Breeding for Resistance to Strike Leaf Blight (*Scolecotrichum graminis*) of Orchardgras in Argentina

A. Andrés
INTA, Argentina

M. Ruiz Diaz
INTA, Argentina

J. Anonne
INTA, Argentina

B. S. Rosso
INTA, Argentina

ID Nº 12-02

BREEDING FOR RESISTANCE TO STRIKE LEAF BLIGHT (*SCOLECOTRICHUM GRAMINIS*) OF ORCHARDGRAS IN ARGENTINA

Andrés, A.[1], M. Ruiz Diaz[1], J. Anonne[1] and B. Rosso[1]

[1]INTA EEA Pergamino. CC 31 (2700) Pergamino, Buenos Aires, Argentina

aandres@pergamino.inta.gov.ar

Abstract

A collection of orchardgrass (*Dactylis glomerata*) was screened under field conditions for resistance to strike leaf blight (SLB) caused by the fungus *Scolecotrichum graminis.* On the whole, thirty five entries from different countries were studied by sampling ten genotypes from each origin, clonally propagated and transplanted as spaced-plant trial in a randomized design with two replicates. Plants were periodically assessed during 1996 and 1997 by estimating disease severity (percentage of leaf affected). During 1997, disease severity data were used to calculate the area under disease progress curves (AUDPC) as a complementary attribute to screen for resistance to SLB. Important genetic differences were observed among different entries by analyzing the amount of symptoms through disease severity during 1996. Similarly, large differences were detected between entries when analyzed through AUDPC, none of them related to origin of germplasm. Results indicated that there should be good possibilities of selecting resistant genotypes to *S. graminis* from INTA Pergamino orchardgrass germoplasm collection.

Keywords: germplasm, orchardgrass, genetic variability, disease resistance, *Scolecotrichum graminis*, *Dactylis glomerata*, AUDPC.

Introduction

Streak leaf blight (SLB) caused by the fungus *Scolecotrichum graminis* is one of the most widespread and destructive diseases of orchardgrass (*Dactylis glomerata*) occurring in Argentina. The grayish-brown to dark brown linear lesions occur on the leaf blade and extend into the leaf sheath. Many authors have reported on the significance of the disease as a limiting factor to variety performance potential (Thomas, 1997). In Argentina, foreign cultivars have consistently shown high susceptibility to *S. graminis* and there is evidence of its deleterious effect on forage yield (Andrés and Annone, 1998) as well as on quality. On the other hand, important levels of incomplete resistance have been found on adapted populations used in intensive forage systems in the Buenos Aires province (Andrés and Barufaldi, 1997). The objectives of this study were to characterize the resistance to *S. graminis* in the orchardgrass collection, of the Germplasm Bank at the Pergamino Experiment Station (INTA), and to select genotypes for the breeding programme in progress at our Institute. The final aim of this programme is to provide new cultivars of orchardgrass, with reasonable levels of resistance to the disease.

Material and Methods

Thirty five entries of orchardgrass (13 OECD – Organisation for Economic Co-operation and Development, 18 european populations and 4 argentinean populations) were collected by March 1996 from the germplasm collection at

Pergamino Experiment Station (Buenos Aires). Each entry was randomly sampled by taking ramets from ten plants, and transplanted into pots with compost and grown under greenhouse conditions in order to increase green tissue and reduce any carry-over effect. At the stage of eight tillers, plants were split into two ramets, and transplanted 0.60 m apart in a randomized block design with two replicates, at the experimental grounds of INTA Pergamino during 1996. During 1996 and 1997 all plants were measured or scored for a range of morphological and phytopatological attributes. The severity of SLB was assessed on each plant as the proportion of leaf area with symptoms appeared using a 0 (0% affected tissue) to 5 (100% affected tissue) local scale (Andrés and Annone, 1998). Assessments of SLB were carried out at 10 day-intervals in the spring season of 1996/97, starting when first symptoms were observed. Area under the disease progress curve (AUDPC) was estimated for each plant-entry combination, from disease severity values, as described by Shaner and Finney (1977). Statistical analyses were performed on each attribute by using the SAS programme (SAS Institute Inc., 1989), considering nested analyses for populations and genotypes. The genetic parameters estimated were genetic variance, environmental variance and broad sense heritability (H).

Results and Discussion

All entries showed some symptoms of SLB. However, the level of disease severity varied greatly among entries (Table 1). No relationship was observed between disease severity and origin, since high and low values were common among representatives of the different countries. The estimated heritability values using disease severity parameters showed that some entries make up good sources of variability for resistance to SLB. This was the case for Syn C29 (ARG), Avion

(SP), Santiso (SP), Sarria (SP). Quiroga (SP), Beariz (SP), Borth (UK) and Cesarina (IT). The analysis of the data through the AUDPC displayed a similar trend (Fig. 1). During 1997 a great proportion of entriess showed two highest infection points at two different dates. For some Spanish entries (Sarria, Chantada, Meira) the disease progress had a linear increase and the infection was more severe than in other Spanish entries (Panton, Aguiar, Quiroga) (Fig. 1). The Argentinien populations (S.A. Areco, Gral. Villegas, Balcarce, Bolivar) collected in Buenos Aires province from old pastures grazed laxly by cattle, showed extremely different AUPDC. Among the Italian cultivars, Dora showed the highest AUDPC, while Cesarina had the lowest one. The results suggest that there should be good possibilities of selecting resistant genotypes to *S. graminis* from the INTA-Pergamino orchardgrass germplasm collection.

References

Andrés, A. and Annone J. (1998). Enfermedades del pasto ovillo: avances en la selección por resistencia genética. Rev. Tec. Agrop. INTA Pergamino. **1**: 25-27.

Andrés, A. and Barufaldi M. (1997). Differences between adapted populations of *Dactylis glomerata* L. in Argentina. Proc.18th. Int.Grass.Cong., Winnipeg, Saskatoon, Canada. pp. 103-104.

SAS Institute Inc. (1989). SAS/STAT User's guide, version 6.07 (4^{th} ed.) SAS Institute Inc. North Carolina.

Shanner, G. and Finney R.E. (1977). The effect of nitrogen fertilization on the expression of slow- mildewing resistance to Knox wheat. Phytopathology **67**: 1051-1056.

Thomas, J.E. (1997) The significance of Disease as a Limiting Factor to Variety Performance Potential. Pages 114-123 in J.R. Weddell, ed. Seeds of Progress. BGS Occasional Symposium no 31. Nottingham, UK.

Table 1 - Severity mean and broad sense heritability (H) of orchardgrass entries from Pergamino Germplasm Bank at highest infection date

ENTRY	ORIGIN	SEVERITY MEAN*	H
Le Oberon	Uruguay (UR)	3.67	0.04
Wana S Per	Argentina (ARG)	2.29	0.03
Cesarina	Italy (IT)	4.19	0.60
Eldar	Italy (IT)	2.19	0.01
Var. Monte	Italy (IT)	3.92	0.01
Akimidori	Japan (JAP)	4.17	0.28
Aonami	Japan (JAP)	2.97	0.59
Makibamidori	Japan (JAP)	3.85	0.51
Hokuto	Japan (JAP)	4.36	0.27
Amply	France (FR)	3.66	0.01
Saborto	UK	3.84	0.01
Dora	Italy (IT)	4.14	0.15
P. del Monte	Portugal (POR)	4.02	0.03
SynC29	Argentina (ARG)	3.07	0.54
Rodez	France (FR)	3.53	0.03
Avion	Spain (SP)	4.22	0.36
Vilapouca	Spain (SP)	3.14	0.01
Santiso	Spain (SP)	4.06	0.28
Parga	Spain (SP)	3.99	0.20
Villalba	Spain (SP)	4.84	0.01
Goiriz	Spain (SP)	2.56	0.01
Meira	Spain (SP)	3.09	0.01
Sarria	Spain (SP)	0.54	0.36
Chantada	Spain (SP)	3.28	0.01
P. Aguiar	Spain (SP)	2.81	0.01
Panton	Spain (SP)	3.41	0.01
Quiroga	Spain (SP)	3.41	0.34
P. Trives	Spain (SP)	2.57	0.01
Bande	Spain (SP)	2.71	0.18
Beariz	Spain (SP)	3.24	0.46
Borth	UK	3.39	0.72
Ballidehob	UK	3.25	0.01
Bolívar	Argentina (ARG)	2.73	0.27
Balcarce	Argentina (ARG)	1.93	0.15
Gral. Villegas	Argentina (ARG)	3.07	0.01
S.A. Areco	Argentina (ARG)	3.70	0.15
LSR (0.05):		1.41	

*SCALE: 0 (0% affected tissue) to 5 (100% affected tissue)

Figure 1- Área under disease progress curves (AUDPC) for strike leaf blight on orchardgrass blight on orchardgrass germplam entries