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Effect of variety, location, and irrigation on selected criteria for evaluating wheat as a feed for ruminants

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Effect of Variety, Location, and Irrigation on Selected Criteria for Evaluating Wheat as a Feed for Ruminants

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Summary

There were no significant differences in in vitro digestibility between wheat varieties, but there was a trend for differences due to locations. Location differences were much wider for test weight, 1000 kernel weight, hardness score and crude protein level than variety differences. Wheat from irrigated plots had higher grain yields and crude protein content, but lower test weights, 1000 kernel weights, and hardness values than wheat from fallow plots at the same location. There were no differences in digestibilities between fallow and irrigated wheat.

Introduction

A better understanding of wheat as a feed is needed to increase its potential use in livestock rations. This study was designed to identify wheat varieties that might have superior feeding qualities and to find improved methods of screening wheat for potential feeding value.

Experimental Procedures

In 1984, a total of 347 individual samples representing 32 hard red winter wheat varieties were grown in Agronomy Department test plots across Kansas. From those 32 varieties, 15 common varieties were selected from each of the 11 different locations. A least squares statistical analysis was done to determine differences caused by variety, location, and fallow vs. irrigated. A 48-hour, first stage, in vitro dry matter disappearance (IVDMD) method was used to estimate digestibility of the 32 varieties. Data for crude protein, test weight, 1000 kernel weight, and hardness were provided by the Grain Marketing Research Laboratory and the Agronomy Department.

Results and Discussion

In vitro digestibilities were not statistically different between the 15 selected varieties, ranging from 77.4 to 80.1%, but IVDMD values ranged from 76.1 to 81.4% for the 11 locations. Crude protein values (dry matter basis) ranged from 11.8 to 12.8% among varieties and from 10.7 to 14.8% among locations. Bushel weights ranged from 56.0 to 59.2 lb for the 15 selected varieties and from 53.2 to 62.4 lb across the 11 locations. Weight of 1000 kernels varied from 22.4 to 26.7 gm. among varieties and from 18.5 to 28.0 gm. among the locations. Hardness indexes of the 15 varieties ranged from 206 to 240 between varieties and from 210

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to 248 between locations. Soft red winter wheats have hardness indexes of around 150. Yields ranged from 56.6 to 71.3 bushels per acre among the varieties and from 44.6 to 92.0 bushels per acre between locations. Irrigated plots were compared with fallow plots at three locations for the 15 selected varieties, and IVDMD values were similar. However, irrigated plots had higher yields (79.2 vs. 60.5 bu/acre) and crude protein levels (12.0% vs. 11.3%). Irrigated plots had lower test weights, 1000 kernel weights, and hardness values (Table 1.1). Further research is needed to determine how these differences affect wheat's feeding value.

Table 1.1. Effect of Variety, Location, and Irrigation on Selected Criteria for Evaluating Wheat as a Feed for Ruminants

Criteria:	15 Varieties	14 Locations	Fallow	Irrigated
	Average ¹ (Range)	(Range)	Average	Average
Yield bu/ac.	61.1 (56.8-71.3)	(44.8-92.0)	60.5	79.2
Bushel Wt., lb	58.0 (56.0-59.2)	(53.2-62.4)	59.6	57.6
1000 Kernal Wt., gm	24.7 (22.3-26.7)	(18.5-28.0)	25.7	23.0
Hardness Index	227 (206-240)	(210-248)	238	223
IVDMD, % ²	78.0 (77.4-80.1)	(76.0-81.4)	79.0	79.0
Crude Protein, %	12.3 (11.8-12.8)	(10.7-14.8)	11.3	12.0

¹Least Squares Means.

²In Vitro Dry Matter Disappearance.

Table 2.2. Comparative Nutritional Composition of 15 Selected Wheat Varieties From 14 Locations

Variety	Crude Protein (%)	IVDMD ² (%)	1000 Kernel Wt. (gm.)	Test Wt. (lb/bu)	Yield/Acre (Bu.)	Hardness Index
Mustang	11.8	78.8	26.7	58.5	59.6	233
Hawk	12.2	79.6	25.3	57.5	56.6	232
Arkan	12.6	79.1	24.3	58.7	60.6	223
Bounty 203	12.5	79.4	26.4	58.5	71.3	214
Bounty 310	12.8	79.0	25.2	58.0	65.6	240
Garst HR64	12.5	79.1	22.3	57.1	59.5	231
Garst 428402	12.4	78.8	25.0	57.1	59.0	231
Hybrex HW1010	12.0	78.9	24.3	58.8	61.0	221
Hybrex HW1019	12.7	79.4	25.7	59.2	58.9	231
Hybrex HW1030	12.3	79.6	24.3	58.2	59.8	232
Newton	12.1	77.4	24.2	58.5	57.5	226
Tam 105	12.2	80.1	24.6	57.5	61.8	229
Tam 107	12.1	78.8	25.8	58.0	67.1	239
Tam 108	11.8	77.5	23.8	56.0	62.0	206
Vona	12.0	79.1	22.4	58.0	56.7	221

¹Least Squares Means.

²In Vitro Dry Matter Disappearance.

Table 3.3. Average Nutritional Composition of Wheat Varieties at 14 Locations¹

Variety	Crude Protein (%)	IVDMD ² (%)	1000 Kernel Wt. (gm.)	Test Wt. (lb/bu)	Yield/Acre (Bu.)	Hardness Index
Manhattan	12.6	80.6	24.7	56.8	71.2	210
Ottawa	11.8	78.6	23.3	53.2	50.7	220
Parsons	12.3	79.1	26.5	58.0	59.4	245
Ft. Hays	13.6	79.1	26.6	59.4	44.6	229
Belleville	13.4	76.5	26.1	56.4	55.1	238
Heston	12.2	79.9	24.0	58.1	44.8	225
Hutchinson	11.2	80.4	28.0	60.4	48.4	212
St. John (Fal)	10.7	79.2	27.7	62.4	67.8	229
St. John (Irr)	11.8	81.4	27.4	61.4	92.0	223
Colby (Fal)	11.5	78.9	22.4	57.8	50.4	236
Colby (Irr)	12.0	79.4	18.5	55.9	66.4	230
Tribune (Irr)	14.8	77.7	20.4	57.8	62.5	222
Garden City (Fal)	11.6	78.9	26.9	58.7	63.4	248
Garden City (Irr)	12.1	76.1	23.2	55.6	79.3	214

¹Least Squares Means.²In Vitro Dry Matter Disappearance.