Reed Canarygrass vs. Grass-Legume Mixtures Under Irrigation as Pasture for Sheep

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Highlight

Yearling Romnelet wethers were used to compare reed canarygrass and brome–orchard–ladino with two levels of nitrogen and ladino clover as additives to the reed canarygrass for three consecutive years. When all factors were taken into account the brome–orchard–ladino gave the most satisfactory results followed closely by the reed canarygrass–ladino clover mixture. Reed canarygrass alone produced the lowest number of sheep days over a three-year period and the lowest actual gains per hectare. The reed canarygrass plus 300 kg of N/ha produced the highest actual weight gain, 640 kg/ha, and the greatest number of sheep days, 2,240. However, the nitrogen fertilizer cost $84.00/ha, which cannot be justified in terms of additional T.D.N. produced. Ladino clover not only makes a substantial contribution to the total dry matter produced but also provides nutrients in the form of nitrogen for the reed canarygrass in the mixture.

The most obvious use of reed canarygrass is in reclaiming low-lying, poorly drained soils. In the United States it has been used extensively to control erosion in water courses and in low areas that are flooded for relatively long periods. To date many farmers and ranchers have been reluctant to use it for hay or pasture on high-quality land that could support other grasses and legumes.

Vose (1959) gives a comprehensive review of the agronomic potential of reed canarygrass and states that early spring growth is best utilized for grazing. He also mentions that only a system of management that involves intermittent grazing is likely to be suitable for reed canarygrass, as the young unfolding shoots are prominent and rather tall, and would be selectively grazed under a system of continuing pasturing. Richards and Hawk (1945) reported a low palatability for sheep when grazing reed canarygrass. However, Schoth (1938) stated that reed canarygrass was primarily a pasture grass, "its long life, long grazing season, and the large quantity of very succulent, palatable forage produced makes it a valuable pasture plant where it survives." Hughes et al. (1953) point out that in general seeding a legume with reed canarygrass has not been successful. This has been due to the smothering effect of the tall-growing grass. However, he does suggest that ladino clover may be grown with reed canarygrass if the grass is not allowed to get higher than 12 to 15 inches.

Because of the perennial shortage of good spring range in the interior of British Columbia, it is felt that irrigated pastures can play an integral part in over-all ranch management for both the sheepman and the cattle rancher. If they are not used full time for grazing they may be harvested for hay or silage. Irrigated pastures also provide a means of increasing livestock numbers.

The objective of this experiment was to evaluate reed canarygrass, with three levels of N, for use as an irrigated pasture crop for sheep, compared to the presently recommended mixture of bromegrass, orchardgrass, and ladino clover.

Materials and Methods

This experiment was conducted at the Research Station, Kamloops, British Columbia. The area is characterized by high summer temperatures, high evaporation rate, and relatively low precipitation. These climatic conditions have produced semi-desert soils, low in organic matter, and relatively high in calcium and potassium. Prior to the start of the experiment the area had been used as an irrigated alfalfa hay field.

The five kinds of pasture used and seeding rates were: (a) bromegrass 13.45 kg/ha, orchardgrass 8.97 kg/ha, ladino clover 1.12 kg/ha; (b) reed canarygrass 11.21 kg/ha; (c) reed canarygrass 11.21 kg/ha plus 300 kg/ha of N, applied in three applications; (d) reed canarygrass 11.21 kg/ha plus 150 kg/ha of N applied in three applications; (e) reed canarygrass 11.21 kg/ha plus ladino clover 1.12 kg/ha.

Where reed canarygrass was used, the varieties Frontier, Ottawa Synthetic 1, and Commercial were seeded separately, each on one-third of each field.

The pastures were established in June 1959, but were not grazed that year. Prior to establishment, 134 kg/ha of P_2O_5 as superphosphate (0-20-0) was broadcast. The soil was disced and packed. All fields were clipped twice during the year of establishment to control weeds.

Three (.135 hectare) paddocks were sown to each of the above-mentioned mixtures, to utilize a three-paddock rotation system and provide for 3 replicates. Sprinkler irrigation was used on all paddocks. The water used was up to 9 dm/ha.

The experimental animals were Romnelet wethers purchased in the fall from the same ranch for each year of the trial. They were wintered on silage and hay at the Research Station, Kamloops. Grazing the experimental paddock began in May 1960 with 15 animals per paddock. The numbers were increased during the flush growth period to take care of the additional forage available. The extra animals were maintained on similar pasture when not required for the experimental paddocks. The average length of a rotation cycle was 20 to 30 days, seven days for grazing and the balance for recovery of the paddock. This, of course, varied with the availability of herbage and the climatic conditions. Even with this system of "put and take" management it was impossible to prevent some waste due to trampling by the animals and rejection of the coarse culms. To remove the waste material the plots were clipped after the removal of the animals. This material was raked and weighed and a sample collected for dry matter determination.

The grazing season averaged 136 days starting May 9 and terminating September 14 to September 26, depending on

Table 1. Lamb performance as related to grass production, on various pastures during 3 years, 1960–62.

Treatments 3-paddock rotations	Dry matter			Weight gain		DM/kg gain		T.D.N.			
	Pro-duced (kg/ha)	Con-sumed (kg/ha)	Ratio P/C	Actual (kg/ha)	Av. daily gain (kg)	Pro-duced (kg)	Con-sumed (kg)	Total (kg/ha)	kg/kg gain	% used for gain	No. of sheep days
1960											
RCG	7,386	5,536	1.33	363	.11	9.21	6.89	3,658	10.1	30.2	1,324
RCG + 150 kg/ha N	11,020	6,867	1.61	582	.15	8.57	5.35	4,856	8.3	35.9	1,605
RCG + 300 kg/ha N	11,835	7,968	1.49	618	.15	8.71	5.85	5,334	8.6	36.9	1,720
RCG + ladino	12,258	9,693	1.27	548	.14	10.20	8.03	5,061	9.2	34.0	1,625
Brome, orchard, ladino	10,237	6,462	1.58	660	.18	7.03	4.45	4,923	7.5	40.1	1,495
1961											
RCG	7,236	4,556	1.59	167	.05	19.6	12.4	2,962	17.7	14.9	1,378
RCG + 150 kg/ha N	14,876	9,759	1.52	304	.05	22.2	14.6	5,524	18.2	20.0	2,505
RCG + 300 kg/ha N	15,643	10,273	1.52	438	.07	16.2	10.6	6,022	13.7	21.0	2,575
RCG + ladino	13,874	11,027	1.26	474	.08	13.3	10.6	6,038	12.7	22.7	2,505
Brome, orchard, ladino	12,820	9,807	1.31	362	.06	16.1	12.3	5,429	15.0	19.3	2,325
1962											
RCG	4,654	3,124	1.49	382	.15	5.53	3.72	2,836	7.4	36.2	1,030
RCG + 150 kg/ha N	13,014	9,624	1.35	805	.14	7.35	5.44	5,826	7.2	33.0	2,290
RCG + 300 kg/ha N	13,988	11,152	1.25	864	.15	7.35	5.90	6,180	7.2	33.4	2,425
RCG + ladino	9,471	7,711	1.23	690	.14	6.21	5.08	5,292	7.7	32.2	2,090
Brome, orchard, ladino	10,199	8,304	1.23	854	.18	5.40	4.40	5,582	6.5	40.5	1,975
3-year summary[1]											
RCG	6,426 c	4,405 b	1.46	304 c	.10	11.48	7.67	3,152 b	11.7	27.1	1,244 b
RCG + 150 kg/ha N	12,970 ab	8,750 a	1.48	564 b	.11	12.70	8.44	5,476 a	11.2	29.6	2,133 a
RCG + 300 kg/ha N	13,822 a	9,797 a	1.41	640 a	.12	10.75	7.44	5,845 a	9.8	30.4	2,240 a
RCG + ladino	11,868 ab	9,477 a	1.25	571 ab	.12	9.89	7.89	5,464 a	9.9	29.6	2,073 a
Brome, orchard, ladino	11,085 b	8,191 a	1.35	625 ab	.14	9.48	7.03	5,312 a	9.7	33.3	1,932 a
			NS		NS	NS	NS				

[1] Duncan's Multiple Range—means having the same subscript are not significantly different ($P < 0.05$).

the year and the treatment. The animals were weighed at the beginning and the end of the grazing season and each time they were moved. Water was withheld overnight but normal grazing was allowed. From this data average daily gains were calculated as well as the feed efficiency data.

The total dry matter produced was estimated by the use of cage yields. The dry matter consumed is an estimate using the "difference method." Pasture output was measured in terms of dry matter production and consumption, animal weight gains, T.D.N. output, and number of sheep days. The yield of T.D.N. was calculated according to the method outlined by Sylvestre and Williams (1952). This method consists of calculating the T.D.N. and requirement of a given animal from maintenance and the T.D.N. required to produce a given amount of gain in live weight. It is based on Morrison's total digestible nutrients because of the large amount of data that is available which makes possible the fixing of fairly reliable standards. Because T.D.N. estimates are estimated from the theoretical requirements for maintenance in gain of animals they are independent from estimates of herbage dry matter yields, and hence total T.D.N. production may give a more reliable estimate of total forage productivity of pasture.

An analysis of variance was used to compare the grass, grass plus N, and grass–legume mixtures.

Results and Discussion

Reed canarygrass, when grown alone and without commercial fertilizer, produced only slightly more than half of the standard pasture mixture of brome–orchard–ladino. This is what might be expected with a pure stand of grass grown under irrigation, especially with reed canarygrass which is a gross feeder of all nutrients. When 300 kg/ha of nitrogen were applied to reed canarygrass it significantly outyielded the standard pasture mixture producing 13,822 kg/ha (Table 1). However, there was no significant increase in forage yield between the two rates of nitrogen application. When a small amount of ladino clover seed was added to the reed canarygrass seeding the resulting forage production was slightly better than the standard pasture mixture, and almost twice as much as when the reed canarygrass was grown alone.

However, by 1962 forage production of the fields originally seeded to reed canarygrass and ladino clover had declined considerably. This was due in part to the fact that the animals found the clover

extremely palatable, grazed it very close, thereby reducing the stand of the legume.

The dry matter consumed is an estimate of the total dry matter intake of the animals as estimated by the "difference method." The more completely the herbage produced is utilized the closer will be the ratio of production over consumption to 1. With the exception of the reed canarygrass alone with no applied N there was no significant difference between the other treatments in the amount of dry matter consumed, and in the case of the P/C ratio there was no significant difference between treatments, although the reed canarygrass plus ladino clover indicated better utilization of the forage.

The actual weight gains in terms of kg/ha showed significant difference for the three-year summary with the highest production being from the reed canary paddocks that had been fertilized at the rate of 300 kg/ha of nitrogen, and the lowest production as might be expected from the reed canarygrass alone which produced only 304 kg/ha of mutton. The standard pasture mixture of brome–orchard–ladino was second in terms of production of mutton followed closely by the reed canary–ladino clover paddocks. There was no significant difference between the three highest treatments. Average daily gain between treatments was not significant. In the case of dry matter per kilogram of gain there was no significant difference in dry matter produced or dry matter consumed. The dry matter consumed per kilogram of gain indicates the efficience of gain which is slightly in favor of the brome–orchard–ladino clover.

Poor response of the animals in 1961 is difficult to explain. They were fed a similar diet during the winter of 1960–61 as for the other two winters. The quality of the vegetation was similar, the animals were from the same rancher, and were in good health. The only explanation may have been temperature. No shade was provided and 1961 had above-average mean temperatures for May, June, July, and August.

Neathery (1964) working in Georgia with Hampshire and Hampshire × Dorset lambs had a similar experience. In 1960 the average daily gain was 0.13 kg; 1961, 0.04; and 1962, 0.08. Cassard et al. (1956), working with range wether lambs sired by Suffolk and Corriedale rams and similar ewes, reported average daily gains ranging from 0.11 kg to 0.16 on irrigated pastures. The higher gains were from the Suffolk crosses.

Because average daily gains and total gain are so easily influenced by grazing management and other factors, animal gains frequently do not accurately reflect total pasture productivity. This was true in 1961 where the actual total gain was down but the dry matter produced was the highest of the three years in the test. Hence T.D.N. production gives a more reliable estimate of total productivity of the pastures.

The average starting weight of the lambs in 1960 was 48.7 kg; 1961, 46.8; and 1962, 38.6. The average gain for the season per animal was 17.8 in 1960, 13.8 in 1961, and 19.9 in 1962. This was for all groups and treatments. The T.D.N. in terms of kg per kg of gain represents a combination of T.D.N. requirements for maintenance and gain. Since the portion of T.D.N. for gain is calculated directly from the actual gains, any differences in the amount of T.D.N. required per pound of gain are a function of the differences in maintenance requirements of the animals which is related to rate of gain. The lower the average daily gain the higher should be the amount of T.D.N. required per kg of gain. This was the case in this experiment where the amount of T.D.N. required per kg of gain was higher for the reed canarygrass than the reed canarygrass plus 150 kg/ha of nitrogen. The wethers had an average daily gain of 0.10 and 0.11 kg, respectively, for these two treatments. In 1961 there was an extremely large amount of T.D.N. used per kg of gain, which in turn is reflected in the percent used for the gain.

The production of lamb per hectare was maintained at a high level by use of additives of nitrogen or ladino clover to reed canarygrass. However, the economics must be considered. The cost of nitrogen is approximately 28¢/kg. This means $84.00/ha to produce an additional 336 kg of lamb. However, 267 kg of extra lamb can be produced with the addition of 1.12 kg/ha of ladino clover seed mixed with reed canarygrass at the time of seeding at a cost of only 50¢. In the case of the nitrogen fertilizer it must be applied each year in split applications, while ladino clover will persist for two or three years.

However, by the third year of the test the ladino clover had been reduced considerably. This was due to the palatability of the ladino clover, which was grazed with relish by the sheep. The loss of ladino clover in the stand meant a corresponding reduction in the amount of nitrogen that could be "fixed" by the legume for the use by the reed canarygrass in the mixture.

Neathery (1964) noted the fact of changes in pasture quality as the season progressed. In his study a decline in pasture T.D.N. explained 61% of the variation in the decline of average daily gain of lambs on pasture. He also found that the animals receiving a corn supplement on pasture had a slower rate of decline in average daily gain. This would indicate a definite advantage to feeding a grain supplement in the latter part of the season when pasture T.D.N. is declining.

Conclusions

The early spring growth of reed canarygrass can best be used by grazing. Reports on palatability vary, probably due to the growth stage of the plant. The forage should be grazed early and eaten down to prevent the plants from flowering and becoming coarse and unpalatable.

In view of the growth habit, only a system of management which involves intermittent grazing is likely to be suitable for reed canarygrass. The young shoots are rather prominent and tall and would be selectively grazed under a continuous system of grazing.

For maximum production it would appear that reed canarygrass plus ladino clover is the cheapest mixture. However, as ladino clover tends to be reduced by grazing, a fertilizer program might be superimposed on the reed canarygrass–ladino clover mixture to maintain high forage production over a longer period.

One of the main problems in handling irrigated pasture is to obtain complete utilization of the forage during the peak growth and at the same time be able to make allowances for that period in the late fall when growth has slowed down, and in some cases practically ceased. This is particularly true with reed canarygrass which is extremely productive during the spring but tends to become dormant in September. The addition of commercial fertilizer at this time is of little use in maintaining growth.

It may be necessary in the spring to cut one paddock of the rotation for hay or silage in order to prevent growth from becoming rank and unpalatable, and hence wasted.

Zero grazing was not tried but might be desirable to obtain maximum production on a per hectare basis.

The brome–orchard–ladino clover mixture may be a little easier to manage but it was not significantly better than reed canarygrass fertilized at 150 and 300 kg/ha, or reed canarygrass plus ladino clover, in terms of total gain or production of T.D.N.

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