Managing spot-type net blotch through cultivar resistance and fungicides in Uruguay

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INTRODUCTION

Spot-type net blotch (STNB) caused by *Pyrenophora teres* f. *maculata* Smed.Pet., has become a predominant disease of barley in Uruguay since it was first reported in 2004 (Pereyra and Germán, 2004) (Figure 1).
Major factors that contributed to this had been no-till and cultivar susceptibility.
In order to optimise disease control measures, cultivar resistance and fungicides were investigated under Uruguayan conditions.

MATERIALS AND METHODS

Evaluating cultivars for resistance

Commercial cultivars, advanced lines and introduced genotypes were characterised under intermediate to high disease pressure in field trials and nurseries at La Estanzuela-Colonia and Young-Río Negro from 2008 to 2010. Field trials were conducted under natural STNB infection and nurseries were planted on infected stubble. STNB severity (%) was assessed at ZGS 33 and 71.

Fungicide strategy and efficacy trials

Two fields trials per year were conducted at Palo Solo. Soriano from 2008 to 2010. Susceptible cv. MUSA 936 was no-till planted on infected stubble. A randomised block design with four replicates was used Treatments for fungicide strategy evaluation corresponded to different fungicide application times: single applications of pyraclostrobin + epoxiconazle at ZGS 22, 31 and 39, double applications at ZGS 22+31, 31+39 and three times applications at ZGS22+31+39. Treatments for the efficacy studies included different fungicides and rates, applied at STNB threshold levels of 5-7% severity. In all cases, STNB severity (%) was assessed four to five times from GS 33 to 79. Area under STNB progress curve (AUDPC) was calculated and grain yield and yield of plump grains (bigger than 2.5mm) were determined.

Figure 1. Symptoms of spot-type net blotch caused by *Pyrenophora teres* f. *maculata*

Table 1. Disease reaction of barley cultivars planted in Uruguay

CULTIVAR	Area planted in 2010 (%)	DISEASE						
		SC[1]	NTNB	STNB	SB	FHB	LR	PM
INIA Ceibo	27	LI[2]	L	IL	IH	IH	H	H
INIA Arrayán	25	L	L	IL	I	I	IH	IH
MUSA 936	15	H	L	H	IH	IH	IH	IH
Norteña Carumbé	13	IH	LI	IH	I	H	I	H
Norteña Daymán	10	IH	I	H	I	IH	H	HI
Ackermann Madi	4	H	H	H	I	IH	L	LI
INIA Guaviyú	3	I	LI	I	LI	I	IH	H
MP 1010	2	IL	LI	IH	IH	LI	L	I

[1]SC: scald; NTNB: net-type net blotch; STNB: spot-type net blotch; FHB: Fusarium head blight; LR: leaf rust; PM: powdery mildew
[2]L: low susceptibility; I: intermediate susceptibility; H: high susceptibility

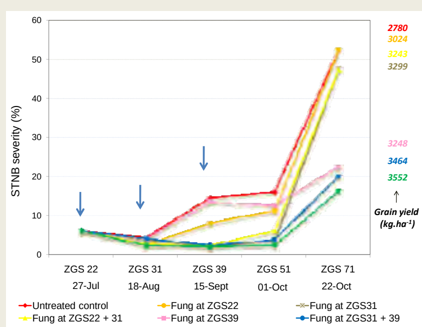

Figure 2. STNB severity and grain yield for different fungicide application strategies. Arrows indicate when fungicide was applied.

Table 2. Area under STNB progress curve, grain yield and plump grain yield in different fungicides in 2009

FUNGICIDE	ACTIVE INGREDIENT	RATE ($cc.ha^{-1}$)	AUDPC	GRAIN YIELD ($kg.ha^{-1}$)	GRAIN >2.5mm ($kg.ha^{-1}$)
Untreated control	-	-	1564.4 a[1]	2072.1	1776.0 bc[2]
Triad + Tebutec	Kresoxim-methyl + Tebuconazole	250+500	1001.0 cde	2467.9	2167.0 abc
Azobin +Tebutec	Azoxystrobin + Tebuconazole	150+500	1030.5 bcde	2343.9	1906.8 abc
Allegro	Kresoxim-methyl + Epoxiconazole	1000	1054.6 bcde	2433.1	2256.4 abc
Opera	Pyraclostrobin + Epoxiconazole	1000	976.4 de	2608.8	2418.0 ab
EXP.BAS 627		1200	1268.9 b	2548.5	1948.2 abc
Ventum Plus	Azoxystrobin + Tebuconazole	400	1038.6 bcde	2630.6	2173.2 abc
Conzerto	Kresoxim-methyl + Tebuconazole	1000	1241.3 bc	2372.0	1929.8 abc
Nativo	Trifloxystrobin + Tebuconazole	800	1052.4 bcde	2447.3	2272.8 abc
Orius	Tebuconazole	750	1242.1 bc	2154.2	1801.3 bc
Silvacur	Tebuconazole	750	1256.6 bc	1835.2	1600.7 c
Sinfonia HK	Kresoxim-methyl + Hexaconazole	1000	1171.8 bcd	2423.3	2139.5 abc
EXP.SAUDU1		400	885.8 e	2813.7	2494.4 a
EXP.SAUDU2		1000	1097.3 bcde	2149.8	1786.6 bc
Orchestra 275	Kresoxim-methyl + Tebuconazole	1000	1082.5 bcde	2356.9	2132.4 abc
P>			*0.0010*	*ns*	*0.0586*

[1]Values in a column followed by different letters are significantly different according to Tukey test at *0.05*.

RESULTS

- Few commonly grown cultivars had high levels of resistance. Cultivars INIA Arrayán and INIA Ceibo that comprised 40 to 52 % of the barley area in 2009 and 2010 had intermediate to low susceptibility and represented the best commercial cultivars for STNB (Table 1) Some advanced lines of the cross INIA Viraro/Perun had high levels of resistance. Introduced genotypes Galleon, TR473, ND23211 and NRB 08 400 had low to intermediate levels of STNB *(data not shown).*
- Optimum timing for fungicide application for STNB control in a susceptible cultivar with large amount of infected stubble on the soil surface was at stem elongation (ZGS 31 to 39) when disease thresholds of 5-8% were attained in double application. Even when the best strategy to reduce STNB and to improve grain yield was to apply fungicide at ZGS 22+31+39, this measure proved not to be profitable.
- Pyraclostrobin + epoxiconazole, trifloxystrobin + tebuconazole, azoxystrobin + tebuconazole and kresoxim-methyl + epoxiconazole were the most effective fungicides in controlling STNB in a single application, improving grain physical quality. (Table 2). No significant differences were found in grain yield in any of the three years. .

✓ Results from these studies suggest that it may be possible to manage STNB by cultivar resistance and timely fungicide applications..
✓ When a susceptible cultivar is planted on infected stubble more than a single fungicide application would be necessary to control STNB

REFERENCES

Pereyra, S. A. y Germán, S. E. 2004. First Report of Spot-Type of Barley Net Blotch Caused by *Pyrenophora teres* f. sp. *maculata* in Uruguay. Plant Disease 88:1162