certain contradiction concerning the genetics of the character.

On the other hand, resistant materials are not always 100 per 100 resistant (Kimble and Grogan, 1960; Guerrero and Laborde, 1980). If these materials could be selected to obtain more homogeneously resistant lines, they would be more adequate to explain the genetics of the character and a better material to introduce resistance into commercial varieties. With these objectives, some experiments have been developed. In all of them, inoculations were made with a zoospore suspension as described by Kimble and Grogan (1960), but at a much higher concentration than that used by these authors. We used 60 x 40 x 8 cm trays containing 200 to 300 plantlets belonging to eight different lines. Inoculation was made by pouring 500 ml of a zoospore suspension at a concentration of 300,000 zoospore/ml.

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TABLE 1. Percentages of mortality in several pepper lines inoculated with different isolates of P. capsici.

Line	Isolate	Bl <sup>(1)</sup>	Ca <sup>(1)</sup>	8303 <sup>(2)</sup>
SUSCEPTIBLE LINES				
		100	30-95	100
BREEDING LINE				
- N° 2		40-80	0-25	100
- Phyo 636		0-80	0	100
- Línea n° 10		0-60	0-5	100
RESISTANT LINE				
- Línea 29		0-10	-	100
- PI201232		0-30	0-5	100
- PI201234		0-25	0	100
- Serrano Criollo de Morelos-334		0-5	0	33

(1) Intervals are given as a summary of several experiments.

(2) Data from only one experiment.

In the first experiments, P. capsici strain Bl, isolated from pepper in Spain, was used. This isolate is one of the most aggressive ones in our collection. It was inoculated on different pepper lines, including susceptible (Morrón lines INIA 65-4, INIA 106, INIA 224 and INIA 225) resistant (Línea 29, PI201232, PI201234 and Serrano Criollo de Morelos-334) and breeding lines (N° 2, Phyo 636 and Línea N° 10). One month after inoculation, the mortality percentages showed that even the most resistant lines could produce some susceptible plants (Table 1). Plantlets surviving from these experiments were selfed. Their progenies and source lines were inoculated again with isolate Bl. The mortality average in progenies was lower than in their respective source lines (Table 2). Most progenies showed no mortality (61 cases out of 89). Only three of the 28 remaining ones had a higher mortality than their source lines. These three cases may be explained by escapes to infection in the source line. Therefore, we can conclude that, in general terms, all the varieties studied responded to selection for higher resistance to isolate Bl in only one generation. Variability was not

TABLE 2. Percentages of mortality in different source lines and progenies of selected plants, all inoculated with the isolate B1.

SOURCE LINE		PERCENTAGE
SUCEPTIBLE LINES		100
BREEDING LINE		
- Nº 2		51
- Phyto 636		23
RESISTANT LINE		
- Línea 29		2
- PI201232		13
- PI201234		8
- Serrano Criollo de Morelos 334		0
PROGENIES OF PLANTS WHICH SURVIVED AFTER INOCULATION OF THE ABOVE MENTIONED -- SOURCE LINES		
SOURCE LINE	NUMBER OF PROGENIES	LEVELS OF RESPONSE (PERCENTAGE OF MORTALITY)
Nº 2	8	0
	5	1-10
	10	11-30
	3	31-60
	2	61-100
Total =28	$\bar{x} = 26$	
Phyto 636	10	0
Línea 29	14	0
PI201232	8	0
	5	1-10
	1	11-30
	Total =14	$\bar{x} = 4$
PI201234	10	0
	2	1-10
	Total =12	$\bar{x} = 1$
Serrano Criollo de Morelos 334	11	0

evidenced either in susceptible lines which showed 100 per 100 mortality when inoculated with isolate B1, or in Serrano Criollo de Morelos-334 which showed virtually no mortality. However, in susceptible or highly resistant lines, there are signs of the genetical variability already found in the other materials. For instance, when inoculating the same collection of varieties with isolate Ca, one of our less aggressive isolates of P. capsici obtained from pepper, some of the susceptible material survived (Table 1). Moreover, when using some Mexican isolates of P. capsici such as 8303 (supplied by Guerrero Moreno, INIA Mexico, through INRA), - susceptible material, breeding lines and most resistant lines became completely - susceptible, while Serrano Criollo de Morelos-334, which was not at all or slightly attacked by isolates B1 and Ca, became partially susceptible (Table 1).

We estimate that 100 per 100 resistant lines to isolate Ca could be selected from the above mentioned susceptible lines as it has been shown for isolate B1 on several lines and PI materials. The same can be applied to Serrano Criollo de Morelos-334 with isolate 8303. Actually, we have selected Serrano Criollo de Morelos-334 plants surviving to isolate 8303 and their progenies will be inoculated with this isolate in order to prove that hypothesis.

These results show that there exists some variability in terms of resistance to P. capsici in some resistant lines such as PI201232 and PI201234 usually employed in breeding programs. This variability was eliminated and lines completely resistant to isolate B1 were selected when source lines resulted infected by that isolate in such a way that it caused neither absolute mortality nor total survival. The quick response to selection for resistance suggests that the number of genes involved is small. However, this is only a hypothesis which must be checked.

#### References

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