Results from the 1989 Alaska Barley Breeding Program

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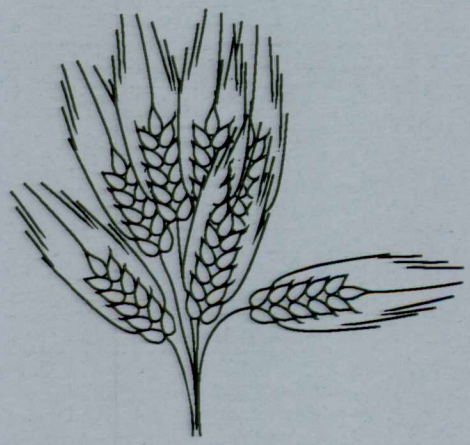

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INTRODUCTION

The development of improved cultivars of barley is accomplished through comprehensive plant breeding programs. Such programs:

1). evaluate genetically-diverse germplasm in order to identify superior-performing genotypes;
2). create new genetic recombinations from crosses or other means using selected parental genotypes;
3). evaluate segregating progeny from these families while exerting selection pressure for desirable characteristics; and
4). identify superior-performing cultivars in yield trials conducted at multiple locations over years.

This circular documents the current status of research in cultivar development associated with the Alaska barley breeding program.

MATERIALS AND METHODS

Approximately 400 barley accessions of diverse origin were evaluated in single row observation in 1989. This germplasm was obtained from a number of sources including the National Small Grains Germplasm Collection, Aberdeen, ID; Nordic Gene Bank, Alnarp, Sweden; Dr. E.A. Hockett, USDA barley breeder at Bozeman, MT; and other contributors. Rows were hand-seeded on May 5. Heading date and plant height were recorded. 'Otal' was seeded every 20th row as a check cultivar.

A diagram of the Alaska barley breeding program is shown in Figure 1. More than 40 successful crosses were made in the greenhouse in 1989. F_1 plants were also grown in the greenhouse to produce F_2 seed. F_2, F_3, and F_4 families were grown in the field, and evaluated for heading date, susceptibility to lodging, and plant height. Superior-performing F_2 and F_3 families were harvested in bulk to be grown as F_3 and F_4 families, respectively, in 1990. Individual heads were selected from superior-performing F_4 families to be grown as headrows in 1990.

At this stage of the breeding program, F_4 families represent the most advanced material available for evaluation. Therefore, discussion of the performance of breeding material will not include generations beyond the F_4. Subsequent Experiment Station circulars will include performance of more advanced stages of testing as they become available.

RESULTS AND DISCUSSION

The performance of the barley genotypes evaluated in single-row observation is given in Table 1. Heading date is expressed relative to that of Otal, with positive and negative values indicating number of days earlier and later heading, respectively, than Otal. Genotypes heading earlier than, or up to two days later than Otal, are considered to potentially possess the level of early maturity required for the short Alaskan growing season. Cultivars which headed more than two days later than Otal are not included in Table 1.

Performance of F_2, F_3, and F_4 families are presented in Tables 2, 3, and 4, respectively. Desirable characteristics include early heading date (zero or positive values), low lodging (low values), and short or medium plant height. Twelve F_2 families were harvested for evaluation in 1990. Four of the last five families listed in Table 2 appeared to show particular promise, combining early maturity with good lodging scores.

Seventeen F_3 families (Table 3) were harvested for evaluation as F_4 families in 1990. The last three families listed in this Table headed earlier than Otal, and also possessed good straw strength. Plants within these families are segregating for covered (normal) and naked (hulless) kernel type. The pedigrees of these families involved the line '2228' as male parent. Unnamed line 2228 obtained from Canada by Roscoe Taylor which appears to possess good combining ability, at least in these crosses which were evaluated.

A total of 1500 heads were selected from 15 F_4 families (Table 4). Number of heads harvested within each family depended upon the assessed value of individual families. Seed from these heads will be grown as head rows in 1990.

Figure 1. *Breeding method used in the Alaska barley breeding program.*

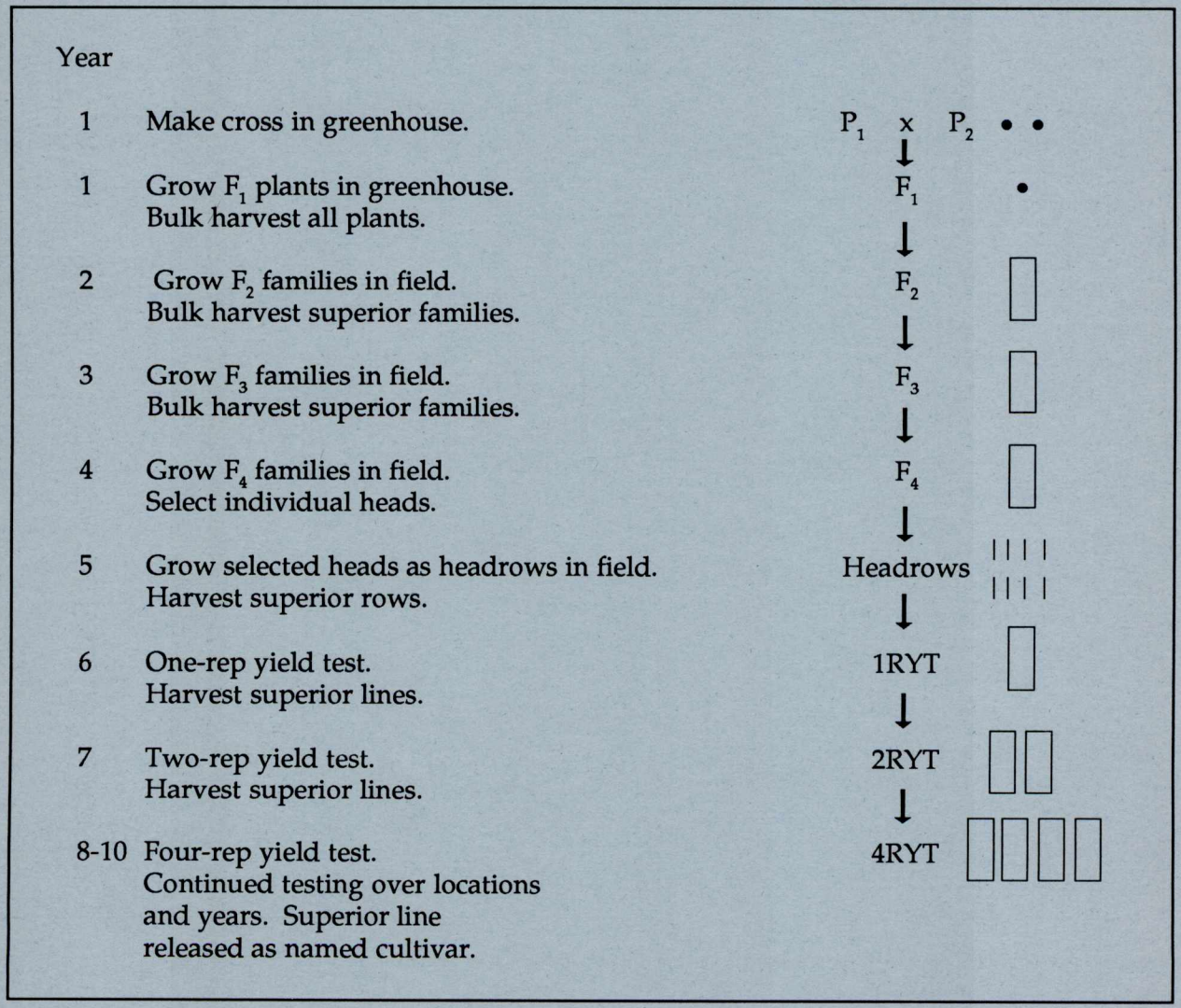

Table 1. Relative heading date and plant height of barley genotypes grown in single-row observation at Palmer in 1989.

Genotype	Relative heading date	Plant height inches	Genotype	Relative heading date	Plant height inches
11957	-2	30	Europeum	-2	29
467622	-2	33	Floya	+1	41
467624	0	32	Gateway	+1	36
467627	0	29	Glatstk Canadisk	0	38
4954	-2	27	H3211	-1	29
4956	-2	26	H3239	-1	31
4963	-2	28	H4374	0	29
5011	-2	24	Hankkija 673	0	22
5860	0	35	Hankkija's Eero	0	27
5871	-1	37	Helmi	-2	28
A Hor 2448/59	-2	29	Hja 63912	-1	28
Advance	+1	35	Hja 78003	-1	23
Ag-Arla	-1	36	Hja 78042	0	27
Arra	0	31	Hja 78104	0	27
Bjorneby	-2	42	Hja 81205	-2	24
Bode	0	24	ID71966	0	25
Bowman	0	33	ID810099	-2	27
Brockilli	+1	23	ID82519	-2	40
Cernigovskij 5	-2	30	ID8540	-2	33
Chervonetz	-2	29	ID85453	-1	24
CI 15229	0	29	Iuzhnii	-2	45
CI 15514	-2	29	Johnston	+1	28
CI15229	0	26	Jotun	-1	42
CI15773	-2	27	Klepeninskij 182	+2	27
CI936	-1	25	Krasnodarskij 35	0	30
Colsess IV	-1	39	Krasnojarskij 1	-2	33
Conquest	-2	44	Krymskij 301	-1	25
D461	-2	27	Kubaner	-1	29
Diamond	-1	34	KVL 109	+1	41
Dickson 154	-2	25	KVL 14	+2	33
Dickson 169	-2	27	KVL 156	+1	31
Doneckij 4	-1	32	KVL 158	0	23
Doneckij 650	-1	25	KVL 160	-2	33
Donnes	0	37	KVL 165	0	34
Doukhobor	-1	25	KVL 177	-2	33
Dzau-Kabutar	-1	23	KVL 194	0	33
ea7 (Early heading gene)	+2	19	KVL 274	+1	33
Edda II	0	39	KVL 343	+3	30
Eero	0	27	KVL 39	-1	31
Eero 80	0	24	KVL 390	+3	27
Ershabet	+1	28	KVL 4	-1	21
Etu	-2	24	KVL 452	+2	34

No. of days earlier heading (+) or later heading (-) than Otal (June 29).

Table 1. (continued)

Genotype	Relative heading date	Plant height inches	Genotype	Relative heading date	Plant height inches
KVL 454	+3	25	msg44cx HA 6-33-02	+2	38
KVL 461	+1	32	MT140523	-2	25
KVL 472	-2	42	MT83422	-2	26
KVL 475	+1	30	MT83435	-2	25
KVL 478	-2	44	MT83533	-2	24
KVL 49	+3	33	MT851012	-2	23
KVL 50	0	38	MT851195	-1	22
KVL 592	-2	43	Naheivandany	0	31
KVL 592	-1	34	ND10341	-2	23
KVL 605	-2	33	ND9866	-2	28
KVL 618	0	34	ND9870	-2	28
KVL 619	0	30	NO 11110191	-1	30
KVL 620	+1	31	Nordlys	+1	27
KVL 625	-2	37	No. 6166	-2	44
KVL 628	-1	35	Odesskij 46	-1	28
KVL 706	0	25	Olli	+1	32
KVL 707	-1	26	Ononojskaja 566	0	29
KVL 748	-1	22	OR8623	+1	18
KVL 75	-1	28	Otra	+1	34
KVL 765	+1	24	Paavo	-2	29
KVL 80	+3	32	Parun	-2	29
KVL 800	+1	28	PI483237	0	28
KVL 81 Tamparkorn	0	31	Pirkka	0	35
KVL 814	-1	24	Polar	-2	40
KVL 85	-2	42	Potra	0	34
KVL 94	+1	32	Primus II	-1	39
KVL 96	-2	44	Puke II	-2	36
KVL 98	+1	34	Regal 1865	-2	37
Lewis	-2	27	Sjak	-1	40
Maskin	0	42	Steptoe	-2	29
Mjos	-2	41	Submedicum 199	-2	29
msg„jd Svalof 73608	-2	24	Suvi	0	32
msg„je Svalof	-2	22	Svalov Mari B145	+1	33
msg„jh Svalof	-1	23	Swedish Hullless	-2	41
msg„ji Svalof	-2	19	Trysil	-2	36
msg„jr Mona	-2	21	UT2507	-1	34
msg„js Mona	-2	21	Vantmore	-2	38
msg1ca Atlas 57	-1	25	Varde	0	26
msg1ca CI3644	+2	18	WA136278	-2	20
msg1ca Kindred	-2	33	WA755283	-2	25
msg1ca Rojo	+1	23	Weibull No. 5492	-2	28
msg1ca Trebi	-1	22	Weibull No. 5666	-1	31
msg2cb Ogalitsu	-1	31	Weibull No. 5672	0	30
msg2cb Trebi	-2	26			

No. of days earlier heading (+) or later heading (-) than Otal (June 29).

Table 2. *Relative heading date, lodging, and plant height of F_2 barley families grown at Palmer in 1989.*

Family	Relative heading date	Lodging 1-9	Plant height inches
Weal/Plains// 68II-63-8-34-28/Massey	+1	3.5	40
Otra/Turk// 75II-68-10-8-7/Wolfe	+1	6.0	35
Datal/Vaugn// Pioneer/Moduc	+1	5.5	37
75II-69-59-33-3/Trebi// 71-1591-Mat 8/Regal	+1	4.0	34
Otal/Highland// 71-991-100/Little Ben	+2	8.0	34
Lidal/Ondall// 75II-69-31-156-110/Frontier	+2	8.0	34
75-991-3977-1125-258/Vantmore// Olli/Windsor	-2	5.0	35
Edda/Advance// 60II-54-2-93/Liberty	-3	2.5	37
B3-B1Mix-40-WA10081-63// CCXXXVI-275/Hector	-3	7.5	36
CCXXXVII-A-270/Datal// 75-1781-120-41/68II-63-8-34-28	-3	4.5	33
CCXXXVI-4/CCXXXII-155// 75II-62-13-11-5/CBB303	0	6.7	35
CCXXXVII-A-242/1630// CCXXXVI-356/CCXXXII-355	+1	7.0	27
CCXXXVI-423//X123-10-5-6-1-1// B3-B1Mix-31/Klages	-2	6.0	38
CCXXXVII-B-315/Advance// 71II-67-21-120/8176-382-761-85-1	+3	2.0	29
CCXXXVII-A-122/68II-63-8-34-28// Olli/CCXXXVI-698	+2	2.5	35
76II-68-2-73-14/CBB286// B3-B1Mix-26/CCXXXII-883	-2	3.0	31
CCXXXVII-B-382/Pioneer// CCXXXVII-A-122/68II-63-8-34-28	+2	2.5	30
CCXXXVI-857/CCXXXII-727// CCXXXVI-A-170/71-1591-Mat 8	+2	2.5	31

No. of days earlier heading (+) or later heading (-) than Otal (June 29).
1=completely upright, 9=completely lodged.

Table 3. *Relative heading date, lodging, and plant height of F_3 barley families grown at Palmer in 1989.*

Family	Relative heading date	Lodging 1-9	Plant height inches
CCXXXVI-4/CCXXXII-55	-3	7.0	28
A2B1Mix-40-WA10081-63	0	6.5	32
CCXXXVI-56/5439	-2	5.0	35
CCXXXVII-A-270/Datal	-2	2.5	25
CCXXXVI-66/CCXXXII-236	0	3.0	25
CCXXXVI-275/Hector	0	3.5	32
CCXXXVI-356/CCXXXII-335	0	7.0	26
CCXXXVI-423/X-173-10-5-6-1-1	-3	9.0	35
CCXXXVII-A-2aX/68II-63-8-34-28	+1	4.0	33
Olli/CCXXXVI-698	+1	6.0	37
CCXXXVI-857/CCXXXII-727	0	3.5	30
CCXXXVII-A-170/71-1591-MAT-8	+1	5.0	35
B3-B1Mix-7/Vanguard	0	6.0	32
CCXXXVII-B-315/Advance	+2	2.5	33
Advance/B3-B1Mix-26	+2	5.0	36
B3-B1Mix-26/CCXXXII-883	-3	3.5	35
CCXXXVII-A-242/1630	0	4.0	36
B2-B1Mix-31/Klages	-4	2.5	32
CCXXXVII-B-382/Pioneer	+2	6.0	34
Otal/1-Nak-1866	+1	5.5	35
75-1781-120-41/68II-63-8-34-28	+2	6.5	41
71II-67-21-120/8176-382-761-85-1	+2	5.0	33
76II-682-73-14/CBB286	-2	7.0	35
75II-62-13-11-5/CBB303	+2	5.0	39
86CCXXXII-31-21/2288	+3	4.0	28
86CCXXXII-159-81/2228	+2	3.5	34
86CCXXXII-176-98/2228	+2	3.0	29

No. of days earlier heading (+) or later heading (-) than Otal (June 29).
1=completely upright, 9=completely lodged.

Table 4. *Relative heading date, lodging, and plant height of F_4 barley families grown at Palmer in 1989.*

Family	Relative heading date	Lodging 1-9	Plant height inches
Lidal/NO-H-181-49	-3	6.0	32
Lidal/NO 11110191	-3	5.5	43
Weal/Plains	-2	3.5	42
68II-65-8-34-28/Massey	0	5.0	40
Otra/Turk	0	8.0	35
75II-68-10-8-7/Wolfe	-2	3.5	40
Datal/Vaughn	-2	7.0	35
Pioneer/Moduc	-2	8.5	37
74II-69-59-33-8/Trebi	0	7.5	37
71-1591-MAT-8/Regal	-2	6.5	43
Otal/Highland	0	7.5	34
79-991-100/Little Ben	0	7.0	42
Lidal/Onda	0	6.5	41
75II-69-31-156-10/Frontier	-2	8.0	38
75II-991-3977-1125-285/Vantmore	-2	6.5	44
Olli/Winsdor	-2	7.5	36
Edda/Advance	+2	5.0	37
60II-54-2-93	1	4.5	44

No. of days earlier-maturing (+) or later-maturing (-) than Otal (June 29).
1=completely upright, 9=completely lodged.

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