RAPESEED QUALITY SURVEYS - 1955 TO 1977

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The Canadian Grain Commission's Grain Research Laboratory has been surveying the commercial Canadian rapeseed crop since 1956. These surveys have consisted of (1) an annual new crop survey, (2) a survey of railway carlots of rapeseed leaving country shipping points (primary elevators), and (3) a survey of cargoes of rapeseed leaving Canadian ports.

In 1970, at the International Rapeseed Congress held at St. Adele, Dr. G.N. Irvine presented a paper in which he summarized the first 15 years of rapeseed quality surveys. It is the intention of this paper to complete this summary up to the present time discussion oil and protein analyses, erucic acid analyses, and analysis for glucosinolates, chlorophyll and other quality parameters.

OIL AND PROTEIN SURVEYS

Several changes in methodology have taken place in recent years. Originally, samples were cleaned, ground between corrugated rolls, and dried overnight in a vacuum oven at 100°C. Oil content was determined on the dried samples with an overnight extraction in the Goldfisch apparatus with petroleum ether. Since the fall of 1976 the oil content of samples from the new crop and individual carlot samples has been determined by use of broad band N.M.R. (Newport Quantity Analyser). At present, cargo shipments, quarterly composites, and standard samples for the NMR procedure are analyzed by the extraction procedure described above. We plan, beginning with the 1978/79 crop year, to modify our extraction procedure to correspond with the A.O.C.S. Tentative Method Ai-3-75.

Protein content is determined on the dried, ground seed by the Kjeldahl method.

Results from oil and protein analyses were originally reported on a dry basis for oil content and on an oil-free dry basis for protein content. The reporting system was modified in 1972 at the request of the trade so that results are now expressed on an 8.5% moisture basis.

Oil content has varied between 37% and 43% (8.5% moisture basis) and has shown an increasing trend since about 1960 (Fig. 1). Protein content on the other hand, has varied between 35% and 39% and has decreased since about 1960. These changes in oil and protein content are probably the result of the Canadian rapeseed breeding program which has tend to breed for higher oil content while neglecting protein content. More recently this program has been modified to breed for both increased oil and protein content. The sum of oil and protein in the seed has remained roughly constant /between 60% and 62% (8.5% moisture basis)/ since 1956 except for the period between 1971 and 1974 when the low erucic acid varieties had slightly lower levels of oil and protein than the earlier varieties. More recent varieties have high oil and protein levels and the sum of oil plus protein is again near 62%.

The range in values found for individual samples is greatest in the crop survey (13% for oil, 17% for protein) and is somewhat less in the carlot

survey (9% for oil, 13% for protein) and considerably less in the cargo survey (5% for oil, 5% for protein). This is the result of a "dilution effect" as the samples are bulked together as they move from the farm through the system to the terminals.

ERUCIC ACID SURVEYS

Canada began converting to low erucic acid varieties of rapeseed in 1970 with the introduction of the varieties Span (B. campestris) and Oro (B. napus). The changeover was made on a voluntary and was endorsed by all facets of industry, government, trade and producers organizations. The Canadian Grain Commission was called on to monitor the changeover and established the Oilseed Research and Control Section in 1971 with the primary function at that time of monitoring declared low erucic acid carlots for erucic acid content. Erucic acid was determined by gas chromatography, initially using a procedure in which the extracted oil is transesterfied with BF_3, but more recently using a more rapid procedure in which the oil is transesterfied in the presence of the meal using sodium methoxide.

Fig. 2 shows how the Canadian changeover to low erucic acid varieties progressed. Farmers very quickly switched to growing the new varieties and by 1973 the average erucic acid content in the new crop was less than 5.0% (the maximum allowable in low erucic acid rapeseed oil in Canada). The changeover in commercial shipments was hampered somewhat by a large carry-over from a record crop of 2.4 million tonnes in 1971, the last year that the high erucic acid varieties were grown. Thus the carlot shipments and cargo shipments of rapeseed did not decrease in erucic acid level as rapidly as the crop survey might indicate. By 1975 all three surveys were consistently showing erucic acid levels less than 5%. And since August 1977 no cargoes of rapeseed shipped from Canada have contained rapeseed with erucic acid levels greater than 5%.

OTHER SURVEYS

Since 1974, the oilseeds section has further expanded the scope of its surveys to include chlorophyll analyses on new crop survey samples, quarterly composites, and cargo shipments. High levels of chlorophyll are undesirable as it is difficult to remove it from oil. Chlorophyll is measured in samples of ground seed by relectance spectrophotometric procedure. Results are reported as ppm chlorophyll on a whole seed basis. Usually 70% or more of the samples in the new crop survey contain less than 10 ppm chlorophyll. The percentage of samples with more than 20 ppm chlorophyll has varied between 5 and 12%.

In 1974, the first variety of rapeseed low in both erucic acid content and glucosinolates were licensed for use in Canada. In 1978 "double-zero" varieties accounted for 30% of the acreage in Western Canada. In 1976 and 1977 the oilseeds laboratory analyzed the glucosinolate content of the new crop samples. About 25% of the samples in 1976 and 28% of the samples in 1977 were found to be low in their glucosinolate content. These surveys will be extended in future years.

The "free fatty acid" content of rapeseed represents a loss factor for processors. In the fall of 1977, a survey of the free fatty acid content in rapeseed carlots was started. It is hoped that this survey will help to show optimum moisture levels for storage of rapeseed as well as seasonal variations in the free fatty acid content.

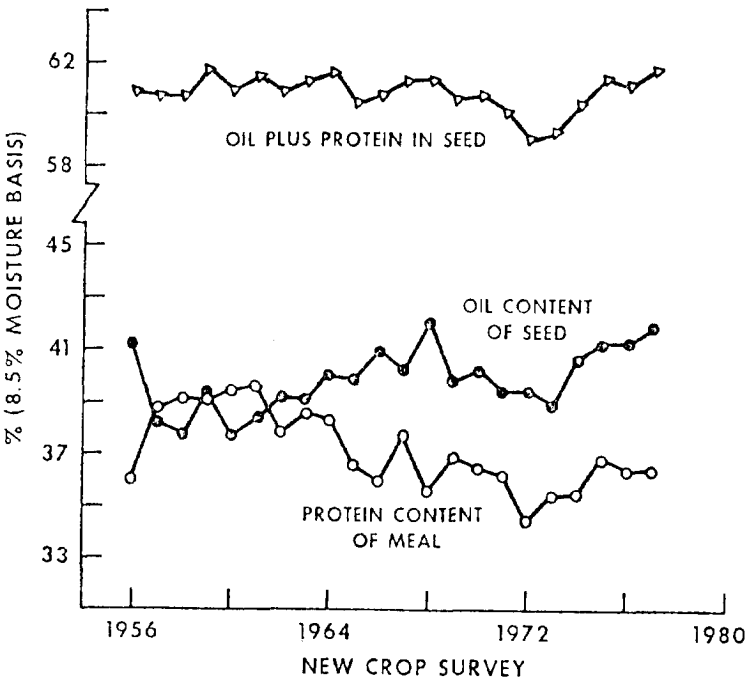

FIG. 1

OIL AND PROTEIN CONTENT OF CANADIAN RAPESEED 1956-1977

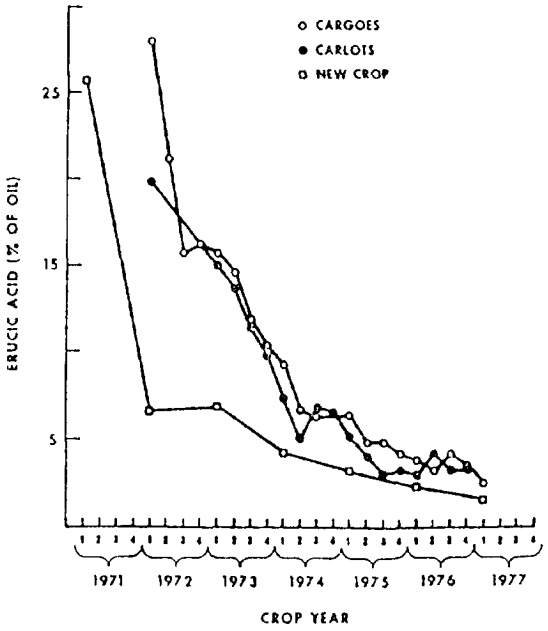

FIG. 2

ERUCIC ACID CONTENT IN CANADIAN RAPESEED OIL 1971-1977