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PATHOGENIC VARIABILITY OF *UROMYCES APPENDICULATUS* IN BEAN PRODUCTION AREAS IN NORTHERN ECUADOR.

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Introduction

Rust, caused by *Uromyces appendiculatus*, is one of the most important diseases of common bean that occurs in the major bean production areas of Ecuador. The northern region in Ecuador, involving Carchi, Imbabura, and Pichincha provinces, represents one of the most important regions of the country where bush bean are planted on 20,000 ha every year (III Censo Agropecuario, 2002). The disease is particularly serious as many local cultivars are highly susceptible and farmers have sequential plantings that favors the spread of the disease. The bean breeding program in Ecuador has focused on the development of rust resistance cultivars for this important production area, but in order to generate cultivars with durable resistance it is important to study the variability of rust races present in the area to know which genes could be effective throughout the region.

Materials and methods

Bean tissue samples infected with rust were collected in production areas during 2004. The samples were processed in the laboratory of the National Institute of Agricultural Research (INIAP) at Santa Catalina Research Station. Monosporic isolates obtained from single uredinia were increased in the susceptible cultivar 'Red Small Garden' (RSG). Eleven isolates were inoculated on the 12 new standard bean rust differentials. The inoculum consisted of a suspension of 30,000 spores/ml. Primary leaves of bean seedlings from the differential set were uniformly inoculated with each isolate using a hand sprayer. The plants were placed in a mist chamber at 100% RH for 18 h. Evaluations were conducted twice using the scale described by Stavely (1984) after the signs of the disease appeared. Plants rated 1-3 were classified as an incompatible reaction and 4-6 as a compatible reaction. To name the races the binary system proposed in the 3rd International Rust Workshop (Steadman et al., 2002) was employed.

Results

Eight different physiological races were identified from the 11 isolates evaluated. The eight races identified were 0:20, 0:24, 2:24, 0:28, 2:28, 0:29, 0:30, 0:61 (Table 1). The isolates were highly virulent on genotypes with Andean origin. The race 0:61 was the most virulent race in this group infecting five of 12 differentials. The five differentials belong to the Andean gene pool. The races 2:24 and 2:28 were able to infect not only Andean differential genotypes but cultivar 'Aurora' from the Mesoamerican gene pool. Race 0:30 was the only race able to infect cultivar Redlands Pioneer from the Andean gene pool. Cultivar 'Golden Gate Wax' was susceptible to all isolates. PC-50 and Montcalm showed a compatible reaction with almost all isolates. The time to

express the symptoms was variable with different isolates so for that reason two evaluations were conducted.

Table 1. Races of *Uromyces appendiculatus* identified with the standard bean differential set for rust. Santa Catalina Research Station. 2005.

Isolate code	Mesoamerican Gene Pool						Binary number	Andean Gene Pool						Binary number
	GN 1140	Aurora	Mex 309	Mex 235	CNC	PI 181996		Early Gallatin	Redlands Pioneer	Montcalm	PC-50	GGW	PI 260418	
1	-	-	-	-	-	-	0	+	-	+	+	+	+	61
2	-	-	-	-	-	-	0	+	-	+	+	+	-	29
3	-	-	-	-	-	-	0	-	-	+	+	+	-	28
4	-	-	-	-	-	-	0	-	-	-	+	+	-	24
5	-	-	-	-	-	-	0	+	-	+	+	+	-	29
8	-	-	-	-	-	-	0	-	-	+	+	+	-	28
9	-	-	-	-	-	-	0	-	-	+	+	+	-	28
13	-	-	-	-	-	-	0	-	-	+	-	+	-	20
16	-	+	-	-	-	-	2	-	-	+	+	+	-	28
20	-	+	-	-	-	-	2	-	-	+	+	+	-	24
21	-	-	-	-	-	-	0	-	+	+	+	+	-	30

¹ - = Incompatible reaction, + = Compatible reaction

Conclusions

Large variability was observed among the isolates evaluated. The small sample size showed that more depth studies on the pathogenic variability must be conducted since eight races out of 11 isolates were identified. The susceptibility displayed by the majority of Andean genotypes in the differential set suggested that the breeding strategy must focus on the incorporation of Mesoamerican resistance genes in local cultivars. Only the differential cultivar 'Aurora' (*Ur-3* gene) among the Mesoamerican group of differential showed compatibility reaction with isolates

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