practices, p. 132–178. In: P. Eck and N.F. Childers (eds.). Blueberry culture. Rutgers Univ. Press, New Brunswick, N.J.
5. Brightwell, W.T. and M.E. Austin. 1980. Rabbiteye blueberries. Ga. Agr. Expt. Sta. Res. Bul. 259. (Bul. 100 revised).
6. Cain, J.C. and G.J. Galleta. 1954. Blueberry and cranberry, p. 121–152. In: N.F. Childers (ed.). Fruit nutrition. Rutgers Univ. Press, New Brunswick, N.J.
7. Eck, P. 1966. Botany, p. 14–44. In: P. Eck and N.F. Childers (eds.). Blueberry culture. Rutgers Univ. Press, New Brunswick, N.J.
8. Eck, P. 1983. Optimum potassium nutritional level for production of highbush blueberry. J. Amer. Soc. Hort. Sci. 108:520–522.
9. Kender, W.J. and F. Anastasia. 1964. Nutrient deficiency symptoms of the lowbush blueberry. Proc. Amer. Soc. Hort. Sci. 85:275–280.
10. Kramer, A. and A.L. Schrader, 1942. Effect of nutrients, media, and growth substances on the growth of the Cabot variety of *Vaccinium corymbosum*. J. Agr. Res. 65:313–328.
11. Mainland, C.M. 1978. Commercial blueberry production guide for North Carolina. N.C. Agr. Ext. Serv. Circ. AG-115.
12. Minton, N.A., T.B. Hagler, and W.T. Brightwell. 1951. Nutrient element deficiency symptoms of the rabbiteye blueberry. Proc. Amer. Soc. Hort. Sci. 58:115–119.
13. SAS Institute. 1982. SAS user's guide: Statistics. SAS Institute, Inc. Cary, N.C.
14. Spiers, J.M. 1978. Effect of pH level and nitrogen source on elemental leaf content of 'Tifblue' rabbiteye blueberry. J. Amer. Soc. Hort. Sci. 103:705–708.
15. Spiers, J.M. 1979. Calcium and nitrogen nutrition of 'Tifblue' rabbiteye blueberry in sand culture. HortScience 14:523–525.
16. Spiers, J.M. 1979. Influence of oxidized and reduced N on 'Tifblue' rabbiteye blueberry growth, p. 64–67. In: J.N. Moore (ed.). Proc. 4th North Amer. Blueberry Res. Workers Conf., Univ. of Arkansas, Fayetteville.
17. Spiers, J.M. 1981. Freeze damage in six rabbiteye blueberry cultivars. Fruit Var. J. 35:68–70.
18. Spiers, J.M. 1983. Influence of N, K, and Na concentration on growth and leaf element content of 'Tifblue' rabbiteye blueberry. HortScience 18:223–224.
19. Tamada, T. and M. Iwata. 1975. Effect of the different forms of nitrogen and pH levels on the growth of rabbiteye blueberry in sand culture. Proc. Jpn. Soc. Hort. Sci. p. 104–105.
20. Trevett, M.F., P.N. Carpenter, and R.E. Durgen. 1968. Seasonal trend and interrelation of mineral nutrients in lowbush blueberry. Maine Agr. Expt. Sta. Bul. 665.
21. Young, R.S. 1952. Growth and development of the blueberry fruit *(Vaccinium corymbosum* L. and *V. angustifolium)*. Proc. Amer. Soc. Hort. Sci. 59:167–172.

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Companion Grass and Mulch Influences on Bahiagrass, Centipedegrass, and St. Augustinegrass Establishment

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Abstract. **This study evaluated the influence of companion grasses and mulch on warm-season turfgrass establishment. Vegetative plantings of centipedegrass [*Eremochloa ophiuroides* (Munro) Hack.] and St. Augustinegrass [*Stenotaphrum secundatun* (Walt.) Kuntze] and seeded plantings of bahiagrass (*Paspalum notatum* var. *saurae* Parodi) and centipedegrass were seeded with nine companion grasses, and they were either mulched or not mulched with grass hay. Data were gathered on seedling stand, rate of ground cover development, and ground cover composition at various intervals after planting. Browntop millet (*Panicum ramosum* L.) was the most rapid companion grass to establish in all plantings, but it was also most competitive to warm-season turfgrasses. Although 'FL-501' oats (*Avena sativa* L.) had a slower establishment rate than Browntop millet, it was less competitive than the latter as warm-season turfgrass cover 63 days after planting was equal to control plots planted without a companion grass. Mulch had a beneficial effect on establishment rate of seeded bahiagrass that negated the need for a companion grass when establishing bahiagrass from seed. Mulch had no detrimental effect on the slow establishment of vegetatively propagated St. Augustinegrass and centipedegrass or on seeded centipedegrass.**

Vegetative planting of warm-season turfgrasses with plugs or sprigs leaves soil bare and unprotected for several months until a complete turfgrass cover is achieved. A typical mechanical planter for centipedegrass [*Eremochloa ophiuroides* (Munro) Hack.] and St. Augustinegrass [*Stenotaphrum secundatum* (Walt.) Kuntze] will space 5 × 5 cm plugs on 25-cm centers. Thus, 96% of soil surface is unprotected and is subject to erosion and weed invasion. If plugs or single sprigs are planted by hand, unprotected soil averages slightly less than 100%. Water losses from irrigation or natural precipitation are high, and elevated soil temperatures may affect plant establishment. Use of mulch has been shown to moderate soil temperature, conserve soil water, and provide excellent protection against wind and water erosion (3). Companion grass species are commonly seeded with legumes (5), while temporary grasses such as ryegrass (*Lolium* spp.) are seeded with cool-season turfgrasses. Both provide quick ground cover until the slower-establishing permanent species dominate the sward. Competition between species during establishment can be a serious problem if compatible seed mixtures

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Table 1. Species studied as companion grasses for establishment of bahiagrass, centipedegrass, and St. Augustinegrass.

Companion grass	Species
Bingham millet	*Panicum* spp.
Browntop millet	*Panicum ramosum* L.
Japanese millet	*Echinocloa crusgalli* var. *frumentaceae* (Roxb.) W.F. Wight
Grofast sorghum	*Sorghum bicolor* (L.) Moench.
Weeping lovegrass	*Eragrostis curvula* (Schrad.) Nees.
Fl-501 oats	*Avena sativa* L.
Gurley Grazer rye	*Secale cereale* L.
Italian ryegrass	*Lolium multiforum* Lam.
Kentucky 31 tall fescue	*Festuca arundinacea* Schreb.

are not chosen (10). Objectives of our studies were a) to identify compatible, temporary grasses that provide rapid ground cover during the slow establishment period for several warm-season turfgrasses and b) to study effects of mulch on establishment of selected warm-season turfgrasses.

Materials and Methods

Duplicate studies were conducted. The first was planted 7 July 1977 at the IFAS Turfgrass Field Laboratory, Gainesville, Fla. The 2nd study was rerandomized and reestablished on the same site on 22 July 1980. During 1979, the site was disked monthly to incorporate and destroy plant residues. The Arredondo loamy fine sand (loamy, siliceous, hyperthermic, Grossarenic Paleudults) at pH 5.8 was not fumigated to allow weed competition.

A drop-type spreader was used to seed 0.9×3.7 m plots of companion grasses listed in Table 1 at a rate suggested by Musser and Perkins (8) of 40 pure live seed (PLS) per square decimeter into 4 turfgrass plantings 3.7×10.1 m in size: a) 'Floratam' St. Augustinegrass plugs 5×5 cm in size spaced on 25-cm centers; b) centipedegrass plugs of the same size and same spacing; c) centipedegrass seeded at 9 PLS per dm^2; and d) 'Argentine' bahiagrass (*Paspalum notatum* var. *saurae* Parodi) seeded at 120 PLS per dm^2. Pure live seed calculations were based on predetermined seed count from each seed lot. Germination percentages of each seed lot were obtained according to standard germination tests (2). Different commercial seed lots of the same cultivars were used in the 2 tests. Seed was lightly hand-raked into the soil after sowing. Fumigated bermudagrass hay [*Cynodon* spp. (L.) Rich.] was mulched by hand on half of the companion grass plots at a rate equivalent to 450 $g \cdot m^{-2}$. The other half received no mulch. Stripped mulch treatments were 1.8×10.1 m in size.

Supplemental irrigation was applied only as needed during the first month of establishment so that mulch effects would not be negated. Thereafter, 0.4 cm of supplemental irrigation per day was applied if needed for optimum turfgrass growth. A 16N–1.8P–6.6K fertilizer at 31 $g \cdot m^{-2}$ was applied at planting and 30 days following planting in both studies. All plots were mowed weekly with a mulching mower at 7.5 cm.

Visual estimates of percentage of grass cover were taken daily for the first 28 days, then weekly estimates of temporary and permanent grasses were made until close of the growing season at the end of September. Ground cover rates (GCR) for companion grasses, which are the sum of mean daily cover estimates, were calculated with the mathematical procedure presented by Maguire (7). Two counts of companion grass seedlings within a 1×10 dm quadrate were made 12 days after planting and were averaged for both studies.

Mean air temperatures in July, August, and September for both studies were 27.8°, 27.2°, and 26.0°C, respectively. Natural precipitation for the same months averaged 16.8, 20.1, and 9.9 cm, respectively. Neither parameter was significantly different between months or years ($P < 0.05$) as determined by t tests. Thus, data for both years were averaged into a single analysis within each turfgrass planting.

Statistical design was a split block with 4 replicates in each of 4 turfgrass plantings. Companion grasses were randomized within permanent grasses, but mulch treatments were stripped perpendicular to companion grasses. Analyses of variance for a split-block design within each turfgrass planting was after Little and Hills (6). Seedling counts and estimates on ground cover percentage were transformed using square root and angular

Table 2. Influence of warm-season turfgrass planting method and mulch on companion grass seedling stands at 12 days after planting.

	Seedlings (no./dm^2)						
	Plugged St. Augustinegrass	Plugged centipedegrass		Seeded centipedegrass		Seeded bahiagrass	
Companion grass		Mulch	No mulch	Mulch	No mulch	Mulch	No mulch
Japanese millet	7.9 ab[z]	8.9 a	7.0 a	9.6 a	6.8 a	9.3 a	7.1 ab
Browntop millet	8.2 a	8.6 ab	6.7 ab	8.9 a	6.4 a	8.0 ab	7.8 a
FL-501 oats	6.1 bc	6.7 bc	5.2 bc	7.8 ab	6.6 a	9.1 a	8.5 a
Bingham millet	5.9 c	5.6 c	4.1 cd	7.0 abc	4.8 ab	5.9 bcd	5.0 bc
Grofast sorghum	3.6 d	5.7 c	3.6 de	5.6 bcd	3.1 bc	7.1 abc	4.4 cd
Italian ryegrass	3.0 d	3.7 d	2.3 e	5.0 cd	2.3 cd	7.8 ab	5.3 bc
Weeping lovegrass	3.4 d	2.9 d	3.7 cd	2.7 ef	3.9 bc	4.3 de	7.3 abc
Gurley Grazer rye	3.2 d	3.6 d	2.3 e	4.3 de	2.4 cd	5.8 bcd	4.5 cd
Ryegrass & fescue	0.8 e	1.0 e	0.9 f	2.5 fg	1.3 de	4.8 cd	3.2 d
Ky 31 tall fescue	0.2 f	0.5 e	0.2 g	1.3 g	0.8 e	2.7 e	4.0 d
None	0 f	0 f	0 g	0 h	0 f	0 f	0 e

[z]Means within columns followed by the same letter and means between mulch treatments within permanent grasses joined by a horizontal line are not significantly different at the 5% level using the Waller–Duncan k-ratio t test or Duncan's multiple range test, respectively.

Table 3. Influence of companion grass and mulch on total cover, ground cover rate (GCR), and composition of ground cover in plugged St. Augustinegrass at various intervals after planting.

	Cover at 7 days (%)		GCR at 28 days (%)[z]		Composition at 63 days (%)		
					Temporary grass		
Companion grass	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch	St. Augustinegrass
Browntop millet	43 a[y]	23 a	48 a	33 a	62 a	57 a	6 de
Japanese millet	31 b	17 b	35 b	26 b	5 d	5 e	5 e
Bingham millet	30 b	16 b	25 c	19 c	41 b	35 b	6 de
Grofast sorghum	29 b	14 bc	20 d	14 d	16 c	8 d	6 de
FL-501 oats	22 c	13 c	15 e	12 d	2 e	1 f	7 cd
Weeping lovegrass	3 de	4 d	6 f	7 e	18 c	20 c	9 abc
Gurley Grazer rye	2 de	2 d	4 fg	4 ef	0 f	0 g	8 bcd
Italian ryegrass	4 d	3 d	3 fg	2 fg	0 f	0 g	9 abc
Ryegrass & fescue	3 de	2 d	2 g	1 fg	0 f	0 g	11 a
Ky 31 tall fescue	2 e	2 d	1 g	1 fg	0 f	0 g	9 abc
None	0 f	0 e	0 g	0 g	0 f	0 g	10 ab

[z]GCR = sum of average percentage of cover per day.
[y]Means within columns followed by the same letter and means between mulch treatments within evaluation periods joined by a horizontal line are not significantly different at the 5% level using the Waller–Duncan k-ratio t test or Duncan's multiple range test, respectively.

Table 4. Influence of companion grass and mulch on total cover, ground cover rate (GCR), and composition of ground cover in plugged centipedegrass at various intervals after planting.

	Cover at 7 days (%)		GCR at 28 days (%)[z]		Composition at 63 days (%)		
					Temporary grass		
Companion grass	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch	Centipedegrass
Browntop millet	38 a[y]	20 a	44 a	31 a	57 a	53 a	11 c
Bingham millet	24 c	13 c	22 c	17 c	23 b	28 b	13 c
Grofast sorghum	29 b	14 ab	20 c	14 d	18 c	12 d	11 c
Japanese millet	28 b	17 ab	32 b	25 b	6 d	6 e	13 c
FL-501 oats	22 c	12 c	16 d	13 d	3 e	2 f	18 a
Weeping lovegrass	3 de	3 d	5 e	7 e	14 c	19 c	14 bc
Italian ryegrass	5 d	4 d	3 efg	2 fg	0 f	0 g	18 a
Gurley Grazer rye	2 e	2 d	4 ef	4 ef	1 f	1 g	17 ab
Ryegrass & fescue	3 de	3 d	2 efg	1 fg	0 f	0 g	18 a
Ky 31 tall fescue	3 de	3 d	1 fg	1 fg	0 f	0 g	18 a
None	0 f	0 e	0 g	0 g	0 f	0 g	18 a

[z]GCR = sum of average percentage of cover per day.
[y]Means within columns followed by the same letter and means between mulch treatments within evaluation periods joined by a horizontal line are not significantly different at the 5% level using the Waller–Duncan k-ratio t test or Duncan's multiple range test, respectively.

transformations, respectively. Comparisons among treatment means within turfgrass plantings were made with the Waller–Duncan k-ratio t test (11), where appropriate, or Duncan's multiple range test (4). Interactions of mulch × companion grass were tested with the appropriately weighted error mean square and Satterthwaite's approximation for degrees of freedom (9). Simple correlations between selected variables were computed where appropriate.

Results and Discussion

Mulch did not enhance seedling stand of companion grass in plugged St. Augustinegrass; however, mulched plots were superior to unmulched plots in seedling stand of companion grasses 12 days after planting with the other warm-season grasses (Table 2). Although some interactions were evident among 3 plantings, mulched plots averaged 4.9 seedlings per dm^2 while unmulched plots averaged 3.8 seedlings per dm^2. Companion grass stand varied from 0.2 to 9.6 seedlings per dm^2, which were far below the desired stand of 40 seedlings per dm^2. Poor grass stand probably was due to seedling mortality, since PLS calculations were based on preplant germination tests. Although Musser and Perkins (8) suggest that 50% seedling mortality is not uncommon, the best millet stand averaged 80% mortality. Additional work on rate of seeding and seedling mortality is needed.

Browntop millet established most rapidly in all plantings (Tables 3–6). In mulched plots, it averaged 42% cover 7 days after planting in spite of low seedling stands. Further, it averaged 60% ground cover at 63 days after planting while warm-season

Table 5. Influence of companion grass and mulch on total cover, ground cover rate (GCR), and composition of ground cover in seeded centipedegrass at various intervals after planting.

	Cover at 7 days (%)		GCR at 28 days (%)[z]		Composition at 63 days (%)			
					Temporary grass		Centipedegrass	
Companion grass	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch
Browntop millet	40 a[y]	23 a	48 a	38 a	62 a	54 a	6 f	5 e
Japanese millet	34 b	18 b	41 b	30 b	6 d	5 e	8 ef	5 e
Grofast sorghum	29 c	15 c	24 c	17 cd	16 c	9 d	9 de	5 e
Bingham millet	24 d	13 cd	26 c	21 c	44 b	33 b	7 f	5 e
FL-501 oats	23 d	11 d	19 d	14 d	3 e	2 f	12 bc	12 bc
Gurley Grazer rye	4 e	4 e	6 e	7 e	0 f	0 f	11 cd	11 c
Italian ryegrass	2 ef	1 f	3 ef	2 f	0 f	0 f	14 ab	11 c
Weeping lovegrass	1 f	1 f	6 e	9 e	16 c	20 c	8 ef	8 d
Ryegrass & fescue	1 f	1 f	1 f	1 f	0 f	0 f	15 a	14 ab
Ky 31 tall fescue	0 f	0 f	0 f	0 f	0 f	0 f	14 ab	16 a
None	0 f	0 f	0 f	0 f	0 f	0 f	14 ab	14 ab

[z]GCR = sum of average percentage of cover per day.
[y]Means within columns followed by the same letter and means between mulch treatments within evaluation periods joined by a horizontal line are not significantly different at the 5% level using the Waller–Duncan k-ratio *t* test or Duncan's multiple range test, respectively.

Table 6. Influence of companion grass and mulch on total cover, ground cover rate (GCR), and composition of ground cover in seeded bahiagrass at various intervals after planting.

	Cover at 7 days (%)		GCR at 28 days (%)[z]		Composition at 63 days (%)			
					Temporary Grass		Bahiagrass	
Companion grass	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch	Mulch	No mulch
Browntop millet	44 a[y]	24 a	49 a	38 a	47 a	42 a	29 g	30 c
Japanese millet	33 b	17 b	41 b	31 b	4 d	3 e	51 e	48 b
Grofast sorghum	29 b	14 c	27 c	20 cd	13 c	7 d	46 ef	47 b
Bingham millet	25 c	13 c	27 c	24 c	34 b	26 b	45 f	43 b
FL-501 oats	21 c	10 d	22 d	18 de	1 e	1 f	72 c	64 a
Gurley Grazer rye	4 d	4 e	15 e	15 e	1 e	1 f	70 c	64 a
Italian ryegrass	3 de	2 f	13 ef	11 f	0 f	0 g	81 ab	67 a
Weeping lovegrass	2 ef	2 f	16 e	16 e	15 c	18 c	58 d	45 b
Ryegrass & fescue	2 ef	1 fg	10 fg	9 f	0 f	0 g	78 b	62 a
Ky 31 tall fescue	2 ef	1 fg	10 fg	9 f	0 f	0 g	78 b	64 a
None	1 f	0 g	9 g	8 f	0 f	0 g	82 a	65 a

[z]GCR = sum of average percentage of cover per day.
[y]Means within columns followed by the same letter and means between mulch treatments within evaluation periods joined by a horizontal line are not significantly different at the 5% level using the Waller–Duncan k-ratio *t* test or Duncan's multiple range test, respectively.

Table 7. Simple correlation coefficients (*r*) in 4 warm-season turfgrass plantings for mulching effects on companion grass competition with warm-season turfgrass cover and weed cover at 63 days following planting.

	Correlation coefficients			
	Turfgrass cover		Weed cover	
Correlated variables of GCR in[z]	Mulch	No mulch	Mulch	No mulch
Plugged St. Augustinegrass	−0.84***[y]	−0.84***	−0.92***	−0.81***
Plugged centipedegrass	−0.81***	−0.83***	−0.87***	−0.85***
Seeded centipedegrass	−0.83***	−0.81***	−0.87***	−0.93***
Seeded bahiagrass	−0.89***	−0.85***	−0.03	−0.24

[z]GCR = ground cover rate of temporary grasses in respective warm-season turfgrass plantings.
[y]***Significance at the 0.1% level of probability.

Table 8. Effects of mulch on warm-season turfgrass cover at 63 days after planting without a companion grass.

Warm-season turfgrass	Cover (%)	
	Mulch	No mulch
Plugged		
St. Augustinegrass	9[z]	10
Centipedegrass	17	20
Seeded		
Bahiagrass	82	65
Centipedegrass	14	14

[z]Means between mulch treatments within grasses joined by a horizontal ine are not significantly different at the 5% level using Duncan's multiple range test.

turfgrass cover was only 6%, 11%, 5%, and 29% in plugged St. Augustinegrass, plugged centipedegrass, seeded centipedegrass, and seeded bahiagrass, respectively. Weeping lovegrass, 'Gurley Grazer' rye, Italian ryegrass, 'Kentucky 31' tall fescue, and the mixture of ryegrass–fescue were unacceptable companion grasses, as none averaged 5% ground cover in mulched or unmulched plots when evaluated 7 days after planting. Cool-season grasses such as ryegrass, tall fescue, and oats should not be seeded if average air temperatures are $>26°C$ (1). However, they were included in this study to determine if they would germinate, establish, and then die rapidly to provide a noncompetitive, anchored mulch. This sequence was observed, but ground cover from ryegrass and tall fescue ranged from 0% to 5%, which was unacceptable. Although 'FL-501' oats produced about half the ground cover as Browntop millet at 7 days, it was much less competitive than Browntop millet. Permanent grass stands at 63 days in most instances were equal to those in permanent grass plots that were planted without a companion grass. 'Gro-fast' sorghum was intermediate in ground cover at 7 days, but, like Browntop millet, it was equally competitive to warm-season grass establishment when evaluated at 63 days.

Mulch had a beneficial effect on rate and total ground cover and, in most instances, on vegetative composition, although interactions associated primarily with poor-performing companion grasses were noted in most plantings (Tables 3–6).

Poor performance of most companion grasses was due primarily to poor seedling stand (Table 1). Simple correlation coefficients ($P > 0.001$) for mulching effect on companion grass seedling stand with total turf cover 7 days after planting varied from $r = 0.82$ to $r = 0.90$ in all turfgrass plantings except in seeded bahiagrass. There was no relationship ($P < 0.05$) between seedling stand of companion grass and total ground cover because of fast germination and establishment of 'Argentine' bahiagrass. Mulched and unmulched bahiagrass plots sown without a companion grass averaged 82% and 65% ground cover at 63 days, respectively (Table 6).

Although companion grasses provided fast establishment and ground cover during the slow establishment period for permanent turfgrass species, they were also competitive with the latter. Correlation coefficients varied from $r = -0.81$ to $r = -0.89$, relating turfgrass ground cover at 63 days with ground cover rate of companion grass (Table 7). However, negative correlation coefficients relating weed infestation with ground cover rate of companion grass were also highly significant in all plantings, except in seeded bahiagrass. Weed infestation in bahiagrass averaged only 3% compared to 42% for other plantings. Thus, the excellent stand of bahiagrass was, in itself, competitive to weed invasion, whereas other turfgrasses were not competitive because of their slow rate of establishment. A compatible companion grass seeded with a warm-season turfgrass produces a more desirable vegetative cover than a ground cover composed primarily of weeds.

Mulch had a beneficial effect on establishment of seeded bahiagrass but, equally significant, mulch did not have a detrimental effect on the vegetatively established warm-season turfgrasses (Table 8). Although soil erosion was not a problem in these studies, mulched plots averaged 41% annual grassy weeds, significantly lower ($P > 0.01$) than the 44% weed infestation in unmulched plots. Weed species and competition would vary between plantings based on soil type and past cropping history. Because of its advantages, mulch application to sprig or plug plantings of centipedegrass and St. Augustinegrass should be used as an aid in the vegetative establishment of these warm-season turfgrasses.

Literature Cited

1. Beard, J.B. 1973. Turfgrass science and culture. Prentice-Hall, Englewood Cliffs, N.J. p. 521.
2. Copeland, L.O. (ed.). 1978. Rules for testing seeds. J. Seed Technol. 3:36–51.
3. Dudeck, A.E., N.P. Swanson, L.N. Mielke, and A.R. Dedrick. 1970. Mulches for grass establishment on fill slopes. Agron. J. 62:810–812.
4. Duncan, D.B. 1955. Multiple range and multiple F tests. Biometrics 11:1–42.
5. Heath, M.E., D.E. Metcalfe, and R.F. Barnes, 1973. Forages: The science of grassland agriculture. 3rd ed. Iowa Univ. Press, Ames.
6. Little, T.M. and F.J. Hills. 1978. Agricultural experimentation—design and analysis. Wiley, New York.
7. Maguire, J.D. 1962. Speed of germination-aid in selection and evaluation for seedling emergence and vigor. Crop Sci. 2:176–177.
8. Musser, H.B. and A.T. Perkins. 1969. Guide to planting. Agron. Monogr. 14:462–490.
9. Satterwaite, F.E. 1946. An approximate distribution of estimates of variance components. Biometrics 2:110–114.
10. Schmidt, R.E. and R.E. Blazer. 1969. Ecology and turf management. Agron. Monogr. 14:217–239.
11. Waller, R.A. and D.B. Duncan. 1969. A Bayes rule for the symmetric multiple comparison problem. J. Amer. Stat. Assoc. 64:1484–1503.