# SEMI-DWARF BARLEY PERFORMANCE IN SASKATCHEWAN

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## INTRODUCTION

Semi-dwarf barleys are characterized by reduced height, thicker stems and high levels of lodging resistance. They have been developed in response to a need for varieties which can be grown under conditions of high fertility and high moisture where lodging and excessive trash can be limiting factors to barley production.

Three relatively new 6-row feed varieties are available in Saskatchewan: Duke, Samson and Winchester, developed by the Crop Development Centre, Saskatoon; Alberta Agriculture, Lacombe; and a U. S. company, Western Plant Breeders, respectively. All exhibit superior lodging resistance and reduced trash production. Semi-dwarf barleys, like semi-dwarf wheat, are poor competitors because of generally slower growth habit. Unlike wheat, which has fair drought tolerance, the barleys require sufficient moisture and do not perform well in drought conditions. The term 'semi-dwarf' can also be misleading. Whereas wheat semi-dwarfs are of relatively constant short stature, barley semi-dwarfs are about 25% shorter than normal varieties and may vary greatly in height depending on growing conditions. However, because of short stature and resulting lodging resistance, the semi-dwarfs provide the opportunity to increase production through increased fertilization and irrigation.

In a 4-year study funded by the Sask. Agriculture Development Fund, the Crop Development Barley and Oat Research Project is evaluating the semi-dwarfs under irrigation and high rainfall conditions for production in northern and eastern Saskatchewan. Studies include variety evaluation trials, seed rate and depth trials, and trifluralin damage trials. Two years data have been collected.

## VARIETY EVALUATION TRIALS

Early studies, carried out from 1983-85 under irrigation, showed semi-dwarfs to outyield normal varieties under ideal conditions. Three year means showed Duke and Samson to outyield Argyle by 24% and 10%, respectively (Table 1). The yield advantage depended on amount of lodging. In one instance, when heavy lodging occured early in the season, Duke outyielded Argyle by 65%. But in drier years, where lodging did not occur, yield advantages dropped to 5-7%.

Under the present project, variety evaluation trials have been carried out for two years. In 1986, experiments were grown at Outlook (irrigated), Saskatoon (irrigated), Melfort, Shellbrook and the Kernen Crop Research Farm. Varieties tested included the 6-row

semi-dwarfs Duke and Samson, short-strawed 6-row Heartland and normal 6-row Leduc. Saskatoon and Shellbrook provided the only useful information; the other 3 sites being lost due to seeding problems and drought. The 1987 trials were conducted at 8 locations: 4 irrigated (Outlook, Aberdeen, Saskatoon 1 - Animal Science, Saskatoon 2 - Preston) and 4 normally high rainfall areas (Shellbrook, Codette, Kelvington, Melfort). The 6-row semi-dwarf Winchester was added to the trial. Three sites, Codette, Kelvington and Melfort, provided little useful information due to drought.

Under heavy lodging conditions, Duke outyielded Leduc significantly by 15% in the 1986 trials (Table 2), but failed to show any yield advantage in 1987 (Table 3). With limited or no lodging, the semi-dwarfs showed no yield advantage and, in some instances, yielded significantly less than Leduc (Table 4). These results indicate that semi-dwarfs exhibit a yield advantage only under ideal conditions, where normal varieties tend to lodge. If lodging is not a problem, even under maximum inputs, then semi-dwarfs may not be higher yielding.

It is important to note that semi-dwarfs do not respond differently than normal varieties to N-fertilization. High yield potential normal varieties should outyield the available semi-dwarfs if there is no lodging problem. However, even in less than ideal conditions where yield advantages may not be apparent, there may still be advantages to growing semi-dwarfs, since the normal varieties may be lodged while the semi-dwarfs are standing. Fewer resources will be required to harvest the crop. Semi-dwarfs should show a real advantage if general lodging is consistently a problem. But if lodging is only localized and periodic, then benefits may be doubtful.

Test weight and plumpness were also examined in the variety trials. Test weights of the semi-dwarf varieties were generally similar or superior to those of Leduc and Heartland, while acceptable tests weights under these conditions were lower than generally desired (Table 5). At two sites, Leduc had significantly lower test weight than all semi-dwarfs. It seems that lower test weight is a characteristic of barley grown under these high yield conditions. The consistently superior test weight of Duke and Winchester vs Samson is definitely noteworthy. Higher test weights would be advantageous, but further testing will determine if this is possible under these conditions.

Plumpness values for semi-dwarfs were similar to Leduc, except for Winchester which was greater due to smaller, rounder kernels (Table 5).

## SEED RATE & DEPTH TRIALS

Seeding rate effects have been evaluated for two years under irrigation at Saskatoon and Outlook. Four varieties (Duke, Samson, Winchester, Heartland) were planted at 4 different rates (60, 90, 120, 140 kg/ha). A similar trial, evaluating seeding depth, was initiated in 1987. The 4 varieties were planted at 4 different depths (3, 5, 7, 10 cm). In both trials, differences were observed

for yield, test weight and plumpness with respect to varieties, rates and depths. However, in all cases to date, no variety x rate or variety x depth interactions were observed. While this data apparently indicated that semi-dwarfs do not respond differently from each other or from normal varieties with respect to seeding rates or depths, readers are cautioned that the results are preliminary. At this time we do not have sufficient data to make recommendations regarding these features.

## TRIFLURALIN DAMAGE TRIAL

In a trial initiated in 1987, semi-dwarfs were evaluated for sensitivity to trifluralin carryover. Results were confounded by drought and experimental layout, but preliminary results indicate that further study of this problem is warranted to see if all or any of the available semi-dwarfs have increased sensitivity compared to normal varieties.

## CONCLUSIONS

Results from two years of study confirm that semi-dwarfs exhibit superior lodging resistance. Under ideal conditions of high fertility and high moisture, semi-dwarfs demonstrate a yield advantage over normal varieties. Test weights are generally lower than desired but this appears to be a characteristic of all barleys in these particular growing conditions. Plumpness values of semi-dwarfs are similar to normal barleys. Semi-dwarfs apparently do not respond differently than normal barleys with respect to seeding rate and depth.

Table 1: 1983-85 YLD. (100's of kg/ha), OUTLOOK IRRIGATED

| VAR. | '83 | '84 | '85 | $\bar{X}$ | % |
|---|---|---|---|---|---|
| ARGYLE | 59 | 56 | 49 | 55 | 100 |
| DUKE | 62 | 60 | 81 | 68 | 124 |
| SAMSON | 57 | 57 | 68 | 60 | 110 |
| LEDUC | | | | | (115) |

Table 2: 1986 YLD. (100's of kg/ha), S.D. VARIETY TEST

| VAR. | AM. SCI. | % | SHELLBK | % | $\bar{X}$ |
|---|---|---|---|---|---|
| LEDUC | 61 a | 100 | 62 a | 100 | 100 |
| HEART | 65 a | 106 | 64 a | 104 | 105 |
| DUKE | 70 b | 115 | 60 a | 98 | 107 |
| SAMSON | 64 a | 105 | 62 a | 101 | 103 |

Table 3: 1987 YLD. (100's of kg/ha), S.D. VARIETY TEST
(lodged sites)

| VAR. | OUTLOOK | % | ABERDEEN | % | $\bar{X}$ |
|---|---|---|---|---|---|
| LEDUC | 50 a | 100 | 53 a | 100 | 100 |
| HEART | 52 a | 104 | 60 a | 113 | 109 |
| DUKE | 50 a | 100 | 59 a | 111 | 106 |
| SAMSON | 49 a | 99 | 53 a | 100 | 100 |
| WIN | 51 a | 103 | 56 a | 106 | 105 |

Table 4: 1987 YLD. (100's of kg/ha), S.D. VARIETY TEST
(no lodging)

| VAR. | AM.SCI. | % | PRESTON | % | SHELLBK | % | $\bar{x}$ |
|---|---|---|---|---|---|---|---|
| LEDUC | 63 b | 100 | 53 a | 100 | 41 ab | 100 | 100 |
| HEART | 61 ab | 97 | 52 a | 98 | 44 b | 107 | 101 |
| DUKE | 59 ab | 93 | 48 a | 91 | 43 b | 104 | 96 |
| SAMSON | 59 ab | 94 | 54 a | 103 | 42 ab | 101 | 99 |
| WIN | 54 a | 87 | 49 a | 92 | 37 a | 91 | 90 |

Table 5: 1987 TEST WEIGHT & % PLUMP

| VARIETY | TEST WT. (kg/ha)(4)* | % PLUMP (4)* |
|---|---|---|
| LEDUC | 58.7 | 77 |
| HEART | 59.3 | 72 |
| DUKE | 60.0 | 79 |
| SAMSON | 58.7 | 77 |
| WIN | 60.5 | 85 |

* # of s.y.