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Cold Hardiness of Bermudagrass and *Paspalum vaginatum* Sw.[1]

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Abstract. **Field and laboratory tests of cold hardiness were conducted on 8 cultivars of bermudagrass (*Cynodon* spp.) and 2 cultivars of *Paspalum vaginatum*. The cultivars of bermudagrass were more cold hardy than those of *Paspalum*. 'Brookings' bermudagrass was the hardiest turfgrass.**

Bermudagrass has excellent wear tolerance and recuperative potential and is the most widely used turfgrass in the southern United States. Its use is limited in the northern extremes of the southern U.S. because it does not tolerate cold well. The variability in cold hardiness (1, 2, 4) of bermudagrass cultivars suggests the possibility of major improvements for this character.

Paspalum vaginatum is known to perform well in sub-tropical areas of Florida and Georgia (5) and appears to have good potential as a turfgrass on saline soils. However, work with turf-type cultivars of this grass is limited. This work was conducted to investigate variability of cold hardiness and low temperature killing point of cultivars of bermudagrass and *P. vaginatum*.

'Pee Dee 102', 'Santa Ana', 'Tifgreen', 'Tifdwarf', 'Tifway', 'LaJunta' (from LaJunta, Colorado), 'NEJC' (from Northeastern Junior College, Sterling, Colorado), 'Brookings' (from Brookings, South Dakota) bermudagrass and 'Futurf' and 'Adalayd' cultivars of *P. vaginatum* were investigated in this study. After a pre-planting application of 977 g soluble N/100m^2, the grasses were planted in the field on May 31, 1978 in a randomized complete block design with 3 replications. After establishment, 567 g (a.i.) of 2,4-dichlorophenoxyacetic acid (2,4-D) plus 567 g (a.i.) of 3,6-dichloro-o-anisic acid (dicamba) per ha was applied to the plots to control broadleaf weeds. At this dosage some damage was noticed on 'Pee Dee 102' and 'Tifway'. A 2% solution of n-(phosphonomethyl) glycine (glyphosate) was sprayed as often as necessary between cultivars to keep them separated. On July 10, 1978, the plots were again fertilized at 488g soluble N/100m^2; after establishment the entire area was topdressed once with soil. Plots were well established and completely covered by the time that 0°C occurred; daily maximum and minimum air temperatures and soil temperature at 5.0 cm were determined.

In order to determine turfgrass regrowth after cold stress cores measuring 10 cm diameter and 5 cm deep were extracted from each plot on a biweekly basis, starting on December 1, 1978 and continuing to March 30, 1979. Cores were placed in flats of sand; arranged in a randomized complete block design with 3 replications; and grown in the greenhouse under a day temperature of about 28° C and a night temperature of 20° . Flats were watered daily. Cultivars were rated for regrowth after 6 weeks on a scale of 0 (no growth) to 10 (complete regrowth).

'Futurf' and 'Adalayd' paspalum did not live through December (Table 1). In December, soil temperatures ranged from +2° to −8.9°, with 14 days between −7.8° and −8.8° . The last sampling date for which any regrowth was obtained for 'Tifway', 'Santa Ana' and 'LaJunta' bermudagrass was January 15. 'Pee Dee 102', 'Tifgreen' and 'Tifdwarf' had regrowth through January 30. Soil temperatures were consistently low in January with the lowest temperatures being −11.1° . 'NEJC' regrew until the February 28 test date while 'Brookings' survived the winter. Soil temperature ranged between −4.4° and −11.1° until February 10. Thereafter, the soil temperature was between −1.1° and −2.2° for the rest of February except for a

Table 1. Regrowth rating of cultivars of bermudagrass (*Cynodon* spp.) and *Paspalum vaginatum*.

Cultivar	Regrowth Rating[z]								
	Dec 1	Dec 18	Dec 30	Jan 15	Jan 30	Feb 14	Feb 28	Mar 17	Mar 30
Paspalum vaginatum									
Futurf	8.7	0	0	0	0	0	0	0	0
Adalayd	8.3	.3	0	0	0	0	0	0	0
Cynodon spp.									
Tifway	8.7	4.7	3.3	2.0	0	0	0	0	0
Santa Ana	10.0	4.7	3.7	1.3	0	0	0	0	0
LaJunta	9.3	6.7	5.7	.3	0	0	0	0	0
Tifdwarf	10.0	7.3	8.0	.3	2.7	0	0	0	0
Pee Dee 102	9.7	8.0	7.3	3.7	2.7	0	0	0	0
Tifgreen	9.7	7.7	7.3	4.0	4.3	0	0	0	0
NEJC	9.3	7.3	6.0	5.7	5.0	5.3	0	0	0
Brookings	4.3	3.7	4.3	7.3	8.0	8.0	7.0	8.0	7.0
LSD 5%	1.5	1.7	1.8	1.8	1.9	1.7	1.8	1.7	1.7

[z] 0 (no growth) - 10 (complete regrowth).

Table 2. Low temperature killing point expressed in °C for cultivars of bermudagrasses (*Cynodon* spp.) and *Paspalum vaginatum*.

Cultivar	Low temperature killing point[z] (°C)							
	Oct 18 1978	Nov 15 1978	Dec 14 1978	Jan 13 1979	Feb 14 1979	Mar 16 1979	Apr 15 1979	May 14 1979
Paspalum vaginatum								
Futurf	−2	−3	−7					
Adalayd	−3	−3	−7					
Cynodon spp.								
Tifway	−3	−4	−7					
La Junta	−2	−4	−9	−9				
Santa Ana	−4	−5	−9	−9				
Pee Dee 102	−2	−5	−11	−11				
Tifdwarf	−3	−5	−11	−11				
Tifgreen	−2	−6	−9	−11				
NEJC	−2	−3	−11	−11	−13			
Brookings	−2	−6	−13	−17	−17	−11	−6	−6

[z] The killing point was considered the midpoint in the inflection curve of the electrolyte loss curve.

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−6.7°C on February 23. 'Brookings' showed poor regrowth from earlier sampling, but at later dates regrowth ratings increased considerably. It is possible that the poor regrowth obtained from samples of 'Brookings' taken in December was due to short day lengths in the greenhouse.

In the spring 'Pee Dee 102', 'Tifgreen' and 'NEJC' were alive in a narrow band near a hedge planting. These patches were under a thicker snow cover than found on other areas of the experimental plot. Snow has an extremely low thermal conductivity and protects turf against low temperature and also serves to reduce frequency of freezing and thawing. Based on climatological data, it appears that 'Pee Dee 102', 'Tifgreen' and 'NEJC' may be able to survive less severe (more typical) winters in Fort Collins, Colorado.

Artificial freezing test. Starting from mid-October, 1978 and continuing monthly until May, 1979, stolons of each cultivar were taken from the field and subjected to a standard freezing test (1). The temperature range was 0 to — 20°C with a temperature treatment interval of 2°. Degree of injury at a given temperature was estimated by conductivity measurements (3). The percentage of injury at each temperature treatment was determined as:

$$\left(\frac{\text{exosmosis of electrolyte at given temperature}}{\text{exosmosis of electrolyte for killed tissue}}\right) 100$$

A plot of the percentage injury against temperature was made and the killing point determined as the mid-point of the inflection of the curve. Table 2 shows low temperature killing points for cultivars on sampling dates. No data recorded for a date indicates that the cultivar was dead.

Bermudegrasses differ in cold hardiness but were generally more cold-hardy than the cultivars of *P. vaginatum* studied. 'Brookings' was the most cold-hardy followed by 'NEJC' while 'Tifway' was least cold-hardy. Bermudagrass tended to acclimate to cold slowly not reaching the maximum level of cold hardiness until mid-winter, rendering it susceptible to cold temperatures which may occur in early winter. Field test data and that for artificial freezing produced similar results.

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CULTIVAR & GERMPLASM RELEASES

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'Starlite' Peach[1]

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'Starlite' peach [*Prunus persica* (L.) Batsch] has been released to provide an early white-fleshed peach for local markets. The fruit is larger and more uniform in size, shape, and maturity than 'Springtime', the leading white-fleshed cultivar of its season.

Origin

'Starlite' originated from a cross (Fig. 1) made in 1959 by V. E. Prince. FV89-14 has early-ripening, firm, highly attractive fruit, but unfortunately is quite susceptible to bacterial spot incited by *Xanthomonas pruni* (E. F. Sm.) Dows.

'Starlite' was selected in 1964 and subsequently tested as FV9-239. It has fruited at experiment stations in Alabama, Georgia, and North Carolina and with grower cooperators in Alabama and Georgia.

Description

Trees of 'Starlite' are vigorous and productive for an early season cultivar. Although susceptible to bacterial spot, the fruit usually escapes injury because it matures early in the season. The chilling requirement for breaking the bud rest period is about 650 hours below 7.2°C. However, 'Starlite' has set good crops in North Carolina where cultivars requiring higher chilling are normally needed. Leaf glands are globose. Trees at Byron have been indexed and found to be free of *Prunus* ringspot virus.

The self-fertile blossoms are showy with large pink petals. Fruit (Fig. 2) are small to medium in size, about 5 cm in diameter when properly thinned. Fruit shape is round with a slight tip. The surface is 70% bright red at maturity, the undercolor being white with a slight green tint. Pubescence is light. The firm, but melting, white flesh tends to be semi-clingstone when ripe, with medium texture and good flavor.

'Starlite' ripens with 'Springold', about 3 days after 'Springtime', or 55 days before 'Elberta' at Byron.

Availability

'Starlite' should be available from commercial nurseries in 1981. Limited amounts of budwood are available from W. R. Okie.

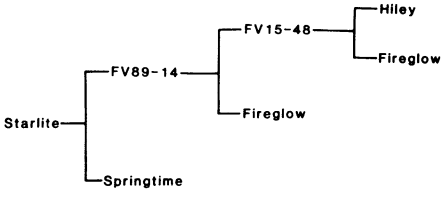

Fig. 1. Pedigree of 'Starlite' peach.

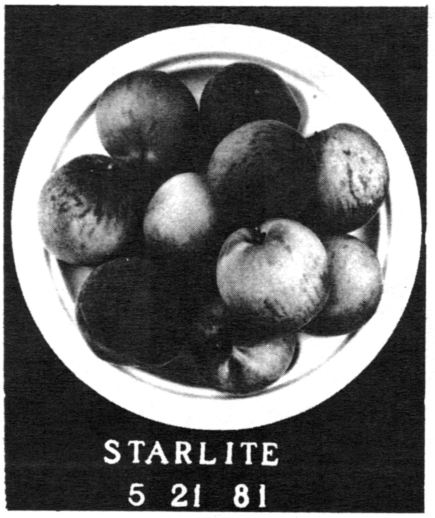

Fig. 2. Mature fruit of 'Starlite' peach harvested May 21.

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