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Comparison of the efficiency of soybean rust control by preventive and curative fungicides sprays, combined with different adjuvants, in Brazil.

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Introduction

The fungicides chemical groups more effective for Asian soybean rust control have been triazoles or the mixtures of strobilurin with triazole. From the 2007/08 harvest, it was observed a reduction of the efficiency of some triazoles on disease control, probably due to selection of populations less sensitive to this group of fungicides by the constant exposure of the pathogen. Until then, the triazoles had better curative effect on soybean rust and strobilurins, better protective effect. Thus, it is essential that the control of the disease is preferably performed with fungicides formulated in a mixture of strobilurin and triazole applied preventively or during the colonization of the host by the pathogen, and with technology that allows for the best deposition, distribution and retention of fungicide in the soybean leaves. The objective of this study was to evaluate the efficiency of Asian soybean rust control through preventive and curative applications of mixtures of strobilurin and triazole, with different adjuvants.

Material and Methods

The experiments were carried out in field condition of commercial soybean production, in Goiania, Goias State, Brazil, in the 2008/2009 crop season, with the cultivar BRSGO 8560 RR, sowed in January 10th and harvest in May 7th. The experimental arrangement was a randomized block design with four replications. Plots were composed by four soybean rows 6 m long. Fungicides were applied three times by a backpack sprayer pressurized with CO_2, delivering 200 l/ha with Jacto® AVI 110-02 spray nozzles. This study was conducted in two trials in order to evaluate the preventive and curative effect of the fungicides and adjuvants combinations (Table 1). In the preventive trial, first spray was done without pustules presents on leaves, at initial flowering stage (R1), second spray at pod formation (R5.1) and third spray at middle grain formation (R5.3). The curative trial had first spray when pustules started to appear in the bottom canopy, at full flowering stage (R2), second spray at initial grain formation (R5.1) and third spray at ending grain formation (R5.4). It was evaluated the disease severity at R2, R5.2 and R5.5 plant development stages by estimating the infected leaf area based on a diagrammatic scale proposed by Godoy et al. (2006). It were also evaluated the level of plant defoliation when untreated plots reached 100%, soybean yield and weight of hundred grains. Statistical analysis was conducted by the software SASM-Agri (Canteri et al., 2001).

Table 1. Treatment data.

Trt.#	Commercial product	Active ingredient	Rate	
			g i.a./ha	l c.p./ha
1	Untreated check	-	-	-
2	BAS 556 01F	pyraclostrobin + metconazole	65 + 40	0,5
3	BAS 512 14F + Break Thru[1]	pyraclostrobin + epoxiconazole	65 + 40	0,25
4	BAS 512 14F + Aureo[2]	pyraclostrobin + epoxiconazole	65 + 40	0,25
5	BAS 512 14F + Dash[3]	pyraclostrobin + epoxiconazole	65 + 40	0,25
6	Opera + Assist[4]	pyraclostrobin + epoxiconazole	66.5 + 25	0,5
7	Opera + Break Thru[1]	pyraclostrobin + epoxiconazole	66.5 + 25	0,5
8	Opera + Aureo[2]	pyraclostrobin + epoxiconazole	66.5 + 25	0,5
9	Priori Xtra + Nimbus[5]	azoxystrobin + cyproconazole	60 + 24	0,3
10	Aproach Prima + Nimbus[5]	picoxystrobin + cyproconazole	60 + 24	0,3

1= added adhesive Break Thru® 40 ml/ha; 2= added soybean metilated oil Aureo® 0,25% v/v; 3= added mineral oil Dash® 0,3% v/v; 4= added mineral oil Assist® 500 ml/ha; 5= added mineral oil Nimbus® 600 ml/ha.

Results

All treatments controlled soybean rust (higher than 90% efficiency) and were more effective when applied preventively. The disease severity at soybean stage R5.5 ranged from 0.38% to 2.00% (check 71.25%) on preventive treatments, and from 1.25% to 6.00% (check 85%) on curative treatments (Table 2). The defoliation index at stage R6 (check 100%) ranged from 33% to 48% preventive and from 43% to 64% curative (Table 2). Soybean yield varied from 3078 kg ha^{-1} to 2638 kg ha^{-1} preventive (check 1547 kg ha^{-1}) against 2633 kg ha^{-1} to 2265 kg ha^{-1} curative (check 1250 kg ha^{-1}) (Table 3).

Table 2. Effect of the preventive and curative fungicides treatments on the control of soybean rust and on defoliation of soybean cultivar BRSGO 8560 RR. Goiania, GO, Brazil. 2009.

Trt. #	Severity at R2[1]		Severity at R5.2[1]		Severity at R5.5[1]		Defoliation[2]	
	Prev.[3]	Curat.[4]	Prev.	Curat.	Prev.	Curat.	Prev.	Curat.
1.	0	0,01	0,32 a	0,26 a	71,25 a	85,00 a	100 a	100 a
2.	0	0,01	0,02 b	0,01 b	0,73 c	5,25 b	34 c	59 b
3.	0	0,01	0,01 b	0,01 b	1,25 b	5,25 b	48 b	64 b
4.	0	0,01	0,00 b	0,02 b	0,63 c	6,00 b	44 b	57 b
5.	0	0,01	0,00 b	0,03 b	2,00 b	4,00 c	41 b	63 b
6.	0	0,01	0,00 b	0,01 b	0,80 c	5,25 b	33 c	59 b
7.	0	0,01	0,00 b	0,08 b	0,43 c	3,25 d	43 b	61 b
8.	0	0,01	0,02 b	0,02 b	2,00 b	3,25 d	43 b	55 b
9.	0	0,01	0,00 b	0,04 b	0,70 c	1,90 e	45 b	53 b
10.	0	0,01	0,00 b	0,04 b	0,38 c	1,25 e	34 c	43 c
CV (%)	-	-	55,43	39,11	19,69	5,05	11,92	8,35

[1]Severity of soybean rust at plant stage R2, R5.2 and R5.5, respectively, expressed in % of infected leave area; [2]Soybean plant defoliation when check plots showed total defoliation (R6); [3]Prev.= means of preventive treatments; [4]Curat.= means of curative treatments. Means followed by the same letters in the column did not differ by Scott-Knott's test ($P \leq 0,05$).

Table 3. Effect of the fungicides treatments on the yield and grain weight of soybean cultivar BRSGO 8560 RR. Goiania, GO, Brazil. 2009.

Trt. #	Yield (kg/ha)			Grain weith (g)[1]		
	Preventive	Curative	Δ (%)[2]	Preventive	Curative	Δ (%)[3]
1.	1547.3 b	1250.0 b	19.2	9.12 b	8.55 b	6.2
2.	2837.6 a	2362.4 a	16.7	13.60 a	12.30 a	9.5
3.	2915.2 a	2264.7 a	22.3	13.63 a	11.71 a	14.1
4.	2990.8 a	2499.9 a	16.4	13.22 a	11.81 a	10.7
5.	2840.6 a	2462.3 a	13.3	13.48 a	11.83 a	12.2
6.	2638.5 a	2393.6 a	9.3	13.29 a	12.03 a	9.5
7.	3077.9 a	2330.8 a	24.3	13.20 a	11.83 a	10.4
8.	2894.7 a	2633.1 a	9.0	12.52 a	12.15 a	2.9
9.	2952.3 a	2359.2 a	20.1	12.86 a	11.90 a	7.5
10.	2931.6 a	2519.4 a	14.1	13.01 a	11.63 a	10.6
CV (%)	13.82	11.47	-	4.12	4.28	-

[1] means of 100 grain weight; [2] % yield reduction of curative treatments in relation to preventive ones; [3] % grain weight reduction of curative treatments in relation to preventive ones.
Means followed by the same letters in the column did not differ by Scott-Knott's test ($P \leq 0,05$).

Conclusions

- All treatments were efficient to control Asian soybean rust with three sprays at the condition of this experiment.
- No difference was observed among the adjuvants used.