PROJECT TITLE: Relationship of Beta-Glucan content of oat and naked-waxy barley with nitrogen fertilizer rates.

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OBJECTIVES: To determine the effect on nitrogen on yield, yield components, protein and beta-glucan content of 'Otana' oat and 'Wanubet' barley.

SUMMARY:

Nitrogen (N) rates of 0, 30, 60 and 90 lbs of N per acre were imposed on 'Otana' oat and 'Wanubet' barley at Moccasin, Conrad and Big Sandy. Nutrient, protein and beta-glucan content have not been determined, yet. A significant grain yield response to N was measured all locations for barley, and oat responded at Moccasin and Conrad locations, only. Additions of N enhanced tillering, plant height, total plant and straw yields for barley. Oat does not appear to be as responsive to N as barley. Mean yields were higher for oat than barley at Conrad and Moccasin, whereas, barley yields were higher than oat at Big Sandy.

RESULTS:

The effect of N of 'Wanubet' barley and 'Otana' oat are summarized in tables 1 through 6. Data were collected at three locations (Moccasin, Conrad and Big Sandy). Nitrogen, protein, and beta-glucan content data are not available at this time. Oat grain yields were higher than barley at Moccasin and Conrad, but barley yields were higher than oat at Big Sandy. Nitrogen applications dramatically increased barley production (tables 1, 3, and 5) but was less pronounced for oat (tables 2, 4, and 6). Test weights were unaffected by N at Moccasin and Conrad but decreased with increasing N at Big Sandy for both commodities. Barley total plant and straw production was increased due to N, however, oat plant and straw yields were unaffected by N. Moccasin was the only location were N content and total N uptake data are available, however, these data along with the other response data indicate oat is less responsive to N than barley. These results are preliminary and may need to be modified when all the laboratory results are considered along with more data from future experiments.

FUTURE PLANS: Continue the research for one more year.

Table 1. Response of 'Wanubet' barley to nitrogen fertilizer rates under dryland fallow conditions at Jon Tester farm near Big Sandy, MT. Northern Agricultural Research Center. 1989.

RATE	PLANT HEIGHT	TILLERS	GRAIN YIELD	TEST WEIGHT	STRAW WEIGHT	BIOLOGIC YIELD	GRAIN WEIGHT	PLUMP	THIN
	in	no/ft	bu/ac	lb/bu	------- cwt/ac --------			------ % ------	
0-N	24.67	26.57	39.40	62.03	33.45	52.35	18.90	18.62	22.37
30-N	26.58	43.28	46.53	62.25	50.58	72.90	22.33	20.20	21.67
60-N	29.14	42.98	48.65	61.73	53.23	76.55	23.32	13.33	26.35
90-N	28.77	44.93	49.65	61.60	48.25	72.08	23.83	9.70	36.30
EXPERIMENTAL MEANS	27.29	39.41	46.06	61.90	46.38	68.47	22.09	15.46	26.68
F TEST FOR RATE	6.03 *	4.75 *	4.64 *	4.31 *	4.25 *	7.47 **	4.70 *	10.56 **	4.39 *
C.V. 2:	3.10	10.02	4.66	0.23	9.26	5.83	4.63	9.63	12.05
LSD (0.05)	2.71	12.63	6.87	0.45	13.74	12.78	3.28	4.76	10.29

*, ** = Significant at 0.05 and 0.01 probability levels, respectively.
Grain yield (bu/ac) based on standard test weight of 48 lb/bu.
Seeding Date: 05-06-89 Harvest Date: 08-14-89
Seeding Depth: 1.50 in Previous Crop: Fallow
Soil Temp @ Sdg: 80 F @ 2 in, 69 F @ 4 in
Depth to Moisture @ Sdg: 0.50 in
Measured Soil Water Content: (Sampling Depth = 48 in)
@ Sdg: 6.7 in
@ Harvest: 1.58 in
Precipitation: Sdg to 14 d before Harvest Maturity (HM): 8.8 in
Soil Analysis (0-6" except NO3 also @ 6-24 & 24-48" depths):
pH = 7.0, O.M. = 0.7 %, NO3-N = 46 lb/ac, P = 6 ppm (Olsen), K = 422 ppm
Soil Series and Taxonomy: Pending (SCS)
Fertilizer: N rates = urea (46-0-0) broadcast and disked just prior to seeding, all plots received 25 lb P_2O_5/ac (0-45-0) with seed
Herbicide: 2,4-Da + Dicamba (0.25 lb + 0.67 fl oz)

Table 2. Response of 'Otana' oat to nitrogen fertilizer rates under dryland fallow conditions at Jon Tester farm near Big Sandy, MT. Northern Agricultural Research Center. 1989.

RATE	PLANT HEIGHT	TILLERS	GRAIN YIELD	TEST WEIGHT	STRAW WEIGHT	BIOLOGIC YIELD	GRAIN WEIGHT
	in	no/ft	bu/ac	lb/bu	--------cwt/ac---------		
0-N	30.08	23.00	59.78	42.03	25.55	44.65	19.10
30-N	30.56	25.85	62.25	42.18	31.88	51.80	19.93
60-N	32.45	29.50	64.68	42.00	36.03	56.73	20.70
90-N	30.90	25.75	63.10	41.25	34.88	55.08	20.20
EXPERIMENTAL MEANS	31.00	26.03	62.45	41.86	32.08	52.06	19.98
F TEST FOR RATE	0.90 ns	1.64 ns	0.41 ns	3.53 *	0.97 ns	1.57 ns	0.43 ns
C.V. 2: (S OF MEAN/MEAN)*100	3.48	8.01	5.15	0.53	14.85	8.21	5.08
LSD (0.05)	3.45	6.67	10.28	0.71	15.24	13.67	3.25

* = Significant at 0.05 probalility level (ns = not significant).
Grain yield (bu/ac) based on standard test weight of 32 lb/bu.
Seeding Date: 05-06-89 Harvest Date: 08-14-89
Seeding Depth: 1.50 in Previous Crop: Fallow
Soil Temp @ Sdg: 80 F @ 2 in, 69 F @ 4 in
Depth to Moisture @ Sdg: 0.50 in
Measured Soil Water Content: (Sampling Depth = 48 in)
@ Sdg: 6.7 in
@ Harvest: 1.25 in
Precipitation: Sdg to 14 d before Harvest Maturity (HM): 8.8 in
Soil Analysis (0-6" except NO3 also @ 6-24 & 24-48" depths):
pH = 7.0, O.M. = 0.7 %, NO3-N = 46 lb/ac, P = 6 ppm (Olsen), K = 422 ppm
Soil Series and Taxonomy: Pending (SCS)
Fertilizer: N rates = urea (46-0-0) broadcast and disked just prior to seeding, all plots received 25 lb P2O5/ac (0-45-0) with seed
Herbicide: 2,4-Da + Dicamba (0.25 lb + 0.67 fl oz)

TABLE 3. EFFECT OF NITROGEN ON THE YIELD, YIELD COMPONENTS, AND NUTRIENT COMPOSITION OF 'WANUBET' BARLEY.
Central Ag. Research Center, Moccasin. 1989.

TREATMENT	GRAIN YIELD	TEST WEIGHT	PLANT HEIGHT	TILLERS	STRAW WEIGHT	TOTAL YIELD	PLANT N	N UPTAKE
lbs N/ac	lb/ac	lb/bu	in	no/ft	lb/ac	lb/ac	%	lb/ac
90-N	2575	59.9	26	59	2639	5146	1.29	66.80
60-N	2088	60.4	25	48	3355	5306	1.02	53.92
30-N	1896	59.9	26	39	1627	3729	.99	36.56
0-N	1594	60.9	28	28	1711	3305	.94	30.66
EXPERIMENTAL MEANS	2038	60.3	26	44	2333	4371	1.06	46.98
F TEST FOR TRT.	11.62	1.95	1.82	5.26	3.90	5.17	4.52	7.13
C.V. 1	11.85	1.11	6.37	26.06	35.62	20.20	14.17	26.30
C.V. 2:	5.92	.56	3.18	13.03	17.81	10.10	7.08	13.15
LSD (0.05)	386	ns	ns	18	1329	1412	.24	19.76

ns = LSD and F test are not significant at p = 0.05.
Planting date: April 21, 1989 Harvest date: August 15, 1989
Previous crop: Tilled barley stubble
Growing Season Precipitation: 10.16 inches
Soil Analysis: 0-6" except NO3 which was 0-19", NO3 = 5.6 lb/ac, P = 17 ppm, K = 234 ppm, O.M. = 3.05 %, pH = 8.0
Soil Series: Judith Clay Loam
Fertilizer: 30 lb/ac of P2O5 as treble super phosphate with the seed, urea applied while seeding in a incorporated, surface band.
Drill: Haybuster 8000 set up with cone attachments for seed and fertilizer distribution. Usual positions of seed and fertilizer were reveresed. Seed was planted about 1.5 inches deep with the opener point while the nitrogen fertilizer was positioned on the surface on both sides of the seed, nitrogen fertilizer was incorporated with the opener action and the packer wheel.
Herbicide: Bronate at pint/ac.

TABLE 4. EFFECT OF NITROGEN ON THE YIELD, YIELD COMPONENTS, AND NUTRIENT COMPOSITION OF 'OTANA' OAT.
Central Ag. Research Center, Moccasin. 1989.

TREATMENT	GRAIN YIELD	TEST WEIGHT	PLANT HEIGHT	TILLERS	STRAW YIELD	TOTAL YIELD	PLANT N	N UPTAKE
lb N/ac	lb/ac	lb/bu	in	no/ft	lb/ac	lb/ac	%	lb/ac
90-N	2910	40.5	36	31	2852	5762	1.29	73.7
60-N	2851	40.4	36	33	2759	5610	1.35	74.3
30-N	2599	40.2	35	27	1747	4345	1.12	48.2
0-N	2068	39.4	33	23	2310	4377	1.18	52.1
EXPERIMENTAL MEANS	2607	40.1	35	29	2417	5024	1.23	62.1
F TEST FOR TRT.	7.96	2.88	2.10	17.33	.54	.92	.98	1.83
C.V. 1	10.45	1.46	6.20	7.56	56.84	31.81	17.40	33.04
C.V. 2	5.22	.73	3.10	3.78	28.42	15.91	8.70	16.52
LSD (0.05)	436	ns	ns	3	ns	ns	ns	ns

ns = LSD and F test are not significant at p = 0.05.
Planting date: April 21, 1989 Harvest date: August 15, 1989
Previous crop: Tilled barley stubble
Growing Season Precipitation: 10.16 inches
Soil Analysis: 0-6" except NO3 which was 0-19", NO3 = 5.6 lb/ac, P = 17 ppm, K = 234 ppm, O.M. = 3.05 %, pH = 8.0
Soil Series: Judith Clay Loam
Fertilizer: 30 lb/ac of P2O5 as treble super phosphate with the seed, urea applied while seeding in a incorporated, surface band.
Drill: Haybuster 8000 set up with cone attachments for seed and fertilizer distribution. Usual positions of seed and fertilizer were reveresed. Seed was planted about 1.5 inches deep with the opener point while the nitrogen fertilizer was positioned on the surface on both sides of the seed, nitrogen fertilizer was incorporated with the opener action and the packer wheel.
Herbicide: Bronate at pint/ac.

TABLE 5. EFFECT OF NITROGEN ON 'WANUBET' BARLEY, NO-TILL.
Western Triangle Ag. Research Center, Conrad. 1989.

VARIETY	GRAIN YIELD	TEST WEIGHT	PLANT HEIGHT	PLUMP	THIN
lbs N/ac	lb/ac	lb/bu	in	%	%
90-N	3323	57.4	36	59	9
60-N	3188	57.6	32	61	10
30-N	2904	57.1	31	59	9
0-N	2200	59.2	28	62	8
EXPERIMENTAL MEANS	2879	57.8		60	9
F TEST FOR TRT.	45.72	1.50		.31	.41
C.V. 1	5.63	2.68		8.76	22.14
C.V. 2	2.81	1.34		4.38	11.07
LSD (0.05)	259	ns		ns	ns

ns = LSD and F test are not significant at p = 0.05.
Planting date: May 15, 1989 Harvest Date: August 21, 1989
Previous Crop: Barley
Growing Season Precipitation: 6.94
Soil Analysis: 0-6" except NO3 which was 0-48", NO3 = 33.8 lb/ac, P = 30.6 ppm, K = 327 ppm, O.M. = 1.97 %, pH = 8.2.
Soil Series: Scobey Clay Loam
Fertilizer: 11-51-0 with the seed, nitrogen as ammonium nitrate applied broadcast on May 18, 1989.
Drill: Station built, double disc, no-till
Herbicide: Roundup preplant, Bronate 1 pt/ac.

TABLE 6. EFFECT OF NITROGEN ON 'OTANA' OAT, NO-TILL.
Western Triangle Ag. Research Center, Conrad. 1989.

TREATMENT	GRAIN YIELD	TEST WEIGHT	PLANT HEIGHT
lbs N/ac	lb/ac	lb/bu	in
90-N	3442	39.3	36
60-N	3291	39.4	35
30-N	3262	40.2	36
0-N	2538	40.0	31
EXPERIMENTAL MEANS	3133	39.7	
F TEST FOR TRT.	10.10	2.71	
C.V. 1	8.13	1.37	
C.V. 2	4.06	.68	
LSD (0.05)	407	ns	

ns = LSD and F test are not significant at p = 0.05.
Planting date: May 15, 1989 Harvest Date: August 21, 1989
Previous Crop: Barley
Growing Season Precipitation: 6.94
Soil Analysis: 0-6" except NO3 which was 0-48", NO3 = 33.8 lb/ac, P = 30.6 ppm, K = 327 ppm, O.M. = 1.97 %, pH = 8.2.
Soil Series: Scobey Clay Loam
Fertilizer: 11-51-0 with the seed, nitrogen as ammonium nitrate applied broadcast on May 18, 1989.
Drill: Station built, double disc, no-till
Herbicide: Roundup preplant, Bronate 1 pt/ac.