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PROGRESS REPORT

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FORAGE PRODUCTION

NOT FOR PUBLICATION OR RELEASE TO ANY MEDIA

Foreword

The data presented in this report summarizes several of the field studies conducted in forage management production. Some data highlights are presented but no attempt has been made to point out all the significant results. Statistical analysis is not shown since most experiments are analysed only on completion of the study.

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Exp. 1260. Top and root responses to seeding year management in Iroquois alfalfa

Direct seeded Iroquois alfalfa was successfully established in May and July 1970 and 1971. The May seeding was harvested in mid-July, well before the application of the autumn managements. The autumn harvest managements, designed to study the proper use of excessive autumn top growth in the seeding year, consisted of removing the terminal three inches (browsing) and all of the top growth in late August, mid September and late October.

The complete removal of all top growth during the autumn produced dry matter yields averaging 1700 and 500 lbs/ac for the May and July seedings, respectively. The yield of the browsed material was not measured. Such treatment effects reduced the food reserves, measured by root density, in the pattern shown for 1970. Complete removal of the top, particularly from the July seeding, severely depleted the food reserves. Further reflections of these autumn harvests were revealed in the succeeding stand and yield. The May seeding was severely thinned and produced low yields if all growth was harvested in the previous August; browsing, however, had little effect on succeeding stand and yield. Although the July seeding produced lower yields in the succeeding June than the May seeding, its aftermath production was heavy. Furthermore, aftermaths from those autumn harvests which caused severe damage in the first cutting, recovered considerable vigor by the second cutting. This recovery is associated with the recommended practice of permitting weakened stands to bloom before harvest. Nevertheless, complete removal of the top on all dates, particularly in September, severely thinned stands and reduced yields. Consequently, it would appear that browsing May seedings can be done at any time during the autumn, but if July seedings are employed, no cutting or grazing should take place.

Management Effects on Plant Development of May and July (1970) Seedings

Seeding Date	Treatment	Root Data 6/11/70 Root Density	No. Plants Per Sq. Ft.	Dry Weight Per Root	Residual Data - 1971 No. Plants Per Sq. Ft.	Yield D.M. Cut 1	Cut 2	Cut 3	Total
May	August 25 - Browsed	.81	29	.654	22	4540	3350	2193	10083
	August 25 - All Cut	.60	27	.424	17	2358	2640	1830	6828
	September 17 - Browsed	.79	23	.713	25	4393	3560	2300	10253
	September 17 - All Cut	.71	25	.599	23	4379	3308	2137	9824
	October 25 - Browsed	.81	23	.734	25	4575	3444	2251	10270
	October 25 - All Cut	.80	27	.633	20	4400	3403	2147	9950
	Not Cut	.83	24	.704	28	4549	3511	2252	10312
July	August 25 - Browsed	.74	17	.463	12	2548	2538	1928	7014
	August 25 - All Cut	.65	19	.298	10	1445	2109	1590	5144
	September 17 - All Cut	.75	19	.473	16	2891	2721	1846	7458
	September 17 - All Cut	.57	17	.261	6	823	2177	1259	4259
	October 25 - Browsed	.70	18	.548	12	2296	2754	1857	6907
	October 25 - All Cut	.67	19	.378	11	1261	2190	1625	5076
	Not Cut	.75	17	.578	16	2733	2743	2016	7492

Exp. 1270, 1320, 1330. Autumn Food Reserve Storage in Forage Species

Timothy, orchard, brome and birdsfoot trefoil, along with alfalfa, are the predominate forage species grown in Ontario. Yet little is known about the effects of managements, particularily during the autumn, on the succeeding stand and performance of any species but alfalfa. Thus in this study, through an examination of successive harvests throughout the autumn, the importance and timing of such harvests is being studied in these crops.

In 1971, the dry matter yield increased for both timothy and orchardgrass, particularly during the first two weeks of September, but showed no increase in October (Table 1). Similarly, bromegrass increased during the first two weeks of September but showed no increase thereafter. Furthermore, the autumn production was considerably lower for that species.

Regrowth after autumn harvests averaged 17 cm for orchardgrass, 16 cm for bromegrass and only 13 cm for timothy on November 8. Nevertheless, regrowth from timothy and orchardgrass provided a dense groundcover while that from bromegrass was extremely sparse, particularily from the Sept. 21 and succeeding cuttings.

Table 1

AUTUMN DRY MATTER YIELD AND PLANT HEIGHT OF THREE GRASS SPECIES

Harvest date	Yield lbs/ac			Nov. 8 height cm		
	Timothy	Orchard	Brome	Timothy	Orchard	Brome
Sept. 1	1760	1990	1170	20	23	24
7	2400	2640	1760	15	19	18
14	2930	3090	1980	12	17	17
21	2900	3130	1860	12	16	14
28	3280	3270	1990	10	14	13
Oct. 3	3240	3250	1850	9	13	11
Uncut	--	--	--	40	62	46

Samples of sod were randomly collected within each plot from all species on November 8. This material was immediately frozen and sub-sampled during the winter when the basal inch was trimmed from 100 vegetative shoots within each sample. This material will be analysed at a later date by Dr. R.W. Sheard of Land Resource Science to establish food reserve levels under the various treatments, and their relationship with succeeding persistence and yield.

The Leo and Empire trefoil seeding failed to establish satisfactory stands in 1970, however, new seedings of those cultivars plus a repeated seeding of the grasses were successfully established in 1971. These seedings will be used for this study in 1972.

Exp. 1300 Influence of Top Growth and Winter Snow Retention Upon Soil Temperatures and Persistence

Saranac alfalfa was harvested frequently and infrequently during the summer of 1970 (and again in 1971), to establish areas of low and high food reserves in the crop. Superimposed on these areas in early November were cutting treatments in which all, a part, or none of the top growth was removed. During the winter snow was kept from some areas where all the top had been taken off. Soil temperatures were recorded weekly from three depths in the soil, and succeeding stand and yield data were obtained.

Table 1 The influence of top growth and snow upon soil temperatures and alfalfa persistence 1970-71

Treatment	Minimum °F			Plants/ sq. ft. 22/6/71	D.M. lbs/ac	
	2 cm	10 cm	50 cm		Cut 1 22/6/71	Season Total
Low reserves (root density .64 Nov. 1970)						
No top, snow removed[1]	13	16	29	0	-	-
No top, snow left	29	31	33	14	3100	7030
6" top, snow left	30	31	33	13	3550	7790
12" top, snow left	29	31	33	16	3780	8000
High reserves (root density .77 Nov. 1970)						
No top, snow removed	30	31	32	15	-	-
No top, snow left	-	-	-	17	4500	9030
6" top, snow left	-	-	-	13	5050	9790
12" top, snow left	29	30	32		4540	9100

[1] Lowest temperature in January, other treatments in March

Excessive snow during the winter of 1970-71 made snow removal difficult and prevented the establishment of snow depth regemes associated with stubble heights of the previous autumn. However, frequent removal of the snow produced low temperatures in the crown area and frost penetration to 50 cm. Where the snow was left, the soil froze for a brief period, generally in February.

Frequent removal of the snow caused complete winterkilling of the alfalfa, and in both high and low food reserve regemes the roots were heaved from the soil. The extent of heaving was greater under low food reserves. Plant stands of all other treatments were similar. Yield differences between high and low food reserves agreed with previous findings. No reason can be given for the apparent higher succeeding yield from the six inch high reserve stubble.

Table 2 Average Monthly Temperatures At Three Soil Depths Under Different Snow Cover - Winter 1970-71

Treatment	Soil Depth	1970		1971			
		November	December	January	February	March	April
No top No Snow	2 cm	43	30	23	26	24	45
	10 cm	43	32	25	27	27	38
	50 cm	45	37	32	31	31	33
No Top Snow Left	2 cm	42	33	32	31	30	42
	10 cm	43	34	34	32	32	38
	50 cm	44	38	37	35	34	36
6" Top Snow Left	2 cm	43	33	32	32	31	45
	10 cm	43	34	33	32	32	40
	50 cm	45	38	36	35	34	37
12" Top Snow Left	2 cm	42	33	32	31	30	43
	10 cm	42	34	33	32	32	38
	50 cm	44	38	36	34	33	36

Exp. 1038, 1039. Legume Protein Production

Several forage legumes were evaluated for protein production in pure stands and in mixtures with ladino clover. Harvesting occurred with all species as soon as flower buds were visible on the majority of the shoots.

Protein content averaged over 20 per cent with most species, digestibilities averaged over 70 per cent. Substancial yields were obtained, particularilly from the first cutting. The addition of ladino clover in mixtures neither increased the protein content nor increased the yield.

Exp. 1038 Dry Matter Yield[1], D.D.M. and Crude Protein Content of Several Forage Legumes - Two Year Average

Legume	Cut 1	Cut 2	Cut 3	Cut 4	Cut 5	Cut 6[2]	Total or Average
Pure Stands							
Vernal	3955	1887	1917	784			8543
% D.D.M.	68.6	72.1	70.4	73.0			71.0
% C.P.	21.6	25.6	26.5	25.9			24.9
Saranac	4069	2100	2043	1224			9436
% D.D.M.	68.2	71.4	69.1	73.5			70.6
% C.P.	20.9	25.3	21.4	25.9			23.4
Sweet Clover	5053						5053
% D.D.M.	64.4						~~68.0~~ 64.4
% C.P.	19.2						~~20.1~~ 19.2
Red Clover	3506	876	1136				~~6666~~ 5518
% D.D.M.	69.7	70.4	64.0				~~72.5~~ 68.0
% C.P.	19.1	21.2	20.0				~~21.5~~ 20.1
Viking Trefoil	2664	1341	1467	1194			~~6261~~ 6666
% D.D.M.	71.7	72.3	72.7	73.1			~~76.6~~ 72.5
% C.P.	21.4	21.0	20.1	23.6			~~26.4~~ 21.5
Ladino Clover	1906	892	1106	559	1048	750	6261
% D.D.M.	80.1	78.4	75.3	74.4	77.8	73.8	76.6
% C.P.	27.5	24.6	25.2	27.4	24.8	28.6	26.4
Mixtures							
Ladino + Vernal	3710	1805	1744	1045			8304
% D.D.M.	70.7	74.5	71.4	74.3			72.7
% C.P.	23.7	22.9	20.8	25.9			23.3
% Ladino	15.7	24.6	30.9	40.6			28.0
Ladino + Saranac	4030	2086	1960	1274			9350
% D.D.M.	68.8	72.1	70.0	74.0			71.2
% C.P.	21.8	22.8	19.7	25.4			22.4
% Ladino	5.4	7.3	16.6	25.3			13.7
Ladino + Red Clover	3234	1323	1370	805			6732
% D.D.M.	72.9	74.6	72.9	71.4			73.0
% C.P.	19.1	19.5	21.9	27.7			22.1
% Ladino	11.6	51.9	57.4	70.8			47.9
Ladino + Viking	2124	811	1071	726	1107	843	6682
% D.D.M.	79.9	78.4	76.0	74.7	77.6	72.1	76.5
% C.P.	26.5	25.5	25.3	22.5	25.6	29.0	25.7
% Ladino	83.3	96.9	98.3	90.3	96.4	99.0	94.0

1 - lbs per acre
2 - 1 year only

Exp. 1128, 1129. Sweet Clover Spacing Study

Two varieties of sweet clover were grown in a growth pattern experiment to study row width and thinning (blocking) effects on dry matter yield and stem characteristics. In the first year, the variety Yukon was used, in the second and third years Goldtop, a taller and more vigorous variety was employed. Harvesting occurred at the very first sign of flowers.

Increasing the row width beyond 14 inches decreased the yield of Yukon while blocking severely reduced its yield at every row width. On the other hand, the narrowest row width produced the highest yield with Goldtop and although blocking improved the yield at that spacing, at the other row widths, it produced somewhat variable results.

Digestibility comparisons cannot be made over years, however within years, the row widths and thinning arrangements appeared to have no significant effect upon the digestibility of the stems.

Increasing the row width or thinning the stand did not appear to influence the stem content of the forage. They did affect the stem diameter however, which increased with the wider row spacings and with the blocking treatments. Furthermore, increasing the row width and blocking the stand increased the plant weight, the height of leaves per stem and the stem weight. However, as pointed out, they did not affect the leaf content.

Statistical analysis has not been completed on the data.

Exp. 1128 Dry Matter Yield, D.D.M. Content, and Stem Component Data of Spaced Sweet Clover

Row Width	Spacing	Year 1*	Year 2**	Year 3**	Total
Dry Matter Yield (lbs/acre)					
7"	Solid	5585	7063	6904	19,552
	Blocked	5263	7766	7562	20,591
14"	Solid	5592	6920	6750	19,262
	Blocked	4637	7190	6535	18,362
21"	Solid	5321	7257	5956	18,534
	Blocked	4869	7182	5561	17,612
28"	Solid	5444	7527	5858	18,829
	Blocked	4921	7135	5916	17,972
35"	Solid	4954	6448	5281	16,683
	Blocked	4104	6920	4630	15,654
D.D.M. Content of Stems					
7"	Solid	57.0	49.3		
	Blocked	58.4	50.4		
14"	Solid	57.1	48.6		
	Blocked	56.9	50.0		
21"	Solid	57.6	48.8		
	Blocked	58.1	49.1		
28"	Solid	56.0	48.5		
	Blocked	58.5	49.1		
35"	Solid	56.0	48.8		
	Blocked	57.4	48.7		
Length of Stems (cm)					
7"	Solid	117	144	145	
	Blocked	118	145	145	
14"	Solid	120	146	147	
	Blocked	121	150	151	
21"	Solid	120	144	152	
	Blocked	122	150	147	
28"	Solid	123	149	153	
	Blocked	122	151	153	
35"	Solid	125	158	152	
	Blocked	121	151	153	
Percent Stem					
7"	Solid	71.0	70.3	76.0	
	Blocked	70.1	70.3	74.7	
14"	Solid	70.6	70.5	74.6	
	Blocked	69.0	70.1	72.6	
21"	Solid	70.2	70.8	75.4	
	Blocked	69.2	69.0	76.2	
28"	Solid	70.0	70.0	74.5	
	Blocked	69.6	68.9	75.0	
35"	Solid	71.9	69.8	74.1	
	Blocked	69.6	67.9	74.9	

* Madrid

Row Width	Spacing	Year 1*	Year 2**	Year 3
Diameter of Stems (cm)				
7"	Solid	.63	.71	.61
	Blocked	.68	.80	.66
14"	Solid	.66	.74	.62
	Blocked	.71	.78	.73
21"	Solid	.68	.74	.70
	Blocked	.75	.81	.74
28"	Solid	.67	.77	.72
	Blocked	.77	.88	.72
35"	Solid	.69	.80	.73
	Blocked	.75	.85	.77
Dry Weight of Leaves - 25 Shoots (g)				
7"	Solid	36.1	59.0	38.3
	Blocked	44.0	64.9	48.5
14"	Solid	40.0	58.5	45.9
	Blocked	50.4	75.8	62.6
21"	Solid	46.2	49.6	52.3
	Blocked	57.0	83.5	62.8
28"	Solid	48.8	67.0	68.3
	Blocked	62.5	95.2	65.9
35"	Solid	50.0	76.1	70.7
	Blocked	58.0	98.3	77.8
Dry Weight of 25 Stems (g)				
7"	Solid	88.3	139.8	121.0
	Blocked	103.3	153.5	145.5
14"	Solid	95.9	139.7	135.2
	Blocked	111.8	177.9	191.0
21"	Solid	108.9	154.4	160.5
	Blocked	128.0	186.0	203.6
28"	Solid	113.1	156.2	198.6
	Blocked	142.8	210.9	197.6
35"	Solid	128.6	176.0	202.0
	Blocked	132.4	207.8	232.5

* Madrid
** Goldtop

Exp. 1139 Alfalfa Spacing Study

This growth pattern study with Saranac alfalfa employed four row widths of solid or thinned (blocked) rows, the latter consisting of a two inch clump of plants growing at 14 inch spacings within the row. Dry matter yield, stem measurements and quality determinations were made at the first flower stage of growth.

Increasing the row width beyond 14 inches generally reduced yield. Similarily, yields were lower from the blocking treatment, particularily in the aftermaths. Although row width and blocking had no marked effects on stem digestibility, blocking tended to produce taller plants and had a marked influence upon increasing the diameter of the stems particularily in the first cutting. Although blocking increased the weight of leaves on 25 stems, it also increased stem weight and consequently appeared to have no significant effect upon the leaf content.

Statistical analysis of the data have not been completed.

Exp. 1139 Dry Matter Yield, D.D.M. Content and Stem Component Data of Spaced Saranac Alfalfa

Row Width	Spacing	Cut 1 Year 1	Cut 1 Year 2	Cut 2 Year 1	Cut 2 Year 2	Cut 3 Year 1	Cut 3 Year 2	Total
Dry Matter Yield (lbs/acre)								
7"	Solid	5657	4646	2536	2846	2073	1477	19,235
	Blocked	5894	4718	2386	2504	1863	1203	18,568
14"	Solid	5231	5057	2476	2796	1976	1404	18,940
	Blocked	4884	4558	2189	2454	1750	1153	17,239
21"	Solid	4907	4663	2330	2610	1866	1284	17,660
	Blocked	4373	4141	2010	2244	1600	1034	15,402
28"	Solid	4909	4277	2167	2072	1780	1150	16,355
	Blocked	4496	3842	1937	2175	1494	986	14,930
D.D.M. Content of Stems (%)								
7"	Solid	56.0		53.1		59.6		
	Blocked	51.5		53.1		58.4		
14"	Solid	53.9		50.0		56.8		
	Blocked	53.3		52.8		57.6		
21"	Solid	51.6		51.2		56.7		
	Blocked	51.9		52.1		57.2		
28"	Solid	50.4		51.4		55.5		
	Blocked	51.4		50.2		54.8		
Length of Stems (cm)								
7"	Solid	104	93	55	57	40	29	
	Blocked	106	101	59	53	41	28	
14"	Solid	103	100	57	58	42	31	
	Blocked	99	102	58	56	44	31	
21"	Solid	98	100	57	55	44	30	
	Blocked	93	100	58	58	45	32	
28"	Solid	94	95	59	58	46	32	
	Blocked	90	102	59	60	48	32	
Diameter of Stems (cm)								
7"	Solid	.33	.29	.24	.25	.18	.20	
	Blocked	.37	.30	.24	.25	.20	.20	
14"	Solid	.36	.30	.26	.25	.19	.20	
	Blocked	.39	.33	.26	.25	.20	.22	
21"	Solid	.36	.30	.26	.24	.20	.20	
	Blocked	.39	.33	.27	.27	.22	.22	
28"	Solid	.37	.31	.27	.26	.21	.21	
	Blocked	.39	.33	.27	.27	.23	.21	

Row Width	Spacing	Cut 1 Year 1	Cut 1 Year 2	Cut 2 Year 1	Cut 2 Year 2	Cut 3 Year 1	Cut 3 Year 2
Dry Weight of Leaves - 25 shoots (g)							
7"	Solid	17.4	14.7	10.2	10.8	7.1	6.0
	Blocked	25.7	16.4	13.1	10.9	8.7	6.3
14"	Solid	21.6	16.1	12.1	11.5	8.3	6.8
	Blocked	24.5	21.8	13.3	11.4	10.2	7.2
21"	Solid	26.0	17.6	12.8	11.4	9.1	6.8
	Blocked	28.1	20.7	14.9	13.5	11.0	8.2
28"	Solid	28.9	19.3	12.7	12.8	9.9	7.0
	Blocked	30.5	20.7	15.1	14.1	11.7	7.1
Dry Weight of 25 Stems (g)							
7"	Solid	29.7	29.5	10.8	14.7	7.1	4.7
	Blocked	44.9	38.1	14.7	13.4	9.1	5.0
14"	Solid	35.0	35.5	13.0	14.6	8.3	5.2
	Blocked	39.7	46.3	15.0	14.9	10.3	6.1
21"	Solid	38.4	36.1	14.8	14.6	9.5	5.3
	Blocked	43.5	44.1	17.0	17.6	11.7	6.6
28"	Solid	39.7	40.3	14.8	17.1	10.6	6.2
	Blocked	47.8	45.2	16.6	20.8	13.1	6.4
Percent Stem							
7"	Solid	63.1	66.5	51.4	57.5	50.2	43.8
	Blocked	63.7	69.9	53.0	55.1	50.8	44.4
14"	Solid	61.9	68.7	52.0	55.8	50.3	43.4
	Blocked	61.8	68.2	53.0	56.8	50.1	46.1
21"	Solid	59.6	66.7	53.5	56.2	50.8	43.6
	Blocked	60.7	67.9	53.2	56.5	51.5	44.5
28"	Solid	57.9	67.7	53.7	57.1	51.9	47.3
	Blocked	61.1	69.1	52.3	59.4	52.9	46.9

Exp. 1471. Fodder Rape and Marrowstem Kale Variety Test

Four varieties of marrowstem kale were evaluated for yield and growth characteristics. The lowest yielding variety, Maris Kestrel, produced the shortest plants with the widest stems and the most leaves (Table 1). The dry matter content of all varieties was similar and averaged 12.6% on the October 28 harvest date.

Table 1. Yield and component data of kale varieties[1] 1971

Variety	Yield lbs/ac		%	Height	Stem	%
	green wt.	dry wt.	D.M.	(cm)	diameter (cm)	Leaf
Midas	76,600	10,230	13.3	110	2.04	24.7
Maris Kestrel	78,600	9,500	12.1	81	2.54	26.6
Dunn's Marrowstem	90,000	11,160	12.5	120	2.43	22.5
Common Marrowstem	84,900	10,760	12.7	117	2.21	21.1

[1] Seeded June 7, 28 inch rows, 4 lbs per acre

Two dates of seeding were employed to evaluate Moani and Rangi aphid resistant New Zealand varieties of fodder rape, along with the commonly grown English broadleaf type. The early seeding was employed to ensure the severe aphid infestation which occurred. Although the variety Rangi was not free from aphids, it did exhibit more resistance as indicated by its greater height and slightly higher yield on October 28 in the early seeding (Table 2). However, the varieties on the aphid-free July seeding were 10 vs 16% dry matter, but produced higher yields that contained shorter and wider stemmed plants with nearly twice the amount of leaf. In this seeding, the English broadleaf variety was slightly superior in yield and leaf content.

Table 2. Yield and component data of fodder rape varieties.[1]

Seed date, Variety	Yield lbs/acre green wt	Yield lbs/acre dry wt	% D.M.	Height (cm)	Stem diameter (cm)	% Leaf
June 4 Moani	23,700	3870	16.3	38	1.19	19.5
Rangi	26,900	4280	16.2	58	1.15	23.0
English broadleaf	23,700	3850	15.9	38	1.33	28.5
July 14 Moani	40,000	4180	10.5	30	1.39	41.1
Rangi	47,900	4780	10.0	43	1.45	40.2
English broadleaf	53,400	5270	9.9	39	1.54	44.3

[1] grown 28 inch rows, 1 1/2 lbs per acre.

The first and second cuttings of Saranac alfalfa were sprayed at baling with two preservatives following a showerless field curing period. All bales were stored for about five weeks in plastic covered piles of 40 bales per treatment, replicated twice. Daily temperatures were taken on three bales within each pile. At the time of initial and final sampling, all bales were examined, and a bulked core sample taken from 15 bales within each pile was used for quality determinations.

Excellent weather at the time of baling accounted for the differences in initial moisture content, but most treatments were baled when slightly tough, particularily in Study 1 (Table 1). Although the mean temperatures were not excessive, higher temperatures were recorded for some individual bales in each study. Temperatures peaked within a few days after baling and were generally higher in the drier baled hay of Study 2.

Treatment	% moisture at		Highest mean temp °F	DDM when baled	When Sampled[1]		
	Baling	Sampling			Bale wt/lb	pH	DDM
Study 1 - baled June 16, sampled July 20							
Proprionic - 20 lbs/ton	22	14	92		47	5.52	60.3
Proprionic - 40 lbs/ton	29	18	93		58	5.40	61.3
Hay savor - 2 lbs/ton	27	16	95		38	6.16	61.1
Hay savor - 4 lbs/ton	26	16	87		38	5.91	61.2
Wet check	27	18	92		35	6.32	59.3
Dry check	18	13	94		-	6.07	61.5
Study 2 - baled July 27, sampled Sept. 9							
Proprionic - 20 lbs/ton	22	16	109	58.9	58	6.90	57.3
Proprionic - 40 lbs/ton	21	16	95	60.0	41	7.06	59.4
Hay savor - 2 lbs/ton	26	16	100	60.9	38	7.05	57.1
Hay savor - 4 lbs/ton	23	16	104	59.1	41	7.20	57.6
Wet check	24	15	93	62.0	43	7.18	56.9
Dry check	21	15	75	60.4	35	6.97	59.0

[1] Invitro digestible dry matter

All proprionic acid treated hay produced rigid, heavy bales containing very brown colored solid slabs. All other treatments were similar in appearance and most contained a slight amount of visible mold. The dry check in both studies had the best appearance, and generally a higher pH than the acid treatments. The pH content of all treatments was higher in Study 2 than in Study 1.

It appeared that all treatments in the second cutting may have declined slightly in digestibility during the storage period. Nevertheless, little differences in digestibility were present among the treatments following about a month of storage within either cut. The dry check was as high in feeding value as any treatment in both studies. The somewhat lower feeding value of the second cutting may have been due to harvesting at a slightly later stage of development.

Early bloom Saranac alfalfa containing 20% dry matter was cut with a swather-conditioner during the PM of June 17. Swaths of 6', 8' and 10' were windrowed on normal (3") and high (5") stubble heights. These treatments were combined in a replicated test with conditioned and unconditioned swathed hay from a 7' farm mower. Samples were taken daily at 1 PM for dry matter determinations.

The dry matter content of the hay on the high and low stubble was very similar throughout the drying period. However, small differences (2%) were obtained between the high and low stubbles with the 10' swath-windrow only. Furthermore, only this width appeared to be delayed in the re-drying process following a rain. The 6' and 8' swath-windrow dried faster than the 10' but none were ready to bale as soon as the farm mower-conditioned hay. The unconditioned hay dried the slowest of all the treatments.

Table 1. The Dry Matter Content of Hay on Normal Stubble

Sample date	Swath-windrow 10'	Swath-windrow 8'	Swath-windrow 6'	7' mower-swath Conditioned	7' mower-swath Unconditioned
June 18*	33	36	42	48	36
19	46	48	49	70	44
20**	62	69	75	79	57
21	30	32	33	40	41
22	53	58	56	72	53
23	68	73	73	76	64
24	74	78	81	84	67
Mean	52	56	59	67	52

* Original dry matter 19.8%.
** One inch evening rain

Exp. 1280, 1451. Variety - Seed Production

Contracting domestic and foreign varieties of forage crops for seed has been conducted in Western Canada for some years. Recently, the seed industry has expressed a strong interest, and is presently contracting seed production in Ontario. Of particular interest to the trade and the Ontario farmer is the seed potential of O.E.C.D. varieties for the European market.

Experiment 1

Six varieties of timothy in one study and 28 varieties in another were seeded in 1970 and harvested for seed production in 1971. Most varieties were of O.E.C.D. origin coming from 12 different countries.

The date of maturity of the varieties ranged from August 4 to September 10. Seed yields ranged from a low of 44 lbs/ac for the Pastimo variety from Holland to a high of 640 lbs/ac for S352 from Great Britain. The Canadian variety Climax yielded 379 lbs/ac.

An additional 43 varieties of nine different species were seeded in 1971 for seed production. They include many O.E.C.D. types that were submitted by several seed companies. The varieties established well. They number as follows - red clover 10, bluegrass 7, fescues 6, timothy 7, bents 6, ryes 5, canary grass 2.

Cultivar*	Country	Date Harvested	Yield lbs/ac
Climax	Canada	Aug. 12	379
Toro	Italy	Aug. 4	400
S51	Great Britain	Aug. 18	238
Pecora	France	Aug. 23	194
S48	Great Britain	Sept. 3	82
S50	Great Britain	Aug. 23	106

* Grown in 14 inch rows
L.S.D. at .05 is 40 lbs.
C.V. 20.9%

Cultivar	Country	Seedling vigor [1]	Date Harvested	Yield lbs/ac
S352	Great Britain	3	Aug. 9	640
Eskimo	Holland	5	Aug. 9	586
Kairyoshu	Japan	3	Aug. 6	554
No. 90	Great Britain	4	Aug. 18	515
Vetrovsky	Czechoslovakia	4	Aug. 16	471
Vandis	Sweden	4	Aug. 12	453
Erecta	Belgium	4	Aug. 12	451
Levorska	Czechoslovakia	3	Aug. 6	445
Melusine	France	4	Aug. 9	438
Topas	Denmark	3	Aug. 18	436
Odenwalder	Germany	3	Aug. 4	424
Barmoti	Holland	3	Aug. 12	409
Pajbjerg	Denmark	4	Aug. 12	381
Lampe II	Sweden	2	Aug. 12	348
Bounty	Canada	4	Aug. 16	328
Clair	U.S.A.	4	Aug. 4	319
Lofar	Holland	4	Aug. 23	295
Champ	Canada	4	Aug. 6	288
Evergreen	Sweden	4	Sept. 3	188
Olympia	Holland	4	Sept. 10	162
Samo	Holland	3	Sept. 10	162
King	Holland	5	Sept. 3	147
Combi	Holland	5	Sept. 10	140
Sceempter	Holland	4	Sept. 10	131
Bariton	Holland	4	Sept. 3	123
Oakmere	Great Britain	5	Sept. 10	122
Sport	France	4	Aug. 30	55
Pastimo	Holland	5	Sept. 10	44
Climax [2]	Canada	3	Aug. 12	379

* Grown in 21 inch rows
1 - Rating 1 good, 5 poor
2 - Adjoining test

Experiment 2

An experiment to investigate the possibility of rejuvinating a sod-bound stand of bromegrass was initiated during the autumn of 1971. A three year old stand of Saratoga bromegrass was sprayed with Paraquat for five successive biweekly intervals commencing on August 15. The sprays were applied in such a manner that 8 inch wide rows of plants remained in unsprayed strips bordered by 22 inch wide sprayed areas. Nitrogen was applied on part of the plot area at time of spraying, the remainder will be applied in the very early spring of 1972.

The initial kill on the sprayed plant appeared satisfactory but some renewed growth late in the autumn prompted a second spray. No data were collected during the autumn period. Seed data will be collected in 1972.

Exp. 1919. Date of Nitrogen Effects on Seed Yield

Ammonuim nitrate was applied at different dates to three grasses to study date of application effects on tiller number, seed yield and seed quality. Nitrogen was applied at 75 lbs per acre, P and K according to soil test. The crops were grown in 14 inch row spacings.

Over the four year period, seed yields of all species were not strikingly affected by the time of nitrogen application. Late fall or very early spring applications appeared equally effective in increasing seed yield. Furthermore, application dates seemed to have little effect upon the panicle and seed quality components measured.

Statistical analysis have not been completed.

Exp. 1919 Date of Nitrogen Effects Upon Seed Yield - 4 Year Average[1]

Application Date	Yield Per Acre (lbs)	PANICLE DATA: Per Sq Foot	Length (cm)	Wt. of 25 Unthreshed	Wt. of Seed from 25	% Panicle Wt. in Seed	Wt. of 200 Seeds
CLIMAX TIMOTHY							
August 15	233	55	7.2	6.66	3.49	52.4	.0703
September 1	248	52	7.4	7.01	3.75	53.5	.0702
September 15	271	65	7.2	6.72	3.63	54.0	.0689
October 1	289	59	7.1	6.73	3.62	53.8	.0701
April 1	265	54	7.1	7.85	4.19	53.4	.0680
Spring-Fall Split	296	57	7.8	7.43	3.90	52.5	.0701
RIDEAU ORCHARDGRASS							
August 15	316	51	12.2	7.91	4.28	54.1	.1418
September 1	323	54	11.8	7.49	4.37	58.3	.1427
September 15	327	57	12.3	7.33	4.15	56.2	.1440
October 1	365	56	12.7	3.51	5.01	58.9	.1426
April 1	356	52	13.7	8.41	4.70	55.9	.1449
Spring-Fall Split	373	45	12.5	8.25	4.97	60.2	.1463
REDPATCH BROMEGRASS							
August 15	342	37	16.0	7.19	3.60	50.1	.6065
September 1	364	42	16.7	7.04	3.58	50.9	.6148
September 15	360	42	16.9	6.91	3.35	48.5	.6039
October 1	360	44	17.2	7.20	3.27	45.4	.5998
April 1	372	35	17.5	7.74	3.85	49.7	.6041
Spring-Fall Split	360	38	17.6	8.10	4.07	50.2	.6107

1 - Redpatch two year average
Weights in grams

Root Reserves of Alfalfa Cultivars and Their Relationship With Autumn Management - M.Sc. Thesis of N. E. Moore, 1971

SUMMARY AND CONCLUSIONS

Field experiments were conducted at Guelph in 1967 and at Elora Research Station in 1970, to study the effect of autumn management on root reserve components (reducing sugar, non-reducing sugar, total sugar, starch TAC, nitrogen, and total reserves) and plant characters (plant height, root density, root weight, root number, and June yield) among three alfalfa cultivars that differed in growth characteristics and winter hardiness. Data were collected throughout the autumn to reveal the autumn storage patterns for carbohydrate fractions, and in November and April for these and other components. Relationships were established among all variables and with the succeeding June dry matter yield.

Marked differences occurred between the years indicating the influence of environmental factors on the alfalfa plant. The cultivars differed relative to their hardiness in the autumn, but in the spring this relationship changed. In 1968 Vernal yielded the highest and Saranac the lowest, whereas, the reverse occurred in 1971. Harvesting during the critical period in the autumn reduced all root reserve components and plant characters studied except non-reducing sugar and plant stand. The results were not consistent for all variables between the years, however, a yield reduction of almost half was consistent. The content of all variables, except non-reducing sugar, nitrogen and root weight, was smaller in the succeeding spring. It would appear that the non-reducing sugars were not influenced by the treatments, however the results also show that non-reducing sugars were present in several interactions involving both the autumn treatments and the seasons.

The correlation coefficients indicated a closer relationship between the June dry matter yield with spring levels of root reserves that with autumn levels. The highest correlation with succeeding yield was obtained with spring root density. Fall plant height also showed a very high relationship with yield. The relationships between the variables in the autumn with the corresponding variables in the spring were high only for root weight, reducing sugar and starch. Of real significance was the high correlation between root density and total root reserves indicating that the root density technique is an excellent measuring tool for these types of root reserve studies.

Top and Root Responses to Seeding Year Managements of Alfalfa Cultivars - M.Sc. Thesis of T. O. Weber, 1971

SUMMARY AND CONCLUSIONS

A detailed field experiment on the seedling development and root reserve storage of alfalfa was initiated at the Elora Research Station in 1969. Two alfalfa cultivars, Iroquois and Saranac, which differed in growth characteristics, were seeded and successfully established in mid-May and mid-July. Data were collected commencing five weeks after seeding on such plant characters as leaf number, height, root density, and leaf, top, and root weight. Autumn harvest treatments, consisting of complete and partial top growth removal, were applied on August 22, September 18, and October 16. Particular attention was drawn to the relationships between seeding date and cultivars following these post-harvest autumn treatments to depict the period most critical on persistence and subsequent yield.

The complete removal of top growth in mid-September of the seeding year decreased final autumn root densities and succeeding forage yields for the two seeding dates and the two cultivars. For the July seeding, the final autumn root densities and the succeeding forage yields were also decreased by the complete removal of top growth during mid-October. Furthermore, the July seedings yielded less in the succeeding year than the May seeding. On the other hand, browsing at any period during the autumn had no marked effect on the reduction of root densities or succeeding yields.

Although the two cultivars used generally showed marked differences in growth characteristics during the autumn, both responded in a very similar manner to the treatments applied.

The data collected during this study revealed that July seedings of alfalfa were as successful as May seedings, and the succeeding dry matter yields of the former approached those of the latter. However, where a summer seeding of alfalfa is to be practiced, no top growth removal should occur during the late autumn period of the seeding year. Furthermore, top removal should not occur during mid-September for May seedings.