POTENTIAL FOR HIGH OLEIC/ LOW LINOLENIC CANOLA FOR AUSTRALIA

**M A English¹ and J Hausler²**

¹ Agriculture Victoria – Horsham, Victorian Institute for Dryland Agriculture, Horsham, Vic 3401 - megan.english@nre.vic.gov.au
² Cargill Australia Ltd, 152 Baillie St, Horsham, Vic 3400 – julia_hausler@cargill.com

ABSTRACT

The major oils currently used for deep-frying in Australia are palmolein and tallow. Ninety thousand tonnes of palmolein are imported into Australia annually for this purpose while an exportable surplus of thirty thousand tonnes of crude canola oil exists. The current composition of canola oil is not suitable for deep-frying, as it is unstable due to a high content of unsaturated fats. Palmolein consists mainly of saturated fats and is a highly stable oil for deep frying but its high level of saturates is undesirable from a health perspective. Saturated fats are associated with heart disease. Monounsaturated fats have been shown to reduce cholesterol and associated heart disease and also have good stability. The major component in canola is the monounsaturated fat, oleic acid. By increasing the percentage of this fatty acid and decreasing levels of the polyunsaturated fat linolenic acid, which is responsible for canola oil’s relative instability, an oil suitable for deep frying with health benefits can be developed. This would create a significant market for Australian farmers. Such developments have been successfully undertaken in Canada, with varieties that yield as well as conventional canola achieving a growing market share. Incorporating the oil traits from these Canadian lines into an Australian background will create High Oleic Low Linolenic cultivars for Australia.

KEYWORDS: oleic acid, linolenic acid, modified fatty acid composition, monounsaturates, polyunsaturates

INTRODUCTION

The Australian domestic market for canola oil has been limited by its lack of adaptation for deep-frying. Palmolein is a very cheap vegetable oil that is widely used in Australia for this purpose. Palmolein is fully imported from SE Asia (predominantly Malaysia) into Australia at 90,000 t/yr (Cargill Australia Ltd, 2000). Eighty four percent of the oils used for deep-frying in Melbourne and Geelong are palm oil derivatives or tallow (Rayner et al, 1998). Canola with a fatty acid composition modified for deep-frying has the potential to replace these oils and become a significant market for Australian farmers. A high oleic/low linolenic (HOLL) canola would suit this purpose.
DISCUSSION

Canola grown in Australia currently has an oil profile of around seven percent saturated fats, 61 percent oleic acid, 21 percent linoleic acid, 11 percent linolenic acid and less than one percent erucic acid (figure 1). The optimum profile for an oil for deep-frying is shown in figure one and comprises five to seven percent saturates, 67 to 75 percent oleic acid, 15 to 22 percent linoleic acid and less than three percent linolenic acid (Scarth and McVetty, 1999). It is possible to alter the fatty acid levels of Australian material to meet the HOLL specifications through breeding. Introduction of material already at this standard from Canada with backcrossing is a possibility. Backcrossing will be necessary to incorporate blackleg resistance levels suitable for Australia.

Figure 1: Comparison of HOLL and Canola fatty Acid Profiles

In Canada the first HOLL canola variety, Stellar was released in 1988 by The University of Manitoba. Initially Canadian HOLL lines had a yield disadvantage of around 20 percent compared to conventional canola. This is no longer the case with HOLL yields similar to those from conventional varieties. The oleic acid content has also increased over time. With breeding techniques like mutagenesis, oleic acid contents of up to 90 percent have been achieved. HOLL canola currently has five percent of the Canadian market. This is expected to increase to 60 percent in the next ten years (Cargill Australia, 2000). In 2000 approximately three hundred thousand acres of modified fatty acid canola was grown under contract in Canada to Cargill with their InterMountain Canola (Barker, 2000). Cargill is one of two major companies involved in developing specialty oil canola for Canada. Dow AgroSciences with their Nexera lines is the other.

While a HOLL canola type is not currently used for deep-frying in Australia, some HOLL type oils are already marketed. High oleic sunflowers have around two percent of the domestic market for vegetable oils (Cargill Australia, 2000). Manufacturers have accepted this oil. Ag-seed Research has developed a low linolenic canola oil marketed as Monola. In 2000, 1000 Ha of Monola was grown under contract to Nutrihealth Australia who market it as bottled oil. Growers of Monola have been paid a premium as the oil is
considered to be a specialty, boutique type oil. These premiums will be eroded if HOLL canola is marketed as a deep-frying oil as it will be competing with palmolein.

To be useful for deep-frying, oils must have stability at high temperatures. Oils with high levels of polyunsaturated fat are easily oxidised. This causes rancidity of the oil as the secondary products of oxidation like aldehydes and ketones produce the off flavours and odours. Canola is not suitable for deep frying as it contains ten percent of the polyunsaturated fat linolenic acid. Some commercially available canola oils are used for deep frying but these oils have undergone hydrogenation which produces trans fatty acids which are associated with elevated levels of LDLs and coronary heart disease. The hydrogenated canola oils also have shorter frying lives than palmolein.

While polyunsaturated fats are unstable, monounsaturated fats like oleic acid have shown high stability for deep-frying. Tests conducted by Food Science Australia have shown that the performance of high oleic canola is related to linolenic acid content. As the level of linolenic acid increases the oil is more likely to darken over time, have increased levels of free fatty acids and polar compounds and decreased sensory qualities. These are all negative traits for a deep-frying oil. Food Science Australia compared three high oleic lines with low, medium and high levels of linoleic acid to palmolein for suitability as deep-frying oil. After eighty hours of frying the high oleic/low linolenic canola oil was the better oil. It maintained flavour stability and was better for most chemical measures and was nutritionally superior. HOLL oil also maintains stability in storage so has a prolonged shelf life when compared to unhydrogenated canola oil.

The content of linoleic acid (C18:2) does not appear to have any effect on the stability of the oil. As linolenic acid content is reduced the linoleic acid content tends to increase. Linoleic acid is important to the flavour of the oil and when oleic acid content is increased to over 75 percent the flavour and sensory qualities are reduced due to the drop in linoleic acid content (Warner and Mounts, 1993).

HOLL canola is a considerably healthier oil than Palmolein. Palmolein is comprised of 46.7 percent saturated fats with palmitic acid (C16:0) at 40 percent of the oil, being the major component (Xu et al., 1999). Saturated fats are associated with heart disease due to the increased levels of low density lipoproteins. Low density lipoproteins are responsible for the deposition of cholesterol on the walls of blood vessels and the associated heart disease. Currently canola oil has the lowest levels of saturated fats of all vegetable oils containing only four percent of the saturated fatty acids associated with increased cholesterol (Scarth and McVetty, 1999). A modification to the canola oil profile to increase the level of oleic (C18:1) acid, will further decrease the level of saturated fats. Monounsaturated fats have a further advantage in that they have not only been shown to lower blood cholesterol but also blood pressure (Debonte and Hitz 1995).

References


