

Grass Combinations for Turfs

**mixtures of cool season grasses with bermudagrass
show promise for year round lawns resistant to weeds**

Vernon T. Stoutemyer

The studies reported in the following article were conducted by Zaki Mahdi, a graduate student in Ornamental Horticulture, working under the direction of Professor Vernon T. Stoutemyer.

Three general types of turf—cool season grasses, warm season grasses, and mixtures of the two—can be grown in southern California.

A cool season grass gives ideal color, but usually involves periodic renovation and reseeding because it does not sufficiently resist invasion of bermudagrass and crabgrass during the summer—except in shade.

A warm season grass is practical, but usually such grasses are dormant and unpleasant in color during much of the winter, when considerable weed invasion may take place.

A mixture of both types of grasses has certain advantages—resistance to pests and weeds and good color in all seasons of the year.

Maintenance of combinations of cool season and warm season grasses, in proper balance, presents some problems because of their different levels of vigor. However, the introduction of new strains of grasses offers the possibility of better matching of the various components of seed mixtures. Merion bluegrass is unquestionably superior to Kentucky bluegrass in most respects and will tolerate lower clipping. U-3 bermudagrass forms a denser, tighter turf than common bermudagrass, which aids in keeping out weeds and crabgrass. The Highland strain of Colonial bentgrass is generally considered to be somewhat superior in drought resistance and vigor to other types and appears to be well adapted to southern California.

Tests for Turf Quality

Some of the improved grasses were used in experiments initiated in March 1952, when portions of well established turf sod of several grasses and combinations were lifted and laid in plots with nine replications.

Three weeks after planting the sod, a liberal top-dressing of compost—heavily infested with weed seed—was given to test the resistance of the various types of turf to weed invasion.

The plots were mowed whenever necessary to keep the height of cut at approximately $\frac{3}{4}$ ". Sufficient organic sewage

sludge fertilizer, containing 6% of nitrogen and 2% phosphorus as P_2O_5 , to furnish nitrogen at the rate of five pounds per thousand square feet per year was applied on the sod surface at intervals of two months. Liberal irrigations were spaced as widely as possible without damage to the grass. No protective measures were taken against insects, diseases, or weeds.

When rated in December, 1952, on the basis of quality, the two outstanding plots of single cool season grasses were those of Merion bluegrass and Highland bentgrass. The best combination was common bermudagrass with Highland bent—which received almost as high a rating as Merion bluegrass and Highland bentgrass—and followed closely by U-3 bermudagrass with Merion bluegrass.

Kentucky bluegrass was intermediate in quality, as were four combinations with common bermudagrass and with U-3 bermudagrass. Differences between these were not sufficiently great to permit exact comparisons, but suggested that the U-3 bermudagrass tends to displace and overbalance a companion cool season grass more than does the common bermudagrass. On the basis of plant density, those combinations having either

Highland bentgrass or U-3 bermudagrass were always high, doubtless because of the fine texture of these two grasses. All combinations having U-3 bermudagrass had a significantly lower weed count than combinations without it. The plots of Highland bentgrass alone were also relatively low in weed infestation.

The outstanding combinations—judged by winter appearance and quality—were all characterized by a relatively high proportion of the cool season grass in relation to the bermudagrass. This was particularly true of the best combination, common bermudagrass with Highland bentgrass. These relationships are shown in the table on the next page.

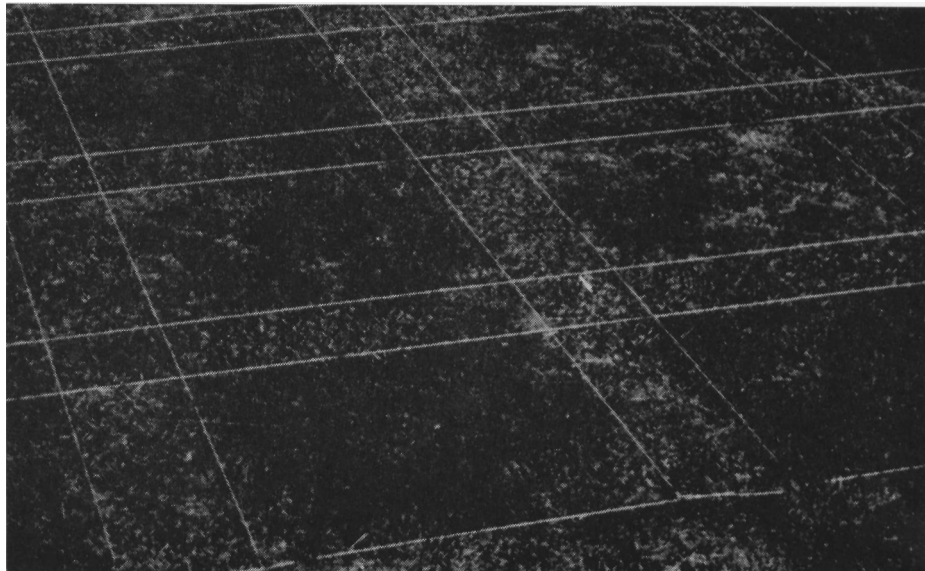
Cutting Height Tests

Additional experiments were conducted to determine the influence of different heights of cutting and different rates of nitrogen feeding on performance of mixtures of cool season and warm season grasses.

Each test plot was 30' long by 15' wide and divided lengthwise into two blocks. One block was cut at $\frac{3}{4}$ " and the other at $\frac{3}{8}$ "

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Latin square arrangements of turf plots.



TURF

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Three fertility levels were superimposed on every block and replicated at random six times. Ammonium sulfate was applied every two months to keep the nitrogen level at 0, 5, and 10 pounds of nitrogen per 1,000 square feet per year. Observations indicated that high rates of application of nitrogen in the summer tended to favor bermudagrass at the expense of the cool season grasses. On the other hand, an adequate supply of nitrogen in the fall and winter proved essential for a really good showing of cool season grasses grown in combination with bermudagrass.

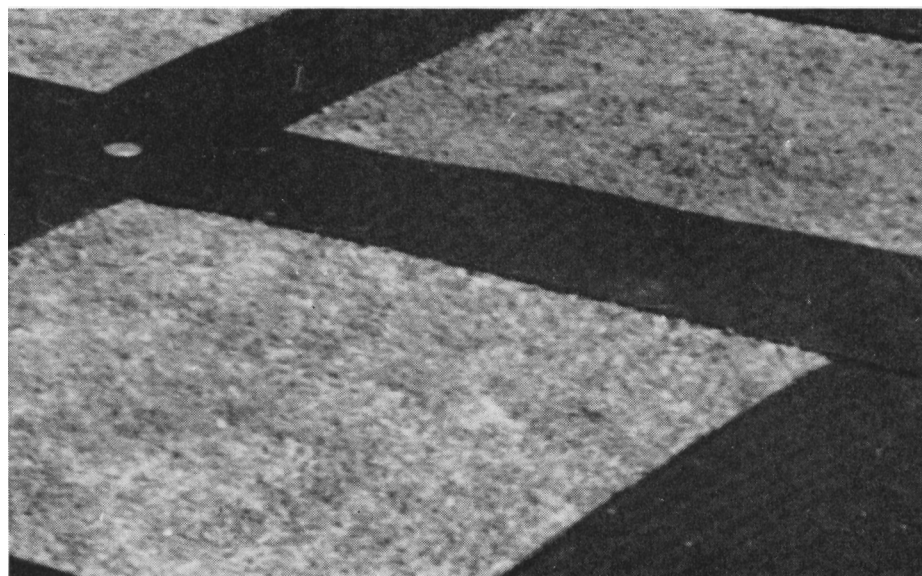
The two different heights of cut did not change significantly the competitive relationships of any of the grasses, although shorter mowing tended to increase the number of plants per area of the U-3 bermudagrass.

In this experiment, the combination with the greatest plant density was U-3 bermudagrass mixed with Merion bluegrass. This was followed in order by the following combinations: common bermudagrass with Highland bentgrass, common bermudagrass with Merion bluegrass, and U-3 bermudagrass with Highland bentgrass.

Weed Populations

The weed populations were influenced greatly by the height of cut and by the level of nitrogen. The number of weeds was always greater under low than under the higher cut. However, other factors are involved in deciding the best height for mowing of turf. Increasing the level of nitrogen always reduced the number of weeds in the turf.

Border strips of turf plots covered with strips of roofing paper before evaluation by committee.



Comparison of Several Bentgrasses, Bluegrasses, and Bermudagrasses, Alone and in Combinations.

Quality rating	Composition of turf	Mean number of plants per one inch plug			Per cent of cool season grass in combinations
		Bermudagrass	Cool season grass (bluegrass or bentgrass)	Total	
1	Highland bentgrass	40.55	40.55	..
2	Merion bluegrass	21.55	21.55	..
3	Common bermudagrass and Highland bentgrass	9.56	23.77	33.33	71
4	U-3 bermudagrass and Merion bluegrass	19.67	13.88	33.55	41
5	Kentucky bluegrass	19.44	19.44	..
6	Common bermudagrass and Merion bluegrass	17.55	7.33	24.88	29
7	Common bermudagrass and Kentucky bluegrass	19.78	7.88	27.66	28
8	U-3 bermudagrass and Highland bentgrass	25.11	10.77	35.88	30
9	U-3 bermudagrass and Kentucky bluegrass	26.33	7.55	33.88	22
Mean differences necessary for significance at 5% probability ...			3.62	9.38	

The weed differences were greater between the plots receiving no nitrogen and those receiving five pounds per year, than between the plots receiving five pounds and 10 pounds of nitrogen. On plots receiving 10 pounds of nitrogen per year, the differences in weed population with high and low mowing were not very great.

At heights of cutting ranging from $\frac{3}{8}$ " to $\frac{3}{4}$ " all observations made on combinations of U-3 bermudagrass with Highland bentgrass, Kentucky bluegrass, or Merion bluegrass, indicate that U-3 bermudagrass is highly competitive with

all of these grasses. They indicate also that U-3 bermudagrass can overbalance them if the management practices do not favor the cool season partner of the combination. This is not true of the same strain of bermudagrass, when combined with a highly aggressive and disease-resistant creeping bentgrass such as the Congressional or Old Orchard strains, cut at putting green height of one fourth inch or less. This type of combination and management is promising for lawns in southern California.

These experiments indicate that a vigorous, disease resistant Colonial or creeping bent appears to be a better possibility for balanced combinations of a warm season grass with a cool season grass than the bluegrasses—either the common Kentucky bluegrass or its improved form, Merion bluegrass—at least in southern California.

Preliminary experiments with annual bluegrass—fall seeded in turf of U-3 bermudagrass and kept at fairway height of cutting—have been very promising. Because annual bluegrass forms seed freely, regardless of close cutting, there is no need to keep the grass alive over the summer months and during the warm season the bermudagrass can be managed without any consideration of the cool season annual bluegrass.

Vernon T. Stoutemyer is Chairman of the Department of Floriculture and Ornamental Horticulture, University of California, Los Angeles.

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