PROJECT TITLE: Studies on alternate cereal crops, speltz, emmer, and triticales: crop yields and quality. 1990.

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OBJECTIVES: The primary objective is to evaluate crops which could be used for non-compliance cropping managements. Considerations are also being given to production costs, feasibility of utilization for grain production. To evaluate speltz, emmer, and triticale varieties and selections for maximum yield and quality (protein).

RESULTS: The results are given in five tables. They include dryland and irrigated spring triticale (Tables 1, 2), dryland winter triticale (Table 3), dryland spring emmer (Table 4), and dryland winter speltz (Table 5). Tables 1 and 2 represent the yield , test weight and agronomic data for ten spring triticale varieties grown under either dryland or irrigation. Dryland yields ranged from 2700 to 2200 lbs/acre with test weights averaging 48.2 lbs/bushel, compared to irrigated yields which ranged from 6100 to 4200 lbs/acre. In both the dryland and irrigated trials, several triticale varieties significantly out yielded Newana spring wheat, which produced 4880 lbs (81 bu/A) under irrigated, and 2200 lbs (36.4 bu/A) on dryland cropping.

The dryland winter triticale yields varied from 3350 to 1655 lbs/acre (Table 3). This compares to our interstate winter wheat variety trial in which yields ranged from 4126 lbs/A (69 bu/A) to 2580 lbs/A (43 bu/A). The higher yielding winter triticales produced yields equal to the yields obtained for the winter wheat varieties, Judith 3400 lbs/A, Tiber 3375 lbs/A, Redwin 3821 lbs/A and Neeley 3166 lbs/A.

Nineteen spring emmer selections obtained from the National Small Grains Germplasm Center, Aberdeen, Idaho, were compared to selected oat, barley, and triticale varieties for yield and test weight when grown under dryland cropping. The results given in Table 4 show that if one compares lbs of grain/acre, the emmer selections produced lower yields than barley, but several selec-

tions did out yield the check oat varieties Otana and Monida. Several triticale varieties performed as well or better than Newana spring wheat. The results would suggest that four emmer selections, PI254148, PI154162, PI154146, and early emmer, PI944664 can produce economic yields comparable to dryland spring oats or barley. While the test weight of emmers are generally lower than barley and higher than oats, one emmer selection, early emmer PI94664 had a test weight of 35.8, which was well above the test weights of either Monida or Otana oats in the study.

The yield and test weight results of the winter speltz trial are described in Table 5. Yields nearly averaged 2800 lbs/A which is similar to the highest yielding emmers planted in 1990. The speltz yielded much higher than the emmer check which is grown in North Dakota. Also, many of the emmers in our alternate grain trial (Table 4) also out yielded the North Dakota emmer.

SUMMARY: Results over the past three years on alternative cereal crop data suggest that varieties of triticale, emmer, and speltz are available which can produce yields similar to commonly grown spring wheat, oats or barley. While each crop listed is generally considered a specialty use commodity, limited and specialized markets do exist for these crops. The extent and interest will depend on the farm program and on marketing and contract developments. It is the purpose of our research to determine if varieties of these crops are available which can produce high yields and which are winter hardy in Montana.

FUTURE PLANS: The research studies will continue for several years, with the objective to generate adequate seed supplies of the higher yielding selections.

TABLE 1 . **1990 DRYLAND SPRING TRITICALE VARIETY TRIAL, SARC, HUNTLEY, MT.**

VARIETY		YIELD CWT/A	TESTWT LBS/BU	PLANTHT INCHES	HEAD DATE
TRITKRAM	KRAMER	27.36	46.37	38.67	166.00
TRITKARL	KARL	26.22	46.87	34.33	165.67
TRITOSUN	SUNLAND	24.95	52.50	36.67	166.33
TRITOT44	WAPITI	24.03	48.67	39.67	166.33
TRITWELS	WELSH	23.97	48.23	39.00	166.00
TRITBEAG	BEAGLE 82	22.64	47.70	38.00	166.67
TRITCARM	CARMAN	22.61	47.93	40.33	166.33
CI 17430	NEWANA	21.85	53.23	29.33	171.00
TRITMARV	MARVAL	21.83	43.20	41.33	166.33
TRITJUAN	JUAN	21.59	47.30	40.00	167.00

******* STATISTICAL TABLE *******

EXPERIMENTAL MEANS	23.70	48.20	37.73	166.77
TOTAL OBSERVATIONS	30.00	30.00	30.00	30.00
NO. OF REPLICATIONS	3.00	3.00	3.00	3.00
NO. OF VARIETIES	10.00	10.00	10.00	10.00
REP. MEAN SQUARE	.49	.30	3.63	.03
VAR. MEAN SQUARE	11.73	25.10	38.13	7.04
ERROR MEAN SQUARE	2.04	.19	1.97	.22
ERROR DEGREES OF FREEDOM	18.00	18.00	18.00	18.00
F TEST FOR REPS.	.24	1.59	1.85	.15
F TEST FOR VAR.	5.76	130.90	19.39	32.22
STANDARD ERROR	1.43	.44	1.40	.47
STANDARD ERROR OF THE MEAN	.82	.25	.81	.27
C.V. 1: (S/MEAN)*100	6.02	.91	3.72	.28
C.V. 2: (S OF MEAN/MEAN)*100	3.48	.52	2.15	.16
LSD (0.05)	2.45	.75	2.41	.80

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TABLE 2 . **1990 IRRIGATED SPRING TRITICALE VARIETY TRIAL, SARC, HUNTLEY, MT.**

VARIETY	YIELD CWT/A	TESTWT LBS/BU	PLANTHT INCHES	HEAD DATE
TRITOT44 WAPITI	61.16	51.93	41.67	163.67
TRITKARL KARL	56.52	52.27	33.67	162.00
TRITJUAN JUAN	54.55	51.30	43.00	164.33
TRITOSUN SUNLAND	52.34	54.87	38.33	163.33
TRITCARM CARMAN	50.06	49.33	40.33	163.67
TRITKRAM KRAMER	49.78	50.43	33.33	162.00
CI 17430 NEWANA	48.81	58.53	32.00	167.33
TRITWELS WELSH	47.29	49.63	43.00	164.33
TRITBEAG BEAGLE 82	47.00	49.03	42.33	164.67
TRITMARV MARVAL	42.45	47.97	42.33	163.67

******* STATISTICAL TABLE *******

EXPERIMENTAL MEANS	51.00	51.53	39.00	163.90
TOTAL OBSERVATIONS	30.00	30.00	30.00	30.00
NO. OF REPLICATIONS	3.00	3.00	3.00	3.00
NO. OF VARIETIES	10.00	10.00	10.00	10.00
REP. MEAN SQUARE	68.58	.32	.70	1.90
VAR. MEAN SQUARE	86.05	29.83	57.70	6.82
ERROR MEAN SQUARE	28.06	.37	5.29	.42
ERROR DEGREES OF FREEDOM	18.00	18.00	18.00	18.00
F TEST FOR REPS.	2.44	.86	.13	4.54
F TEST FOR VAR.	3.07	81.02	10.90	16.29
STANDARD ERROR	5.30	.61	2.30	.65
STANDARD ERROR OF THE MEAN	3.06	.35	1.33	.37
C.V. 1: (S/MEAN)*100	10.39	1.18	5.90	.39
C.V. 2: (S OF MEAN/MEAN)*100	6.00	.68	3.41	.23
LSD (0.05)	9.09	1.04	3.95	1.11

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TABLE 3 . **1990 DRYLAND WINTER TRITICALE TRIAL, SARC, HUNTLEY, MT.**

	VARIETY	YIELD CWT/A	TESTWT LBS/BU	PLANTHT INCHES	HEAD DATE
T59	T59	33.51	44.97	47.67	148.00
T61	T61	29.20	45.53	46.00	148.00
CAN1	CARMAN	28.91	44.43	46.00	147.67
T44	WAPITI	27.95	43.80	45.00	147.67
ND2	DOUBLE CROP	26.66	45.57	61.00	155.00
WHITMAN	WHITMAN	26.59	39.07	45.33	150.67
T54	T54	25.40	45.60	63.67	150.67
I18	I18	24.66	43.73	53.67	150.00
ND1	239	23.80	45.13	59.33	153.33
WASH2	VT086497	23.05	38.73	29.67	150.67
CAN3	DECADE	22.42	35.33	48.00	152.33
CAN5	81DE01012	21.95	46.63	63.67	162.00
WINTREE	WINTREE	20.60	45.60	61.33	162.00
CAN6	81DE01015	19.98	45.77	60.67	162.00
CAN2	81DE01021	19.27	45.13	59.33	161.67
CAN4	81DE01002	19.09	45.63	60.67	162.00
WASH1	VT087501	17.66	35.37	37.67	150.67
FLORA	FLORA	16.55	35.27	33.00	156.00
***** STATISTICAL TABLE *****					
EXPERIMENTAL MEANS		23.74	42.85	51.20	153.91
TOTAL OBSERVATIONS		54.00	54.00	54.00	54.00
NO. OF REPLICATIONS		3.00	3.00	3.00	3.00
NO. OF VARIETIES		18.00	18.00	18.00	18.00
REP. MEAN SQUARE		14.43	9.38	32.07	1.41
VAR. MEAN SQUARE		61.68	49.52	344.99	94.50
ERROR MEAN SQUARE		13.77	4.65	5.05	1.80
ERROR DEGREES OF FREEDOM		34.00	34.00	34.00	34.00
F TEST FOR REPS.		1.05	2.02	6.35	.78
F TEST FOR VAR.		4.48	10.65	68.25	52.51
STANDARD ERROR		3.71	2.16	2.25	1.34
STANDARD ERROR OF THE MEAN		2.14	1.25	1.30	.77
C.V. 1: (S/MEAN)*100		15.63	5.03	4.39	.87
C.V. 2: (S OF MEAN/MEAN)*100		9.03	2.91	2.53	.50
LSD (0.05)		6.16	3.58	3.73	2.23

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TABLE 4 . 1990 DRYLAND ALTERNATE GRAIN CROP NURSERY, SARC, HUNTLEY, MT.

VARIETY	YIELD *BU/AC	YIELD LBS/AC	TESTWT LBS/BU	PLANTHT INCHES	HEAD DATE
STEPTOE BARLEY	79.3	3809.86	41.37	39.33	163.00
LEWIS BARLEY	69.5	3337.50	47.27	36.00	165.33
CRYSTAL BARLEY	60.7	2914.88	43.27	37.67	168.67
PI 254148 EMMER	81.3	2601.66	33.87	30.33	164.67
PI 254162 EMMER	81.1	2596.73	29.87	35.67	172.00
EARLY EMMER PI94664	79.7	2549.06	35.77	32.00	166.67
HAYBET BARLEY	52.8	2535.99	41.53	39.33	164.67
88Y MERINOS J10 TRITICALE	48.2	2410.72	51.93	39.67	166.67
PI 254146 EMMER	72.8	2328.32	33.17	28.00	171.33
OTANA OATS	71.6	2291.05	28.57	39.33	173.33
YARSLOV EMMER CI1526	71.4	2285.31	30.37	37.00	176.67
MONIDA OATS	71.3	2280.58	26.80	36.67	174.00
CENEX 96190 TRITICALE	43.9	2196.51	49.43	50.00	167.33
PI 101971 EMMER	68.3	2186.51	38.33	31.67	164.00
PI 306535 EMMER	67.5	2159.97	32.27	40.33	171.00
FLORIDA 201 TRITICALE	65.4	2092.50	47.23	43.00	165.33
PI 94614 EMMER	61.6	2091.57	31.63	38.33	176.67
VRENAL EMMER CI1524	65.1	2083.10	34.17	33.67	164.67
PI 254158 EMMER	61.6	1972.77	27.80	37.00	174.67
CI 4573 EMMER	59.2	1895.83	31.57	37.00	177.00
PI 355478 EMMER	58.5	1872.29	32.90	37.67	171.00
VTO82478 TRITICALE	35.6	1780.02	43.87	35.00	174.33
PI 94626 EMMER	53.5	1713.49	29.73	35.00	172.67
WHITMAN TRITICALE	34.1	1703.49	40.50	35.67	176.67
PI 350000 EMMER	48.4	1548.54	29.63	40.00	177.67
CI 7686 EMMER	46.4	1485.01	28.63	41.33	178.67
PI 272527 EMMER	44.4	1420.74	29.00	49.33	179.67
PI 190921 EMMER	44.3	1417.27	28.77	39.00	179.00
SPRING EMMER	44.3	1417.27	33.77	37.00	177.67
PI 355474 EMMER	28.2	903.11	44.03	39.33	177.33
***** STATISTICAL TABLE *****					
EXPERIMENTAL MEANS		2129.39	35.90	37.71	171.74
TOTAL OBSERVATIONS		90.00	90.00	90.00	90.00
NO. OF REPLICATIONS		3.00	3.00	3.00	3.00
NO. OF VARIETIES		30.00	30.00	30.00	30.00
REP. MEAN SQUARE		*******	5.71	14.08	6.14
VAR. MEAN SQUARE		*******	160.00	64.04	86.84
ERROR MEAN SQUARE		*******	1.83	6.95	5.01
ERROR DEGREES OF FREEDOM		58.00	58.00	58.00	58.00
F TEST FOR REPS.		8.29	3.12	2.03	1.23
F TEST FOR VAR.		27.11	87.39	9.21	17.35
STANDARD ERROR		198.09	1.35	2.64	2.24
STANDARD ERROR OF THE MEAN		114.37	.78	1.52	1.29
C.V. 1: (S/MEAN)*100		9.30	3.77	6.99	1.30
C.V. 2: (S OF MEAN/MEAN)*100		5.37	2.18	4.04	.75
LSD (0.05)		323.77	2.21	4.31	3.66

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*BU/AC FIGURED ON

BARLEY TESTWT 48#
OATS TESTWT 32#
EMMER TESTWT 32#
TRITICALE TESTWT 50#

Table 5 . 1990 dryland winter speltz trial, SARC Huntley, MT.

Variety	Yield lbs/A	Test wt lbs/bu	Plant ht inches	Head Date
Willie [1]	2803	25.0	49	172
Sindelar [2]	2800	24.2	39	172
Champ [3]	2637	24.3	47	172
949 [3]	2830	23.6	43	171
Emmer check [4]	1590	30.0	40	---

1. Speltz obtained from Purity Foods, Okemas, Mich.
2. Speltz obtained from Dover Sindelar, Billings, MT.
3. Champ and 949 obtained from Cert. Seeds, Wooster, Ohio.
4. Emmer (used as a comparison) received from the University of North Dakota, State Research Center, Minot, N.D.

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