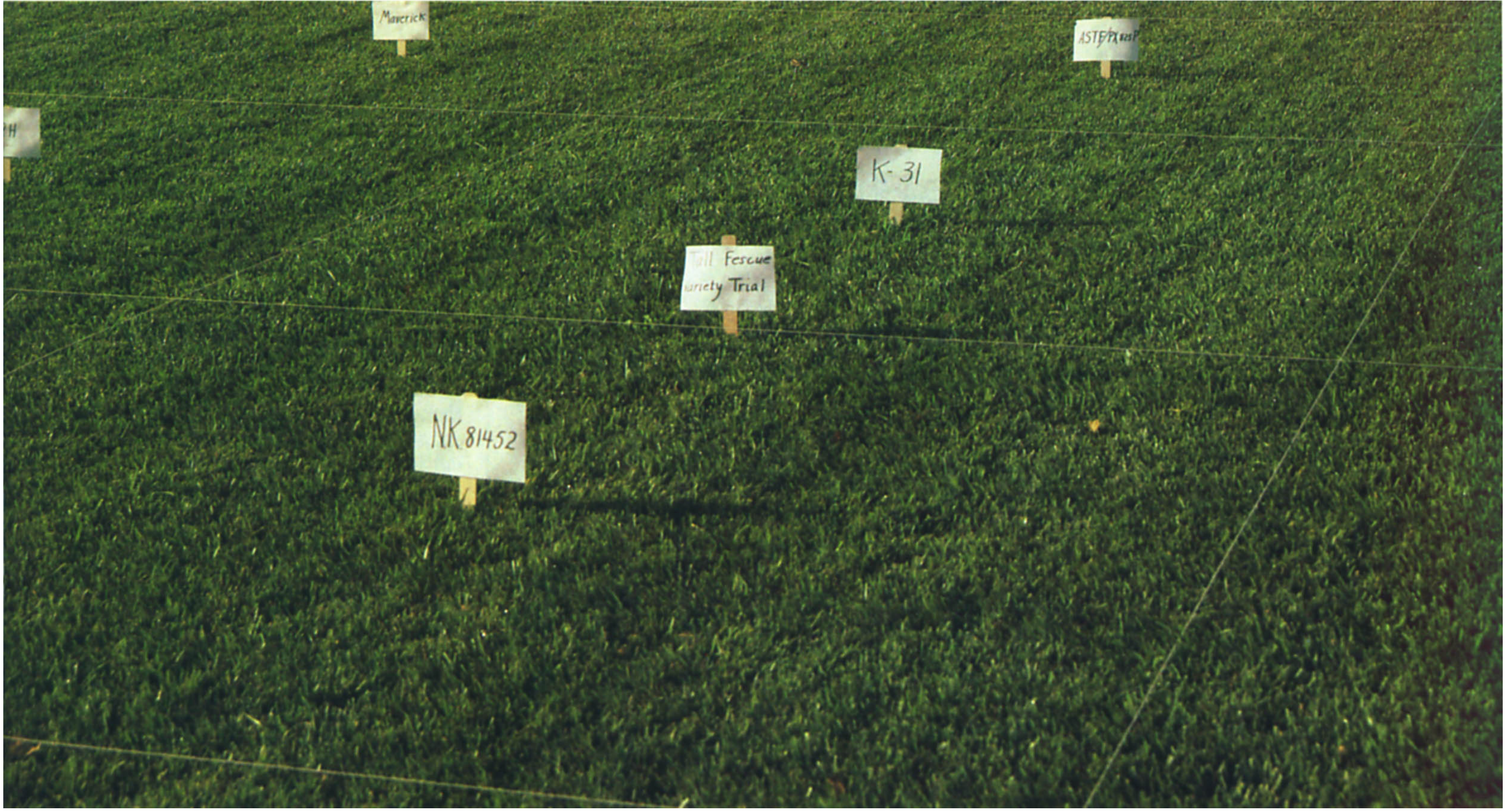

Most of the new turf-type tall fescue cultivars tested produced significantly higher quality turf than older forage-type cultivars. Plots were nearly weed-free a year after seeding.

Tall fescue gaining popularity as a turfgrass

M. Ali Harivandi

Until recently, tall fescue was not considered a desirable grass species for use as turf. Very coarse leaf texture, lack of dark green color, low density, low tolerance to close mowing, and ineffectiveness in spreading were the most obvious reasons. New cultivars have been or are now being improved with respect to these characteristics, however, and when the improvements are complete, the popularity of tall fescue (*Festuca arundinacea* Schreb.) may surpass that of both Kentucky bluegrass (*Poa pratensis* L.) and perennial ryegrass (*Lolium perenne* L.) in California.

Tall fescue's poor reputation as a lawn grass may be overcome by newly developed cultivars that produce a denser, dark green turf.

Background

A native of Europe, tall fescue is a bunch-type perennial with coarse-textured leaves, which is adapted to a wide range of soils, and is essentially a cool-season grass but intolerant of extreme temperatures. It does particularly well in the transition zones (regions where cool- and warm-humid, or cool- and warm-semiarid climates meet) and in southern portions of the cool-humid region. Although moderately heat tolerant, tall fescue forms a nonuniform, patchy turf under extremely high temperatures, and therefore cannot compete with aggressive warm-season grasses like bermudagrass (*Cynodon* spp.). Nor is it recommended for the northernmost and southernmost portions of California or the high altitudes of the state's mountain regions, because of its sensitivity to temperature extremes.

The tall fescue root system can penetrate as deep as 4 feet under optimum conditions, but is generally concentrated in the top 6 to 12 inches of the soil. It is propagated by seed and, where a dense, uniform stand is desired, seeding rates of 10 to 12 pounds per 1,000 square feet are recommended. Recommended mowing height for tall fescue is in the range of 1.5 to 3 inches; it generally does not tolerate cutting closer than 1.5 inches.

Although tall fescue tolerates a soil pH of 4 to 8.5, the optimum is in the range of 5 to 6.5. The grass prefers well-drained, medium-textured soils. It responds to fertilization but, as a low-maintenance turf, can be successfully grown under low fertilization. (Color is the major quality component affected by fertility.) Tall fescue has good drought and shade tolerance and is moderately tolerant of submergence, waterlogged conditions, salinity, and alkalinity.

Tall fescue has excellent tolerance of major turf diseases and insects and, if properly managed, competes well with most weeds. The primary turf diseases affecting tall fescue are brown patch *(Rhizoctonia solani)*, Gerlachia patch *(Gerlachia nivalis)*, Typhula blight *(Typhula incarnata)*, and disorders caused by *Helminthosporium* spp.

Tall fescue does not produce stolons and, although some strains may produce very short rhizomes, these do not result in significant spreading of the grass. Its rate of tillering is also slow. These characteristics, and the fact that the older tall fescue cultivars, such as 'Alta', 'Kentucky-31', and 'Fawn', are the coarsest of all cool-season turfgrasses, translate to generally poor performance when these cultivars are used in turfgrass mixtures.

Noticeable differences in color were evident between the new turf-type cultivars and older varieties. The new cultivars are a darker green than the patches of older forage types.

TABLE 1. Tall fescue cultivar evaluation, UC Deciduous Fruit Field Station

Cultivar	Overall quality score*	Color†	Density†	Texture‡	Weed†
New turf-type:					
Jaguar	7.7	7.8	8.6	6.5	1.6
Olympic	7.7	7.9	8.4	7.0	1.7
Adventure	7.6	7.9	8.4	7.2	2.1
Apache	7.6	7.8	8.5	7.0	1.6
Falcon	7.6	7.8	8.3	7.2	1.4
Mustang	7.4	7.9	8.5	7.0	1.8
52W	7.4	7.7	8.6	6.1	1.7
Houndog	7.4	7.8	8.3	7.4	1.7
Maverick	7.4	7.8	8.3	7.3	1.9
522	7.3	7.7	8.2	6.9	1.4
ASTF/PX80	7.3	7.7	8.2	7.4	1.5
Tempo	7.3	7.6	8.1	6.6	1.6
Brookston	7.1	7.6	8.1	6.7	1.5
52H	7.1	7.6	8.3	7.6	1.6
ASTF/PX82 F	7.1	7.6	8.1	7.6	1.7
Rebel	7.0	7.4	8.1	7.4	1.9
NK81452	6.9	7.6	7.7	7.6	2.5
Galaway	6.7	7.3	7.5	7.8	1.5
Clemfine	6.5	7.0	7.5	8.2	2.1
MER FP 802	6.1	6.8	6.8	8.3	1.5
Old forage-type:					
Kentucky-31	5.9	6.7	6.5	8.9	1.4
Fawn	5.9	6.7	6.6	8.5	1.7
Alta	5.5	6.4	6.3	9.0	2.0
LSD (0.01)**	0.4	0.3	0.3	0.4	0.8

NOTE: Data are averages of monthly or seasonal ratings over a period of three years. All ratings are on a scale of 1 to 9, as follows:
* Score of 9 = the ideal cultivar in terms of overall quality. A rating below 6 denotes an unacceptable turf stand.
† Score of 9 = darkest color, highest density, or highest weed activity.
‡ Score of 9 = coarsest leaf texture. This is a comparative visual evaluation using Kentucky bluegrass as the standard with a score of 5.
** LSD (Least Significant Difference) of 0.01 for a characteristic exists between two cultivars when the difference in their rating for that character exceeds the LSD listed.

Due to its wide range of adaptability, however, tall fescue has been used for a variety of turf purposes, such as athletic fields, parks, cemeteries, playgrounds, roadsides, airfields, waterways, slopes, and, to a lesser degree, home lawns. With the introduction of improved cultivars, use of this grass is rapidly expanding. Many owners of home lawns and some golf courses (nonplay areas) are replacing their old Kentucky bluegrass or perennial ryegrass with new, fine-leaved tall fescue cultivars.

A number of older forage-type tall fescue cultivars have been around for some time; 'Alta', 'Fawn', 'Goar', 'Kenmont', 'Kentucky-31', and 'Kenwell', for example, were developed between 1940 and 1970. Fine-leaved turf-type tall fescues have been developed only recently. Although more work remains to be done, such as correcting the lack of rhizomes or stolons, before tall fescues become as popular as Kentucky bluegrass or perennial ryegrass, the newly developed cultivars are generally darker green, have finer and smoother leaves, and are more tolerant of shade than are the older cultivars.

Evaluations

In June 1983, a trial was initiated at the UC Deciduous Fruit Field Station, Santa Clara County, to evaluate tall fescue cultivars then available as well as several experimental varieties. They were tested for turfgrass suitability in central coastal California, an area of "transition zone" climate.

Twenty-three cultivars were seeded on June 17, 1983, at a rate of 10 pounds per 1,000 square feet (487 kilograms per hectare) in 64-square-foot (6-square-meter) plots and replicated three times in a randomized complete block design. Analysis of the soil, a silt loam, at the beginning of the study indicated favorable pH, safe salinity and boron levels, and adequate phosphorus and potassium.

Routine maintenance of the plots consisted of total annual application of 4 pounds per 1,000 square feet (195 kg/ha) nitrogen from ammonium nitrate (applied twice in the spring and twice in the fall), mowing at 2 inches (51 mm), and irrigation as needed. Plots were not exposed to any appreciable traffic, and no herbicide, fungicide, or insecticide was applied. The trial ran for three years, ending in May 1986.

During the evaluation period, plots were visually rated, monthly or seasonally as relevant, for color, density, texture, weeds, disease and insect activity, and overall quality. Table 1 summarizes combined data for the three-year evaluations.

At the trial site, average monthly soil temperatures ranged from a low of 44°F

(6.7°C) in January to a high of 70.1°F (21.2°C) in August, with measurements taken at a depth of 5 inches (12.5 cm). Monthly air temperatures also hit a low in January at 50.9°F (10.5°C); the highest average monthly air temperature was 74.4°F (23.6°C) in July.

Results

Overall quality ratings are based on evaluation of all turfgrass quality components combined into one turf score. As indicated by the overall ratings, most of the newly developed cultivars produced a significantly higher quality turf than did the older cultivars. The same conclusion emerges from review of the individual quality components. The newer cultivars had a darker green color and produced a denser stand of grass. They also had a finer texture than did the older cultivars; the finest textured of all those studied, however, had less finely textured leaves than Kentucky bluegrass.

No disease or insect activity was detected on any of the cultivars during this study. Plots were heavily infested with various broadleaf weeds, however, at the time of seedling emergence and establishment. Some plots were actually covered up to 70 percent by weeds two to three months after seeding. Nevertheless, all cultivars eventually out-competed the weeds and most were weed-free by the beginning of the second growing season. Thereafter, the only weed was a minor infestation by annual bluegrass (*Poa annua* L.), and that only on some plots.

Conclusions

The results of this study suggest that newly developed tall fescue cultivars are well suited for use as turf under central coastal California conditions, characterized as a "transition zone" climate. These new cultivars perform significantly better as turfgrasses under such conditions than do old cultivars. Since all tall fescue cultivars competed well with weeds and none were affected by the area's common diseases and insects, this grass also may be considered an efficient species to maintain as far as pest control is concerned.

The newly developed tall fescue cultivars produce high-quality turf at a seeding rate of 10 pounds per 1,000 square feet, a mowing height of 2 inches, and nitrogen fertilization of 4 pounds per 1,000 square feet.

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The blue alfalfa aphid.

Jack Kelly Clark

Low temperature decreases CUF 101 alfalfa resistance to blue alfalfa aphid

Charles G. Summers □ Albert S. Newton

The blue alfalfa aphid was first discovered causing damage to California alfalfa in 1974-75. By 1978, the alfalfa cultivar 'CUF 101', containing resistance to blue alfalfa aphid, *Acyrthosiphon kondoi,* was developed and released by University of California researchers. Since its release, CUF 101 has occupied a significant portion of the alfalfa acreage in California's southern San Joaquin and Imperial valleys. Data collected during the development and field testing of CUF 101 suggest tolerance as a mechanism conferring resistance in this cultivar, but there is no information on the possible contribution of antibiosis as well.

The loss of resistance to blue alfalfa aphid could require additional pesticide treatments in unusually cool spring weather.

Host-plant resistance can be divided into three basic mechanisms: nonpreference (antixenosis), antibiosis, and tolerance. Antixenosis is a property making the plant an unacceptable host so that it is avoided by a potential pest. Antibiosis refers to an adverse effect of the host on pest biology, reducing survival or reproductiveness of the pest. Tolerance is the ability of the plant to withstand pest infestation levels that would significantly decrease yield or quality in a susceptible plant. These mechanisms may act singly or together to produce the observed resistance.

While probably of little importance in the short-term, commercial use of resistant cultivars, knowledge of the biological mechanisms has both biological and practical significance. The stability and effectiveness of resistance may well depend on the mechanisms involved. Spotted alfalfa aphid, *Therioaphis maculata,* has developed eight biotypes, so that researchers have had to reintroduce resistance into commercial alfalfa cultivars several times. Tolerance, depending on its level, may be overwhelmed by unusually large pest populations, resulting in unanticipated losses.

Perhaps of equal importance to knowledge of the mechanisms is knowledge of the stability of resistance over a range of climatic conditions. Temperature is known to bias the expression of alfalfa resistance to aphids. Researchers in California, Arizona, and elsewhere have found a decrease in the expression of resistance to spotted alfalfa aphid with decreasing temperatures. Aphid fecundity and survival were both greater at lower temperatures. In the 'Lahontan' clone C-902, resistance was completely lost at 50° and 60°F. In this report, we explore the possible contributions of antibiosis and examine the effect of temperature on CUF 101 resistance to the blue alfalfa aphid.

Methods

We started the first generation of aphids, hereafter referred to as the parental generation (P), by selecting four-hour-old nymphs from stock colony stem mothers. The next (F_1) generation was initiated