

QSCI 482 Winter Lab 10

Name:

To investigate the effect of sulfur and nitrogen on the growth of red clover, a plant scientist conducted a greenhouse experiment using a CRD with the treatments in a crossed layout. The sulfur levels were applied at rates of 0, 3, 6, and 9 pounds/acre, and the rate of nitrogen application was either 0 or 20 pounds/acre. Greenhouse pots were prepared with uniform soil, allowing for $r = 3$ pots per treatment combination.

Dry matter yields, in grams/pot, of red clover.

		Sulfur			
		0	3	6	9
Nitrogen	0	4.48	4.70	5.21	5.88
		4.52	4.65	5.23	5.98
		4.63	4.57	5.28	5.88

	3	5.76	7.01	5.88	6.26
		5.72	7.11	5.82	6.26
		5.78	7.02	5.73	6.37

Table 2.6. Expected Mean Squares for twoway CRD anova.

Source	df	EMS
Treatment T	$t - 1$	$\sigma^2 + \frac{rg}{t-1} \sum_i \tau_i^2$
Treatment G	$g - 1$	$\sigma^2 + \frac{rt}{g-1} \sum_j \gamma_j^2$
T × G	$(t - 1)(g - 1)$	$\sigma^2 + \frac{r}{(t-1)(g-1)} \sum_{ij} (\tau\gamma)_{ij}^2$
Within	$tg(r - 1)$	σ^2

Complete the ANOVA table

For alpha level=0.05

SOV	Df	SS	MS	F-ratio	F-obs	F-crit	Result
Sulfur	3	3.06	1.02	MSS/MSE	272	3.24	Reject Ho
Nitrogen	1	7.83	7.83	MSN/MSE	2088	4.49	Reject Ho
Sulfur x Nitrogen	3	3.76	1.2533	MSSxN/MSE	334.213	3.24	Reject Ho
Within	16	0.06	0.00375				

State a conclusion in terms of the original question.

The null hypothesis for no sulfur effects, no nitrogen effects, and no interaction effects from sulfur and nitrogen on red clover growth can be rejected. There is strong evidence to suggest that sulfur, nitrogen and their interaction effect red clover growth.