

## Factors associated with reduced pea yields in south-eastern South Australia

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Yield testing of peas in south-eastern South Australia showed that genotypes need to be resistant to powdery mildew (*Erysiphe polygoni*) and tolerant of a visual yellowing due mainly to iron deficiency.

### Methods

Pea lines were yield tested on rendzina soils at Millicent and Glenroy from 1985 to 1988. Yellowing due mainly to Fe deficiency developed occasionally in some lines after wet soil conditions. Yellow symptoms were given a visual colour score (VCS). Young leaf tissue at Millicent was analysed for Fe in 1985 and Fe, Mn and Zn in 1986. After assessing VCS, Fe and Mn were applied to the foliage and the deficiency symptoms were overcome. Powdery mildew at Millicent first occurred in 1986, and was visually scored. Sulphur applied to the foliage in 1987 and 1988 retarded mildew development.

### Results and discussion

Except at Millicent in 1986 when powdery mildew was severe, highest grain yield was associated with the highest VCS (ie greenest plants):

- Millicent 1985:  $Y = 532(\text{VCS}) - 26.0(\text{VCS})^2 - 799$  ( $100r^2 = 57$ ;  $n = 33$ )
- Glenroy 1986:  $Y = 6801 - 1172(\text{VCS}) + 91.9(\text{VCS})^2$  ( $100r^2 = 50$ ;  $n = 72$ )

(where  $Y$  = grain yield (kg/ha) :  $\text{VCS}$  = visual colour score; 10 = 100% of plant green; 0 = 0% plant green, ie 100% yellow).  $\text{VCS}$  was associated with tissue Fe concentration ( $\text{Fe} = \text{Fe} (\mu\text{g/g})$  in young leaf during flowering):

- Millicent 1985:  $\text{VCS} = 0.92\text{Fe} - 0.008\text{Fe}^2 - 17.1$  ( $100r^2 = 58$ ;  $n = 65$ )
- Millicent 1986:  $\text{VCS} = 0.09\text{Fe} + 2.8$  ( $100r^2 = 29$ ;  $n = 71$ )

Yield was not associated with tissue Fe, Mn or Zn concentrations. Some nutrient concentrations are shown in Table I. Pea grain from Glenroy 1986 was Mn deficient. Derrimut, Pennant and their crosses tended to have the lowest VCS. Early Dun, its crosses, and White Brunswick crosses tended to have the highest VCS. Accessions 916, 437 and 227 in crosses improved VCS. Visual yellowing, regardless of cause, is important in genotype selection.

**Table 1. Nutrients ( $\mu\text{g/g}$ ) in young leaf tissue of some peas at Millicent**

	Alma	Dun	Wirrega	Pennant	Derrimut	Maitland	P177-1	P234-1
Fe	58(45)*	57(48)	47(43)	46(32)	50(42)	58(45)	51(41)	37(-)
Mn	23	31	18	22	19	28	20	17
Zn	56	62	48	51	49	70	58	53
VCS*	8.5(8.8)	7.5(8.8)	7.5(7.8)	6.5(4.8)	6.5(5.3)	9.0(8.5)	5.0(6.0)	5.5(-)

\* = 1985 value in brackets; \* = Visual colour score (0 to 10) of whole plant  
\* = ranges: Fe 37-71 (32-53); Mn 17-31; Zn 43-79; VCS 5.0-9.5 (4.5-10.0)

Two semi-leafless lines M93 and M30-8-2-1 were resistant to powdery mildew each year (Table 2). Both were Early Dun crossed with accession 916. Resistant lines were highest yielding except in 1988 drought conditions.

**Table 2. Yield (kg/ha) of peas at Millicent in presence of powdery mildew**

Year <sup>a</sup>	M93	M30-8-2-1	Haitland	Alma	Early Dun	Dinkum	lsd(0.05)
1986	2998 (0)*	2242 (0)	797 (7)	966 (7)	794 (7)	677 (10)	197
1987	2484 (0)	2684 (0)	1818 (+)	1936 (+)	1937 (+)	1030 (+)	399
1988	581 (0)	286 (0)	617 (+)	867 (+)	756 (+)	572 (+)	311

<sup>a</sup> No sulphur applied in 1986 to retard the mildew; severe drought in 1988

\* Powdery mildew score (0 = 0% ;+ = >50% ;10 = 100% plant height infected)