

Contribution of Dockage (admixture) to the Chlorophyll Content of Canadian Canola Exports

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Abstract The 2004 Harvest Survey of Canadian canola (1) had higher than average chlorophyll content due to a cooler than normal season combined with an early damaging frost resulting in immature seed. As a result, chlorophyll levels in many No. 1 Canada Canola (1CC) export shipments increased to over 30 mg/kg (2). Dockage has been suspected in contributing to the chlorophyll levels in canola cargoes but until this study, the extent was unknown. Dockage separated from export samples was tested for chlorophyll using the ISO method. Chlorophyll in the dockage ranged from 67 to 114 mg/kg. With dockage removed, the chlorophyll level in 1CC export samples was approximately 3.5 mg/kg lower.

Introduction

The 2004 Harvest Survey of Canadian canola (DeClercq, 2004) had higher than average chlorophyll content due to a cooler than normal season combined with an early damaging frost resulting in immature seed. As a result, chlorophyll levels in many No. 1 Canada Canola (1CC) export shipments, measured on a "tel quel" or uncleaned sample basis, increased to over 30 mg/kg (Export Quality Reports Canola Canada Export Quality, May 2005, 2005). Dockage is defined as any foreign material mixed in a parcel of canola that can be removed by approved cleaning procedures (Canadian Grain Commission, 2005) Dockage has been suspected in contributing to the chlorophyll levels in canola cargoes but until this study, the extent was unknown. Commercially clean export shipments can have up to 2.5% dockage (admixture) with the average in the 2004-05 crop year 1.8%. Shipments with more than 2.5% dockage are referred to as 'Not Commercially Cleaned'. There is some concern that the chlorophyll measured in clean samples of seed is not representative of the chlorophyll that is in the material being processed since crushing plants may not clean seed to the levels designated in the grain grading guide. This may be particularly true in years such as 2004 where an early fall frost resulted in a large number of small seeds that would fall through the minimum sieve size designated for removal of dockage from canola prior to grading. This study was designed to evaluate the contribution of dockage to the chlorophyll levels in canola export shipments for the 2004-2005 crop year.

Methods

The study included 96 canola export cargo samples from vessels loaded between August 8 2004 and March 8 2005. The cargo samples were part of the Grain Research Laboratory's on-going monitoring program and were sourced from Canadian grain terminals through the Canadian Grain Commission's Industry Services division. A sub-sample was cleaned of dockage in accordance with the Official Grain Grading Guide (Canadian Grain Commission, 2005). The procedure involved passing the sample through a 6.5/64 inch round-hole sieve (No. 6.5) to remove large material then through a 0.028 inchX15/32 inch (No. 0.028) slotted sieve to remove small material. The remaining sample was put through a Carter Dockage Tester with air control at 5 to remove light (aspirated) material.

Six cargo samples had additional small material separated by passing through a 0.040 inchX15/32 inch slotted sieve (No. 0.040).

The samples were analyzed for chlorophyll by the ISO spectrometric method (ISO 10519:1997, 2000) before and after removal of the dockage. In the more detailed study each fraction of the dockage was analyzed for chlorophyll, also by the ISO method.

Discussion

In recent years, canola exports shipments from Canada can be divided into two categories based on dockage levels, canola cleaned to export standards with a maximum of 2.5% dockage and samples of canola containing more dockage than in the export standard, designated as Not Commercially Cleaned (NCC). Both types of exports were included in this study. By mid-November 2004 canola from the newly harvested crop began to make up a significant amount of the export shipments as was indicated by a sharp increase in the chlorophyll of No. 1 Canada shipments from less than 25 mg/kg to more than 30 mg/kg, with some shipments exceeding 40 mg/kg when samples were tested on a *tel quel* basis (Figure 1). Removal of dockage from the 1 Canada canola cargoes reduced the chlorophyll content on average by 3.5 mg/kg (Table 1). The chlorophyll content of high dockage cargoes was reduced by 6.0 mg/kg. While there is a relationship between the level of dockage and the amount of chlorophyll due to that dockage (Figure 2), the relationship is not strong.

In a study of six NCC export shipments, chlorophyll in the dockage fractions ranged from 67 to 114 mg/kg (Table 2) with the highest levels being in the aspirated and the two slotted sieve fractions. The high chlorophyll fractions had large quantities of immature and frosted seed (Figure 3).

Conclusions

While the dockage fractions accounted for part of the increase in chlorophyll of 2004-05 cargo exports, it does not account for all. Most of the increase has to do with the high levels of chlorophyll in immature and frosted seeds that were not removed as dockage and the overall increase in background chlorophyll in the seed. Removal of dockage reduced the chlorophyll content of ICC cargoes on average 3.5 mg/kg. The higher dockage cargoes (NCC) had greater reduction in chlorophyll contents when dockage was removed.

Dockage fractions, which for the 2004 shipments included large quantities of immature and frosted seeds, had chlorophyll contents of 67 to 114 mg/kg.

References:

1. (May 2005) *Export Quality Reports Canola Canada Export Quality, May 2005* [Web Page] Available at <http://grainscanada.gc.ca/Quality/Canola/exports/canmondata-e.htm>, Accessed July, 2005.
2. Canadian Grain Commission (March 2005) *Official Grain Grading Guide* [Web Page] Available at <http://grainscanada.gc.ca/Pubs/GGG/ggg-e.htm>.
3. DeClercq, D. R. (2004), "Quality of Western Canadian Canola 2004." Canadian Grain Commission, Grain Research Laboratory. Winnipeg.
4. ISO 10519:1997 (2000), Rapeseed - determination of chlorophyll content - spectrometric method. International Organization for Standardization, Geneva.

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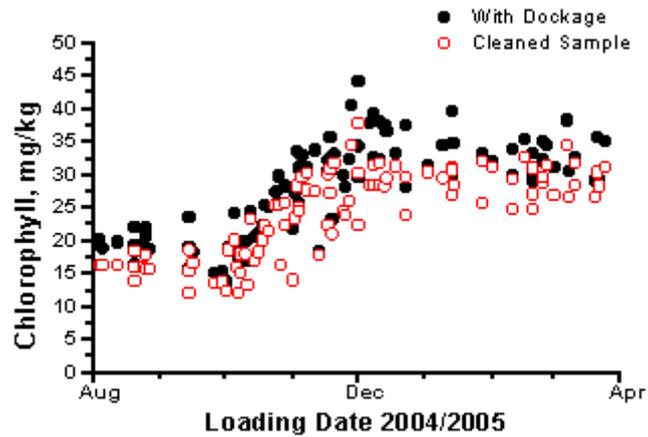


Figure 1. Chlorophyll content of 1 Canada canola (1 CC) exports during 2004-05, with and without dockage.

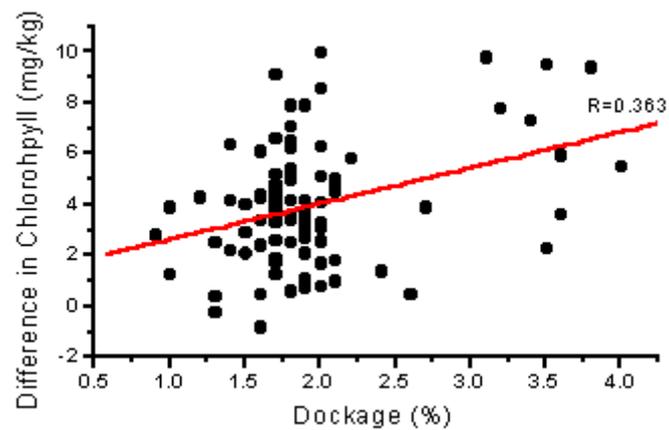


Figure 2. Relationship between difference in chlorophyll between clean and uncleaned samples and dockage level.

(Insert Figure 3 here)

Figure 3. Images of canola dockage fractions



Table 1. 2004-2005 Canola export chlorophyll content (mg/kg)

	No. 1 Canada Canola	No. 1 Canada Canola NCC ^a
Original Sample	27.9	28.0
Cleaned Sample	24.4	22.1
Difference	3.5	6.0
n	68	12
Mean Dockage Level (%)	1.8	3.4

^a Not commercially cleaned

Table 2. Chlorophyll content of dockage fractions from six NCC canola exports^a

	Dockage Component %			Chlorophyll Mg/kg			Contribution to Difference
	Mean	Min.	Max.	Mean	Min.	Max.	
Seed							
Original sample	3.58	2.74	4.09	34.2	32.5	36.2	
Cleaned sample				29.8	27.8	32.4	
Difference				4.4	2.9	6.3	
Dockage Fraction							
Over No. 6.5 Round Hole Sieve	0.36	0.25	0.43	66.9	45.4	74.8	0.2

Through No. 0.028 Slotted Sieve	0.92	0.68	1.30	97.0	82.1	102.9	0.9
Aspirated	0.84	0.58	1.00	113.7	99.3	121.7	1.0
Between No 0.028-.040 Slotted Sieve	1.46	0.97	1.95	112.4	102.9	120.1	1.6