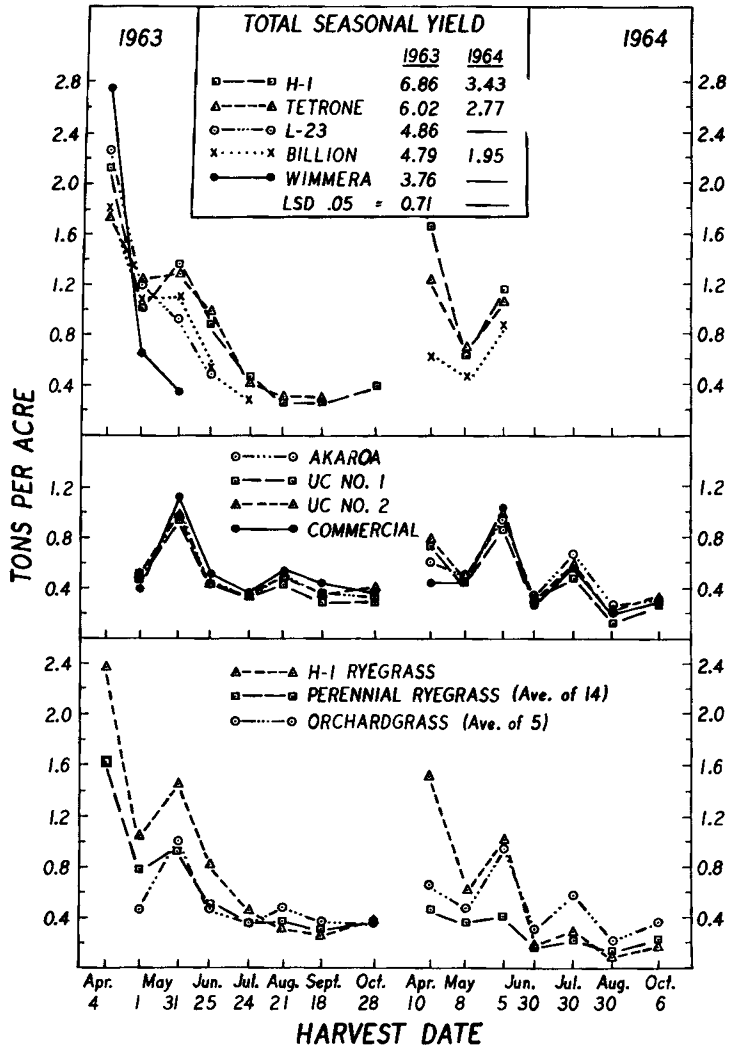
SEASONAL DISTRIBUTION OF DRY MATTER YIELDS OF ORCHARDGRASS AND ANNUAL AND PERENNIAL RYEGRASSES GROWN IN ROD ROWS AT U.C. DAVIS.



Yield trials with ORCHARDGRASS *and* RYEGRASS

The greatest proportion of dry-matter yields of annual and perennial ryegrass, as measured in rod-row field trials, occurred mostly in April, May and June at Davis, while orchardgrass yields were more evenly distributed throughout the harvest season. Ryegrasses generally were more vigorous and higher yielding than orchardgrass in the first year. Total seasonal yields in the first two years of the trial averaged 3.8 tons per acre for 14 perennial ryegrass selections and 3.4 tons per acre for five orchardgrass selections. These findings resulted under conditions of this trial and are not necessarily predictive of results under grazing management.

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FIELD TRIALS to rate the performance and herbage yield potential of orchardgrass, *Dactylis glomerata* L., annual ryegrass, *Lolium multiflorum* Lam., and perennial ryegrass, *Lolium perenne* L., were conducted in separate nurseries at Davis in 1963 and 1964, using certain commercial varieties in addition to selections from breeding programs then underway at Davis.

In October 1962, the nurseries were hand sown with several seeds per inch, in rod rows, on moist beds 3 ft apart, and replicated six times in randomized complete-block designs. Nitrogen was applied as ammonium nitrate and side dressed at 70 lbs per acre on May 14 and August 22, 1963, and 100 lbs per acre on April 27, 1964. Furrow irrigations were at approximately 10-day intervals each season.

A light tractor mower with a 3-ft sickle bar fitted with lifters was used to harvest the rows two inches above the ground at approximately 30-day intervals. The full row was harvested as the sample of a single replication and a weighed subsample was saved for determining the percentage dry-matter after oven drying the subsample at 160°F. Average seasonal dry-matter percentage for orchardgrass was about 23%, slightly lower than for perennial ryegrass at near 27%. Yields (in tons of dry matter per acre) were determined by using the 3- by 16½-ft plot row as the unit area and applying the subsample dry-matter percentage to the full row fresh weight.

The graph shows the seasonal distribution of yields obtained in the three trials. Because they are based on dry-matter accumulation during arbitrarily chosen and widely spaced intervals, this graph shows approximations rather than exact seasonal growth curves.

The short-lived nature of five ryegrasses qualified them to be tested (as a unit) separately from the perennials. These were Wimmera, a named variety of *Lolium rigidum* Gaud.; L-23, a commercial lot of *L. multiflorum;* Billion and Tetrone, named tetraploid varieties of *L. multiflorum* and New Zealand H-1, a named hybrid variety of *L. multiflorum* × *perenne* and considered a short-lived perennial. Statistical analysis of the data for 1963 gave the comparisons shown in the table at the top of the graph. Note that the stands of Wimmera and L-23 expired before the June 27 and July 24 harvests, respectively, in 1963—as expected of true annuals. The variety Billion ceased production after July 24 but resumed producing harvestable growth the following spring.

The distribution of yields for the four orchardgrasses graphed illustrates a rather narrow range of behavior. A fifth entry (table 1) showed no unusual divergence from this behavior and was omitted to simplify the graph.

Perennial ryegrass

Table 2 summarizes the perennial ryegrass trial. The "approximate heading span" was determined by observing the presence or absence of inflorescences immediately prior to each harvest date. It is not intended to refer precisely to the onset or termination of heading but rather to indicate the period of the year during which a reproductive state of growth was found. The orchardgrasses did not vary appreciably in their "heading spans." In 1964, inflorescences occurred only at the June 5 harvest.

In addition to a high total yield, an even seasonal distribution of that yield is also often desirable. A numerical value expressing a relationship between these two attributes was determined for the perennial ryegrass trial (table 2) by ranking the dry-matter yields at each harvest from 1 to 15, lowest to highest yielding respectively, and taking the season's mean of the aggregate rank values of an entry as its "mean rank value" (MRV). The entry ranking highest most consistently would have the largest MRV, although not necessarily the greatest total yield.

Three varieties of tretraploid perennial ryegrass were included in the *L. perenne* row trial, Petra, Reveille and Taptoe. Their seasonal dry-matter production did not exceed that of commercial perennial ryegrass in either year and their "rank values" generally remained below those for commercial perennial ryegrass at each cutting.

The generalized production curve for perennial ryegrass (see graph) was derived from the mean of the production of all entries, excluding New Zealand H-1 which departs enough in growth characteristics from the other entries to warrant treating it separately. The graph shows that certain ryegrass entries outyielded orchardgrass in the spring with the reverse occurring from onset of summer into fall. This relationship supports the use of combinations of species to extend the season of production in pastures. Perennial ryegrass yielded less in the second year than in the first (table 2). The perennial ryegrass trial was terminated in the third year, after an initial spring harvest, because of developing irregularities between replications and general failure to recover uniformly.

Orchardgrass

Orchardgrass yielded less in the third year (table 1) than in either of the previous two years. The yield reductions in both ryegrass and orchardgrass were attributable in part to crown center deterioration but this condition was more apparent in orchardgrass than in ryegrass. These observations suggest that it would be difficult to predict what the total dry-matter production patterns would be for various species and varietal combinations in long-term perennial pastures under grazing management.

It is also apparent from the graph that a total dry matter yield advantage must be considered in relation to when it is produced during the year. If no provision can be made to utilize a short-term seasonal flush of growth, it has little advantage.

The results of these trials should be considered valid only in comparisons within the experimental conditions imposed. There is ample evidence, both in the research literature and in practical farming operations, that behavior of spaced or row-sown plants harvested mechanically at predetermined intervals may not necessarily prove the same when grown in mixed swards under grazing conditions.

Plant qualities such as persistence, salt tolerance, disease resistance, competitive ability and animal acceptance, as well as yield capacity, vary in importance with given circumstances but must also be considered when estimating the overall advantage of a particular pasture plant.

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TABLE 1. DRY-MATTER YIELDS OF FIVE SELECTIONS OF ORCHARDGRASS GROWN IN ROD ROWS

Entry	Dry matter per season			
	1963	1964	1965*	Total
	Tons			
Akaroa (named variety)	3.44	3.58	2.20	9.22
†UC No. 1 (breeder's synthetic)	3.15	3.19	2.77	9.11
†UC No. 2 (breeder's synthetic)	3.52	3.70	2.33	9.55
†1961 Bulk (breeder's stock)	3.44	3.53	2.57	9.54
Commercial (commercial lot)	3.68	3.23	1.84	8.75
$S_{\bar{x}}$ =	0.17	0.09	0.29	0.43
$LSD_{.05}$ =	N.S.	0.26	N.S.	N.S.
CV =	4.9	2.7	12.4	4.6

* For convenience in graphing, 1965 yields are omitted from Figure 1.
† Limited amounts of seed are available for distribution for research purposes.

TABLE 2. SOURCE, DATES OF HEADING, DRY-MATTER YIELDS AND MEAN-RANK VALUES* (IN ROD-ROW TESTS) FOR 14 SELECTIONS OF PERENNIAL RYEGRASS PLUS NEW ZEALAND H-1

Entry	Abbrev.	Source	Approximate heading span 1964	Dry matter yield (tons/acre) and mean rank value*							
				1963			1964			1965†	
				Entry	Tons	MRV	Entry	Tons	MRV	Entry	Tons
Lot 111	(111)	Commercial Lot	1st cut—July 28	H-1	7.24	10.0	H-1	3.61	9.8	PE	2.21
‡Peterson's Early	(PE)	Breeder's Selection	1st cut—July 28	NE	6.58	11.8	PE	2.73	9.1	H-1	1.73
Nyquist's Early	(NE)	Breeder's Selection	1st cut—July 28	PE	6.47	11.7	COM	2.41	10.5	COM	1.54
Nyquist's Late	(NL)	Breeder's Selection	May 6–July 28	LIN	6.19	9.9	NE	2.34	9.5	NE	1.47
Linn	(LIN)	Named Variety	May 6–July 28	111	6.04	7.8	D-1	2.29	11.4	NL	1.29
Reveille	(REV)	Named Tetraploid	May 6–July 28	COM	5.64	8.3	LIN	2.20	7.3	D-1	1.28
‡Peterson's Medium	(PM)	Breeder's Synthetic	May 6–July 28	NL	5.60	8.9	A-11	2.09	9.8	111	1.25
S-23	(S-23)	Named Variety	May 6–August 27	A-9	5.49	9.4	NL	1.98	6.1	REV	1.24
‡A-9 Intermediate	(A-9)	Breeder's Synthetic	May 6–August 27	REV	5.48	6.4	TAP	1.98	7.8	LIN	1.20
Commercial	(COM)	Commercial Lot	May 6–August 27	A-11	5.39	8.6	A-9	1.96	5.1	A-9	1.07
New Zealand H-1	(H-1)	Named Variety	May 6–October 5	TAP	5.36	6.7	111	1.96	8.2	TAP	1.05
Petra	(PET)	Named Tetraploid	June 4–July 28	PM	5.34	5.4	PET	1.95	9.4	S-23	0.98
Taptoe	(TAP)	Named Tetraploid	June 4–August 27	PET	5.25	8.6	PM	1.85	5.7	PM	0.97
‡A-11 Late	(A-11)	Breeder's Synthetic	June 30–July 28	D-1	4.87	4.4	S-23	1.75	5.2	A-11	0.89
‡D-1 Hybrid	(D-1)	Breeder's Hybrid	June 30–July 28	S-23	4.47	2.1	REV	1.71	5.1	PET	0.80
				$S_{\bar{x}}$ =	0.26		$S_{\bar{x}}$ =	0.09		$S_{\bar{x}}$ =	0.16
				$LSD_{.05}$ =	0.74		$LSD_{.05}$ =	0.26		$LSD_{.05}$ =	0.44
				CV =	4.6%		CV =	4.1%		CV =	12.7%

* At each harvest the 15 entries were ranked one to 15, lowest to highest yielder, respectively. The season's mean of the aggregate rank values of an entry is called its mean rank value (MRV).
† Only one cutting, for residual yield, was made, on April 4, 1965.
‡ Limited amounts of seed are available for distribution for research purposes.