

I. PROJECT TITLE: Evaluation of winter spelt and winter triticale for forage production.

II. PROJECT LEADERS: G.F. Stallknecht, K.M. Gilbertson

III. PROJECT PERSONNEL: Donald Salmon, Ag. Canada Lacombe, Alberta, Oregon State, Ole Cantu, Resources, Seeds, Inc., Gilroy, CA. cooperating.

IV. OBJECTIVES: To evaluate the yield and quality of winter cereals for use as forage for livestock feed.

V. RESULTS: Tables 1 and 2 describe the forage yield and quality data of selected winter triticale and spelt cultivars under dryland and irrigated cropping. The winter cereals were planted at 60 and 90 lbs/Acre dryland and at 90 and 120 lbs/Acre under irrigated cropping. Planting rates did not significantly effect either yield or quality in this study. Triticale produced higher forage yields than spelt when harvested at the soft dough stage, while spelt out yielded triticale when harvested at the boot stage. While all spelt selections in the trial were awnless and could be harvested for hay, only one triticale, (trical 102) which has awns less than 1/8 inch could be considered for use as a dry hay crop. Triticale harvested at the boot stage averaged 17.1 percent protein compared to 5.8 percent at soft dough. Under dryland cropping spelt harvested at the boot stage averaged 16.0 percent protein, compared to 10.0 percent at the soft dough stage. Under irrigated cropping, percent protein of triticale was 7.4 and 18.2 for the soft dough and boot stage of growth, while spelt forage had a average protein of 10.7 and 17.4 at the soft dough and boot stage of growth.

Yields of triticale forage averaged 1.12 and 2.62 ton/Acre harvested at the boot stage, dryland and irrigated respectively, while spelt forage yields averaged 2.23 and 3.48 ton/Acre or better than one ton higher than spelt under dryland and irrigated cropping. However, when harvested at soft dough the yield trends were reversed. Triticale out yielded spelt, yield averages for triticale were 4.95 and 7.82 ton/Acre dryland and irrigated, compared to spelt yields of 3.73 and 6.1 dryland and irrigated. However, while spelt yield average lower than triticale at the soft dough stage, percent protein averaged significantly higher in spelt, 10.7 to 7.4 for triticale under irrigation, and 10.0 to 5.8 under dryland cropping.

V. SUMMARY: Both winter triticale and winter spelt produce high yields of forage, when compared to spring hay barley or spring oats. Spelt has a distinct advantage for forage compared to triticale, spelt is awnless, and has a significantly higher protein content than triticale, particularly at the soft dough stage of harvest.

VII. FUTURE PLANS: Studies will be continued.

TABLE 1. 1994 DRYLAND WINTER FORAGE COMPARISON

	SEEDING RATE & VAR/STAGE OF HARVEST	YIELD T/A DM	MOIST %	PLANTHT INCHES	HEAD DATE	% PROT	NDF	ADF
<u>SOFT DOUGH STAGE - DRYLAND</u>								
64	PRESTO-60SD	5.55	50.10	38.50	142.00	4.20	51.35	20.25
74	PRESTO-90SD	5.55	47.92	39.50	142.00	3.45	53.65	22.35
61	B0010-60SD	5.50	57.88	35.50	153.00	6.55	48.00	23.85
71	B0010-90SD	5.45	57.46	37.00	153.00	6.60	49.90	23.50
69	BOB-60SD	5.30	55.56	39.50	154.50	7.75	48.30	25.75
79	BOB-90SD	4.65	57.39	41.00	156.00	7.30	53.15	28.10
63	TRICAL102-60SD	5.15	51.36	50.50	151.50	7.15	48.25	26.80
73	TRICAL102-90SD	4.85	51.96	51.00	151.00	5.50	51.35	24.50
68	TIBER-60SD	4.90	49.30	40.00	154.50	5.05	52.70	24.30
78	TIBER-90SD	4.80	48.40	39.00	155.00	6.75	55.70	27.85
70	NEWCALE-60SD	4.85	53.01	39.00	143.00	5.00	49.90	21.20
80	NEWCALE-90SD	4.75	52.41	39.00	143.00	4.00	49.20	21.15
62	PIKA-60SD	4.85	52.41	52.50	155.50	9.25	54.25	29.70
72	PIKA-90SD	4.75	50.57	54.50	156.00	6.90	59.10	32.65
65	TRILLIUM-60SD	4.75	50.21	47.50	149.50	4.05	57.05	27.25
75	TRILLIUM-90SD	4.85	51.77	48.00	150.00	4.40	54.20	25.30
67	WINTRI-60SD	4.80	52.67	56.00	154.00	5.65	58.40	31.20
77	WINTRI-90SD	4.70	51.97	53.50	153.00	5.45	53.55	26.60
28	PI355618-60SD	4.15	55.22	49.00	162.50	9.75	63.05	35.25
38	PI355618-90SD	4.45	57.58	52.00	157.50	8.55	64.25	36.50
66	TL335-60SD	4.50	55.45	34.50	150.00	4.90	52.20	22.95
76	TL335-90SD	4.25	53.65	33.00	150.00	6.25	53.10	25.75
29	PI355647-60SD	4.50	56.86	52.00	162.00	11.90	56.00	34.50
39	PI355647-90SD	3.70	55.88	52.50	161.00	7.60	60.80	34.05
27	PI348337-60SD	3.60	55.09	42.50	163.00	10.25	61.25	35.65
37	PI348337-90SD	4.10	56.94	44.50	162.00	10.60	63.40	38.05
22	GR900-60SD	3.15	57.14	42.50	162.00	10.95	58.45	33.00
32	GR900-90SD	4.10	57.90	46.00	160.50	10.05	56.10	30.35
23	SIND MIX-60SD	3.60	55.18	47.00	165.00	10.30	62.65	37.10
33	SIND MIX-90SD	4.05	54.94	46.50	164.00	10.70	60.80	36.05
30	PI347888-60SD	3.20	53.45	46.00	164.00	10.50	61.80	35.55
40	PI347888-90SD	3.90	52.67	48.50	162.50	9.60	66.90	40.10
26	PI348203-60SD	3.40	52.00	45.50	164.00	9.80	60.80	35.00
36	PI348203-90SD	3.80	56.04	51.50	163.50	9.75	62.40	35.40
25	PI347887-60SD	3.50	50.38	44.00	162.50	9.80	60.15	33.70
35	PI347887-90SD	3.70	48.47	47.00	161.00	9.50	63.75	37.30
21	VITA II-60SD	3.45	54.46	43.50	161.00	9.55	62.15	36.65
31	VITA II-90SD	3.35	51.93	43.00	160.50	9.65	58.85	32.30
24	ALTGOLD-60SD	3.40	54.55	46.00	161.50	10.20	63.25	37.10
34	ALTGOLD-90SD	3.45	52.65	43.50	160.50	10.30	62.80	37.90

BOOT STAGE - DRYLAND

9	PI355647-60B	2.10	77.58	35.50	.00	16.10	44.50	27.30
19	PI355647-90B	2.40	78.46	38.00	.00	15.65	47.35	30.20
5	PI347887-60B	2.35	77.89	37.50	.00	15.30	46.95	29.70
15	PI347887-90B	2.85	77.15	37.50	.00	16.05	47.60	30.15
1	VITA II-60B	2.30	78.70	36.00	.00	16.55	46.35	30.40
11	VITA II-90B	2.70	78.50	36.00	.00	16.30	49.55	31.65
4	ALTGOLD-60B	2.15	78.60	35.50	.00	10.80	47.75	25.25
14	ALTGOLD-90B	2.65	79.38	35.00	.00	17.25	48.00	32.35
7	PI348337-60B	2.05	79.71	35.00	.00	16.55	48.45	31.00
17	PI348337-90B	2.35	78.98	36.00	.00	15.65	49.10	31.65
2	GR900-60B	2.05	80.84	36.50	.00	16.15	43.60	27.00
12	GR900-90B	2.30	80.18	35.00	.00	16.30	45.10	27.60
3	SIND MIX-60B	1.95	80.46	33.50	.00	17.55	45.95	30.30
13	SIND MIX-90B	2.25	79.31	34.00	.00	17.60	45.70	30.60
6	PI348203-60B	2.00	80.65	35.00	.00	16.55	49.40	32.00
16	PI348203-90B	2.20	80.52	36.00	.00	17.50	46.65	30.85
8	PI355618-60B	2.15	79.62	35.50	.00	14.95	47.45	31.40
18	PI355618-90B	2.50	79.97	34.50	.00	14.30	51.20	33.10
10	PI347888-60B	2.15	79.34	35.50	.00	16.50	46.60	30.25
20	PI347888-90B	2.05	79.25	35.00	.00	15.95	46.70	30.30
43	TRICAL102-60B	1.35	87.55	31.00	.00	16.50	48.80	32.50
53	TRICAL102-90B	1.65	87.51	32.00	.00	16.30	52.60	31.60
44	PRESTO-60B	1.30	87.69	25.50	.00	15.35	43.50	28.50
54	PRESTO-90B	1.45	87.91	24.50	.00	13.70	46.25	29.55
45	TRILLIUM-60B	1.15	88.18	25.50	.00	15.40	48.30	32.20
55	TRILLIUM-90B	1.35	88.08	27.50	.00	16.20	47.15	32.00
50	NEWCALE-60B	1.00	88.06	24.50	.00	14.30	46.50	30.50
60	NEWCALE-90B	1.35	86.28	25.00	.00	15.20	46.55	30.80
41	BOO10-60B	1.10	87.62	22.00	.00	18.95	39.15	27.45
51	BOO10-90B	1.25	87.32	21.50	.00	18.60	43.85	29.90
42	PIKA-60B	1.10	89.03	26.00	.00	20.30	39.65	28.55
52	PIKA-90B	1.15	88.76	25.50	.00	18.95	43.05	30.05
46	TL335-60B	.90	89.45	20.00	.00	16.65	41.55	27.15
56	TL335-90B	1.00	89.71	20.50	.00	16.65	41.60	27.55
47	WINTRI-60B	.80	88.94	24.50	.00	18.40	41.50	28.25
57	WINTRI-90B	.95	89.77	27.00	.00	18.65	40.00	28.35
49	BOB-60B	.45	90.73	18.50	.00	18.60	36.05	24.90
59	BOB-90B	.90	88.61	20.50	.00	18.75	38.15	26.35
48	TIBER-60B	.70	88.66	22.50	.00	19.75	40.80	29.45
58	TIBER-90B	.65	88.08	21.00	.00	15.00	44.30	29.80

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

	YIELD	MOIST	PLANTHT	HEAD	%		
EXPERIMENTAL MEANS	T/A DM	%	INCHES	DATE	PROT	NDF	ADF
EXPERIMENTAL MEANS	3.00	68.67	37.49	79.15	12.22	51.20	30.14
NO. OF VARIETIES	80.00	80.00	80.00	80.00	80.00	80.00	80.00
F TEST FOR REPS.	.51	3.06	.04	.70	.11	.06	1.01
F TEST FOR VAR.	44.12	123.24	53.26	86.34	16.45	16.92	8.37
C.V. 1: (S/MEAN)*100	10.65	2.92	5.02	15.07	13.83	5.01	7.03
C.V. 2: (S OF MEAN/MEAN)*100	7.53	2.06	3.55	10.65	9.78	3.54	4.97
<u>LSD (0.05)</u>	<u>.64</u>	<u>3.99</u>	<u>3.75</u>	<u>23.74</u>	<u>3.36</u>	<u>5.10</u>	<u>4.22</u>

DATE PLANTED: 9/30/93 HARV: TRIT AT BOOT: 5/20/94
 SPELT AT BOOT: 6/3/94
 TRIT & SPELT SOFT DOUGH: 6/28/94
 94DRYFOR.WFD 94DRYFOR.STT

TABLE 2. 1994 IRRIGATED WINTER FORAGE COMPARISON

VARIETY / STAGE OF HARVEST	SEEDING RATE &	YIELD	MOIST	PLANTHT	HEAD	% &		
	T/A DM	T/A DM	%	INCHES	DATE	PROT	NDP	ADF
<u>SOFT DOUGH STAGE - IRRIGATED</u>								
61	B0010-90SD	7.95	65.31	45.00	149.50	7.30	52.35	26.95
71	B0010-120SD	8.75	63.77	40.50	149.50	7.35	53.20	27.35
64	PRESTO-90SD	8.65	60.99	44.00	148.00	5.65	47.55	15.45
74	PRESTO-120SD	7.90	62.07	48.50	149.50	7.05	47.90	20.20
67	WINTRI-90SD	8.25	62.73	47.00	152.00	7.55	55.10	29.00
77	WINTRI-120SD	7.30	65.65	47.50	153.00	7.35	54.00	28.25
62	PIKA-90SD	8.25	64.66	48.00	153.50	8.50	50.70	27.80
72	PIKA-120SD	7.45	63.79	52.00	156.00	10.00	52.20	29.40
65	TRILLIUM-90SD	8.20	64.46	47.00	150.00	8.10	51.70	26.85
75	TRILLIUM-120SD	7.45	62.36	46.50	151.50	7.65	29.90	34.55
69	BOB-90SD	7.85	64.76	43.50	155.00	9.10	45.85	27.00
79	BOB-120SD	8.05	66.97	44.50	155.50	7.95	51.40	27.25
66	TL335-90SD	7.95	62.88	42.00	149.00	5.75	52.20	24.75
76	TL335-120SD	7.40	63.42	44.00	149.00	6.45	53.05	24.85
63	TRICAL102-90SD	7.80	62.24	56.00	151.50	7.20	49.80	24.30
73	TRICAL102-120SD	7.10	64.46	51.00	152.50	7.45	47.60	21.25
28	PI355618-90SD	7.70	67.15	48.00	163.00	11.70	54.40	31.10
38	PI355618-120SD	6.65	64.87	50.00	162.00	9.35	55.70	31.20
70	NEWCALE-90SD	6.95	63.80	48.00	151.50	7.10	45.40	19.10
80	NEWCALE-120SD	7.65	61.57	50.50	148.00	6.50	50.10	21.90
68	TIBER-90SD	7.15	62.72	47.00	153.50	9.00	46.75	22.50
78	TIBER-120SD	7.20	62.10	49.00	155.50	8.20	51.10	25.15
22	GR900-90SD	5.50	66.60	48.50	161.50	10.10	55.70	31.10
32	GR900-120SD	6.75	66.55	47.50	160.50	9.45	53.65	28.55
27	PI348337-90SD	6.20	64.62	46.50	161.50	10.10	56.25	31.45
37	PI348337-120SD	6.70	64.23	45.00	161.50	10.70	54.30	29.75
29	PI355647-90SD	6.45	65.08	48.50	161.50	11.05	53.90	30.60
39	PI355647-120SD	6.60	63.59	51.00	160.50	9.10	55.65	29.95
23	SIND MIX-90SD	5.65	66.18	51.00	163.50	10.40	57.65	33.30
33	SIND MIX-120SD	6.50	65.71	47.00	162.50	11.25	55.95	31.95
26	PI348203-90SD	5.80	66.03	50.00	163.00	11.15	56.40	32.80
36	PI348203-120SD	6.05	65.50	47.00	161.00	11.45	51.95	28.10
30	PI347888-90SD	5.60	67.62	49.00	161.50	11.20	60.35	36.85
40	PI347888-120SD	5.85	64.92	49.00	162.00	11.30	52.15	28.65
21	VITA II-90SD	5.45	67.57	45.00	161.50	11.75	58.55	35.30
31	VITA II-120SD	5.85	64.77	46.50	160.00	10.25	57.40	32.15
25	PI347887-90SD	5.35	67.33	48.50	159.50	11.05	54.15	30.25
35	PI347887-120SD	5.60	65.06	47.00	159.50	9.50	50.85	26.10
24	ALTGOLD-90SD	5.35	65.18	47.00	162.00	11.65	54.45	31.85
34	ALTGOLD-120SD	5.45	66.75	47.50	161.50	12.20	53.65	31.45

BOOT STAGE - IRRIGATED

5	PI347887-90B	3.30	80.66	44.00	.00	16.70	52.50	34.25
15	PI347887-120B	3.90	80.63	41.50	.00	15.90	55.50	37.25
8	PI355618-90B	3.65	81.83	43.00	.00	16.90	52.50	35.50
18	PI355618-120B	3.85	83.45	41.00	.00	16.70	52.45	35.10
2	GR900-90B	3.45	81.62	44.00	.00	16.40	51.45	33.55
12	GR900-120B	3.80	81.99	40.00	.00	16.95	50.60	33.50
6	PI348203-90B	3.20	82.72	43.00	.00	18.10	41.55	34.10
16	PI348203-120B	3.65	82.21	42.00	.00	18.15	47.80	32.45
3	SIND MIX-90B	3.15	82.18	47.00	.00	18.20	50.05	34.50
13	SIND MIX-120B	3.65	82.65	43.00	.00	18.15	48.50	33.40
7	PI348337-90B	3.45	81.38	42.50	.00	16.00	54.35	36.05
17	PI348337-120B	3.60	83.10	42.50	.00	18.80	46.75	32.50
9	PI355647-90B	3.25	82.40	44.00	.00	17.45	49.70	34.15
19	PI355647-120B	3.60	81.89	44.50	.00	18.15	50.10	34.40
1	VITA II-90B	3.15	82.28	44.00	.00	18.35	48.25	33.75
11	VITA II-120B	3.60	81.96	40.50	.00	17.90	49.95	34.25
10	PI347888-90B	3.10	82.78	42.00	.00	17.85	49.65	33.50
20	PI347888-120B	3.45	82.50	44.50	.00	18.00	51.20	34.65
4	ALTGOLD-90B	3.35	81.06	43.50	.00	16.45	55.05	37.10
14	ALTGOLD-120B	3.35	82.29	43.00	.00	16.80	54.20	37.25
46	TL335-90B	2.45	85.55	28.00	.00	18.40	44.00	29.60
56	TL335-120B	3.05	83.71	26.00	.00	17.85	44.90	30.10
44	PRESTO-90B	2.75	84.88	33.50	.00	17.30	50.95	32.95
54	PRESTO-120B	3.00	84.77	26.00	.00	15.55	53.10	35.55
41	B0010-90B	2.90	82.45	28.50	.00	18.70	45.25	30.95
51	B0010-120B	2.70	84.78	24.50	.00	19.75	40.70	29.05
50	NEWCALE-90B	2.80	83.78	29.50	.00	15.70	50.85	33.90
60	NEWCALE-120B	2.70	84.30	28.50	.00	17.40	49.05	33.30
45	TRILLIUM-90B	2.55	84.90	28.50	.00	16.40	52.70	35.45
55	TRILLIUM-120B	2.75	84.93	27.00	.00	16.85	51.70	35.00
47	WINTRI-90B	2.65	84.26	30.50	.00	19.95	44.75	30.60
57	WINTRI-120B	2.05	85.73	26.50	.00	20.35	41.65	28.65
43	TRICAL102-90B	2.55	84.86	27.00	.00	16.90	53.05	35.75
53	TRICAL102-120B	2.60	86.07	28.50	.00	18.45	48.30	32.90
49	BOB-90B	2.35	85.29	32.50	.00	19.00	42.15	28.90
59	BOB-120B	2.55	84.76	24.00	.00	19.35	42.65	29.15
42	PIKA-90B	2.30	86.05	32.00	.00	19.70	42.50	29.65
52	PIKA-120B	2.45	86.39	26.00	.00	19.20	45.05	31.05
48	TIBER-90B	2.25	83.33	25.50	.00	18.80	45.60	31.35
58	TIBER-120B	2.45	84.11	24.00	.00	19.30	46.50	31.85

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

	YIELD	MOIST	PLANTHT	HEAD	%			
	T/A DM	%	INCHES	DATE	PROT	NDF	ADF	
EXPERIMENTAL MEANS	4.97	74.03	41.46	78.29	13.48	50.48	30.66	
NO. OF VARIETIES	80.00	80.00	80.00	80.00	80.00	80.00	80.00	
F TEST FOR REPS.	1.74	.40	3.80	.90	.41	.41	1.90	
F TEST FOR VAR.	20.11	69.20	8.187	000.35	44.68	2.05	3.36	
C.V. 1: (S/MEAN)*100	13.39	2.20	10.17	1.70	7.29	9.60	11.10	
C.V. 2: (S OF MEAN/MEAN)*100	9.47	1.56	7.19	1.20	5.15	6.79	7.85	
LSD (0.05)	<u>1.32</u>	<u>3.24</u>	<u>8.39</u>	<u>2.65</u>	<u>1.96</u>	<u>9.64</u>	<u>6.78</u>	
DATE PLANTED: 9/30/93	HARV: TRIT AT BOOT: 5/20/94							
	SPELT AT BOOT: 6/3/94							
	TRIT AND SPELT AT SOFT DOUGH 6/28/94							
	94IRRFOR.WFD 94IRRFOR.STT							