CULTIVAR AND SEEDING RATE EFFECTS ON STAND POPULATION, LEAF TEXTURE AND DISEASE INCIDENCE OF CREEPING BENTGRASS

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INTRODUCTION

A unique aspect of the increase in number of seeded creeping bentgrass cultivars is the diversity of growth habits, soil adaptation and disease susceptibility. Conventional wisdom in golf course design and construction says to apply inordinately high amounts of seed to ensure rapid establishment and a fine leaf texture. In the case of Penncross, both of the above are true, based on John Madison's work from 1966. However, high seed rates of Penncross did not improve visual cover ratings one month after germination and they were often associated with high incidence of disease. Therefore, as the new bentgrasses become more widely used, the question in my mind is, "If high rates are specified, what will be the short term response and long term consequences?"

The objective of this experiment is to determine the effect of various seeding rates on leaf texture, stand population, and disease incidence of creeping bentgrasses representing an assortment of growth habits and disease susceptibility.

EXPERIMENTAL METHODS

Seven commercial available creeping bentgrass cultivars were seeded in July 1993 and 1994 at two locations. Seeding in 1993 was a Greenwood Hills Country Club in Wausau, Wisconsin and at the O.J. Noer Facility. Soil type in Wausau was a sandy loam pH 7.1. The Noer plots were seeded on a Batavia silt loam pH 7.5.

Apron® treated and untreated seeds from the same harvest year were sowed at 0.5#, 1.0#, 2.0# and 4.0# PLS/M (25,45,94 and 195 kg PLS/M). Seed amounts were determined by weight and the Apron treated seed amount was increased 25% to account for the weight of the pretreatment. Plots were irrigated several times a day to promote germination and create conditions conducive to damping off pathogens.

Seedling density was determined by counting three square inch areas in each plot. Three weeks and six weeks after emergence. Tiller density was determined by counting tillers in a 20.25 cm^2 core one year after establishment. A tiller was defined as a shoot that had separated or almost separated from the parent at ground level (Lush, 1992). Visual cover rating was taken six weeks after emergence and rated on a percent plot covered bases. Leaf texture was rated using the NTEP guidelines where 1 = fine, 9=coarse. Disease incidence and severity was rated by counting number of injured areas per plot.

Analysis of variance for seedling density, disease incidence, leaf texture and tiller density as influenced by cultivar, pretreatment and rate.

Source	Seeding Density	Disease	Leaf Texture	Visual Cover	Tiller Density
Cultivar ©	NS	**	**	**	*
Pretreatment (PT)	**	**	NS	NS	*
Seed rate (SR)	**	**	**	**	*
CxPT	NS	NS	NS	NS	NS
CxSR	*	*	*	**	*
PTxSR	*	*	NS	NS	*
CxPTxSR	*	*	NS	NS	NS

*significant at p=0.05
**significant at p=0.01

RESULTS

The interaction of fungicide pretreatment and seeding rate significantly influenced initial seedling density at three weeks independent of cultivar. In 1993, severe damping off infestations occurred, however, infestations were significantly less in 1995 in both treated and untreated plots. It is likely that seedlings may have been affected immediately after emergence and no symptoms developed. As seeding rate increased, seedling survival decreased with untreated seed having significantly lower survival at each rate.

The data presented in many of the graphs includes Penncross, Providence, and Crenshaw. These grasses represent the various growth habits from prostrate to upright. Also, disease instance is incremently different for each cultivar. Seeding density at six weeks was influenced by cultivar with Crenshaw and Providence producing significantly more seedlings at each seed rate. Again, pretreatment enhanced survival over untreated seed. Interestingly, visual cover ratings were not influenced by pretreatment. Visual cover was affected by cultivar and seeding rate and indicates the need to consider growth habit when determining seeding rate. Penncross ratings are consistent with those observed by Madison in 1966, while the moderately upright Providence does benefit from 0.85 to 1.15# PLS/M for 95% cover and the upright Crenshaw requires a seed rate of 2# PLS/M to provide 95% cover at six weeks.

As expected, Penncross leaf texture was finer as seeding rate increased. However, finer textured cultivars such as Providence and Crenshaw seem to reach their finest texture at the optimum seeding rates determined from the visual cover plot. Therefore, newer bentgrasses do not benefit from higher seeding rates to achieve finer texture.

In the second year of the study, tiller density was influenced by seeding rate and pretreatment as well as cultivar and seeding rate. Crenshaw creeping bentgrass develops an extensive number of tillers, making it a superior turf for putting surfaces where high shoot density can increase ball roll. Providence and Penncross tiller density increased at similar rates and as a whole, no cultivar is following the self-thinning rule. The self-thinning rule states higher shoot densities have smaller tillers and thereby less biomass as compared to lower tiller densities having more robust tillers and greater biomass.

The ecological concept of carrying capacity is a measure of the amount of organisms, an environment can sustain. This principle appears evident relative to the disease incidences on cultivars treated or untreated at increasing seeding rates. The first example was in March when *Typhula* sp. Snow mold data was available. It revealed a well-known weakness of heat tolerant grasses, such as Crenshaw. Very little snow mold was obvious at the 0.5 and 1.0# rate of untreated seed, however, treated seed above 0.75# had severe snow mold incidence and increased directly proportionate to seeding rate.

The disease information continues to support the hypothesis that there are long term consequences to higher seeding rates. Any weaknesses in disease susceptibility are exacerbated as seeding rate increases. The dollar spot sensitivity of Crenshaw provides a clear example. Furthermore, low seeding rate (0.5#) Apron treated Crenshaw has as high as a tiller density and dollar spot incidence as the 4# rate of untreated Crenshaw. Therefore, deciding on pretreatment might mean seeding rates should be reduced.

SUMMARY

The influence of seeding rate on leaf texture is cultivar dependent. Fungicide pretreatment increases seedling density, tiller density and consequently disease incidence. It may be possible to use lower seeding rates with pretreated seed.

Increased seeding rate increases tiller density and disease incidence one year after establishment. Increased seeding rates exacerbate cultivar weaknesses. Therefore, in light of these data, the process of selecting and establishing bentgrass from seed should include knowledge of growth habit and pest resistance. Then decisions can be made that balance the short-term need and long-term benefits of choosing the optimum seeding rate.

Figure 1. The influence of seeding rate and pretreatment on bentgrass seedling survival (expressed as a percentage of PLS).

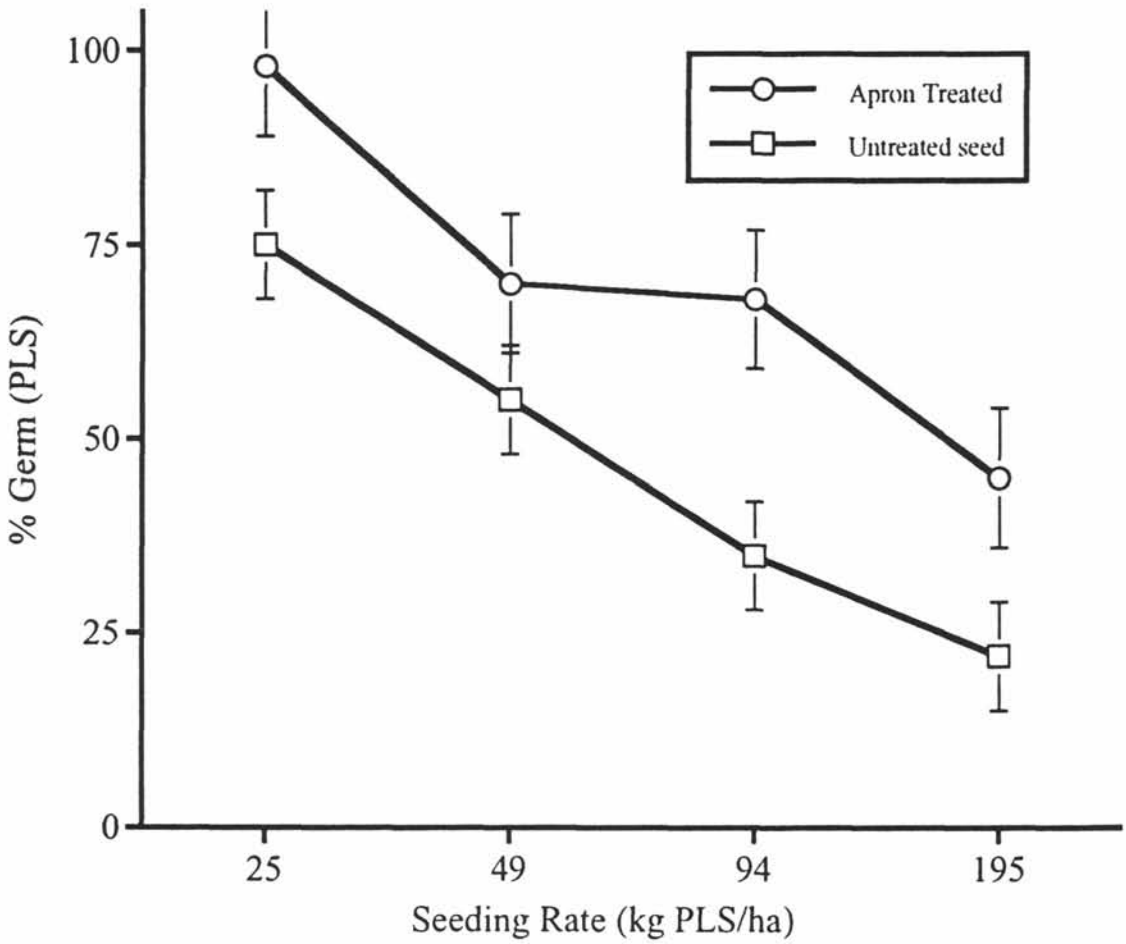

Figure 2. The influence of bentgrass cultivar, seeding rate, and pretreatment on seedling density 6 weeks after emergence.

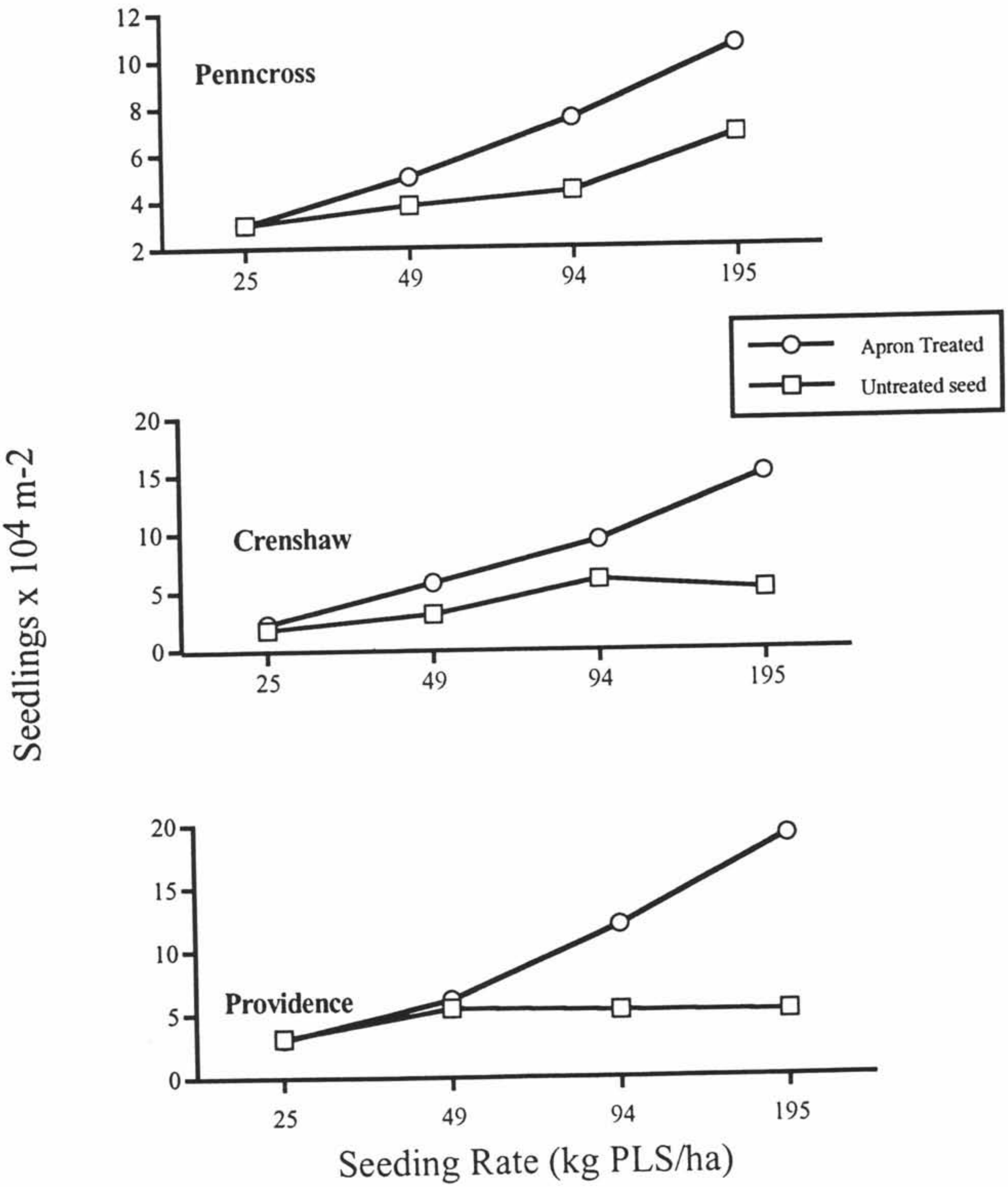

Figure 3. The influence of bentgrass cultivar and seeding rate on visual rating 6 weeks after establishment.

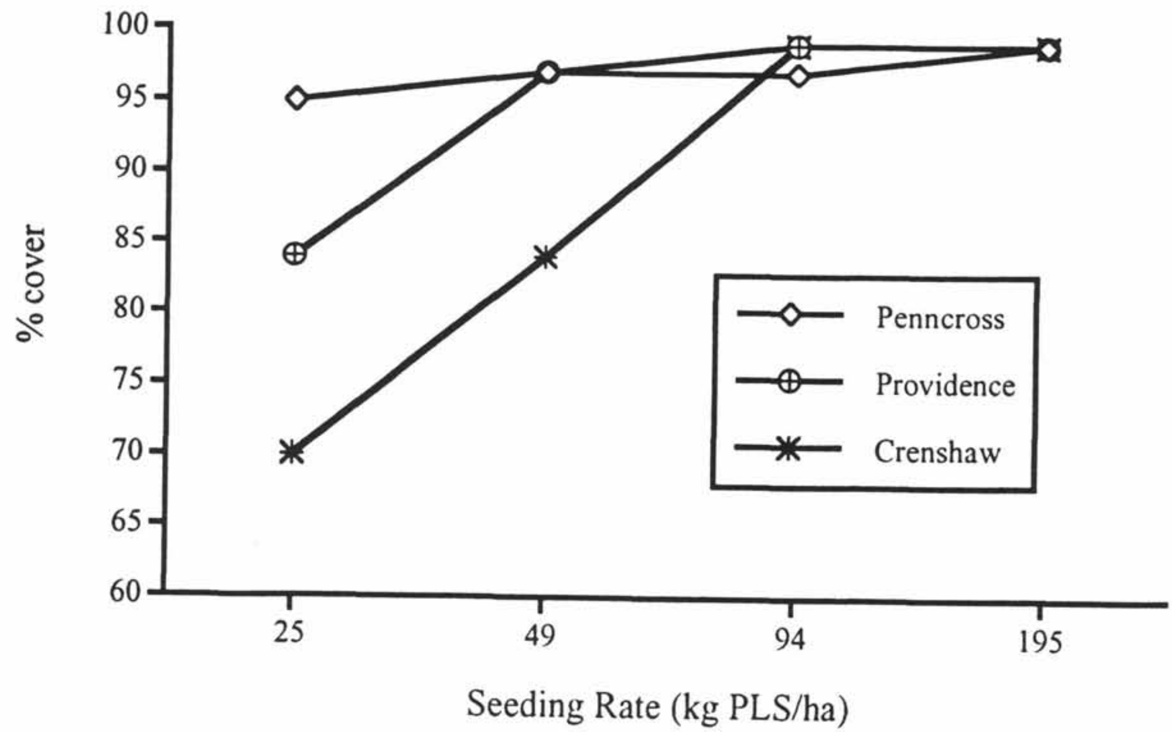

Figure 4. The influence of bentgrass cultivar, seeding rate, and pretreatment on leaf texture.

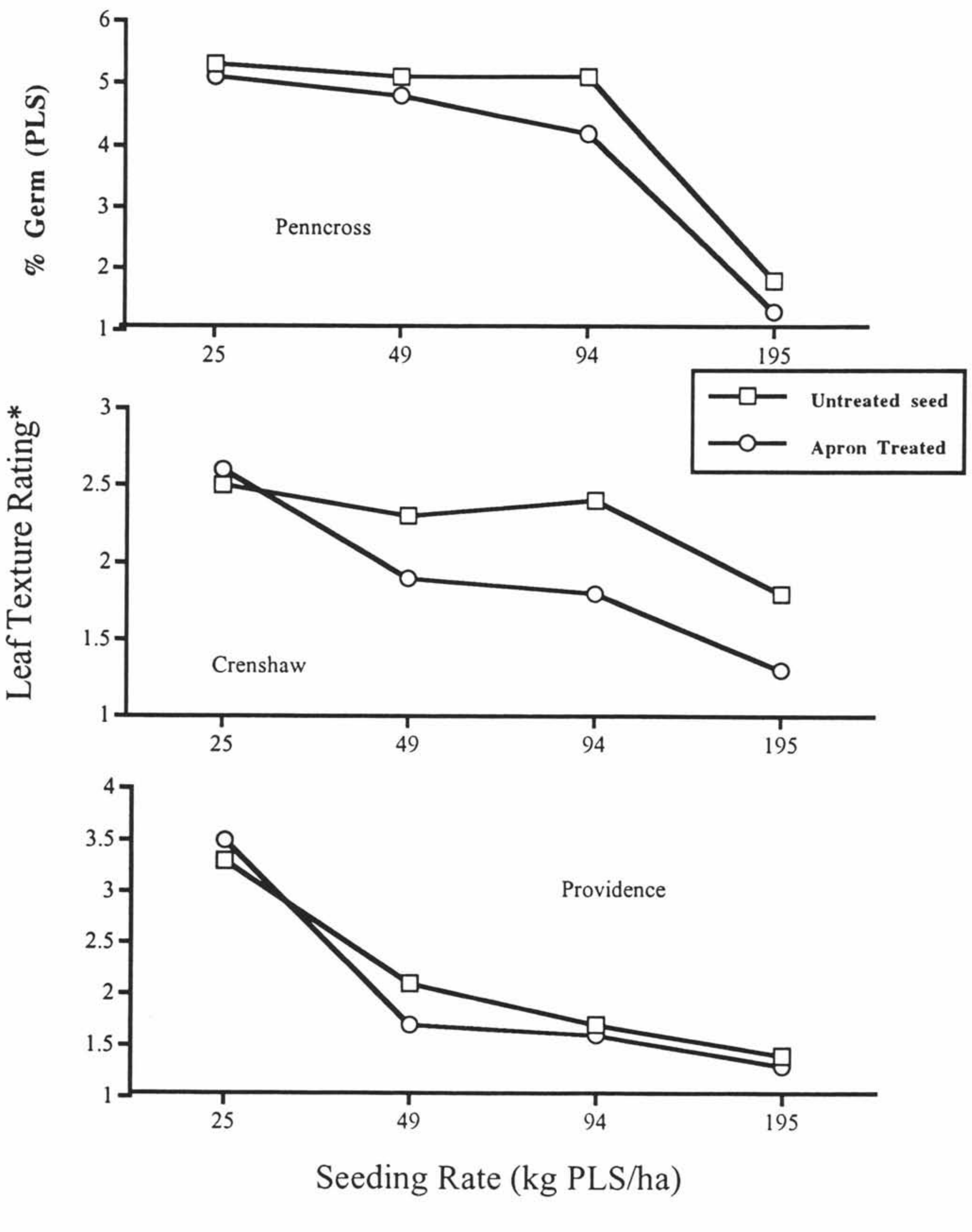

Figure 5. The influence of bentgrass cultivar, seeding rate, and pretreatment on tiller density 1 year after establishment.

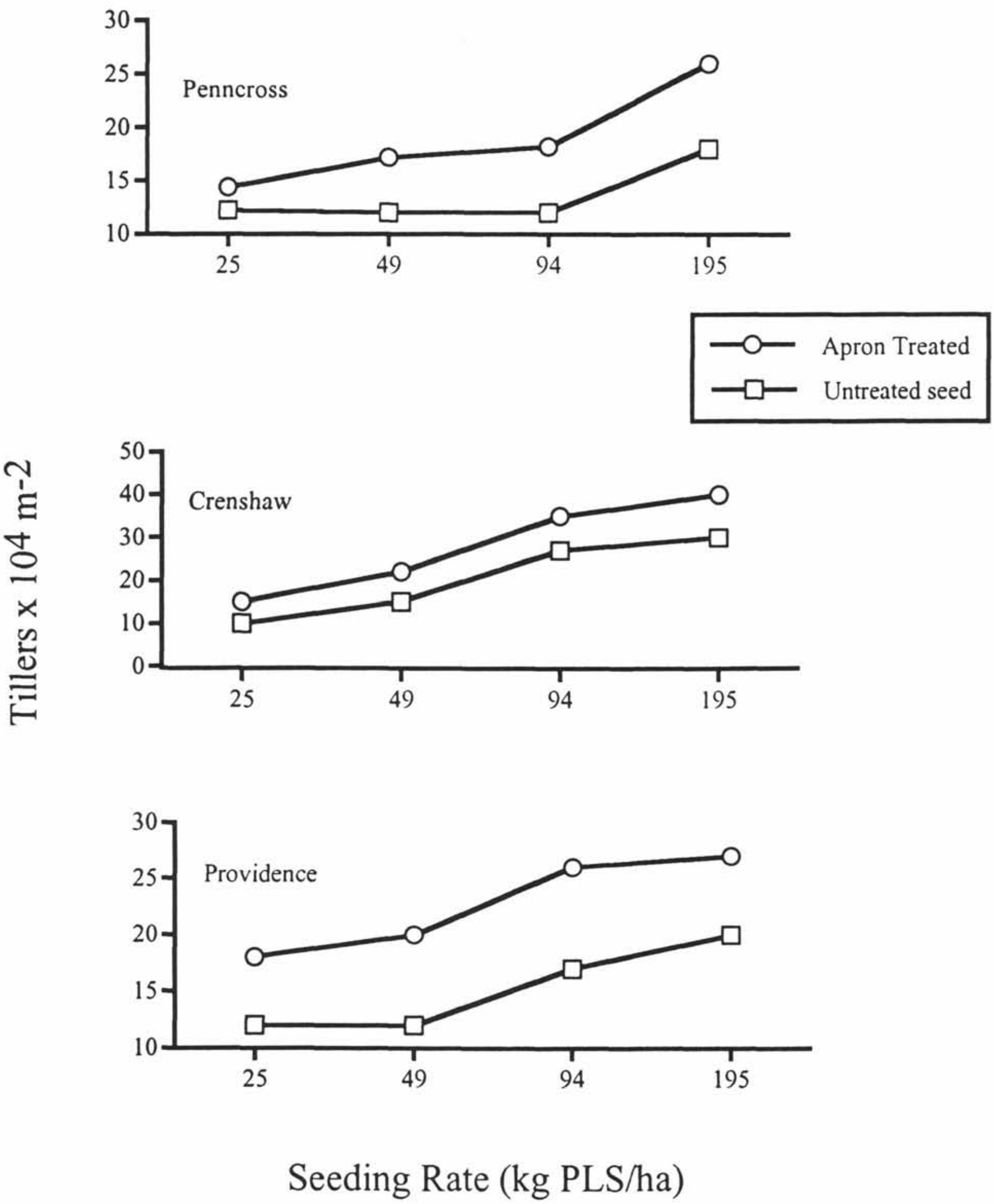

Figure 6. The influence of seeding rate and pretreatment on the incidence of *Typhula* sp. snow mold on Crenshaw creeping bentgrass.

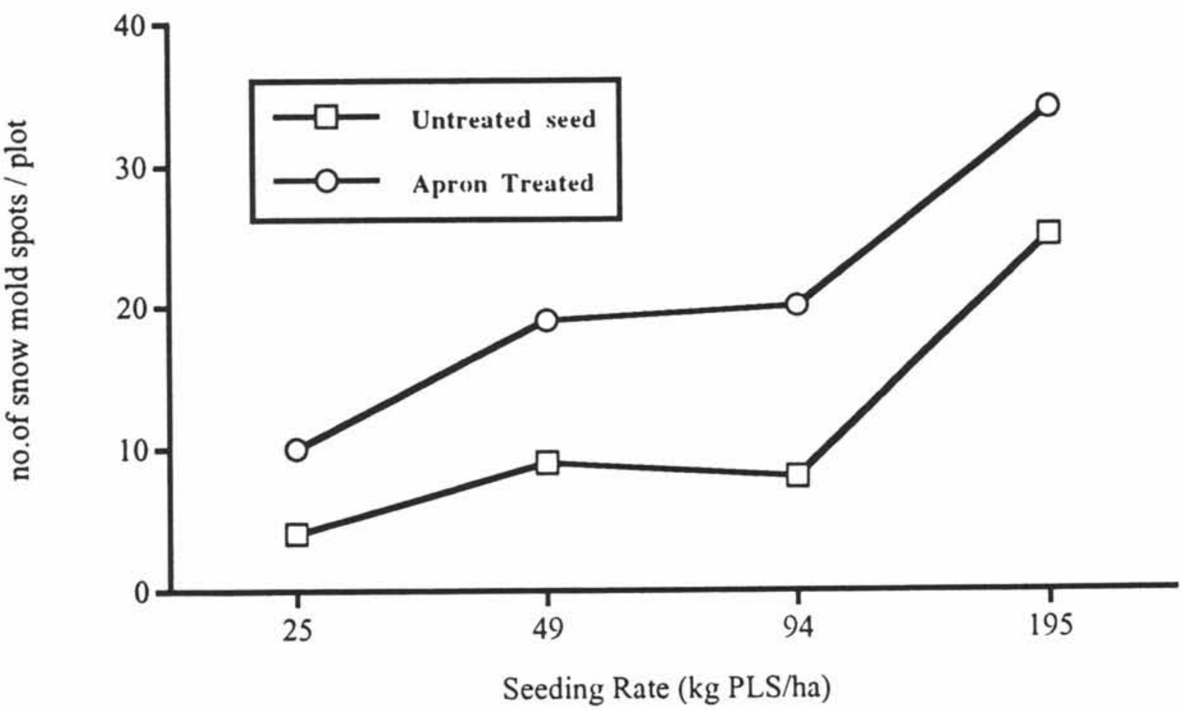

Figure 7. The influence of bentgrass cultivar, seeding rate, and pretreatment on the incidence of *Moellerodiscus & Lanzia* spp. 1 yr. After establishment.