WHEAT PRODUCTION AND SOIL CHEMICAL PROPERTIES OF ORGANIC AND CONVENTIONAL PAIRED SITES IN WESTERN AUSTRALIA

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Summary. Wheat production levels and soil chemical properties on eight paired adjacent fields managed organically and conventionally in Western Australia were monitored and compared in three years (1992-1994). Sites were paired to ensure soil types, crop history before conversion of the organic paddock and, in most cases, the farm managers were the same, so that the management system was the primary object of difference. At four sites (1, 3, 5, 6), the grain yield of organic and conventional wheat was comparable, but grain yield of organic wheat was significantly depressed at the other four sites. The yield depression in the organic plots was most likely related to the lower pre-sowing Colwell-extractable phosphorus level in the soil, later sowing, and low nitrogen supply. In the organic plots, nitrate nitrogen and organic carbon had increased significantly after 2-3 years of pasture in site 3, but Colwell-P and Colwell-K were greatly reduced during this period.

INTRODUCTION

Organic farming systems have been considered as an alternative to conventional farming systems in Europe and North America, where the farmers achieved comparable financial returns. Although the yield had been depressed in the organic system by 10-15%, this was offset by decreased costs of production (1, 2). These results may not be relevant to South West Australia where soils are often highly weathered and contain low nutrient reserves (3).

The aim of this study was to compare wheat production and soil chemical properties of paired sites organically and conventionally managed in Western Australia.

MATERIALS AND METHODS

A wheat field at each of eight certified organic farms in the WA wheatbelt was selected (Table 1). Each site was paired with a nearby wheat crop on the same soil type and with similar cultivation history apart from the recent conversion of the organic sites. Organic sites were generally cropped after 2-3 years pasture whereas the conventional sites were cropped 2-3 years in the previous four. Except for sites 2 and 4 all the other paired sites were on the same farm and under the same management. At each site, four 20x20 m plots were selected for measurement of soil properties and wheat production.

RESULTS

The grain yields at sites 4, 7 and 8 were significantly higher in the conventional fields than the organic. The yield of organically grown wheat was lower by about 64%, 24% and 30%, respectively, at these sites. At site 2, oats was sown instead of wheat and the grain yield of both organic and conventional plots was low, reflecting that both soils and extractable P levels regarded as deficient for wheat (5). The higher yield obtained from the organic plots may indicate better adaptation of oats of the low P soils than wheat (1). Overall, wheat yield was depressed 15% in the organic plots compared to those in paired conventional plots (Fig 1). This yield decrease was most likely related to lower pre-sowing Colwell-P in soil, later sowing and decreased nitrogen.

Table 1. General characteristics of organic and conventional paired sites compared in this study

Sites	Farm Type	Soil Type	Crop Rotation (1987-1992)	Type of fertiliser[a]	Colwell-P (mg/kg)

1	Organic	Red earth	PPPC	Nil	28
1	Conventional	Red earth	CCCP	DAP, Urea	21
2	Organic	Red	PPPW	Nil	3
2	Conventional	Calcareous	CCCP	DAP, Urea	3
		Red			
		Calcareous			
3	Organic	Red earth	PPWPP	Dynamic lifter	19
3	Conventional	Red earth	PWWW	DAP, Urea	19
4	Organic	Red	WPWWP	Nil	8
4	Conventional	Calcareous	WPWW	DAP, Urea	11
	Red				
	Calcareous				
5	Organic	Red earth	WPPPW	Nil	30
5	Conventional	Red earth	WPWWW	Agras No.1	50
6	Organic	YellowDuplex	PPPC	Dynamic lifter	10
6	Conventional	YellowDuplex	PPCC	DAP, Urea	19
7	Organic	Red earth	PPPW	Nil	19
7	Conventional	Red earth	PPPW	DAP, Urea	39
8	Organic	YellowDuplex	PPPC	Dynamic lifter	48

8	Conventional	YellowDuplex	PPCC	Dap, Urea	28

a) DAP: Diammonium phosphate, 17.5% N, 20% P. Dynamic lifter; 3.2% N, 2.8% P,

Urea; 46% N Agras No 1; 17.5% N

b) P: Pasture, C: crop, W: wheat.

Figure 1. Grain yield of eight paired sites organically and conventionally managed in WA wheatbelt.

ACKNOWLEDGMENTS

The authors thank Grains Research and Development Corporation for funding this study (1991-1996).

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