High Oleic / Low Linolenic Winter Oilseed Rape Varieties – The First Five Years of UK Cultivation

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Abstract
Winter Oilseed rape (WOSR) varieties with high oleic / low linolenic (HOLL) oil quality were developed mainly to fulfil the demand for a rapeseed oil with improved stability.

The required quality has now been commercially available in Europe in a WOSR background for five years and several varieties (SPLENDOR, V140OL, V141OL and V161OL) have been grown on a significant European area during this period.

This poster examines the cultivation of the WOSR HOLL crop from the perspective of the UK market, with particular emphasis on:

1. Maintenance of the required quality – we have enough information now to present a comprehensive evaluation of the various factors that can compromise HOLL quality, their relative importance and strategies to minimise their effects.
2. Quality monitoring – strategies and methodologies to ensure that the crops delivered for crushing will meet the specifications required by the industry.
3. Varietal performance – in terms of HOLL quality in a wide range of environmental situations, and also agronomy and output compared with conventional quality varieties.

The first five years of commercial cultivation on farms have demonstrated that with the implementation of good management practices, the UK HOLL crop can meet the standards required by the industry and also the expectations of growers.

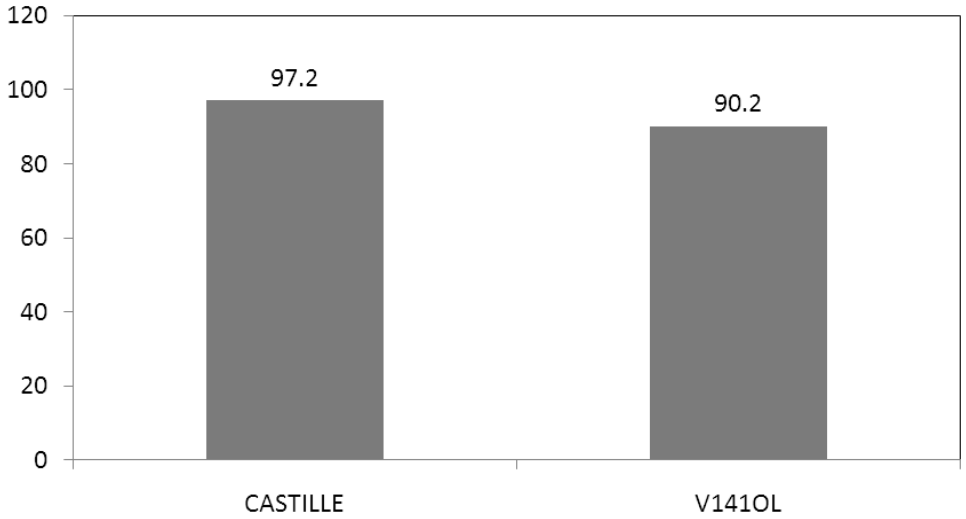
Introduction
Oil from winter oilseed rape has been an important globally traded commodity since the removal of Erucic acid from commercial varieties in the 1970's (Downey 1964).
The disadvantage of rapeseed oil for some applications was a lack of oxidative stability caused by relatively high levels of polyunsaturated fatty acids. The solution to this was partial hydrogenation – a technique also used to convert rapeseed oils to solid fats.
Hydrogenation removes double bonds from the fatty acids, but this process results in a proportion of the molecules changing from a "cis" configuration to a "trans" configuration. The latter has been associated with adverse health effects (Mozaffarian et al 2006) and there has been increasing pressure and regulation against partially hydrogenated fats.
Saturated fats such as Palm Oil can be used as a substitute for partially hydrogenated oils, but these also have potential health issues (and questions on sustainability).
Reducing the linolenic acid (C18:3) content (Thorman et al 1996) and increasing the oleic acid (C18:1) content (Schierholt 2000) improves stability and if the linolenic acid content is reduced to below about 3.5% and the oleic acid content increased to above 67% , then hydrogenation is not required (Scarth and Mcvetty 1999). Commercial realities can change these figures somewhat as the oil is often blended with that of other crop species before being supplied to the end user, so oleic levels in excess of 75% are preferred.
Suitable high oleic/low linolenic (HOLL) profiles have been achieved in winter oilseed rape varieties by conventional breeding in a combined venture between the Monsanto and DSV breeding organisations. The high demand for this oil profile meant that the crushers could offer growers a premium for producing these varieties and crops have been grown in a number of countries, including the UK, France, Germany and Switzerland.
In the UK, HOLL crops (marketed under the VISTIVE brand) have now been grown commercially for five years, so we believe we have enough experience to provide a reasonable assessment of their performance.

Data

Yield and Agronomy

An independent view of the UK performance of winter HOLL varieties can be obtained from the 'Classified List' of all varieties on the UK National List (NIAB Association 2009) and from the UK recommended list (HGCA 2011). The most widely grown of the HOLL varieties 'V141OL' was tested in the UK recommended list trials in 2008/9 and 2009/10, allowing a four year mean (including previous National Listing data) gross output figure to be compiled. This figure allows for a good comparison with conventional '00' varieties. A comparison of the major agronomic data can also be made. The most widely grown 00 variety over this time period was the variety 'CASTILLE' so this is the variety chosen as a comparator

Figure1**. Yield (Gross Output) of HOLL variety V141OL compared with CASTILLE over A Four Year Dataset (2006-2010) Data expressed as % mean of 4 commercial controls**



Source = HGCA Recommended Lists 2011/12 for cereals and oilseeds

Table 2**. Agronomic characteristics compared**

	Oil Content % at 9% Moisture	Lodging Resistance 9=Good	Maturity 9=Early	Shortness of stem 9 = Short	Canker Resistance 9=Good	Light Leaf Spot Resistance 9=Good
CASTILLE	43.6	7.7	5.7	7.7	6.0	4.9
V141OL	45.5	8.0	5.9	6.6	6.3	6.5

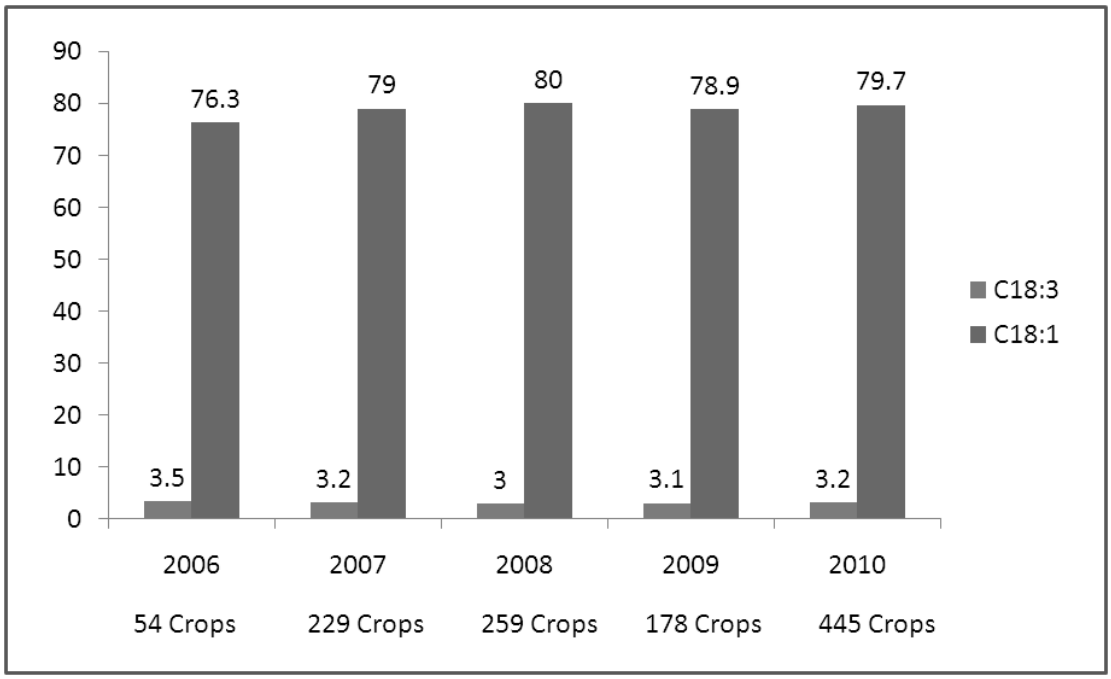
Full dataset available at www.hgca.com

V141Ol is better than CASTILLE for a number of key agronomic characteristics (Table 2).
In general on-farm yields of the HOLL varieties have been excellent, with a number of crops exceeding five tonnes per hectare. Some crops were grown on land that was new to oilseed rape cultivation so the yield averages should not be directly compared to the national mean, but it is fair to say that performance so far has been very encouraging.

Quality

To ensure that the HOLL quality delivered to the crush is maintained (and for growers to claim their quality bonus) all crops have been sampled and tested. Consequently a large dataset is available.

Figure3**.The Quality of HOLL crops over five years of UK Cultivation**



The number of crops rejected because they fall outside of the quality parameters has been relatively low. For example in 2010 just over 6% of crops failed to meet requirements. Most of these failures were due to high levels of volunteers or cruciferous weeds, but there were a few that were due to poor segregation or mix ups after harvest.

Discussion

The trials data suggests that there is currently a yield penalty of around 7% for growing HOLL varieties. We believe that newer hybrid HOLL varieties will reduce or even eliminate this penalty. Farm experience of the current HOLL varieties has been extremely positive and yields achieved along with the quality bonus have given the majority of growers a positive view of this new crop. There are no obvious agronomic deficiencies with the HOLL varieties – in fact Table2 presents a very positive picture, with V141OL beating CASTILLE on a number of criteria.

The quality achieved has also been encouraging. Some earlier in-house work suggested that linolenic levels could rise and oleic levels fall with increasing latitude. This could be the case, but if so, on this evidence the effect is not great enough to cause problems with the UK cultivation of this crop. The testing procedure using GLC (Gas Liquid Chromatography) is quite labour intensive, but work on NIR (Near Infra Red Reflectance) has been quite encouraging.

Volunteers and cruciferous weeds present threats to the quality, but where crops are managed well these can be overcome.

Demand for this oil specification is rising, and as new hybrid varieties narrow the yield gap we can expect HOLL varieties to comprise a larger part of the UK rapeseed area in the future.

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