Last updated: **October 2005**

OILSEED RAPE and TURNIP RAPE

Family: *Cruciferae*

Genus: *Brassica*

Species: *napus* (oilseed), *rapa* (turnip)

Source: Copyright CSL

Contents

General Background

The oilseed and turnip rapes are predominantly grown in cool temperate regions of the Northern hemisphere such as Northern Europe, Canada and China.

Oilseed rape (OSR) is the third most important crop in the UK after barley and wheat with nearly 558,000 ha under cultivation. With an average yield of 2.9 t/ha, total UK production in 2004 stood at 1,609,000 t (9% moisture content). 90 % of OSR is grown on non set-aside land, 10% grown on set-aside. The area of rapeseed grown in Europe

(2004) is approximately 4.5 million ha, quarter of worldwide production, with 2005/06 estimates at 4.63 million ha. Although a larger area will be cultivated, rapeseed production will be lower due to increase demand of biodiesel. Globally, it is ranked as the third most important oilseed crop after soybean and palm (ACTIN newsletter no. 12 June 1999). Plant breeders developed oilseed rape from the 'weed' rapeseed (*B. napus oleifera*) and the first double zero variety was marketed in 1974.

Oilseed and turnip rapes can be either winter or spring sown. The winter rapes are sown during the last 10 days of August and the first 10 days of September and harvested the following July. The faster growing spring rapes are sown in Northern Europe during late March and early April and harvested mid-August to September.

Rape exists as annual and biennial plants. Both oilseed and turnip rape have a tuberous tap root. The swede turnip is a variety of *B. napus* and the common turnip is a variety of *B. rapa*. Each plant has a number of racemes on which yellow flowers are carried. The height of the crop varies on the variety sown but is typically between 50–250cm. The plants are 60-70% self-pollinated but insects and wind also assist pollination. Both rapes can be cross-pollinated with other wild *Brassicae* such as Charlock and wild mustards (black and white). Cross-pollination affects the glucosinolate content of the resulting seed and hence there are strict rules governing rapeseed product to maintain genetic purity, especially in the double low varieties. Pollen from OSR has been recognised as a cause of allergic sensitisation (Focke *et al* 1998, Int. Arch. of Allergies and Immunology) producing symptoms of hay fever. However, pollens from grasses and trees, which are common causes of hay fever, are also in the air at the same time as pollens from OSR. The seeds of both oilseed and turnip rape are small - about the size of this 'o'- and contain about 40% oil which is extracted by crushing to leave a high protein containing meal.

The main types of oilseed rape (OSR) currently grown:

Double low (00) varieties were originally grown for food and contain low levels (typically less than 1%) of erucic acid (which humans find hard to digest), and low levels of glucosinolates (a sulphur compound which makes the meal by-product indigestible for animals). In 1999 417,000ha of '00' rapeseed was grown in the UK, producing 1,334,000t seed. The same year the EU produced a total of 10.5 million tonnes from 3.5 million hectares of oilseed rape. Current uses of ‘00’ varieties include oil for human consumption and high protein meal for animal feed.

Industrial/alternative uses include feedstocks for pharmaceuticals, and hydraulic oils, and the meal as a lawn care product. Rapeseed straw is utilised as a fuel or a bedding material.

High erucic acid rape (HEAR) varieties are grown specifically for their erucic acid content - typically 50-60% of oil. In 1998, 34,000ha of HEAR was grown in Europe which produced 56,000t of oil. In 2003, HEAR grown on UK set-aside for non-food crops increased from 5,300 ha (1998) to 20,200 ha. A small proportion of HEAR (~2,000ha) is used to produce behenyl alcohol, which is added to a waxy crude mineral oil to improve its flow.

Turnip rape

Early ripening spring turnip rapes (*Brassica rapa*) have been developed in Canada and Scandinavia where extreme winter conditions and short growing seasons preclude the use of autumn sown rape.

Autumn turnip rapes seem to be a promising alternative to northern growers with successful establishment possible well after the latest safe drilling dates for autumn swede rape and once again will mature about three weeks earlier. Varieties so far in observation plots have been relatively weak stemmed. No assessments on yield potential were available from UK trials in 1995. Turnip rapes meet the same quality standards for oil and cake as well as swede rape with low erucic acid and low glucosinolates.

The introduction of the EU Arable Area Payment Scheme (AAPS) equalised the area subsidies for both winter and spring sown rape, overturning the relatively economic returns from the winter and spring crop. Following these changes a number of new turnip rape varieties were introduced to the market, as alternatives to the spring rape (swede rape) varieties already being grown.

Key differences between '00' spring and turnip rape

	Spring Oilseed Rape	Turnip Rape
Seed rate	5-6 kg/ha	3.5 kg/ha
Nitrogen	130-150 kg/ha	100-120 kg/ha
Pigeon damage	Risk	None
Seed losses	High risk	Low risk
Harvest date	Mid-September	Mid-August
Yield	2.50 t/ha	2.20 t/ha

Source: J. G Crowley. 1998.

While turnip rape yields are 10-15% lower, the guarantee of a late August harvest is very attractive where a winter cereal is to follow.

Details of Quality Characteristics

***Glucosinolate content**: -* Glucosinolates are thioethers and can contribute to the 'hot', bitter taste of condiments (e.g. horseradish). The glucosinolate content of rapeseed meal varies considerably between sites and seasons.

Erucic acid: - Low erucic varieties are those in which the erucic acid constitutes 2% or less of the measured fatty acids (National Institute of Agricultural Botany, NIAB 1995). Oil with high erucic acid content is valuable as an industrial lubricant, and is eligible for growing on set-aside land under contract terms to merchants.

OO: - Double low varieties conform to the standard of low glucosinolate and low erucic acid.

***HEAR**: -* Rapeseed varieties with High Erucic Acid Content (HEAR) are valuable as an industrial lubricant.

Typical oil contents of Turnip rape and Oilseed rape (%)

Oil Type	Turnip Rape	Single and '00' OSR vars.
Palmitoleic (C16:1)	32	ca. 60
Linoleic (C18:2)	15	ca. 30

Linolenic (C18:3)	1	10
Erucic (C22:1)	50	<1

Brassica oilseed fatty acid profiles

	C16	C18	C18:1	C18:2	C18:3	C20:1	C22:1
B. napus cv. Tobin	4.3	1.7	52.7	24.5	14.2	1.2	0.6
B. napus	3.8	1.6	39.2	20.5	9.2	11.7	14.9
B. napus	3.0	0.8	9.9	13.5	9.8	6.8	53.6
B. napus	10.0	1.0	51.0	19.0	13.0	1.0	trace
B. napus Stellar (Io 18:3)	5.0	2.0	64.0	24.0	<3.0	1.0	trace
B. napus VHOAR mutant	3.0	1.6	85.4	3.6	3.9	1.3	0.0
B. rapa Tobin	3.8	1.2	58.3	24.0	10.3	1.0	0.3
B. rapa Echo	2.5	1.0	32.5	18.8	8.9	12.0	23.5
B. rapa R-500	2.5	1.0	13.0	13.5	10.1	5.5	51.1

Source Carruthers S P ,*et.al*. 1995.

<u>Current Production and Yields</u>

Crop production statistics for 2000 (‘00’ and HEAR varieties)

Country	**Area Harvested ‘000ha**		**Yield t/ha**	
	‘00’	**HEAR**	**‘00’**	**HEAR**
Austria	51.76	0	2.71	0
Belgium/Luxembourg	13.00	0	2.69	0
Denmark	78.00	0	5.27	0
Finland	63.00	0	1.38	0
France	1225.00	4512.00	2.92	2.0
Germany	1080.24	28000.00	3.31	2.9
Greece	0	0	0	0
Ireland	2.60	0	1.92	0
Italy	45.23	546.36	0.96	1.78
Netherlands	1.00	0	4.00	0
Portugal	0	0	0	0
Spain	31.40	0	1.58	0
Sweden	48.13	0	2.45	0
UK	402.00	973	2.81	2.0

Source : FAO 2001 and IENICA 2001

Constraints upon Production

European production is controlled by the Blair House agreements and financial penalties can be imposed if either total sown areas of oil crops (Sunflower, OSR, Soya and Linseed) exceeds 4.933 million hectares, or meal production from industrial cropping rises above 1 million tonnes.

Most UK farmers grow the higher yielding winter crop, although plants are susceptible to pigeon damage, as often they are the only green leaves in an otherwise barren winter environment. If not discouraged, pigeon damage is likely to stunt growth, reduce yield and in extreme cases kill the plant. Alternatively growth of the spring crop is more likely to be restricted by either lack of or excess moisture at crucial times for germination and growth.

There are some limitations to the introduction of new modified oil profile rapes, which need to be overcome; including public and consumer perceptions and views, although other high oleic crops appear to be acceptable (sunflower). Further development of 'designer' oil profiles is likely to be the fastest way to meet industry's needs, although introduction of GM rape in Europe is likely to be limited.

Oilseed rape is prone to shattering which gives rise to a significant volunteer problem in subsequent crops. Crop development studies to minimise this problem would increase yield and reduce costs and problems with volunteers. The development of a number of types of oilseed rape could give problems of future crop purity and identification. The development of visual markers for each crop type could have significant long-term benefit.

The oil extraction industry is based on old technology; the development of improved extraction technology needs to offer cost savings, improved environmental practice and the ability to handle an increasing range of crop types.

The overall value of oil crops depends on a market for crop by-products, such as straw and grain which does not meet the quality requirements. Traditionally these have been used as animal feed but increasingly by-products are less able to meet the requirements of the animal feed manufacturers. New products, particularly in the non-food area, are required to improve the total income from oilseed crops.

Industrial Use

While considerable substitution of OSR oils for imported tropical oils, animal fats and mineral oils is theoretically possible, it is unlikely to occur because European OSR oils are generally more expensive. Substitution is more likely to occur for environmental and customer preference reasons.

Major technical performance barriers remain to be overcome to enable vegetable oils to be more widely competitive with mineral oils.

Lubricants

Development of new biodegradable environmentally friendly products. Development of new products based on high oleic oils where high oxidative stability is required.

Economic

Price is a major barrier to development. European oilseed prices are not competitive in comparison with the world market prices for vegetable and mineral oils.

The impact of Agenda 2000 on the production of non-food oilseed production is likely to be negative. While the reforms suggest a 10% set aside area, the between year area will fluctuate. This unpredictable fluctuation in area may cause significant problems to producers growing non-food oilseeds on set-aside and to industry utilising the production. Industry cannot plan investment and development when the raw material supply is so variable.

Environmental

Oilseed rape crops produced by gene transfer offer a potential to meet industry oil profile demands, but are currently unacceptable to the general public. It will be necessary to devise acceptable environmentally friendly production practices to minimise pollen transfer and public anxiety to enable commercialisation of these types.

Much of the benefits of OSR oils are built on biodegradability and good ecotoxicity performance. These benefits must be seen to be maintained in all new products.

Better education coupled with EU-wide schemes to label environmentally friendly products based on OSR oils (as already exist in some countries) would enhance consumer demand.

EU Actions

The position of non-food oilseeds in Agenda 2000, particularly in relation to set aside and acceptable crops needs urgent review to minimise barriers created to increased non-food oilseed production. The WTO Blair House accord poses limitations on oilseed production. The position of EC/US Oilseeds Agreement post 2003 needs clarification and any barrier to increased non-food oilseed production removed.

It would be helpful to long-term research and investment by industry if the EU could produce a definitive long-term statement governing industrial crops and ensure integration of policy making in EC. There is continuing need for EC support of research and development, particularly to help overcome scientific/technical barriers (e.g. shattering). More of this support should be directed towards pilot projects to bridge the gap between scientific small-scale developments and full commercialisation.

Communication

Communications between the main participants in the non-food oil industry, farmers, seed vendors, storage operators, research bodies, crusher, refiners and industrial users need improvement.

Communication of the new OSR oil products and their environmental benefits, to industrial and domestic users will overcome the lack of knowledge and enhance product demand.

Markets and Market Potential

The main uses for rapeseed oil is in cooking oils or margarine's with the rape meal being used for animal feed.

Canola quality rape seed (OO var.) have virtually no nutritionally undesirable long chain fatty acids and can be further improved by decreasing the linolenate content from 10% to 3% which gives enhanced shelf life. For industrial applications very high oleic acid content (80-90%) is preferred due to its suitability for certain chemical reactions and ease of extraction.

HEAR oil contains approximately 50% erucic acid (OO contains less than 2%). HEAR oil has special properties which include: High smoke and flash points, oiliness and stability at high temperatures, ability to remain fluid at low temperatures and durability. The principal end use of HEAR is to produce erucamide, a 'slip agent' used in injection moulded plastics and polythene manufacture. Erucamide is a large relatively complex molecule and consequently attempts to produce it synthetically from petrochemicals would be very expensive. HEAR oil is used to produce erucamide which is used as a slip additive in polythene and polypropylene, to reduce surface friction and prevent adhesion between film surfaces. HEAR oil is also used in printing inks, lubricants and has a range of other applications.

Rape seed oil is currently incorporated into lubricants for two-stroke petrol engines and rape seed oil-derived methyl esters can be used as a diesel substitute.

Markets for Rapeseed Oils

Most European countries have oilseed crushing and refining facilities. Crushing/refining technology is generally well developed but new investigations are in progress to identify more environmentally friendly and cost effective extraction technology.

i) Biofuels
ii) Lubricants
iii) Surface coatings
iv) Polymers
v) Medicinal

i) Biofuels

A significant part of rapeseed oil is now used for industrial purposes, predominantly biofuels

The EU Directive on Biofuels requires member states to have a minimum 2% of biofuels in all fuel sold for transport by the end of 2005, increasing to 5.75% in 2010. Biofuels are important as they can reduce carbon emissions by up to 70% thereby helping countries adhere to the Kyoto Protocol and domestic CO^2 targets.

In Europe, the most important biofuel is biodiesel (representing approximately 80% of biofuel production). Within Europe, biodiesel is mainly produced from rapeseed, which can then be blended in various proportions with conventional diesel or as a direct substitute.

Germany is Europe's largest biodiesel producer followed by France then Italy. It is also an important importer of rapeseed for biodiesel.

Biodiesel production in 1,000 t

	2002	2003	2004
Germany	450	715	1,088
France	366	357	502
Italy	210	273	419
UK	3	9	15

Source : GAIN Report E35058

Biofuel Corporation has started work on what is expected to be the largest and most modern biodiesel plant in Europe. Seal Sands, located in Teeside, UK, is expected to produce 250,000 t of biodiesel each year from rapeseed oil.

ii) Lubricants

Size of Lubricant Markets, based on 1993 data:

Country	Lubricants Market (Kt)
Austria	86.1
Belgium	218.8
Denmark	77.8
Finland	93.0
France	890.5
Germany	1,164.8

Greece	122.0
Ireland	40.0
Italy	780.0
Luxembourg	10.0
Netherlands	274.8
Norway	82.7
Portugal	103.3
Spain	358.0
Sweden	141.5
Switzerland	69.3
United Kingdom	806.1
TOTAL	5,319

In 2000 the European lubricants market totals 5.3 million tonnes per annum and can be divided up as follows:

2.5 million tonnes of vehicle lubricants (47%)

2.3 million tonnes of industrial lubricants (43%)

0.5 million tonnes of marine and aviation lubricants (10%)

The total European market for drilling oils/muds amounts to 80,000 tpa.

Advantages of Rapeseed oil as a lubricant

OSR oils have good environmental characteristics. They are inherently biodegradable, of low ecotoxicity and toxicity towards humans, derived from renewable resources, and have no net carbon dioxide contribution to the atmosphere. Their cost falls in the range between mineral and synthetic oils.

Natural properties which favour rapeseed oil as a lubricant

1. The viscosity index is high
2. The structure endures mechanical stresses well (the viscosity does not decrease during use).
3. Low friction coefficient means only slight heating of the oil during use.
4. Due to its polarity the oil adheres to metal surfaces and provides good protection against corrosion.
5. Liquid even at temperatures below -35ºC

Because of these characteristics it is not surprising that considerable efforts have been directed towards using them in designing environmental fuels and lubricants. These efforts by the petrochemical industry have been widely publicised over recent years.
Evidence indicates that a number of major players in lubricants markets have prepared vegetable-oil-derived substances as substitutes for current fossil petrochemical derived lubricants. IENICA partners have identified the following companies as having interests although many are focusing on use of tropical oils rather than European produced oils:

Fuchs
Shell/BP
Elf Aquitaine/Total/Fina
Lubrizol International
Novance
Castrol
Croda
OMV

Factors limiting the use of rapeseed oil:

The use of vegetable oils as lubricant base oils is restricted by some technical disadvantages:

1. High price.
2. Will not withstand long-term use at temperatures above 100ºC even with additives.
3. Reduction in the efficiency of oil soaked brakes
4. Stubborn staining

Very high oleic oils seem to offer the best compromise in terms of technical characteristics. As a result high oleic rapeseed are beginning to find uses where higher oxidative stability is required but commercialisation is still a long way off.
Much has already been achieved in fulfilling the technical needs of specific applications but technical challenges remain to expand specifications using new sources of vegetable oils and increase usage.

Market opportunities already exist particularly where high environmental contamination occurs:

Type of oil	OSR alternative already in use
Chainsaw oils	rapeseed oil
Drilling oils/drilling muds	rapeseed esters
Cutting esters which have specific health benefits	rapeseed esters

iii) Surface coatings

Vegetable oils are used as 'vehicles' in printing inks.

Advantages of using vegetable oils in printing inks:

Environmentally friendly

Less toxic

Easier to remove than traditional 'vehicles'. The ease of de-inking is becoming more important as more paper is re-cycled.

Although the majority of conventional sheet-fed offset printing inks are soy-based, between 1,000t and 2,000t of OSR oil is included in printing inks in the UK annually (S. P. Curruthers et al 1995), to supply a limited demand for 'ecologically responsible inks'. The potential maximum usage of OSR oil for printing inks in Europe has been estimated as 210,000t rapeseed equivalent to 70,000ha of OSR.

Factors limiting the use of vegetable oils in printing inks:

Cannot compete on price with mineral oil vehicles

Increased use likely to depend on environmentally based legislation.

iv) Polymers

Whilst the majority of polymers are derived from petroleum, certain products are based upon, or incorporate vegetable oil-based derivatives and there appears to be considerable scope for an expansion in the use of vegetable oils in polymer production. Rapeseed oil derivatives can be used in the manufacture of polymers as:

- *Functional additives (where they can alter physical properties)*

  Rapeseed oil derivatives are used as slip, anti-block, anti-static and plasticising agents, as stabilisers and processing aids and as flame retardants in the manufacture of plastics. The principal chemical currently produced and used this way is erucamide, which is derived from HEAR and used as a slip agent in polythene film. The UK used some 14,000 ha HEAR in this way in 1995. Erucic acid can be used as the starting material for both Nylon-13 and Nylon -13, 13 but no commercial production is known.

- *Reactive ingredients (where they form part of the polymer chain)*

  Rapeseed oils can be used as reactive agents in the manufacture of polyamides, polyesters and polyurethanes. The potential to produce oils from modified plants and for using biotechnological processes to convert vegetable oils into polymer substrates is substantial.

- *Direct production of polymers*

  Polymers can already be derived from plants via the bacterial fermentation of carbohydrate feedstocks from double low (00) varieties.

v) Medicinal

Several of the Glucosinolate compounds found in oilseed rape have been established as having cancer-preventative properties. This could be a huge breakthrough in the future as this area is further developed.

EU 15 Usage of European produced vegetable oils in technical/chemical industries:

Crop	Quantity oil (000t) 1998	Quantity oil (000t) 2004
Rapeseed	265	350*
High oleic rapeseed		35***
High erucic rapeseed	56	79**
Total	321	464

Assumptions:-

* 5% annual growth in demand

** 4% annual growth in demand

*** current demand assumes that supplies will be available
Source: Sylvain (1999)

It has been postulated that demand for European oilseed rape oil for non-food uses will increase by 140,000t by 2004 to a total of 464,000t. There appear to be few scientific limitations to the increased production of oilseed rape (double low and high erucic). General increase in productivity has consistently occurred as the result of plant breeding and improved agronomy. It is important that sufficient input continues to improve productivity and reduce inputs through an improved understanding of individual crop physiology. An increased crop area is likely to be the most positive method of providing the anticipated increased demand.

Markets for Rapeseed Meal

There has been a significant increase in the production of rapeseed meal due to heightened crush for biodiesel. Rapeseed meal is used as a livestock feed in varying quantities for cattle, sheep, pigs and poultry. However, rapeseed meal may have detrimental effects when fed in large quantities. (i.e. fishy tasting eggs if fed in too large a quantity to layers). Its main industrial uses are as follows.

OSR meal proteins:
i) Bioplastics
ii) Adhesives
iii) Cosmetics
iv) Encapsulation agents
v) Lawn care product
vi) Combustion material

OSR meal proteins

The main possible non-food applications for proteins can be seen in the table below.

Proteins for non-food applications:

Applications	Requirements
Bioplastics	Biodegradability
Coatings	Water resistance

Glue, adhesives	Film forming resistance, Solubility
Paper	Stabilisation of dispersions viscosity
Emulsifiers	Stabilisation of emulsions

Source ; G. Antonini. *et.al.* 1999

The production of protein-based plant products for non-food markets can be based upon extracting protein from existing low value by-products like rapeseed meal. Currently, soybean and wheat proteins represent the most important resource for protein production with some emerging availability of pea proteins and cottonseed proteins and very recently rapeseed proteins. Vegetable proteins are already used in a number of situations, e.g. plastics and adhesives, while their current usage is small, their potential is significant.

i) Bioplastics

Natural properties which favour OSR proteins for bioplastics:

Show thermoplastic properties

Good biodegradation properties

Thermoplastic processing is being studied for the production of packaging foils and disposables

Research on protein extracted from rapeseed meal has created prills which can be converted into moulded plastic products.

Bioplastic use is currently small but potentially enormous. However, competition with starch derived plastics must be recognised.

ii) Adhesives

Isolates from oilseed rape meal protein show high solubility in water making them highly applicable to adhesive formulations.

iii) Cosmetics

Cosmetics are a small market by volume but with high value-added potential. Plant proteins are active ingredients contributing to better component compatibility.

iv) Encapsulation agents

Proteins have promising applications as controlled release encapsulation agents for pharmaceuticals, agrochemicals and flavours.

Limiting Factors

Biopolymer products must not only be technically feasible but also economically competitive. Additionally, the supply of raw materials must be reliable in terms of quality and quantity. However, while competitiveness can be achieved and availability is ensured, plant proteins are currently in most cases purchased as "bulkware" like food products. In general, it is likely that food protein would have the higher value, especially from true protein crops. However, where proteins can be extracted from lower value protein-containing by-products, the economic potential for its exploitation as a non-food feedstock will probably be much greater.

v) Lawncare products

Rapeseed meal has been developed as a lawn care product. Trials of a rapemeal based fertiliser have shown success in terms of grass colour, growth and moss reduction. (P A Wallace et al, Levington :HGCA research project, April 1999)

vi) Combustion material

The main thermic characteristics of rapeseed meal allow its utilisation as a material for combustion. The ash content is relatively low and its calorific power is approximately equivalent to the ones of charcoal.

Markets for Rapeseed Straw

Straw produced from oilseed rape can be used as animal bedding or for feed purposes. As a source of fibre, it is inferior to crops such as flax, hemp or linseed, but superior to cereal straw (and therefore suitable for some low-grade uses). Although there is no established use for OSR straw in 1996 straw realised 8,500 x1000t ODM in Europe, at a market price of 47 ECU/t ODM.

Genetic Manipulation

Oilseed rape is at the forefront of genetic engineering technology and several varietal types have successfully completed trial and are currently awaiting approval from the EU for commercial release. The developments are of two major types:

1. Enhanced or altered quality/yield characteristics.
2. Tolerance to pest, disease or herbicide tolerance.

The first varieties likely to be commercially available in the EU are the glufosinate ammonium herbicide tolerant oilseed rapes. Other genetically modified rapes are glyphosphate tolerant oilseed rape and varieties with modified fatty acid content, in particular high lauric acid rapeseed. The introduction of these varietal types will require careful planning and is at present the subject of much debate.

Other Information

Conversely, soils rich in sulphur can lead to raised levels of glucosinolates in the rape seed and foliage as can climatic conditions (Merrien, 1989). Double '00' varieties low in glucosinolates may also be more palatable to grazing pests such as pigeons, rabbits and hares, and therefore susceptible to attack from such pests.

OSR yields and quality can be affected by a number of fungal diseases, the most significant being : Canker (*Leptosphaeria malculans*), light leaf spot (*Pyrenopziza brassicae*) asexual stage *Cylindrosporium concentricum*, downy mildew (*Peronospora parasitica*), alternaria (*Alternaria brassicae*), sclerotina (*Sclerotinia sclerotiorum*) clubroot (*Plasmodiophora brassicae*) and white leaf spot (*Pseudocercosporella capsellae*). Three aphid transmitted viruses can infect OSR. Beet western yellows virus is most common, followed by turnip mosaic virus and cauliflower mosaic virus. Pollen beetle can also be a problem and must be controlled by a spray program.

Research

UK research into the production of resin from refined rapeseed oil has identified that it can be applied to the production of both ceramic and lignocellulose based composite materials. Composite materials primarily rely on formaldehyde-based resins. Formaldehyde has been established as an irritant to both the respiratory tract and skin and has also been classified as a carcinogenic. Conclusions from research so far indicate that the use of rapeseed as a resin produces similar mechanical strength and water resistance to tiles produced via the conventional resin method. The overall production system is a net consumer of carbon dioxide with no unusual emissions from the resin that could cause undesirable environmental characteristics. A market opportunity will exist for new, environmentally friendly resins upon further research on vegetable oils (such as rapeseed) as long as they are competitive in price, performance and adaptable to current manufacturing processes.

Useful Websites

http://www.actin.co.uk/newsletter/issue12

http://ienica.net/ienicareports.html - Statistics broken down by European countries on oilseed production

http://www.defra.gov.uk - Statistics for oilseed grown in the UK

http://www.genewatch.org - Information on GM oilseed crops and further research

http://www.HGCA.com

http://www.rrz.uni-hamburg.de/biologie/b…ugarten/BrassicanapusLvarnapus/Rape.htm

http://www.r-p-a.org.uk/content/images/articles/UK%20Biofuel%20Facilities.pdf - Biodiesel locations in the UK

http://www.fas.usda.gov/gainfiles/200503/146119213.pdf - European overview of oilseeds

http://www.fas.usda.gov/gainfiles/200506/146130062.pdf - European overview of oilseeds

BioMat Net

Oilseed rape (Brassica napus ssp. oleifera)

AIR Programme

AIR2-CT93-0879 Pod shatter in Rape

AIR3-CT94-2063 Vegetable oils and their fatty acid esters (VOFA) as substitutes for organic solvents in industrial processes.

Crops for Industry and Energy in Europe

ECLAIR Programme

Commercial success of ECLAIR Programme:

AGRE-0061: The whole crop biorefinery project (Bioraf)

AGRE-0010 The methyl esters of Rapeseed: New industrial outlets for agriculture.

AGRE-0039 Seed oils for new technical applications (SONCA)

European Commission

Arable cropping under Agenda 2000

FAIR Programme

FAIR-0364 A project to promote: 'Familiarisation with and acceptance of crops incorporating transgenic technology'.

FAIR-1669 Integrated strategies for the management of stem canker of oilseed rape in Europe.

FAIR-2069 The assessment of genetic purity in hybrid varieties of crops.

FAIR-3072 Engineering shatter resistance into oilseed rape

FAIR1-CT95-0260 High quality oils, protein and bioactive products for food and non-food purposes based on biorefining of cruciferous oilseed crops

FAIR3-CT96-1314 European Network for Research Coordination on Biocontrol of Oilseed rape (BORIS).

FAIR-PL97-3884-CTVO-NET Chemical-technical utilisation of vegetable oils.
FAIR-2025 Increase in performance of natural regrowing oils to lubricate earthmoving equipment.

FAIR-1625 New valorisation of rapeseed/sunflower lecithins, in cosmetic and fermentation industries – AVAIL.

Contacts

References

S. P. Carruthers, J. S. Marsh, P. W. Turner, F. B. Ellis, D. J. Murphy, T. Slabas and B. A. Chapman. 1995. Industrial Markets for UK-Produced Oilseeds. HGCA Research Review No OS9. London: HGCA.

M. Focke, W. Hemmer, B. Hayek, M. Goetz, R. Jarisch. 1998. Identification of allergens in oilseed rape (*Brassica napus*) pollen. *International Archives of Allergy and Immunology*. vol. 11. pp 105-112.

The Hutchinson Family Encyclopaedia. 2000. Helicon Publishing Ltd 2000.

A. Merrian. 1989. Double low oilseed rape in France: Factors affecting glucosinolate levels. *Aspects of Applied Biology*. vol. 23. pp109-116.

G. Antonini, P. Burghart, L Champolivier, J. Evrard, J. Gueguen. 1999. Evaluation of non-food utilisation of rapeseed meal. *New Horizons for an old crop.* Proceedings of the 10th International Rapeseed congress, Canberra Australia.

J. Howell, Resins from Vegetable Oils: from grams to kilograms and beyond. http://www.ost.gov.uk/link/08_Howell_JS.pdf

IENICA Summery Report for the European Union. 2000.