# PROCESSING NEW RAPESEED VARIETIES IN CANADA - A COMMERCIAL ASSESSMENT

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New varieties of rapeseed have become almost an annual occurence as our plant geneticists improve the oil and protein content, and the yield and physical characteristics. In fact, we have experimenced a continual process of change.

As new varieties are introduced in Canada, our geneticists have worked closely with the crushing industry to control the early commercial production, assure separation and testing and to develop the varieties to a satisfactory commercial level. This process has been co-ordinated through annual discussions organized by Dr. R.K. Downey of the Agriculture Canada Research Station in Saskatoon. Through these meetings, research farm data, laboratory data and commercial testing and development have been co-ordinated. Varieties from Dr. Zenon Kondra of the University of Alberta and Dr. Baldur Stefansson of the University of Manitoba, as well as those of Agriculture Canada, have been involved in this programme.

Other papers at this symposium will provide information on the biochemical make up of our new varieties. This paper will deal only with physical properties and commercial extraction experience.

The new varieties we are currently concerned about are the double-low B. Napus varieties of Tower and Regent and the triple-low B. Campestris variety "Candle" which adds lower fibre and partially yellow-coated seed to low erucic and low glucosinolate quality.

Our company operates three crushing plants in Western Canada. One is direct solvent and the other two are expeller solvent plants. We also do some refining, hydrogenation and packaging.

Considerable quantities of both B. napus and B. Campestris varieties are regularly grown in Western Canada, so our plants have become accustomed to changing between these seed types and mixtures of them. Perhaps for this reason, we view adjustment of the crushing operation to accomodate changes in seed supply as a regular procedure in operations.

We have also noted changes in seed for processing due to weather, harvest conditions and even between seed grown in the North and South of our growing region. B. Napus varieties characteristically seem to have higher oil and lower protein content when produced in Northern areas, as for example Tower from the 1977 crop:

| | Northern Area | Southern Area |
|---|---|---|
| Oil Content | 43.5% | 42.0% |
| Protein in Meal | 36.0% | 38.5% |

(Slide #1)

The slide demonstrates the appearance differences of the varieties. The larger-seeded, darker Midas, which is a low-erucic variety, varies little in physical appearance from Tower and Regent. The smaller-seeded B. Campestris varieties are the low-erucic Torch and the new, triple-low Candle. Note the great color improvement in Candle. Also note the further color improvement possible in experimental B. Napus and B. Campestris varieties.

(Slide #2)

This slide highlights the significant differences in make up of a number of the varieties we are dealing with in this paper.

(Slide #3)

This slide shows the significant change in hull thickness of the Candle variety, producing its higher yield of oil and protein with a reduction of fibre.

CRUSHING

We have now processed a significant amount of Tower. While limited Regent has been processed, we are sure it handles the same as Tower. Inadequate Candle has yet been available to confirm observations, although there will be significant use of this variety in the coming year.

From a commercial standpoint, we do not have enough data to prove any characteristics of the new varieties in the crushing step. To the extent that characteristics might be in some degree of evidence, subject to further verification over a series of crop years, we should observe the following:

1. The low-glucosinolate seed has a greater tendency to shatter when rolled. This performance suggests some cellular differences from regular glucosinolate varieties, which could possibly derive from the common genetic source of Bronowski. This shattering, or excessive breakdown of the meat, reflects in a slightly greater tendency of the material to choke screens and hamper perculation in solvent extraction.

2. Offsetting this, elimination of the glucosinolate permits the greater use of moisture in cooking the seed. This allows for some toughening of the material, but it does not fully offset the tendency to shatter, in our opinion. We have expeller cake moisture of 6-7% on Tower versus 5-6% on Midas.

3. In direct solvent extraction, and on significant volumes of Tower processed, we have not found that cooking temperatures can be significantly reduced from those used for Midas. We look for a temperature in the first kettle of 55 Degrees C., increasing to 110 Degrees C. However, in expeller solvent extraction we are able to reduce maximum cooking temperatures to about 90 Degrees C. from 100 Degrees C.

(Slide #4)

This slide will show the crystal structure in margarine produced from Tower oil after storage. The photomicrographs are provided by a filter technique developed by Dr. Jim Rubenstein of the University of Saskatchewan at Saskatoon. The filter provides the color to the polarized light technique.

This crystal formation takes place over time and is not apparent in the early weeks after manufacture. Following several months, the margarine is very grainy with heavy crystals. This phenomenon also exhibits itself in a marbling effect throughout the margarine brick.

(Slide #5)

Through process and emulsification changes, we have resolved the problem as this slide indicates. We are using sorbitan tristearate emulsifier.

The increase in C18 fatty acids in the new varieties has increased the potential for crystal growth, since the C18's may migrate faster and form larger crystal structures than occurs in mixtures of C16's, C20's and C22's. Thus, sunflower and the new rapeseed oils exhibit this tendency in hardened formulations.

We suspect, but cannot substantiate, the crystal stability in the second slide may be attributed to the cyclic ring in the molecular structure of sorbitan tristearate enhancing and creating a very strong emulsion and thereby inhibiting crystal growth.

(Slide #6)

A slide of soya margarine does not exhibit crystal growth.

Margarine, produced for the oil extracted from the Candle variety, as in this slide, does not produce the same crystal structure as Tower oil, but it does develop crystal clumps.

(Slide #7)

Margarine made from Candle oil with modified processing shows few crystals and these are well scattered.

We find the oils from the new varieties refine well. Process and formulation changes are necessary in hardened products to control crystal growth.

We attribute the failure to reduce cooking temperatures in direct solvent to the first factor discussed. Our experience would indicate we still must cook heavily to produce a suitable material for solvent perculation, in addition to myrosinase inavtivation.

4. As a result of the tendency of the double-lows to shatter and pulverize more readily, the expeller operation becomes somewhat more sensitive for production of a satisfactory cake. We have experienced better extraction performance by tightening up on the expeller operation and reducing throughput slightly, forming a better cake.

5. Only very limited crushing of lower-fibre Candle has taken place to date. Based on very slim evidence, we would observe that the reduced fibre in this variety may well further complicate the preparation and solvent extraction process, because there is some evidence that the material is more difficult to prepare for solvent extraction. Lower fibre may also result in adding to the filtration problems.

On commercial operations to date we have found that the anticipated improvements in processing we expected through elimination of the glucosinolate have not materialized, primarily due to apparent changes in the physical properties of the new varieties in preparation. Extraction problems, overall, have not eased in our case. We must emphasize that this is a matter of degree and that we are extracting successfully on Tower. The evident values in improved oil and meal obviously considerably outweigh the degree of processing difficulty. It is well to refer to the fact that each year's crop is variable and we have not yet a sufficient span of experience to clearly distinguish between varietal and seasonal variances.

## REFINING

Low erucic oils, of which we have the most experience with Tower, refine normally.

Oil from Tower appears to reduce the use of catalyst to the level normally experienced for soya oil, through the reduction of catalyst poisoning.

Formulation changes have been minor. They are due to the flatter S.F.I. curves.

In using the new rapeseed oils in hardened products, there has been a significant change in crystallization performance of the products, especially as compared to oils with even 15% erucic.

These crystallization problems started with the low-erucic varieties and have been accentuated in the double-lows.