

Nematodes - a major factor in crop sequence effects on Darling Downs wheat.

J.P. Thompson¹, J. Mackenzie¹ and Janet S. McCulloch²

Department of Primary Industries,

¹ Queensland Wheat Research Institute, Toowoomba 4350 and

² Plant Pathology Branch, Indooroopilly, 4068.

Astute farmers near Jondaryan have claimed depressed yields for the second wheat crop in a rotation of sorghum(S)-S-S-bare fallow for 14 months - wheat (W)-W-W. Because the problem follows a long fallow, albeit in the second crop, it has been linked to "long fallow disorder" (Leslie and Whitehouse 1966). Our research during three years has examined factors of crop sequence, fertilizers, broad-spectrum soil fumigants, non-volatile nematicides and cultivar tolerance.

Results showing the depressed yield of the second crop are given in Table 1.

TABLE 1. Grain yield (t/ha) of Timgalen wheat in relation to crop sequence; (N 120kg/ha; P 30kg/ha and Zn 13kg/ha applied to all crops).

Year	Wheat crop number after Sorghum sequence - Long fallow			
	First	Second	Third	Fourth
1977	0.95	0.37	0.60	-
1978	1.92	1.20	1.59	1.49

From measurement of many soil biological and chemical factors, the endoparasitic root-lesion nematode Pratylenchus thornei was indicated as a major factor, being most numerous in the soil before the second crop. Table 2 shows the responses to soil fumigants and non-volatile nematicides obtained in the second crop in 1978.

TABLE 2. Grain yield (t/ha) of Timgalen wheat in relation to soil treatment.

Nil	Chloropicrin (220kg/ha)	Dazomet (450kg/ha)	Fenamiphos (10kg/ha)	Aldicarb (10kg/ha)
1.19	1.71	1.74	1.72	2.81

Subsequent trials have shown aldicarb to be the most effective nematicide, controlling P. thornei in the roots and both P. thornei and the ectoparasitic nematode Merlinius brevidens in soil from around the roots. Substantial responses to nematicides were also obtained on first year wheat, in which root-lesion nematodes multiplied during crop growth. Control by nematicides in one wheat crop resulted in fewer nematodes and substantial yield advantages (0.5t/ha) in the next crop.

Clipper barley in place of the second wheat crop grew very well and had few nematodes in the roots. No comparable resistance was found among nine wheat cultivars currently recommended for the Darling Downs. Cultivars Gatcher and Banks grew very poorly without treatment with fertilizer and nematicide.

Sorghum was not a host for P. thornei (R.C. Colbran, priv. comm.) thus accounting for low numbers before the first wheat crop. The decline in P. thornei numbers to the third crop was associated with an increased incidence of nematode-trapping fungi and putative bacterial parasites. This decline phenomenon afforded only partial control of P. thornei in the third and subsequent wheat crops.

Leslie, J.K. and Whitehouse, M.J. (1966). Ann. Rept. Qld. Wheat Res. Inst. for 1965-6, pp 38-39.

