

Supplementary Materials

Influence of soil residual boron on rice performance and soil properties under conventional and conservation rice–wheat cropping systems

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Supplementary Tables

Table S1. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the soil health after rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Soil organic carbon		Soil microbial biomass nitrogen		Soil microbial biomass carbon	
		0-10 cm	10-20 cm	0-10 cm	10-20 cm	0-10 cm	10-20 cm
Replication	3	0.092	0.004	163.77	31.64	15.17	58.83
Wheat tillage-B (WT-B)	7	1.102**	0.012ns	391.78*	59.39**	810.07**	315.25**
Error	21	0.032	0.011	142.46	11.24	51.85	12.31
Rice production systems (RPs)	1	2.441**	2.002**	2512.52**	594.14**	1444.00**	637.56**
WT-B × RPs	7	0.048ns	0.014ns	14.02ns	1.60ns	18.32ns	7.27ns
Error	24	0.054	0.016	87.79	18.83	45.11	18.22
Total	63						

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$

Table S2. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the soil nutrient concentration after rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Total nitrogen		Available phosphorus		Exchangeable potassium		Soil boron	
		2017	2018	2017	2018	2017	2018	2017	2018
Replication	3	0.00014	0.00004	0.1200	0.00096	4.51	10.35	0.00043	0.00051
Wheat tillage-B (WT-B)	7	0.01772**	0.04359**	1.5717**	1.66654**	24.95ns	29.92ns	0.00847**	0.00592**
Error	21	0.00033	0.00024	0.0720	0.00533	10.11	28.93	0.00033	0.00038
Rice production systems (RPs)	1	0.04569**	0.04050**	3.3169**	3.19516**	34.36*	2256.25**	0.00003ns	0.01381**
WT-B × RPs	7	0.00231**	0.00113*	0.0942ns	0.28963**	5.11ns	10.25ns	0.00054ns	0.00014ns
Error	24	0.00033	0.00046	0.0586	0.00648	7.23	27.25	0.00035	0.00017
Total	63								

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$

Table S3. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the yield related traits of rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Productive tillers		Kernels per panicle		1000-grain weight	
		2017	2018	2017	2018	2017	2018
Replication	3	73.02	12.93	11.85	16.85	5.20	0.74
Wheat tillage-B (WT-B)	7	374.13**	950.69**	32.56*	288.20**	10.46**	54.32**
Error	21	39.38	19.09	11.02	3.11	0.85	0.44
Rice production systems (RPs)	1	8510.06**	892.51**	637.56**	56.25**	7.80*	36.31**
WT-B × RPs	7	55.42ns	12.87ns	5.92ns	12.82ns	0.87ns	1.97**
Error	24	38.50	10.57	12.04	7.66	1.33	0.30
Total	63						

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$

Table S4. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the grain yield, biological yield, harvest index and water productivity of rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Grain yield		Biological yield		Harvest index		Water productivity	
		2017	2018	2017	2018	2017	2018	2017	2018
Replication	3	0.180	0.056	0.555	0.380	13.79	0.10	0.0055	0.0017
Wheat tillage-B (WT-B)	7	2.046**	0.974**	7.518**	3.743**	38.19ns	118.80**	0.0598**	0.0349**
Error	21	0.049	0.021	1.387	0.135	23.06	3.86	0.0015	0.0008
Rice production systems (RPs)	1	1.071**	0.570**	3.591*	1.559**	225.14**	150.98**	0.7971**	0.9666**
WT-B × RPs	7	0.187*	0.054*	3.475**	1.204**	18.48ns	40.78**	0.0061*	0.0011ns
Error	24	0.070	0.021	0.652	0.180	8.84	4.79	0.0021	0.0007
Total	63								

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$

Table S5. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the grain and straw B concentration and grain quality of rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Grain B concentration		Straw B concentration		Grain amylose		Grain protein	
		2017	2018	2017	2018	2017	2018	2017	2018
Replication	3	0.0434	0.0272	0.0207	0.0010	0.553	0.056	0.0191	0.0043
Wheat tillage-B (WT-B)	7	0.3932**	0.4902**	0.0047ns	0.0426**	22.092**	21.036**	0.0715**	0.3511**
Error	21	0.0430	0.0177	0.0118	0.0013	0.175	0.127	0.0207	0.0276
Rice production systems (RPs)	1	0.0961ns	0.1278**	0.0036ns	0.0206**	7.784**	1.749**	0.0014ns	0.1936ns
WT-B × RPs	7	0.0513ns	0.0181ns	0.0063ns	0.0021*	0.231ns	0.494**	0.0108ns	0.0114ns
Error	24	0.0533	0.0103	0.0065	0.0008	0.210	0.118	0.1100	0.0589
Total	63								

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$

Table S6. Analysis of the variance for the influence of B application in plough tillage and zero tillage wheat on the grain quality of rice harvest in puddled transplanted rice (PuTR) and direct seeded rice (DSR) systems

Sources of variation	DF	Grain chalkiness		Grain carbohydrate		Grain fat	
		2017	2018	2017	2018	2017	2018
Replication	3	0.00009	0.00094	66.48	229.78	0.00826	0.0154
Wheat tillage-B (WT-B)	7	0.01202**	0.01883**	26.55ns	119.43ns	0.04422**	0.0224**
Error	21	0.00104	0.00194	72.22	65.64	0.00506	0.0022
Rice production systems (RPs)	1	0.34516**	0.11391**	88.83ns	176.22ns	0.00004ns	0.0081*
WT-B × RPs	7	0.00163ns	0.00118ns	15.44ns	11.80ns	0.00387ns	0.0025ns
Error	24	0.00125	0.0062	27.98	57.72	0.00330	0.0018
Total	63						

DF = Degree of freedom; ns = non-significant; * = significant at $p \leq 0.05$; ** = significant at $p \leq 0.01$