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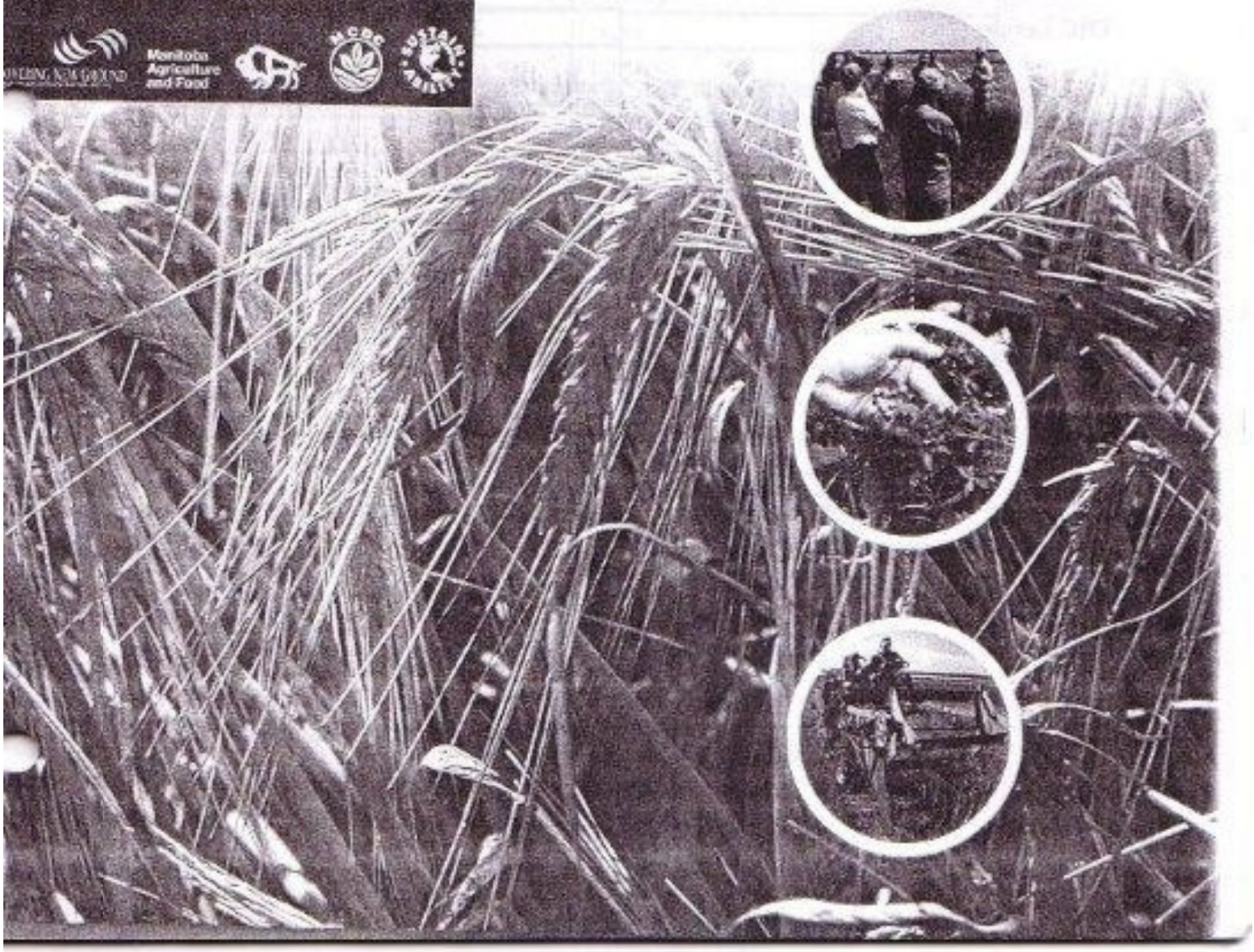


Industrial Hemp for Silage Trial

Site Information:

Location: Dauphin, Manitoba
Cooperator: Robert Baker

Seeded: May 28, 2001
Harvested: Throughout Season

Background:

Industrial hemp is a new alternative crop, which compliments prairie crop production rotations. It breaks the traditional crop cycles affecting cereals and offers enhanced cropping options and profits for farm businesses.

Industrial hemp was licensed for production in Canada for commercial production by Health Canada in 1998 for the first time in 50 years.

During the growing season natural disasters such as hailstorms and windstorms can break down the crop and render it useless as a grain or fiber crop. Livestock feed could be an appropriate salvage operation.

In future, with appropriate forage quality varieties and licensing, it may be competitive to grow strictly as an annual silage crop.

Research is required to evaluate the quality of hemp fiber/residue as a livestock feed.

Objective:

To harvest and evaluate Industrial Hemp plants at various growth stages for its suitability as a livestock feed stuff (silage).

Design, Materials and Operations:

One Industrial Hemp - Hemp Variety (USO 31) - was harvested at 4 growth stages (Elongation, Early Flowering, Late Flowering, Maturity - 3/4 seed maturity).

Whole plant samples from two, one square meter areas were chopped in 2" lengths, mixed and dried. Wet and dry weights were recorded.

Feed testing was done (Prairie Feed Resource Center). Full Cornell test used including protein, moisture, Ca, P, ADF, NDF, Ash, Ruminant, Energy Estimates.

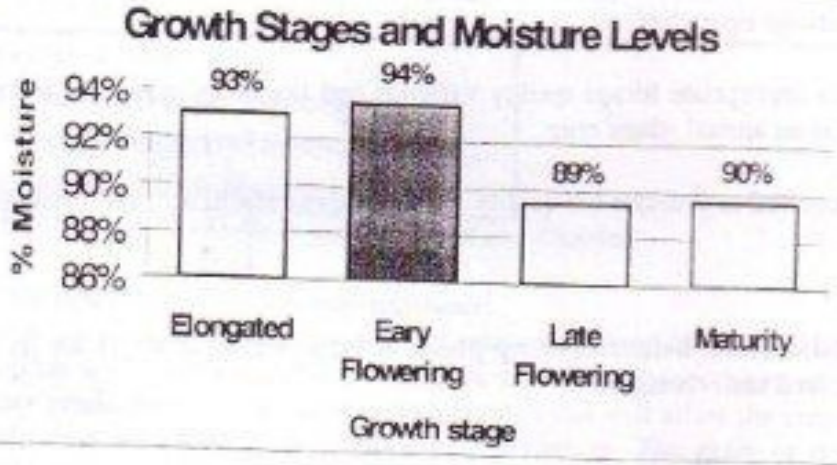
This background data can be used to compare to any other currently used forage for energy comparisons.

Results:

Harvest Dates	Harvest Stage	Wet Tons per Acre	Dry Tons * per Acre	% Moisture
7/17/2001	Elongated	14.42	1.00	93.04%
7/31/2001	Early Flowering	32.69	2.12	93.52%
8/14/2001	Late Flowering	32.78	3.46	89.46%
8/28/2001	Maturity	32.23	3.35	89.62%

***Total Plant Weight – air dried**

In the early growth stages up to mid flowering, the plants contain a very high percentage of moisture. By late flowering and early seed set, the percentage of moisture in the plant has dropped from 93% and stabilized at 89% through to maturity. The 1999 commercial crop experienced major stalk breakage during the elongation and early growth stages from very strong winds. As moisture content declines, fibre content increases.



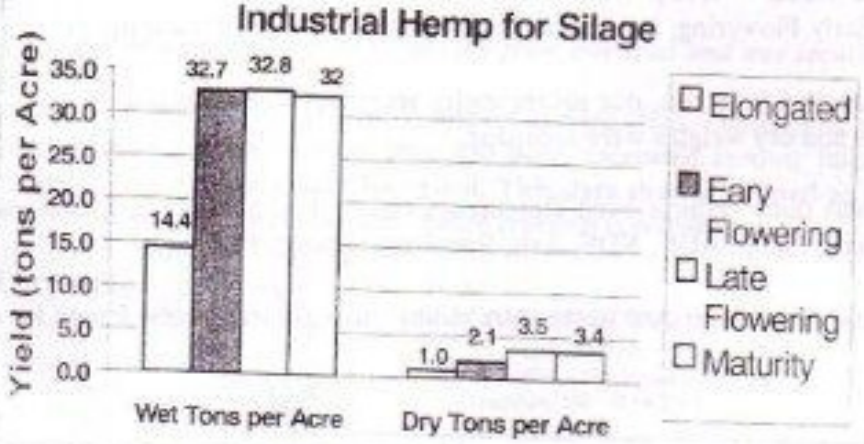


Table 1. Supplementary calculated data (dry matter basis)

Sample	Predicted TDN from ADF %	Predicted TDN (2001 NRC Dairy) %	Predicted D.E. (2001 NRC Dairy) MCal/kg	Non fibre carbohydrate (NFC) %	Predicted NDF digestibility coefficient (2001 NRC Dairy)
#1 Industrial Hemp clippings	57.0	57.2	2.76	17.33	0.30
#2 Industrial Hemp clippings	42.17	49.9	2.220	16.04	0.36
#3 Industrial Hemp clippings	43.0	53.9	2.3610	20.48	0.33
#4 Industrial Hemp clippings	43.31	56.14	2.451	16.28	0.33

Feed Test information:

The narrow ratio of ADF to NDF is not what one would expect of most vegetative material, particularly forages. Briefly, these samples could best be described as follows:

Samples #1 (Elongated) : Higher in protein, lower in ADF and NDF than the others. Ash content is the highest, with total gross energy being the lowest. The NDF is lower than compared to a grass hay and is higher than that expected for a legume hay such as alfalfa. The ash content is only 2 or 3 percent units higher than an alfalfa cut at the 10% bloom stage.

The % Calcium (CA) and % Phosphorus (Phos) is being analyzed but is not available at time of printing. An indication at this stage of development is available from the Low THC Research Report 99-10028-R1 referenced in the footnote. At 19.4% protein and 40.9% ADF, the %Ca tested at 1.87% and % Phos was 0.27%.

Samples #2 and #3 (Early and Late Flower) : Medium protein, with ADF and NDF contents indicative of mature material. Gross energy contents are medium owing to lower fat contents and medium ash contents. The slightly higher gross energy of sample #3 is from a slightly higher fat, and similar ash content than sample #2.

Sample #4 (Mature) : The highest in gross energy resulting from its higher than expected fat content, although similar in ash, protein and fibre contents to samples #2 and #3. The higher fat or ether extract is particular to this sample. The stage of maturity, amount of seed set, % oil and varietal difference should be researched further to dteremine the effects on the silage fermentation process and livestock acceptability.

From Table 1, note the 2001 NRC Dairy was used to model and predict energy as well as Penn State equation that only uses ADF to predict energy. The true energy is really closer to the NRC Dairy than the ADF predictions. These samples have little hemi cellulose type of

materials (ADF-NDF) and must be mostly lignin and cellulose. Hemp used to be grown for cellulose. However, the lignin contents are lower than expected with reasonable NDF digestibility coefficents. With variations in fat and lower lignin, energy contents will vary. The use of only ADF will not work to predict energies on these samples, because a certain level of lignin is assumed and so is fat.

Sample Description	Moisture	CP (%)		ADF (%)		NDF (%)		EE (%)		GE(%)	
		as rec'd	dry basis	as rec'd	dry basis	as rec'd	dry basis	as rec'd	dry basis	as rec'd	dry basis
Sample # 1 Elongated	7.82	17.57	19.06	35.75	38.79	45.33	49.18	1.77	1.92	3705.36	4019.70
Sample # 2 Early Flower	6.32	11.16	11.91	49.50	52.85	59.57	63.59	1.38	1.47	3969.34	4237.23
Sample # 3 Late Flower	6.15	9.52	10.14	49.66	52.91	57.06	60.80	2.18	2.32	4088.75	4356.78
Sample # 4 Mature	6.52	11.24	12.02	48.40	51.78	55.72	59.61	5.48	5.86	4194.76	4487.42

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Important Considerations and Recommendations:

Data and results must be viewed with caution as this is only one trial, on one year and with one variety. The trial does point to the value of industrial hemp as a potential livestock feed.

Note:

At this time Industrial Hemp can not legally be grown for silage. This work is being done under a research permit from Health Canada. It is hoped that if further research shows promise, perhaps the policy can be changed.

Conclusion:

Initial results indicate that Industrial Hemp may be used for silage purposes. More work is needed on time of cutting, and varieties. This data is from one site in one site year and must be viewed with caution.

Related or Other Works:

"The Nutritive Value of Hemp Meal for Ruminants" by A. F. Mustafa, J.J. McKinnon, and D. A. Christensen, Dept. of Animal and Poultry Science, University of Saskatchewan, Saskatoon

"Low THC Hemp Research Report, 1999 - Hemaruka, Alberta" by Curtis Weeks, Cereal & Oilseed Specialist, Alberta Agriculture, Food & Rural Development, Box 160, Coronation, Alberta, TOC 1CO

Sponsored in part by:

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