

## **Reduction of yield losses from *Rhizoctonia* crown and root rot by use of mixtures of resistant and susceptible sugarbeet varieties**

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### **Introduction**

Varietal mixtures have seen increasing interest in recent years as a low-cost way to reduce disease severity within fields. Mixtures slow disease spread from plant to plant since susceptible plants are more widely spaced from each other and overall inoculum is reduced.

*Rhizoctonia* crown and root rot is an economically important disease of sugarbeets in Michigan with few methods available for its control besides genetic resistance. Taproots of resistant varieties, however, have a markedly lower yield and percent sugar than commonly planted susceptible varieties and are only recommended for use in severely infested fields. Since the majority of affected fields have moderate *Rhizoctonia* crown and root rot disease pressure, we tested the effect of variety mixtures on disease incidence, yield and % sugar in these situations. *Rhizoctonia solani*, the causal fungus, is patchy in distribution, spreading slowly throughout a growing season: it was thought that resistant beets could interdict the spread of the fungus, protecting susceptible beets and boosting yields.

### **Methods**

In 1998-2000 plots were planted in fields thought likely to have *Rhizoctonia* disease problems. Due to the patchy nature of the disease, plots were 4-6 rows and 300-800 m long, to average out disease intensity between plots. Each plot was planted with various mixtures of susceptible and resistant varieties (**Table I, II**) along with control plots with 100% susceptible or resistant varieties. Each treatment was replicated 4-5 times.

Counts of disease incidence were taken at each site 2-3 times after the first onset of *Rhizoctonia* symptoms. Plants with aboveground symptoms characteristic of the disease were included in the counts. Yield and % sugar (average of 3 samples containing 10 beets) were obtained at harvest.

**Table I.** Yields (tons/A) and (RWSA (lbs/A) ) for variety mixtures. S= Susceptible, R=Resistant variety. 0 = no disease. + = moderate, ++=severe disease.

YEAR	1998		1999				2000	
Farm	98-1	98-2	99-1	99-2	99-3	99-4	00-1	00-2
Disease	+	+	+	+	0	0	+	++
Mixture	E-17 RH3		C-648 C-1353		E-17 RH-3		E-17 RH-5	
100 % S	19.6 (4734)	13.8 (3485)	19.9 (4765)	19.5 (5131)	28.7 (7975)	25.4 (6687)	21.28 (4451)	14.93 (3034)
84% S 16% R	19.9 (4698)	14.4 (3488)	21.1 (5234)	18.5 (4708)	30.0 (8174)	25.9 (6671)	--	--
75% S 25% R	--	--	--	--	--	--	21.73 (4799)	16.25 (3222)
67% S 33% R	19.2 (4579)	14.3 (3578)	19.2 (4598)	21.9 (5396)	29.3 (7666)	25.9 (6675)	--	--
50% S 50% R	18.9 (4174)	13.8 (3394)	19.5 (4776)	20.9 (5321)	29.2 (7510)	25.1 (6818)	--	--
100% R	17.3 (3771)	13.3 (3046)	16.5 (3826)	19.5 (4890)	29.3 (7696)	25.0 (6090)	21.57 (4610)	18.20 (3647)

**Table II.** Mean Incidence of Rhizoctonia crown and root-rot symptoms in variety mixtures. (Mean number of diseased plants per plot) Plots 4-6 rows x 300-800 m long. Means with the same letter are not significantly different. Two out of four fields surveyed in 1999 had no disease. S= Susceptible variety, R=Resistant variety. 0 = no disease. + = moderate, +=severe disease.

YEAR	1998		1999		2000	
Farm	98-1	98-2	99-1	99-2	00-1	00-2
Dis. Sever.	+	+	+	+	+	++
Mixture	E-17 RH-3		C-648 C-1353		E-17 RH-5	
100 % S	6.62 a	15.67 a	14.00 a	16.79 a	20.67 a	402.46 a
84% S 16% R	5.29 a	14.29 a	10.42 ab	22.67 a	--	
75% S 25% R	--	--	---	---	10.87 a b	284.58 a
67% S 33% R	4.48 a	11.95 a b	9.50 ab	16.17 a	--	--
50% S 50% R	5.81 a	11.14 a b	9.42 ab	17.13 a	--	--
100% R	3.48 a	4.57 b	2.04 b	13.85 a	1.80 b	69.25 b