Processing Canola Meal for Higher Energy Content

Canola Meal Research Meeting

September 27-28, 2007
Saskatoon

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Processing Alternatives to Increase Energy

- Dehulling – front-end or tail-end
- Leave more oil in meal
- Reduce temperatures and moisture during processing

Dehulling

- **Front-end**. Remove hulls at seed cracking - flaking stage (prior to press). Hulls removed by aspiration
  - Meal crude fibre content approximately 7%
  - Seed size variability reduces efficiency. Sizing uneconomical.
  - Lower press cake intrinsic strength leaves higher residual oil (6%-8%), which can be reduced by use of expander.
  - Oil left in hull (10% - 15%). Poorer quality oil.

- **Tail-end.** Separation of high fibre (hull) fractions by air classification/fractionation
  - Difficult to make significant reductions in fibre

- **Results**
  - Not effectively commercialized.

- **Conclusions**
  - Would require a more loosely bound hull, perhaps associated with larger seed size, to be effective

Increase Oil Content of Meal

- Processing without solvent extraction (cold press, expeller press) leaves approximately 6% - 20% oil in meal

- Expeller pressing involves high temperatures but leaves less oil in meal

Nutrient composition of Australian canola meal

Nutrient (dry matter basis)	Cold press	Expeller	Solvent
Protein, %	26.5	32.5	33.3
Crude fibre, %	15.7	14.9	12.7
Crude fat, %	25.6	14.9	4.5
Glucosinolates, umol/g	11.1	1.4	3.0
Total lysine, %	1.74	1.73	1.87
Reactive lysine, %	1.30	1.09	1.14

Nutrient composition of Australian canola meal

Nutrient (as is basis)	Expeller	Solvent
Protein, %	36.3	37.3
Moisture, %	7.1	10.7
Crude fibre, %	10.6	9.9
Crude fat, %	11.1	3.4
Lysine, %	1.97	2.02
Poultry (layer) AME, kcal/kg	2940	2390
Poultry (broiler) AME, kcal/kg	2340	1910
Swine DE, kcal/kg	3320	2965
Cattle NElact, MJ/kg DMB	8.7	7.4

Economics of solvent versus expeller processing

Solvent meal (1% oil content)

$950 x 42%	= $399
$180 x 58%	= <u>$104</u>
Total	= $503

Expeller meal (7% oil content)

$950 x 36%	= $342
$180 x 64%	= <u>$115</u>
Total	= $457

Difference = $46 on crush margin

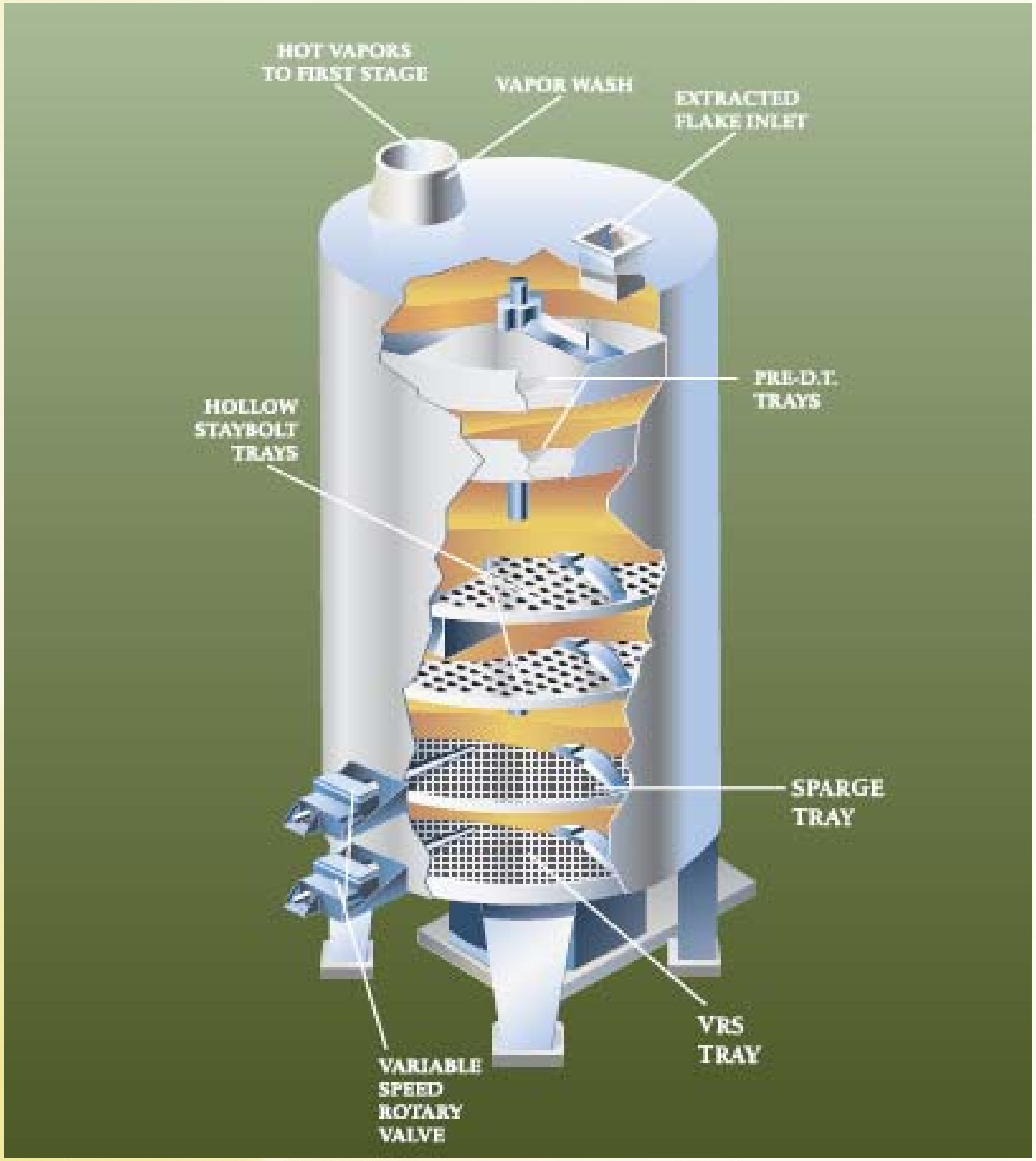
Break even on expeller is $71/t premium on meal

$950 x 36%	= $342
$251 x 64%	= <u>$161</u>
Total	= $503

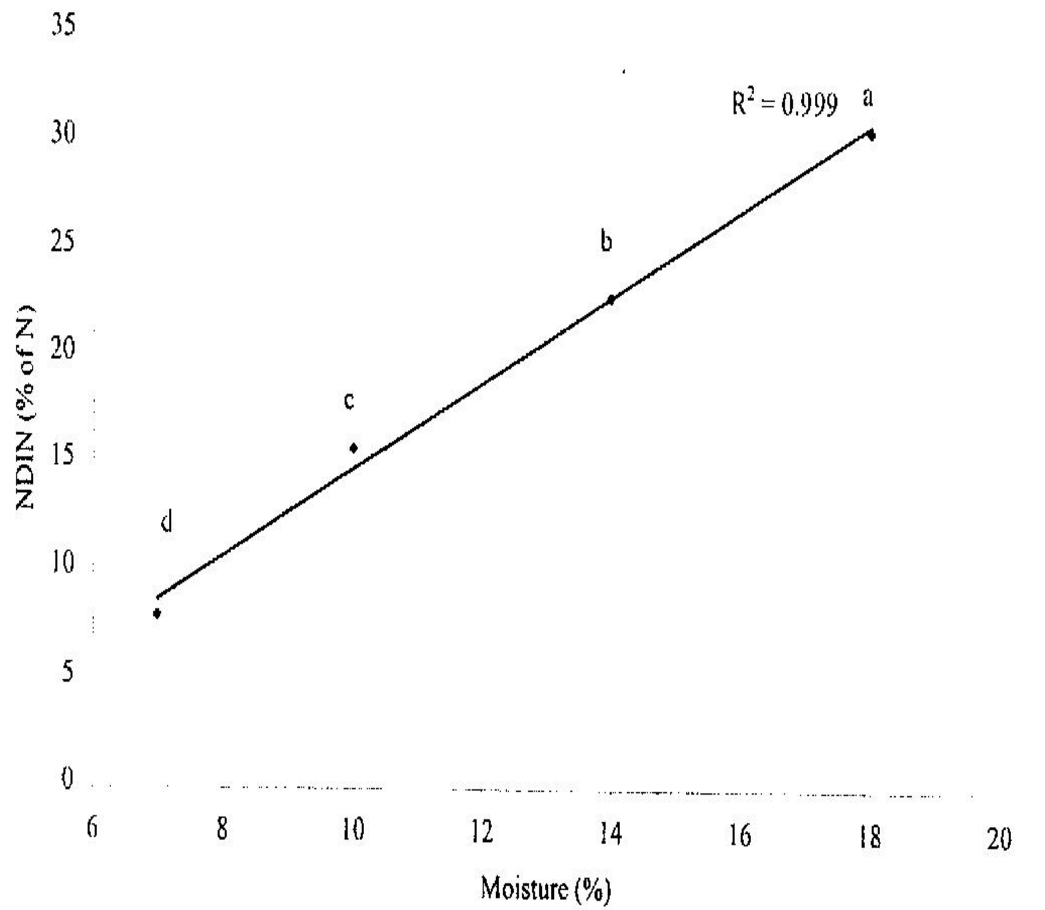
Reduce processing moisture and temperature

- Pre-press, solvent extraction plants have Desolventizer-Toaster's (DT's) designed for soybean processing (deactivate trypsin inhibitor).
- Typical moisture and temperature conditions in DT's will damage canola meal quality

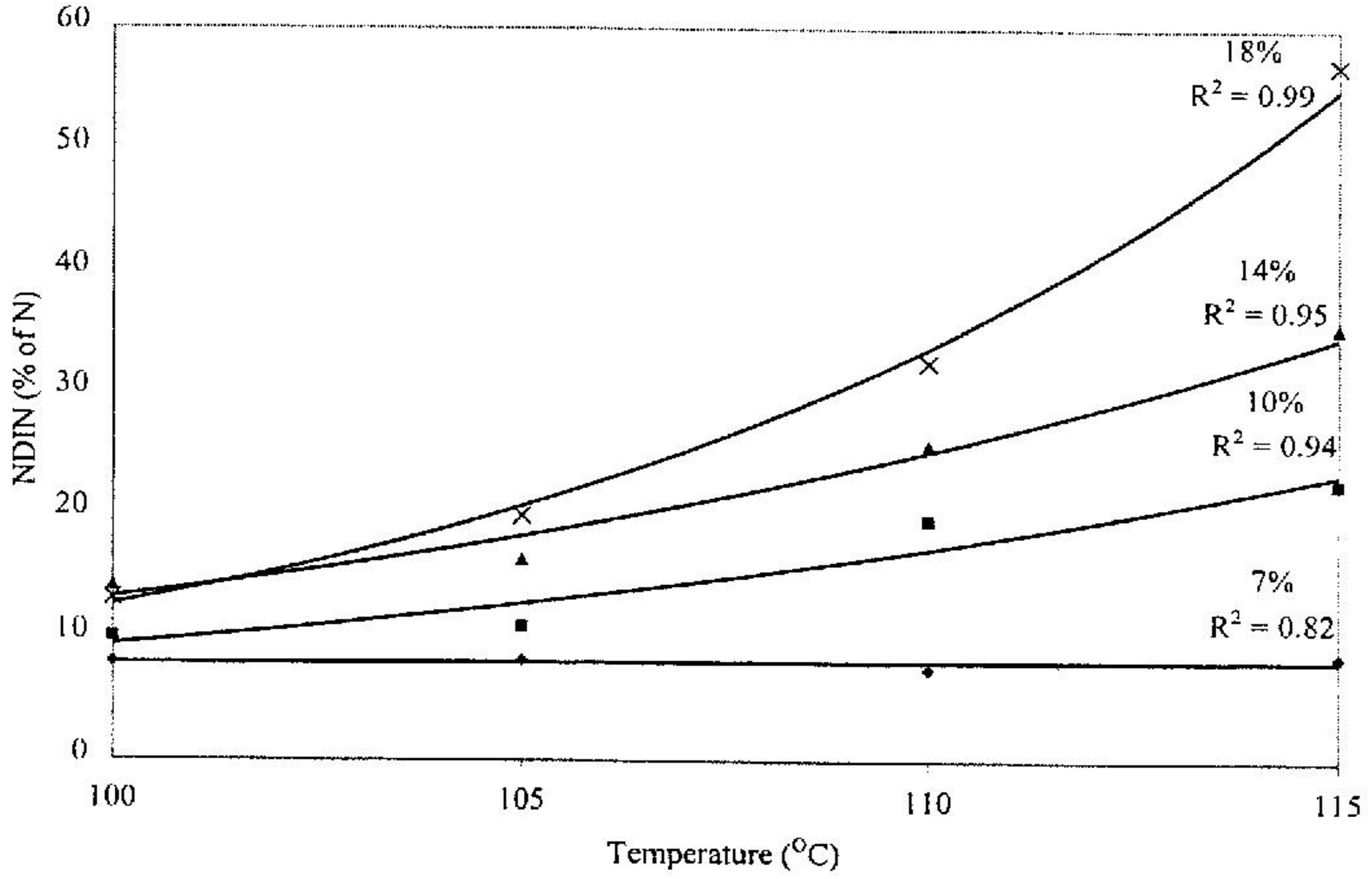
Crown/Schumacher Desolventizer-Toaster



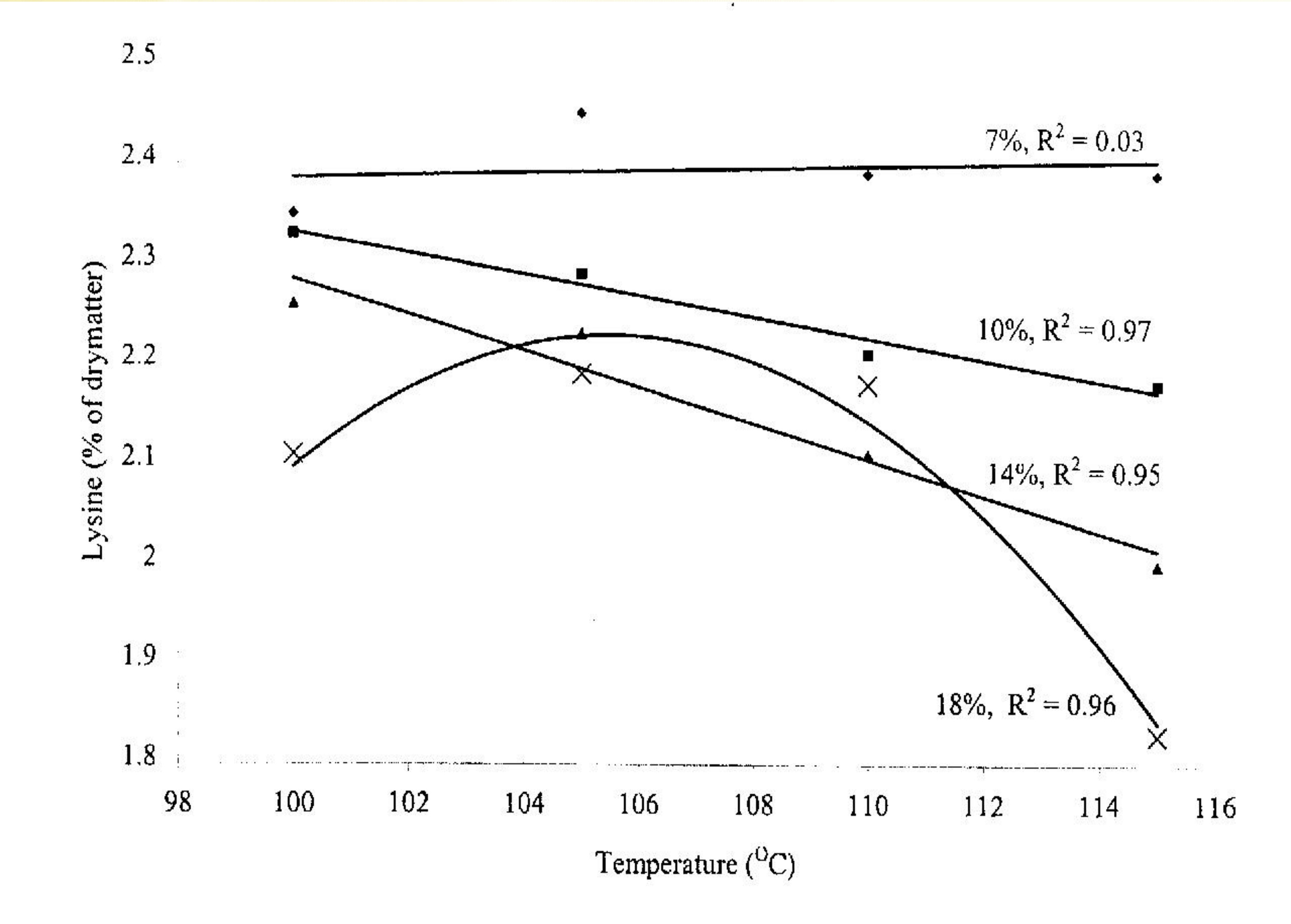
The effects of moisture content during heat treatment on the NDIN content of canola meal. Classen and Newkirk, 2002



The effect of moisture and temperature on the NDIN content in canola meal after 10 minutes of heating. Classen and Newkirk, 2002



The effect of moisture and temperature on lysine content during heat processing of canola meal. Classen and Newkirk, 2002



Amino acid levels and poultry digestibility of toasted and non-toasted canola meals. Newkirk et al., 2003.

	Total		Digestibility coeff.	
	NTCM	TCM	NTCM	TCM
Crude Protein	39.5	38.8	81.9	66.2
Lys	2.35	2.16	89.7	76.5
Arg	2.34	2.59	93.5	86.3
His	1.24	1.21	90.6	83.0
Cys	0.92	0.93	86.4	69.8
Met	0.77	0.81	91.5	85.6
Thr	1.74	1.71	82.4	67.2
Glucosinolates	15.9	7.5		

Effect of feeding toasted and non-toasted canola meal on broiler chicken performance. Newkirk and Classen, 2002.

	NTCM	**TCM**
NDIN, %CP	11.3	19.7
Body weight, 39 days	2.181	2.148
Feed/gain, 0-39 days	1.88	1.88
Glucosinolates, umoles/g	21.9	9.7
Serum T_3, ng/dL	235	263

Effect of feeding toasted and non-toasted canola meal at 28% dietary inclusion level on growing-finishing pig performance. Thacker and Newkirk, 2005.

	NTCM	TCM
Daily gain, 29-107 kg	0.91	0.93
Daily feed intake, 29-107 kg	2.37	2.49
Feed/gain, 29-107 kg	2.61	2.68
Glucosinolates, umoles/g	15.6	1.0
Diet protein digestibility	72.1	71.5

Alternatives to conventional desolventization-toasting

- Elimination of sparge steam (reduce moisture).
  - Turn off sparge steam in conventional DT's and add vents
    - Effective in reducing damage
    - Affects flow and solvent recovery rates
  - Flash desolventization
    - Costly
    - Operates at low temperature - not necessary
  - Vacuum assisted desolventization
    - Reduces boiling point of hexane
    - Increased migration of hexane out

- Eliminate solvent
  - Supercritical extraction with compressed Carbon Dioxide