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Rice Affected by Seed Treatment, Soil Compaction and Nitrogen at No-tillage and Conventional Tillage

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INTRODUCTION

The water availability for flood irrigated rice (*Oryza sativa* L.) is decreasing worldwide. Therefore, developing technologies to allow growing rice in aerobic condition, such as a no-tillage system (NTS) can contribute to produce upland rice grains without yield losses and also in saving more water.

This study aimed at determining the best combination of management options for producing upland rice.

MATERIAL AND METHODS

A randomized blocks design, in a factorial scheme, was used in the Brazilian Cerrado. The treatments consisted of a combination of five rice cultivars (BRS Caçula, BRS Serra Dourada, BRS Sertaneja and BRS Esmeralda) with two compaction pressures in the seed furrow (25 kPa or 126 kPa), two types of seed treatment (with or without pesticide) and two types of N management (all at sowing or all at topdressing).

CONCLUSION

1. Applying N at sowing instead of at topdressing produced higher grain yield in the no-tillage system (NTS).
2. Under this system, upland rice genotypes show higher grain yield, with higher compaction pressure.
3. Seed treatment with pesticide provided greater grain yield for the BRS Sertaneja, in NTS, and for all genotypes in the conventional tillage (CTS).
4. BRS Esmeralda, in NTS, and BRS Esmeralda and BRS Primavera, in CTS, were the most productive genotypes. Moreover, in NTS, the application of N at sowing and the compaction pressure on the seed furrow are important for increasing upland rice grain yield.
5. In CTS, seed treatment is important to improve upland rice grain yield.

Table 3. Number of tillers (NT), plant height (PH), number of panicles m⁻² (PAN), spikelet fertility (SF), 1,000-grain weight (MGRain) and grain yield (YIELD) of upland rice cultivars under conventional tillage, as a function of N management, compaction pressure on seed furrow and seed treatment with pesticides.

Treatment	NT	PH	PAN	SF	MGRain	YIELD
<i>N management</i>	n° m ⁻²	Cm	n° m ⁻²	%	g	kg ha ⁻¹
20 days after sowing	240 a	114 a	239 a	88 a	27.84 a	4720 a
1 day after sowing	225 b	114 a	224 b	88 a	28.09 a	4585 a
<i>Compaction pressure</i>						
25 kPa	233 a	114 a	232 a	88 a	27.87 a	4586 a
126 kPa	232 a	115 a	231 a	88 a	28.07 a	4718 a
<i>Seed treatment</i>						
Without pesticide	239 a	114 a	238 a	88 a	27.79 b	4569 b
With pesticide	226 a	114 a	225 a	88 a	28.14 a	4735 a
<i>Cultivars</i>						
BRS Caçula	275 a	110 c	274 a	90 a	28.10 b	3421 c
BRS Serra Dourada	287 a	110 c	285 a	89 ab	27.73 b	4677 b
BRS Sertaneja	161 c	119 a	160 c	85 c	29.41 a	4444 b
BRS Esmeralda	228 b	113 b	227 b	88 b	26.27 c	5410 a
BRS Primavera	212 b	119 a	211 b	88 b	28.33 b	5310 a

¹ Means followed by the same letter in the column do not differ according to the Tukey's test (p ≤ 0.05). The average growth duration of the cultivars was 109 days.

RESULTS AND DISCUSSION

Table 1. Number of tillers (NT), plant height (PH), number of panicles m⁻² (PAN), spikelet fertility (SF), 1,000-grain weight (MGRain) and grain yield (YIELD) of upland rice cultivars under no-tillage system, as a function of N management, compaction pressure in the seed furrow and seed treatment with pesticide.

Treatment	NT	PH	PAN	SF	MGRain	YIELD
<i>N management</i>	n° m ⁻²	Cm	n° m ⁻²	%	g	kg ha ⁻¹
20 days after sowing	199 a	105 b	197 a	88 a	27.45 a	3446 b
1 day after sowing	202 a	108 a	201 a	89 a	27.37 a	3678 a
<i>Compaction pressure</i>						
25 kPa	196 b	105 b	195 b	88 a	27.49 a	3362 b
126 kPa	205 a	108 a	204 a	89 a	27.33 a	3763 a
<i>Seed treatment</i>						
Without pesticide	191 b	106 a	190 b	88 a	27.45 a	3419 b
With pesticide	210 a	107 a	209 a	89 a	27.37 a	3705 a
<i>Cultivars</i>						
BRS Caçula	241 a	106 c	240 a	88 b	27.22 b	2508 c
BRS Serra Dourada	232 a	100 d	230 b	91 a	23.10 c	3774 b
BRS Sertaneja	146 c	111 a	144 c	86 c	30.95 a	2895 c
BRS Esmeralda	197 b	107 bc	196 b	88 b	27.37 b	4533 a
BRS Primavera	188 b	109 ab	187 b	88 b	28.41 b	4102 b

¹ Means followed by the same letter in the column do not differ according to the Tukey's test (p ≤ 0.05). The average growth duration of the cultivars was 109 days.

Table 2. Effect of interactions between cultivars and seed treatment, and between seed treatment and nitrogen management, in the grain yield of upland rice cultivated under no-tillage system.

Cultivars	Seed treatment with pesticide	
	without	with
	kg ha ⁻¹	
BRS Caçula	2467 c A	2548 d A
BRS Serra Dourada	3701 b A	3848 bc A
BRS Sertaneja	2430 c B	3359 c A
BRS Esmeralda	4443 a A	4624 a A
BRS Primavera	4056 ab A	4147 ab A
	N management	
	N at topdressing	N at sowing
Without pesticide	3201 b B	3637 a A
With pesticide	3691 a A	3719 a A

¹ Means followed by the same capital letter in the line and by the same lower case in the column do not differ according to the Tukey's test (p ≤ 0.05).



Rice under no-tillage



NTS after rice sowing



Compaction rice row



Seeder machine



Rice seed treated



Soil tillage



Rice sowing on conventional tillage

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