

DIEBACK OF PERENNIAL RYEGRASS DOES NOT REDUCE SEED YIELD

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The cause of dieback, a form of premature stand loss in perennial ryegrass seed fields, has eluded researchers for nearly a decade. Seed growers have characterized this disorder as a failure of portions of the stand to regrow in autumn after harvest. Plants affected by this disorder cease to be perennial and act like an annual. Several potential causes of dieback have been investigated including plant diseases, pests, soil fertility, herbicide damage, and others. None have been successfully linked to dieback. An important clue to the appearance of the disorder is that it might be more prevalent in years with dry conditions in late summer extending well into autumn.

We used a rainfall simulator and rain-out shelters to control August and September rainfall in field trials with two cultivars of perennial ryegrass, Affinity and Buccaneer. The rainfall simulator was used to simulate a one-inch rainfall during the following times: mid-August, mid-September, and rainfall during both mid-August and mid-September. Rain-out shelters were used to exclude natural rainfall in August and September. Natural rainfall during these periods was compared to the artificial rainfall treatments.

Tiller production decreased as the stand aged, with the greatest decrease observed with low rainfall in August and September. Losses in tiller production were proportional to the amount of rainfall received in August and September. Tiller production at the same rainfall level in first-year stands was greater than in second- or third-year stands. In other words, crops were less responsive to rainfall in older stands than in young stands. This supports the contention that as plants become older they are increasingly more susceptible to stress conditions. Therefore, the ability to replace the older tillers as they die is markedly reduced. Continual summer and early-fall water stress may be a major contributing factor to the onset of dieback.

Stand cover was affected by the water stress in August and September and in some cases losses exceeded 50% of the original stand. No rain in August and September produced the lowest amounts of plant cover in each year, and contributed most to the decline of the stand. Higher rainfall treatments produced more stand cover, but stand loss was evident with increasing age across all rainfall treatments. Even in the low water stress environment created by the natural rainfall treatment, which averaged 3.65 inches (154% of average), stand loss was not prevented.

Climatological data for Corvallis indicate that the average rainfall for August and September is 2.38 inches. However, our research indicates that about 4 inches of rainfall during August and September may be necessary for optimum tiller production. Rainfall amounts that reach or exceed 4 inches are relatively rare in August and September. Our combined August and September treatment delivered a total of 2 inches whereas August and September treatments received 1 inch each. Rainfall during this period is 2 inches or less in nearly half of the years. Moreover, the extremely dry conditions simulated by the no rainfall or 1 inch in August or September treatments are more common than one might think. Less than 1 inch of rainfall can be expected during August and September in nearly one-third of the years. Therefore, perennial ryegrass seed crops may be under moderate to severe moisture stress during the early regrowth period in most years. This stress may have had detrimental effects on the ability of plants to recover and produce the tillers necessary for stand persistence.

Flowering and seed yield were not reduced in drought-affected stands in any of the three-harvest years (1996, 1997, and 1998) in our study (Table 1). Although stand loss and reduction in crop regrowth were substantial under conditions of post-harvest summer drought stress, fertile tiller production in the following spring was unaffected. Plants growing in the drought-thinned stands produced more fertile tillers per plant than those receiving adequate rainfall after harvest, accounting for the lack of differences in fertile tiller production at the various rainfall levels. The innate ability of perennial ryegrass to compensate for great losses in stand is evident. Seed growers do not need to be concerned about these stand losses as seed yield is not impacted by dieback.

Table 1. Rainfall treatment effects on seed yield of Affinity and Buccaneer perennial ryegrass.

Rainfall treatment	<u>3-year average seed yields</u>	
	Affinity	Buccaneer
	----- (lb/a) -----	
Natural	1104 a \perp	1067 a
No Rain	1052 a	1004 a
August	1026 a	1005 a
September	1058 a	1048 a
August + September	1057 a	1029 a

\perp Means within columns are not significantly different when followed by the same letter by Fisher's Protected LSD values ($P = 0.05$).