

Flax Cultivar Food Quality Evaluation

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Background

Johnson Seeds purchases human consumption flaxseed on the basis of samples sent from producers. Samples must contain less than 5 per cent dark and/or immature seeds to be selected. It is difficult for Manitoba flax producers to produce flax with less than 5 per cent of these visually distinguishable poor quality seeds. A large part of this situation is due to environmental conditions - heavy dews, rainfall on mature fields, etc, but a recent study conducted by Dr. Dave McAndrew of the AAFC Morden Research Centre has shown that the cultivar affect is also significant (personal communication). He did his study on only a few cultivars, so it was felt that it would be good to follow up by including more recently released cultivars.

Objective

The human consumption (HC) food quality flax market pays a premium to producers who can meet the standard. If the probability of having Manitoba Interlake produced flaxseed selected for the HC market can be increased by recommending specific cultivars, it should earn more revenue for interlake producers and make flax production in the Interlake region more attractive. It will also allow Johnson Seeds to be more competitive by saving on freight costs incurred from purchasing seed from regions further west. The objective of the trial was to evaluate the harvested seed for human consumption (HC) quality; measuring the effects of cultivar, planting date and test location on seed quality.

Methods

A small plot (1.2 x 3m), four replication trial was conducted at Arborg, MB in 2008 using 10 flax cultivars, planted on May 17 and May 27. In addition, flax harvest samples for eight genotypes across eight Manitoba locations were received from the Manitoba Crop Variety Evaluation Trials (MCVET). HC quality was determined through a visually subjective rating system where a rating of three or less was considered acceptable; and through a more objective system where the unacceptable seeds in a 5 or 10 gram sample were picked out and reported as a percentage of the whole sample. A sample is considered acceptable if it has 5% or less unacceptable seeds. Three different individuals - the Johnson Seeds agronomist, seed processor and trader each subjectively rated the seed samples from the Arborg trial, although only the agronomist evaluated samples from all reps, so no statistical analysis could be performed on the ratings by the processor and trader.

Discussion

The weather in 2008 was cool and wet with a delayed start to the season in the Manitoba Interlake Region. Other regions of Manitoba were also below normal for temperature, but the level of moisture varied considerably between regions. Most of the regions suffered from rainfall during the harvest season, which will have adversely affected seed quality.

At the Arborg location, the trial resulted in good reliable data with significant variety and seeding date effects seen for seed yield and other agronomic characteristics; and for HC seed quality. For the purpose of this report, although the agronomic data are presented in **Table 1**, only the effects on HC seed quality will be discussed. The cultivar and seeding date effects for HC seed quality were significant although the cultivar effect was not consistent between seeding dates. **Figure 1** shows the results of the HC quality analysis of the 10 cultivars planted on May 17, while **Figure 2** includes the results from the May 27 seeding date. The coefficient of variation (CV), which is expressed

Table 1: Flax Variety x Seeding Date HC Quality Evaluation Trial Means, Arborg, MB 2008

Variety	Seeding	Yield		Days to	Plant	Lod- ^{a/}	HC	Rating ^{c/}
Name	Date	(% Bethune)	(g/plot)	Maturity	Height	ging	Quality ^{b/} (% bad seeds)	(1-10)
AC Carnduff		88	595	96	69	2.8	4.3	4
CDC Bethune		100	678	101	68	2	4.5	4
CDC Sorrel		98	668	100	73	2.9	3.3	3.8
Hanley		87	588	97	65	2.9	4.7	6
Lightning		103	696	100	65	1.9	4	3
Macbeth		105	710	100	67	2.1	4.3	3.5
Prairie Blue		107	729	100	66	1.9	3.8	4.6
Prairie Grande		94	639	98	65	2.8	9	7
Prairie Thunder		90	612	98	61	2.1	6.3	5.3
Taurus		101	683	100	64	1.8	4.7	5.4
Mean		97	660 ^{d/}	99	66	2	5	5
C.V.(%) ^{f/}		11.3	11.3	-	5.3	24.5	26.3	9.3
LSD (0.05) ^{g/}		8 ^{e/}	53 ^{e/}	-	3.0	0.4	1.0 ^{e/}	0.4 ^{e/}
	May-14	100	765	101	64	3	5.4	4.4
	May-27	73	555	97	68	1.6	4.3	4.8
LSD (0.05)		5 ^{e/}	34 ^{e/}	-	1.0	0.3	n.s. ^{e/}	0.2 ^{e/}

a/ Lodging was rated from 1 to 9 with 1 = erect and 9 = flat down.

b/ HC quality - the weight of unacceptable seeds in a 5 gram sample were evaluated and reported as the weight and the percent. 5 percent or less dark or immature seeds is generally deemed to be acceptable.

c/ The harvest samples were visually rated with less than 3 being acceptable and 9 = all seeds unacceptable.

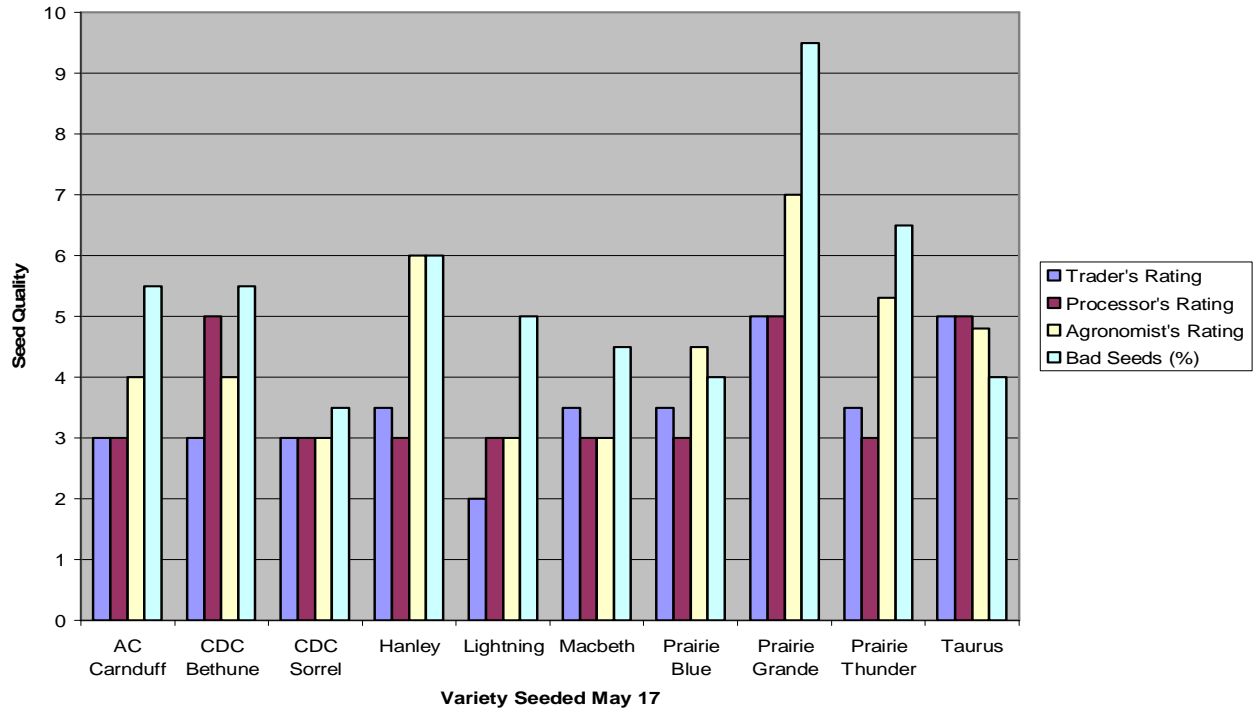
d/ The average yield of CDC Bethune was 1410 kg/ha (1260lb/ac; 24 bu/ac)

e/ The variety x date interaction was significant - use data for this characteristic which show the value for each variety at each date.

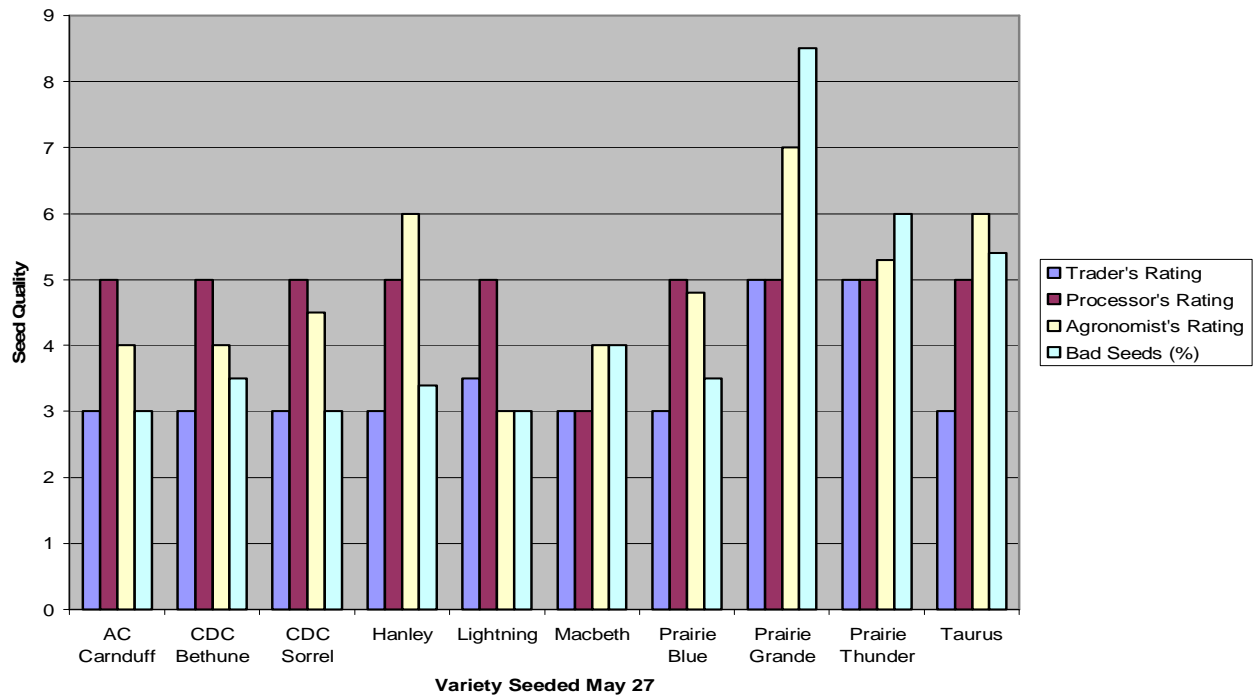
f/ Coefficient of Variation - refers to the proportion of unexplained variation in the data - expressed as a percentage of the overall mean.

g/ Least Significant Difference - any two means in the same column that differ by more than this value are considered significant with a confidence level of 95%. "n.s." indicates that the differences are not significant.

the proportion of variation in the data that cannot be explained, was quite a bit higher for the objective measure of poor quality seeds than the subjective rating system. In certain seed samples it was quite clear as to which seed were good and which were poor, while in other samples the line between good and poor seeds was not as distinct. The varieties also differed in their shade of brown seed colour. The variety Prairie Grande, for example, produced seeds so dark, at the Arborg site, that even the good seeds looked too dark. This colour factor also made it more difficult to pick out only the darkest seeds. In general, the cultivars CDC Sorrel, Lightning, Macbeth and Prairie Blue produced the best seed quality, with Prairie Grande consistently producing the poorest. It is interesting to note that the subjective ratings made independently by three different individuals are not entirely consistent with each other or with the more objective rating. This shows that most of the samples were in the marginal area for seed quality as is not uncommon for the Manitoba Interlake Region.



**Figure 1: Flax Cultivar HC Seed Quality Analysis for May 17, 2008
Planting Date; Arborg, MB**



**Figure 2: Flax Cultivar HC Seed Quality Analysis for May 27, 2008
Planting Date; Arborg, MB**

Flax harvest samples for eight genotypes across eight Manitoba locations were also received from the Manitoba Crop Variety Evaluation Trials (MCVET) for HC seed quality analysis. Both cultivar (**Figure 3**) and location (**Figure 4**) effects were significant with CDC Sorrel, Hanley Prairie Blue and FP2214 producing the best seed quality. CDC Bethune, Prairie Thunder, Prairie Grande and FP 2223 produced the poorest seed quality. The Hamiota, Rosebank and Portage sites produced the best quality harvest samples, with the samples from the Dauphin site being the poorest.

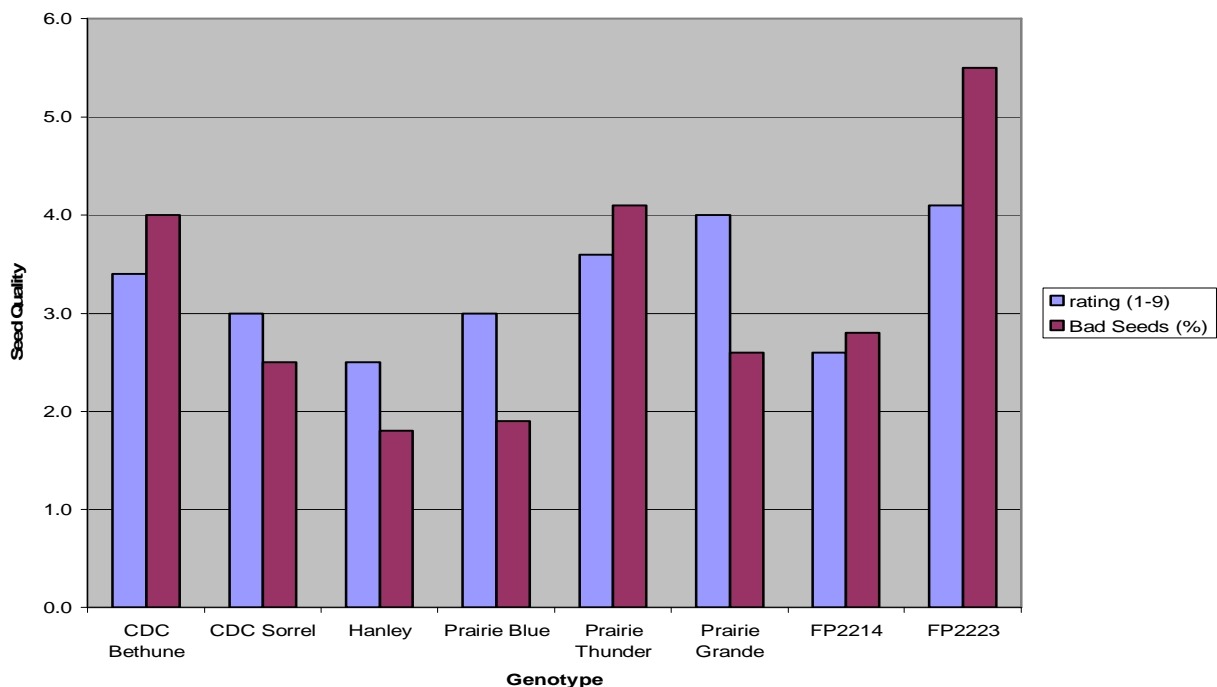


Figure 3: Means of the HC Seed Quality for Eight Flax Genotypes, MCVET, 2008

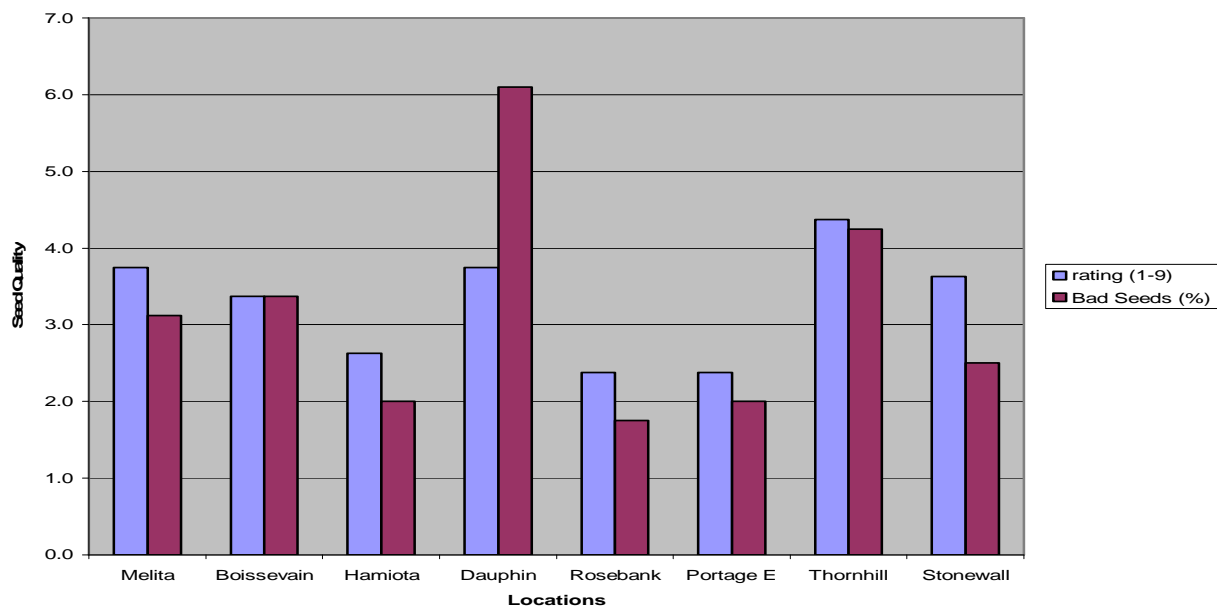


Figure 4: Means of the HC Seed Quality for Eight Flax Genotypes, MCVET, 2008

Results

These results indicate that flax variety does have an influence on the potential to produce human consumption quality seed, even in regions where HC quality seed is more difficult to obtain. Also, in some years and regions, HC quality will be difficult to obtain, depending on harvest conditions. There will continue to be a tendency to prefer to select flax seed from the regions that traditionally produce the highest quality seed, before selecting from the more marginal areas. Commercial selections are made on a subjective basis, so the better the seed quality when originally selected, the lower the chance of selecting a lot that in the end does not meet quality standards after processing.

Acknowledgements

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