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An Evaluation of Tall Fescue and Kentucky Bluegrass Mixes

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Tall fescue, a native of Europe, was introduced into the United States by early settlers for pasture use and soil stabilization purposes. Two varieties of pasture-type tall fescues, 'Kentucky 3 1' and 'Alta', were widely used for minimum maintenance turf sites because of their comparative low maintenance requirements, high wear tolerance and broad environmental adaptation capability (3).

Tall fescue has been particularly useful in turfgrass transitional climatic zones, which are located between temperate and subtropical climate zone in the United States, because of its high tolerance to warm temperature and its ability to grow, without winter dormancy, in relatively cool, but not severe, winter conditions. Therefore, it has been used as a mono stand or, in some instances, as a polystand, usually with Kentucky bluegrass (1). The tall fescue - Kentucky bluegrass mix has been used by sod growers because of increased sod strength when the rhizome-producing Kentucky bluegrass is present. When mixed with Kentucky bluegrass, a very high percentage of tall fescue is suggested (85-95%) on a seed weight basis), otherwise, the tall fescue in the mix can become uneven, reducing the aesthetics and usefulness of the sward (1,2,4). Mowing heights and fertilization programs have influenced tall fescue content and resulting unevenness (2,4). Also, improved cultivars of Kentucky bluegrass have not performed well when mixed with pasture-type tall fescue because of the characteristic of Kentucky bluegrass to quickly dominate the stand (2).

In the late 1970's, and throughout the 1980's, turf-type tall fescues were released from breeding programs that emphasized finer leaf texture, darker green color and increased density. The new cultivars gained immediate acceptance in turfgrass transitional climatic zones because of their superior turfgrass quality characteristics. Because of the availability of the newer, turf-type tall fescues, it was the purpose of this study to evaluate the compatibility of three cultivars of tall fescue when singly mixed with three Kentucky bluegrass cultivars, over a 4 to 5 year period.

METHODS

'Alta', 'Mustang' and 'Jaguar' tall fescues and 'Kenblue', 'Columbia' and 'A34' Kentucky bluegrass cultivars were chosen for this study. Each tall fescue cultivar was seeded alone and as a mixture with each Kentucky bluegrass cultivar. Each mixture consisted of 95% tall fescue and 5% Kentucky bluegrass on a seed weight basis.

The study was established in April 1985 at the University of California, Riverside, Turfgrass Research Facility. The on-site soil is a Hanford fine sandy loam with a pH of 7.0. Throughout the study, the trial area was regularly fertilized with nitrogen, mowed weekly at 2 inches with a rotary mower with clippings removed, and irrigated based on replacement of water use as calculated from a nearby automated weather station and adjusted for distribution uniformity of the irrigation system.

RESULTS

The selection of cultivars of tall fescue and Kentucky bluegrass was based on their previously observed competitiveness in California and from personal communication. Alta tall fescue, a pasture-type cultivar, is least competitive and of lowest density; Mustang and Jaguar are turf-type tall fescues with a higher tiller density. Kenblue is a Kentucky bluegrass of comparatively low vigor, with Columbia intermediate, and A34 characterized by high vigor and very competitive growth habit.

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Table 1 presents the turfgrass quality ratings for the monostands of the three tall fescue cultivars and for the tall fescue - Kentucky bluegrass mixes. For each year and for the summation of all years, Alta established alone, or mixed with a Kentucky bluegrass cultivar, gave inferior quality performance when compared to the monostands or polystands of the turf-type tall fescue cultivars. The coarser leaf texture of Alta and the uneven growth of treatments that contained Alta accounted for the lower turfscores.

Table 1. Turfscorer for monostands of three tall fescue cultivrrs and polystand of tall fescue and Kentucky bluegrass at UC Riverside (19851989). (l-9 rating system, 9 ideal.)

	Year					
Treatments	1985	1986	1987	1988	1989	All Years
Alta	5.2d*	5.0c	4.7 c	4.9 d	4.7c	4.9 d
Alta&A34	5.1d	5.2c	4.9c	5.4b	5.4b	5.2c
Alta & Columbia	5.3d	5.2c	4.9 c	5.2bc	5.4b	5.2c
Alta & Kenblue	5.3d	5.1c	4.6c	5.0cd	4.8c	5.0cd
Mustang	6.4abc	6.6 b	6.5 b	6.8 a	6.7 a	6.6 ab
Mustang & A34	6.1 c	6.8ab	6.5b	6.9 a	6.6 a	6.6 b
Mustang & Columbia	6.5ab	6.9ab	6.7ab	6.9 a	6.6 a	6.7 ab
Mustang & Kenblue	6.3bc	6.7ab	6.5b	6.7a	6.7a	6.6ab
Jaguar	6.6ab	7.0ab	6.7ab	6.8a	6.7a	6.8ab
Jaguar & A34	6.7 ab	6.9ab	6.9a	7.0 a	6.8a	6.8 ab
Jaguar & Columbii	6.7 A	7.1a	6.9a	7.0a	6.7a	6.9a
Jaguar & Kenblue	6.6ab	6.9ab	6.8ab	6.8a	6.7a	6.8ab

* Values followed by the same letter within a column are not significantly different at the 5 % level of probability.

There were few differences noted between monostands and polystands of Mustang and Jaguar tall fescues for each year or for the summation analysis for all years. Also, the Kentucky bluegrass cultivars provided limited influence on turfgrass quality, especially as the swards matured. These results indicated that the tall fescue part of the mix was having the primary influence on the turfgrass quality observed throughout the study.

That observation is supported by the results presented in Table 2. Counts of species composition taken in 1986, 1988 and 1989, showed that Mustang and Jaguar dominated the treatments throughout the study period. There were no significant differences noted with Mustang and Jaguar mixes with Kenblue, Columbia and A34. In contrast, the percent of Alta tall fescue in mixes with any Kentucky bluegrass cultivar was significantly lower than similar mixes with Mustang and Jaguar. Also, the percent Alta decreased with time when mixed with the more competitive cultivars of Kentucky bluegrass. Alta appeared to stabilize around 65% when mixed with Kenblue, which agrees with previous reports of mixes of pasture tall fescue and common Kentucky bluegrass cultivars (4).

Table 3 presents thatch measurements that were taken in 1988 and 1989. In general, more thatch was found in monostands and polystands that contained

Table 2. Percent tall fescue of Alta Mustang and Jaguar cultivars in monostands and polystands with A34, Columbia and Kenblue Kentucky bluegrass.

	Year		
Treatments	1986	1988	1989
		%	
Alta	96.5 a	99.4 b	100.0 a
Alta & A34	61.2 e	31.6 e	39.5 d
Alta & Columbia	74.8 cd	41.4 e	28.9 d
Alta & Kenblue	68.0 de	61.9 d	65.8 c
Mustang	97.4 A	100.0 a	98.2 ab
Mustang & A34	90.0 ab	83.4 bc	83.9 abc
Mustang & Columbia	82.3 bc	79.5 c	80.8 bc
Mustang & Kenblue	88.8 ab	95.9 ab	83.5 bc
Jaguar	97.1 a	109.0 a	98.6 ab
Jaguar & A34	91.5 ab	85.3 abc	86.6 ab
Jaguar & Columbia	90.8 ab	90.1 abc	87.3 ab
Jaguar & Kenblue	89.3 ab	94.7 abc	92.8 ab

* Values followed by the same letter within a column arc not significantly different at the 5 % level of probability.

Mustang and Jaguar tall fescue in comparison to those that contained Alta. There was little influence of the Kentucky bluegrass cultivars on thatch depth in mixes with either the turf-type cultivars or with Alta tall fescue. Increased thatch accumulation with the newer tall fescues has been reported previously (5).

Table 3. Thatch depth, in mm, of Aha, Mustang and Jaguar tall fescue in monostands and when mixed with A34, Columbia and Kenblue Kentucky bluegrass.

	Year	
Treatment	1988	1989
Alta	20.2 c*	21.4 f*
Alta&A34	22.2 c	23.0 def
Alta & Columbia	23.8 bc	24.4 cde
Alta & Kenblue	22.2 c	22.0 ef
Mustang	29.7 a	30.2 a
Mustang & A34	28.1 a	26.5 bc
Mustang & Columbia	27.4 ab	25.4 bcd
Mustang & Kenblue	28.0 A	27.7 ab
Jaguar	29.3 a	24.1 def
Jaguar 8~ A34	26.4 ab	21.6 ef
Jaguar & Columbia	28.6 a	27.1 bc
Jaguar & Kenblue	29.8 a	26.6 bc

• Values followed by the same letter within a column are not significantly different at the 5% level of probability.

This study showed that mixes of selected Kentucky bluegrass cultivars with Mustang or Jaguar turf-type tall fescues performed much differently than did mixes of the same Kentucky bluegrass cultivars with Alta tall fescue, a pasture-type grass. The Kentucky bluegrass and turf-type tall fescue mixes were of equal turfgrass quality, including evenness of stand, to monostands of the turf-type tall fescue cultivars. Also, the species composition remained stable over the time period of this study, with the turf-type tall fescue dominating the mix, irrespective of the Kentucky bluegrass cultivar examined. In contrast, mixtures of Kentucky bluegrasses with a pasture-type tall fescue produced lower quality, uneven swards with dramatically reduced percentages of tall fescue.

In summary, sod growers, turfgrass managers or seed distributors who have reason to use mixes of Kentucky bluegrass and tall fescue can expect better quality and more uniform grass stands when turf-type tall fescues are used instead of pasture-type cultivars of tall fescue.

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Plant Growth Regulators and Their Effect on Rooting in Newly Sodded Turf

Pamela M. Elam [1]

There are many plant growth regulators (PGRs) used in turf to reduce mowing frequency and clipping yields while still maintaining a quality of turf. PGRs may allow for decreased input in terms of mowing, reduced seedhead development and improved color in some cases. However, there is little information on the effect PGRs might have on the root development of newly planted sod.

The purpose of this project was to evaluate six PGRs for their effect on root development on newly sodded turf and to evaluate the comparative turf quality, clipping weights, clipping frequency and activity period after PGR application.

MATERIALS AND METHODS

The trial was conducted in a greenhouse at the University of California Agricultural Experiment Station in Parlier during the summer of 1991. One gallon nursery pots were filled with a clean sand medium and uniform 4-inch-diameter discs of newly cut sod were planted. In this trial, we evaluated Kentucky bluegrass, tall fescue and 'Tifgreen' hybrid bermudagrass. The potted sod was placed in a greenhouse and grown at 80°F under sprinkler irrigation. The pots were irrigated two times daily for 5 minutes the first week and once daily for 10 minutes thereafter. Three days after planting, the PGR treatments were applied as a spray application at the following rates:

1. cimectacarb (Primo 2 EC) @ 0.27 pound per acre
2. cimectacarb (Primo 2 EC) @ 0.54 pound per acre
3. fluprimidol (Cutless 50 WE) @ 1.5 pounds material per acre
4. mefluidide (Embark 2E) @ 1 pint material per acre
5. amidochlor (Limit) @ 2.5 pounds material per acre
6. check

Amidochlor and fluprimidol are taken up by the roots and so were lightly watered in after application. Cimectacarb and mefluidide are more actively absorbed by the foliage and were not watered in.

During the 4-week observation period, color/quality ratings were made on a l-10 scale (l=dead, 5 = check). Quality can be less than, equal to or better than the check and is evaluated based on color, density and whether there was a deformity in plant growth. Height measurements, clipping weights and clipping frequency were also recorded. The turf was maintained at the optimum height for the species. Kentucky bluegrass and tall fescue were maintained at 2.5 inches and hybrid bermudagrass was maintained at 0.75 inches. If the plants exceeded the desired height by one third, the plants were clipped. The treatments were replicated four times, All statistical analyses were based on a Randomized Complete Block Design. All results are reported at the 5% level of significance using Duncan's Multiple Range Test.

At the end of 4 weeks, the activity of the PGRs ceased. The plants were uprooted, the roots were washed and root length was measured. The roots were then separated from the plant, weighed, oven dried and weighed again to determine biomass.

RESULTS AND DISCUSSION

The first variable evaluated was quality. It is important to note, that this was a greenhouse trial and field results may vary. Quality ratings at either rate of cimectacarb were not significantly different from the control for all turf species. Fluprimidol reduced turfgrass quality slightly but significantly as compared to the check only for bermuda. Mefluidide and amidochlor-treated turf generally had the lowest quality. See Figure 1.

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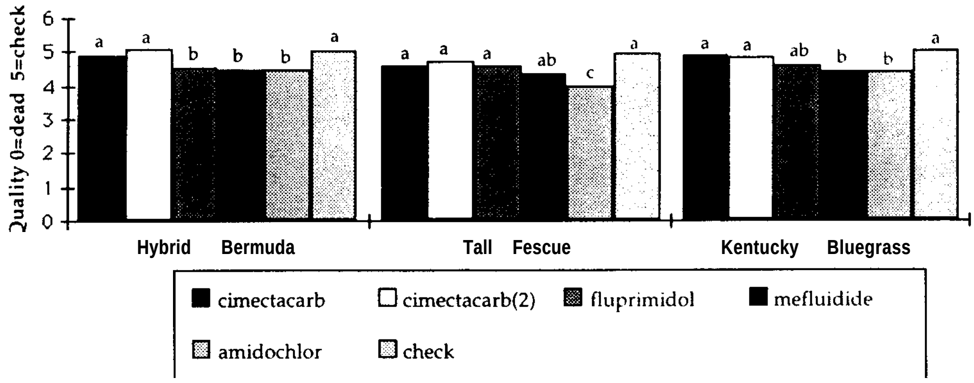
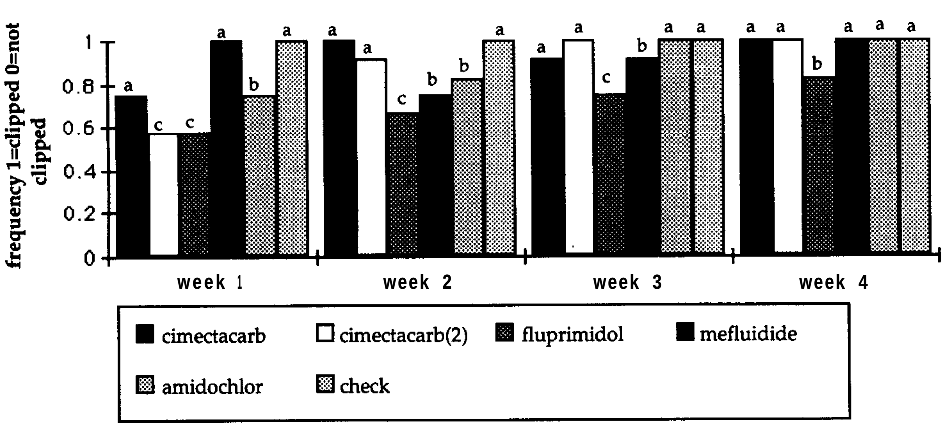
Figure 1. Quality ratings for all treatments within varieties.



For each set of measurements, values with the same letters are not significantly different (Duncan's multiple range test, P< 0.05.)

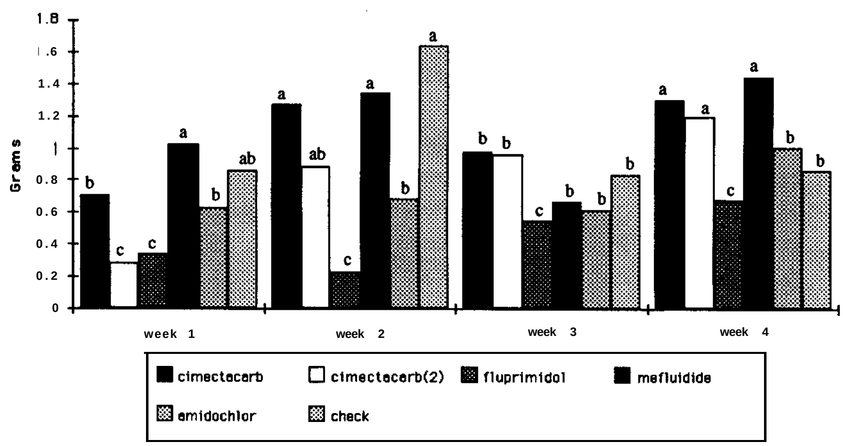
Clipping frequency is as important a consideration as clipping weight because once clipping commences, costs are essentially the same in terms of work hours, and machine costs, independent of clippings collected. In this trial we evaluated clipping frequency on a "yes" or "no" basis with 1 =clipped and O=not clipped. The decision to clip or not to clip was based on whether the growth was one third higher than the desired cutting height. Clipping frequency across varieties was not significant, however, it was between treatments. Over all, the clipping frequency was lowest in the first 2 weeks after the PGR application with all plants needing some clipping by the third and fourth weeks. Cimectacarb at the high rate and fluprimidol-treated turf had the lowest clipping frequency for the first week and fluprimidol maintained the lowest frequency through the trial. See Figure 2. Clipping weights were also evaluated. Clipping weights are valuable in that they give an indication of vigor. The greater the clipping weights, the more vigor. The effect of varieties was not significant. During the first week, cimectacarb at the higher rate and a fluprimidol-treated turf, had the lowest clipping weights. In the second, third and fourth weeks, fluprimidol treated turf still had the lowest clipping weight. Also, in the fourth week, four of the treatments had clipping weights higher than the check. This may be due to the cessation in PGR activity on the turf and a subsequent increase in growth rate as the response. See Figure 3. It was interesting to note

Figure 2. Clipping Frequency over all turf varieties over four week period.



***Frequency l=Clipped,** O=Not clipped
For each set of measurements, values with the same letters are not significantly different.
(Duncan's multiple Range test, P<0.05)

Figure 3. **Clipping weights overall turf varieties over a** four week **period**



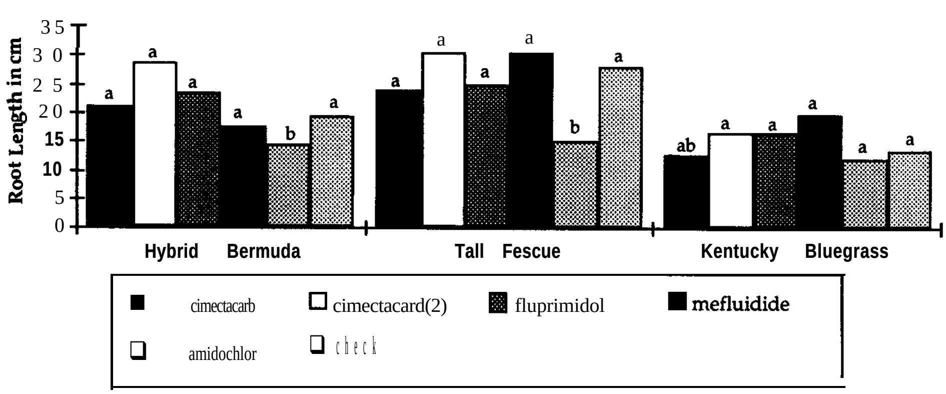
For each set of measurements, values with the same letter are not significantly different.
(Duncan's multiple range test, P<0.05).

that in the second week, most clipping weights went up dramatically and then fell off again. The changes in growth rates may be due to increased rooting of the sod, adaptation to the greenhouse environment and/or leaching of fertilizer from the sod layer.

At the end of the evaluation period, rooting characteristics were examined to ascertain if the PGRs inhibited or otherwise affected rooting. In the statistical evaluation, there were no significant differences in the dry root weight and thus no differences in root biomass. The only significant difference in the length of roots 4 weeks after treatments was with the amidochlor treatment. In amidochlor-treated hybrid bermuda and tall fescue, the roots had a significantly reduced root length. Amidochlor-treated Kentucky bluegrass, however, was not significantly affected by the treatment. What is interesting, however, is that the total biomass was not affected by any of the treatments, indicating that while roots may not move deeply in the soil with some treatments, there is still a significant degree of root proliferation. This would indicate that there would be little affect on a turfgrass sod treated with a PGR in terms of its ability to grow roots while still limiting, for a short period, foliar growth. See Figure 4.

It is important to consider all four factors: quality, mowing frequency, clipping weight and rooting, in combination to determine an optimum treatment. In this trial, fluprimidol had the lowest clipping frequency and clipping weight, but it also had a lower quality rating, when hybrid bermudagrass was treated. It did not, however, inhibit rooting. Amidochlor also had a significantly reduced clipping weight and, up to the third week, a reduced clipping frequency, but it also had the lowest turf quality score throughout the trial and the least amount of rooting of all the treatments. Conversely, cimectacarb at the high rate, maintained a high quality rating and had good root growth, but only reduced the clipping frequency for 2 weeks after the application. Mefluidide

Figure 4. Root length four weeks after plant growth regulator treatment.



For each set of measurements, values with the same letters are not significantly different.
(Duncan's multiple range test, P<0.05.)

apparently did little except reduce the turf quality on hybrid bermudagrass. It reduced clipping frequency slightly only during the second and third week, had clipping weights equal to or higher than the check, and root length equal to the check. Because of the variability of response between treatments and species, it is important to determine the primary goal in treating a sod with a growth regulator and what quality expectation one would have for a treated turf.

In summary, this study would indicate that it is possible to treat newly sodded turf with some PGRs to reduce grass shoot growth without significantly affecting rooting in a greenhouse situation. It will be important to determine if applications of PGRs to newly sodded turf in the field will result in a similar response.

UC TURF CORNER

UC Turf Corner contains summaries of recently reported research results, abstracts of certain conference presentations and announcements of new turf management publications.

Grass Clipping Management

Ali Harivandi [1]

Each year Californians generate approximately 44 million tons of municipal solid waste. As our population grows and trash dumps become scarce, the solid waste problem becomes more critical. Although voluntary waste recycling has been in place in many California communities for years, waste reduction became mandatory for California municipalities with the passage of AB 939, California's Integrated Waste Management Act. This statute mandates that each jurisdiction in the state reduces its trash output by 25% by 1995 and 50% by the year 2000, with 1990 as the base year. Concurrent to the passage of AB 939, the newly created California Integrated Waste Management Board (CIWMB), began implementing a comprehensive set of laws addressing California's solid waste disposal dilemma while lessening the demand on diminishing natural resources.

It is estimated that 20% of waste going to land-tills is yard waste. Cornposting is one successful method of dealing with such waste; the Board is also exploring ways to reduce yard waste generation. Since grass clippings comprise a significant portion of this waste, the Board supports the practice of "grasscycling." Consequently, with the assistance of U.C.C.E., information has been developed to promote grasscycling among both homeowners and professional landscape managers.

Grasscycling is a new term for the old practice of leaving clippings on the lawn after mowing. This practice is environmentally sound and saves time, energy and our rapidly declining landfill space. A grasscycling research project at the Bay Area Research and Extension Center in Santa Clara generated interesting data: preliminary results show that using a mulching (recycling) mower on a Kentucky bluegrass/ perennial ryegrass lawn can reduce grass clipping waste by up to 300 pounds per 1000 sq ft per year. Regular analysis of grass clippings suggest that leaving this quantity of clippings on lawn can add up to 4 pounds of nitrogen per 1000 sq ft per year. No thatch has accumulated where clippings are returned to the lawn. This project will continue for one more year and is expected to generate additional useful data.

Invasive Characteristics of Kikuyugrass

Cheryl A. Wilen, Jodie S. Holt and David W. Cudney [2]

Kikuyugrass *(Pennisetum clandestinum)* is a perennial grass that was introduced into California from western Africa. As an aggressive weed in turf, it interferes with growth of desired turf by spreading rapidly via thick stolons and rhizomes. Kikuyugrass may also spread by seed. Another undesirable characteristic of kikuyugrass is its production of heavy thatch. Currently there are no cultural or single

1 From: Proceedings, UCR Turfgrass Research Conference and Field Day, September 14, 1993. p. 4.

2 From: Proceedings, UCR Turfgrass Research Conference and Field Day, September 14, 1993. p. 3.

chemical methods to control kikuyugrass with the exception of total renovation using either glyphosate or methyl bromide.

In order to understand how to control kikuyugrass in California, we examined physiological and growth characteristics of this grass. We found that, despite kikuyugrass being a warm-season grass, it had photosynthetic rates similar to those of the cool-season grass tall fescue when subjected to low leaf temperatures. At higher leaf temperatures, kikuyugrass had greater photosynthetic rates than both tall fescue and the warm-season species; it has the potential to produce biomass even during cool periods. Growth rate experiments showed that kikuyugrass produced biomass similar to that of tall fescue when grown under cool temperatures, and its biomass greatly exceeded that of both St. Augustinegrass and fescue when grown in warm temperature.

To examine whether kikuyugrass is spread by seeds, we collected plants from golf courses in Palo Alto, Nipomo and Riverside and studied their genetic makeup. We found that there were few genotypes overall, which indicated that spread by seeds was not as common as spread by vegetative means. The exception was in Palo Alto, where we found several different genotypes. We hypothesize that this was due to the patchiness of the course, which allowed seeds to germinate and spread without competition from established plants. Thus, spread by seeds could be a problem where the turf is not thick.

Buffalograss Identification

Lin Wu

Buffalograss *(Buchloe dactyloides* is a warm-season grass that is receiving plant breeding attention because of low-input needs. The objective of this work was to develop an efficient and accurate method to identify cultivars and breeding lines using Random Amplified Polymorphic DNA (RAPD) markers. The study evaluated 25 lines of buffalograss, three extraction methods and fresh or oven-dried leaves.

It was reported that buffalograss contains diploid (2n = 20), tetraploid (2n = 40) and hexaploid (2n = 60) races. Diploid and tetraploid races are restricted to areas in central Mexico, New Mexico and southern Texas. A list of the lines examined and their ploidy level is given in the following table.

It was found that the DNA profiles produced by the DNA extracted by the three extraction methods for dry or fresh leaves were very similar. The study reported 80% reproducibility, demonstrating the method "can be used for buffalograss DNA fingerprint analysis," which will be useful in plant improvement programs. More research will be needed for positive buffalograss identification with these methods.

(See: Lin Wu and Hong Lin. 1994. Identifying Buffalograss *(Buchloe ductyloides (Nutt.)* Engelm.) Cultivar Breeding Lines Using Random Amplified Polymorphic DNA(RAPD) Markers, J. Amer. Soc. Hort. Sci. 119(1):126-130.) (VAG 2-17-94)

Buffalograsses and ploidy levels of culitivars and breeding lines used for tbe RAPD marker studies:

Buffalo-grass	Ploidy level	Buffalo-grass	Ploidy level	Buffalo-grass	Ploidy level
AZ143	Hexaploid	Highlight 92	Diploid	NTDG-4	Hexaploid
Bison	Hexapklid	NE84-315	Hexaploid	NTDG-5	Hexaploid
Buffalawn	Diploid	NE84-436	Hexaploid	Prairie	Tetraploid
Highlight	Diploid	NE84-453	Hexaploid		
Highligh 4	Diploid	NE84-609	Hexaploid	Rut-T-4-7	Diploid
Highlight 15	Diploid	NESS-378	Hexaploid	Rut-T-2-l	Diploid
Highlight 25	Diploid	NTDG-1	Hexaploid	Rut-T-2-3	Diploid
Highlight 911	Diploid	NTDG-2	Hexaploid	Rut-T-3-3	Dipbi
Highlight 912	Diploid	NTDG-3	Hexaploid	Rut-T42	Diploid

New Buffalograss Performance Characteristics

V. A. Gibeault, S. T. Cockerham, R. Green and R. Autio[1]

Buffalograss, *Buchloe ductyroides (Nutt.)* Engelm., a warm-season grass, is native to the U.S. great plains "short grass country" extending from western Minnesota - central Montana in the north to Texas - Arizona in the south. Outside the U.S. borders, buffalograss is found in Canada and Mexico in natural stands. In areas of its adaptation, rainfall is in the 12 to 35 inches per year range. Buffalograss is usually dioecious (having separate male and female plants), but monecious (male and female flowers on same plant) plants are fairly common.

Interest in buffalograss has increased in the 1980's and 1990's because it is considered to be low maintenance grass. It is low growing, has a relatively

1 From: Ptuceedings, UCR Turfgrass Research Conference and Field Day, September 14, 1993. p. 8.

low nutritional requirement, has a low water use rate and is highly drought resistant. Turfgrass quality characteristics are only fair, however, for the native or range cultivars of buffalograss. Therefore, turfgrass breeding activity for the past decade has focused on improving grass color, overall appearance including density and leaf texture, recuperative potential and lengthening the growing season.

Twenty-two cultivars and experimental lines of buffalograss were established vegetatively at the UC Riverside Turfgrass Research Project in August, 1991. Following establishment, the grasses were weekly mowed at 2 inches during the growing season, watered based on calculated ET for warm season turfgrasses and fertilized at 0.5 pound N per 1000 square feet in Feb., Apr., Jun., Aug., Oct. and Dec. Monthly visual ratings from various characteristics were taken.

This study will continue for 2 more years but already there have been obvious differences observed among the cultivars and experimental lines. The grasses selected from Mexico or the southern U.S. perform similarly and in contrast to the more northern selected grasses. The southern grasses appear to be faster to establish, have less staminate culms, are more dense and have better overall turfgrass quality. The more northern selected grasses have a deeper green to gray-green color.

WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in their original labeled containers in a locked cabinet or shed, away from food or feeds and out of the reach of children, unauthorised persons, pets and livestock.

Recommendations are based on the best information currently available, and treatments based on them should not leave residues exceeding the tolerance established for any particular chemical. Confme chemicals to the area being treated. THE GROWER is LEGALLY RESPONSIBLE for residues on his crops as well as for problems caused by drift from his property to other properties or crops.

Consult your County Agricultural Commissioner for correct methods of disposing of leftover spray material and empty containers. **Never burn pesticide containers**

PHYTOTOXICITY: Certain chemicals may cause plant injury if used at the wrong stage of plant development or when temperatures are too high. Injury may also result from excessive amounts of the wrong formulation or from mixing incompatible materials. Inert ingredients, such as wetters, spreaders, emulsifiers, diiuents and solvents, can cause plant injury. Since formulations are olten changed by manufacturers, it is possible that plant injury may occur, even though no injury was noted in previous seasons.

NOTE: Progress reports give experimental data that should not be considered as recommendations for use. Until the products and the uses given appear on a registered pesticide label or other legal, supplementary direction for use, it is illegal to use the chemicals as described.

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