# EFFECTS OF PLANTING DATE AND VARIETY ON ANNUAL RYEGRASS PERFORMANCE IN THE KLAMATH BASIN

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## Abstract

Seven annual ryegrass varieties were planted at the Klamath Experiment Station (KES) in two randomized complete block design experiments with four replications on June 9, 1998 and September 4, 1998. Three harvests were taken from the spring planting in 1998. Forage from both planting dates was harvested four times in 1999. Samples from each harvest were dried, ground to 1-ml-sieve size, and analyzed using a near infrared spectrophotometer to determine forage quality.

Total forage yields for three cuttings in 1998 ranged from 1.62 to 2.05 ton / acre. Yields in the spring planting experiment during 1999 ranged from 2.05 to 3.57 ton / acre. Two-year total yields in the spring-planted trial ranged from 4.10 to 5.33 ton / acre. The lowest yield was found for the Multimo variety, which failed to produce measurable forage in the third and fourth cuttings in 1999. All varieties in the fall-planted trial achieved higher yields in four cuttings in 1999 than were produced in seven cuttings over 2 years in the spring-planted trial.

Forage quality was excellent for all varieties. Crude protein ranged from about 15 percent averaged over all cuttings from the fall-planted trial, to 22 percent for 1998 harvests from the spring-planted trial. Total digestible nutrients ranged from 59 to 62 percent. Annual ryegrass quality was equal to or better than quality observed in all entries in a multi-year study of cool-season grasses conducted at KES from 1995 to 1998. With the exception of Multimo, all varieties persisted over 2 years. The studies will continue in 2000 to evaluate stand persistence further.

## Introduction

Hay (other than alfalfa) and pasture production accounted for over 56,000 acres within the Klamath Irrigation Project in 1999. Total grass hay production may exceed 75,000 acres in the region. Specialty markets for horses and various exotic species require high quality grass hay and may pay premium prices.

An experiment conducted at KES from 1995 through 1998 evaluated performance of several varieties of tall fescue, orchardgrass, perennial ryegrass, and Bromus species. These perennial species generally are intended for long-term production for hay or pasture. There are situations where a short-term hay crop may meet a rotation or specialty market niche. Studies were conducted at KES in 1998-99 to evaluate annual ryegrass as an option for short-term, high quality forage production. Two Italian ryegrass and five Westerwold type varieties were planted in spring and fall to determine performance under possible planting

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scenarios. This report summarizes performance during 1998 and 1999. The study will continue in 2000.

## Procedures

Two separate experiments were established on Poe fine sandy loam soil at KES. The site was used for long-term grass research plots from 1992 through 1996. An alfalfa trial established at the site in 1997 experienced a partial stand failure. Remaining alfalfa plants were killed with Roundup (glyphosate) in fall 1997. Seedbed preparation for the spring planting was accomplished in early June. Seven ryegrass varieties were planted on June 9, 1998 in a randomized complete block design with four replications. Seed was planted at 0.25-inch depth in 6-inch rows at the recommended seeding rate with a Kincaid cone seeder. Individual plots were 5 feet wide and 20 feet long with 5-foot alleyways between plots. Fertilizer was applied before planting according to soil analysis recommendations. Additional nitrogen fertilizer was applied after each harvest, except the June 10 harvest in 1999, at approximately 50 lb N / acre. Irrigation was applied with solid-set sprinklers according to crop needs.

Forage was harvested at early seed-head development crop stage with a Carter self-propelled flail chopper with a 3-foot header. Approximately 1 lb samples from each plot were oven-dried, ground to pass a 2-ml-sieve with a Wiley Mill and a 1-ml-sieve with an Udy Mill, and analyzed using a near infrared spectrophotometer to determine forage quality. Yield data are reported on a dry matter basis. Yield and forage quality data were analyzed statistically using MSUSTAT software. Least significant differences (LSD) are based on *student's t* at the 5 percent probability level.

## Results and Discussion

In 1998, spring-planted forages were harvested on July 28, August 19, and September 15. All varieties produced less than 1.0 ton / acre in each cutting (Table 1). Yield differences between varieties were not statistically significant. The Multimo variety had slightly higher total yield than all other varieties. Forage quality was uniformly high for all varieties and was consistent between cuttings. Mean quality data for the three cuttings are presented in Table 1. Very high quality was influenced by the immature growth stage at harvest.

Spring-planted ryegrass exhibited less vigorous production than fall-planted grasses during 1999. Spring-planted Multimo did not recover after the second cutting and failed to produce measurable yield in third and fourth cuttings (Table 2). The other varieties ranged from 2.93 to 3.57 ton / acre in total yield in 1999. Welda and Top Seed were among the highest in total yield in 1999. Crude protein content was 5 percent lower averaged for all cuttings than in 1998. All other quality parameters were similar for both years. In contrast to 1998 data, quality was not consistent between cuttings (Table 3). Lowest quality was observed in the second cutting, while first and fourth cuttings had the highest quality as measured by total digestible nutrients and relative feed value. Lower forage quality for the July 1999 harvest undoubtedly was related to the failure to apply fertilizer after the June 10 harvest.

The fall-planted forages produced higher yields for all varieties and all cuttings than spring-planted forages in 1999 (Table 4). Mean total 1999 yields were 77 percent higher for fall-planted than spring-planted annual ryegrass. Multimo produced significantly lower yield than all varieties except Torero in the fall-planted experiment. All varieties produced higher yields in four cuttings for fall planting than in seven cuttings over 2 years for the spring planting. Forage quality was lower in fall-planted forages, but was equal to quality observed in a wide range of cool-season grass species and varieties evaluated at KES in 1995-98.

## Summary

Results of these experiments indicate that annual ryegrass will perform best as a short-term forage crop under fall planting management. Planting could follow harvest of spring cereals for hay or grain production. This crop also could serve as a short-term rotation between long-term alfalfa rotations. With the exception of Multimo and Torero, little difference was observed in yield or quality between varieties evaluated. Anecdotal evidence on quality of annual ryegrass has been obtained from several local livestock producers who have purchased nearly 100 tons of annual ryegrass hay produced at KES as a rotation crop from 1997-99. All buyers have reported excellent acceptance by horses and beef cattle. These experiments will be continued for 1 year more to observe stand persistence and production potential for the second year following fall planting.

**Table 1.** 1998 forage yield and quality of 7 annual ryegrass varieties planted June 9, 1998 at KES, Klamath Falls, OR.

| Variety | Type | Forage yield | | | | Forage quality [1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Cut 1 | Cut 2 | Cut 3 | Total | CP | ADF | NDF | TDN | RFV |
| | | ton/acre | | | | % | | | | |
| Urbana | Italian | 0.46 | 0.44 | 0.72 | 1.62 | 22.9 | 30.3 | 47.1 | 61.5 | 129 |
| Multimo | Italian | 0.70 | 0.53 | 0.82 | 2.05 | 21.4 | 30.3 | 48.9 | 61.5 | 124 |
| Weldra | Westerwold | 0.61 | 0.52 | 0.60 | 1.73 | 20.7 | 29.9 | 47.8 | 61.9 | 128 |
| Top Seed | Westerwold | 0.69 | 0.44 | 0.63 | 1.76 | 21.6 | 30.2 | 47.7 | 61.6 | 128 |
| Caramba | Westerwold | 0.60 | 0.51 | 0.69 | 1.80 | 22.1 | 30.2 | 46.5 | 61.6 | 131 |
| Billion | Westerwold | 0.57 | 0.47 | 0.63 | 1.68 | 21.7 | 31.0 | 47.3 | 60.7 | 128 |
| Torero | Westerwold | 0.70 | 0.56 | 0.70 | 1.95 | 22.1 | 30.9 | 47.4 | 60.9 | 128 |
| Mean | | 0.62 | 0.50 | 0.68 | 1.80 | 21.8 | 30.4 | 47.5 | 61.4 | 128 |
| CV | | 23 | 21 | 15 | 13 | 2 | 2 | 1 | 1 | 2 |
| LSD (p = 0.05) | | NS | NS | NS | NS | 0.7 | NS | 1.1 | NS | NS |

[1]CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, TDN = total digestible nutrients, RFV = relative feed value.

**Table 2.** 1999 forage yield and quality of 7 annual ryegrass varietes planted June 9, 1998 at KES, Klamath Falls, OR.

| Variety | Type | Forage yield | | | | | Forage quality [1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cut 1 | Cut 2 | Cut 3 | Cut 4 | Total | CP | ADF | NDF | TDN | RFV |
| | | ton/acre | | | | | % | | | | |
| Urbana | Italian | 1.50 | 0.55 | 0.63 | 0.43 | 3.11 | 17.0 | 29.8 | 48.5 | 62.1 | 127 |
| Multimo | Italian | 1.32 | 0.73 | 0.00 | 0.00 | 2.05 | --- | --- | --- | --- | --- |
| Weldra | Westerwold | 1.43 | 0.75 | 0.71 | 0.51 | 3.40 | 15.6 | 30.2 | 50.9 | 61.6 | 121 |
| Top Seed | Westerwold | 1.58 | 0.69 | 0.74 | 0.56 | 3.57 | 16.2 | 29.9 | 50.5 | 62.0 | 123 |
| Caramba | Westerwold | 1.22 | 0.54 | 0.70 | 0.47 | 2.93 | 17.0 | 29.7 | 48.7 | 62.2 | 127 |
| Billion | Westerwold | 1.13 | 0.77 | 0.78 | 0.54 | 3.23 | 17.1 | 30.1 | 48.6 | 61.8 | 127 |
| Torero | Westerwold | 1.09 | 0.88 | 0.77 | 0.52 | 3.26 | 16.8 | 30.2 | 49.2 | 61.7 | 126 |
| Mean | | 1.32 | 0.70 | 0.62 | 0.43 | 3.08 | 16.6 | 30.0 | 49.4 | 61.9 | 125 |
| CV | | 24 | 26 | 17 | 21 | 11 | 4 | 4 | 4 | 2 | 5 |
| LSD (p = 0.05) | | NS | NS | 0.16 | 0.14 | 0.52 | NS | NS | NS | NS | NS |

[1]CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, TDN = total digestible nutrients, RFV = relative feed value.

**Table 3.** Effect of harvest date on forage quality of annual ryegrass established on June 9 and September 4, 1998 at KES, Klamath Falls, OR.

| | | Forage quality [1, 2] | | | | |
|---|---|---|---|---|---|---|
| Planting date | Harvest date | CP | ADF | NDF | TDN | RFV |
| June 9, 1998 | July 28, 1998 | 22.7 | 30.2 | 47.9 | 61.6 | 127 |
| | August 19, 1998 | 21.3 | 30.9 | 47.7 | 60.9 | 127 |
| | September 15, 1998 | 21.4 | 30.2 | 47.1 | 61.7 | 129 |
| | June 10, 1999 | 15.9 | 24.8 | 43.5 | 67.9 | 149 |
| | July 15, 1999 | 12.4 | 34.0 | 54.5 | 57.2 | 107 |
| | August 18, 1999 | 18.8 | 31.9 | 52.6 | 59.6 | 113 |
| | September 25, 1999 | 19.5 | 29.2 | 47.6 | 67.7 | 129 |
| September 4, 1998 | June 10, 1999 | 13.8 | 28.5 | 47.8 | 63.6 | 131 |
| | July 15, 1999 | 11.0 | 35.1 | 55.3 | 56.0 | 104 |
| | August 18, 1999 | 17.4 | 33.1 | 52.5 | 58.3 | 112 |
| | September 25, 1999 | 17.6 | 31.5 | 49.3 | 60.2 | 122 |

[1]CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, TDN = total digestible nutrients, RFV = relative feed value.

[2]Values are means for all varieties except August 18 and September 25, 1999 when means include all varieties except Multimo for the June 9 planting date.

**Table 4.** 1999 forage yield and quality of 7 annual ryegrass varietes planted on September 4, 1998 at KES, Klamath Falls, OR.

| | | Forage yield | | | | | Forage quality [1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Variety | Type | Cut 1 | Cut 2 | Cut 3 | Cut 4 | Total | CP | ADF | NDF | TDN | RFV |
| | | ton/acre | | | | | % | | | | |
| Urbana | Italian | 2.82 | 1.05 | 0.91 | 0.68 | 5.46 | 14.6 | 32.0 | 50.2 | 59.6 | 120 |
| Multimo | Italian | 2.60 | 1.05 | 0.52 | 0.37 | 4.55 | 15.5 | 32.2 | 53.6 | 59.4 | 112 |
| Weldra | Westerwold | 2.33 | 1.46 | 1.07 | 0.71 | 5.57 | 14.3 | 32.8 | 53.3 | 58.6 | 112 |
| Top Seed | Westerwold | 2.64 | 1.16 | 1.12 | 0.70 | 5.62 | 14.1 | 31.7 | 51.9 | 59.9 | 116 |
| Caramba | Westerwold | 2.25 | 1.20 | 1.11 | 0.79 | 5.35 | 15.3 | 32.3 | 51.1 | 59.2 | 117 |
| Billion | Westerwold | 2.15 | 1.45 | 1.16 | 0.80 | 5.56 | 15.4 | 32.0 | 50.9 | 59.5 | 118 |
| Torero | Westerwold | 2.04 | 1.15 | 1.02 | 0.79 | 5.00 | 14.9 | 31.8 | 50.1 | 59.8 | 120 |
| Mean | | 2.40 | 1.22 | 0.99 | 0.69 | 5.30 | 14.9 | 32.1 | 51.6 | 59.4 | 116 |
| CV | | 16 | 27 | 16 | 14 | 8 | 6 | 4 | 4 | 2 | 5 |
| LSD (p = 0.05) | | NS | NS | 0.24 | 0.14 | 0.60 | NS | NS | NS | NS | NS |

[1]CP = crude protein, ADF = acid detergent fiber, NDF = neutral detergent fiber, TDN = total digestible nutrients, RFV = relative feed value.