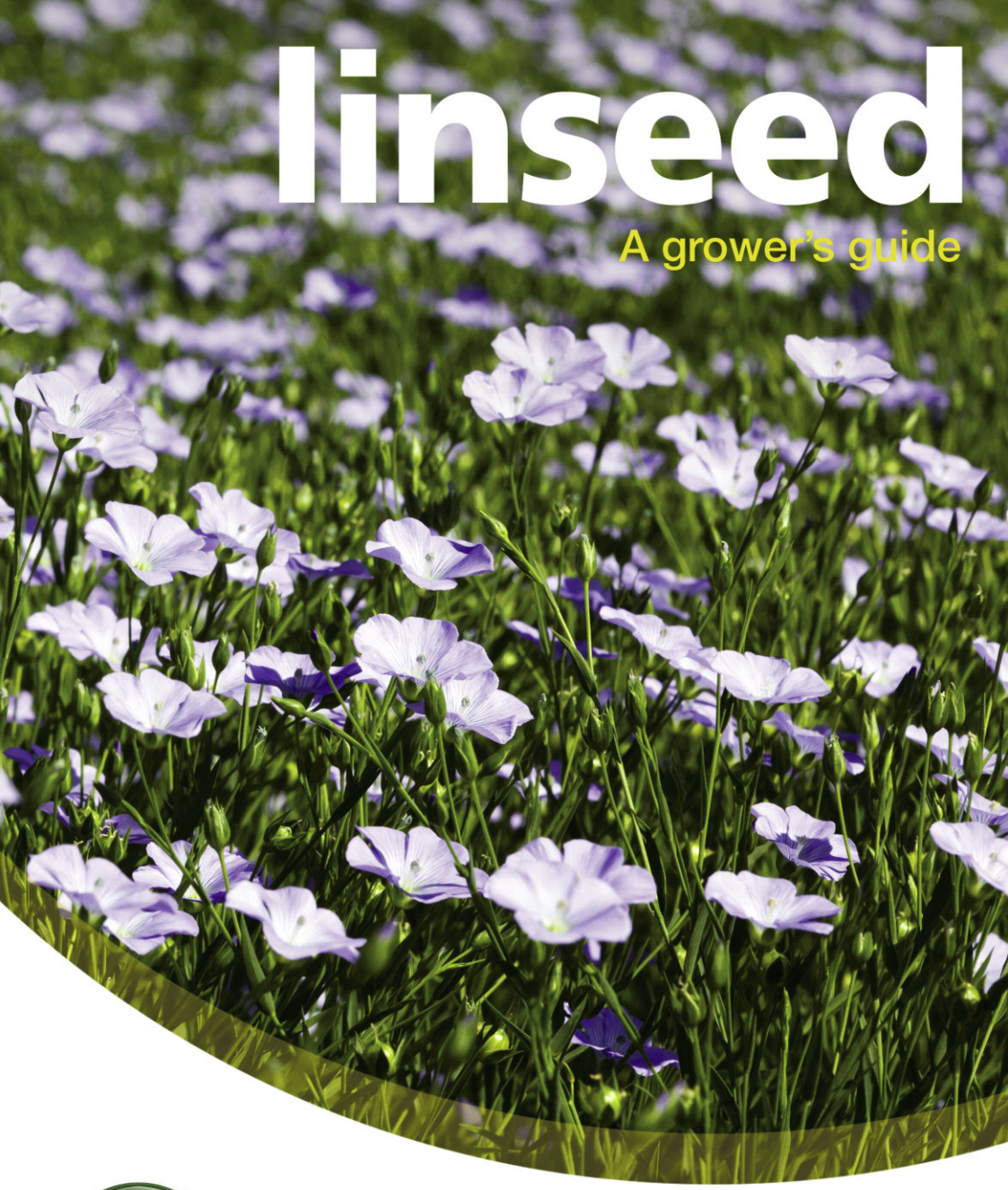
linseed

A grower's guide



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A Premium Crops booklet produced in association with *CPM*

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Introduction

Contents

There can be few growers who haven't considered over the past 12 to 18 months whether they should widen their rotation by introducing a new crop. Blackgrass has been one of the key drivers. But with oilseed rape proving increasingly troublesome, and the ecological focus area advantage falling away from pulses, linseed is firmly back in the picture as a strong option.

The good news is that varieties have moved on in recent years, as has agronomic understanding of the crop. Spring linseed has always had the reputation of a crop for which a there's a good range of off-label herbicide approvals. Now there are a number of good winter linseed options that make the crop stack up well against other winter breaks.

This is progress that's needed, because linseed brings with it a number of stumbling blocks that have tended to make growers shy away from the crop. Not least of these is a reputation of a crop with a poor gross output. Harvesting difficulties also rank high as a reason it's fallen out of favour, often coupled with a late maturity.

That's why *CPM* is pleased to support this technical guide that's been compiled by Premium Crops. The company's put considerable investment into testing varieties for the UK market and developing the agronomy of the crop. Much of that information has been brought together into this guide.

Starting with a summary of the market, there's then a good insight into varieties, given by the breeders themselves. You'll probably be surprised, not just at the range of options available in both spring and winter types, but also how they stack up financially – there's clear information on all these aspects. A thorough walkthrough the agronomy is rounded off with valuable tips on a hassle-free harvest. There are then experiences direct from two growers who have come back to the crop.

Linseed's unlikely to become the highest performing crop in your rotation, but it could become a useful addition, especially if you have agronomic issues on your farm that need ironing out. All that's probably keeping you from giving linseed another go are answers to some of the questions you may have about the crop. We think you'll find those answers in this booklet, which makes it one worth hanging on to.

Tom Allen-Stevens, Editor, CPM

Markets

In addition to the UK and Europe, linseed supplies come from as far afield as Canada, Ukraine, Russia and Kazakhstan, which means that despite its relatively small size, of 1.5 to 2 million tonnes, linseed is a truly global crop.

There are many types of linseed, varying skin colour and oil characteristics for example; most brown linseed globally is crushed to produce technical oils for use in paints and varnishes; most famously in the manufacture of linoleum flooring and the treatment of cricket bats! Most yellow linseed is destined for for use as confectionery and human consumption.

Whether it is brown or yellow, virtually all UK linseed is used in the human consumption food chain either directly as grain or indirectly as a processed product.

In recent years, a new market for high Alpha-Linolenic Acid (ALA) or high Omega-3 linseed has emerged primarily for use in specialist animal feeds. For example Valorex, a French animal feed company linked to the association 'Bleu Blanc Coeur', buys over 55,000t of high ALA Linseed each year for use in its 'Tradilin'-branded animal feeds. Livestock fed on these linseed-based feeds produce meat and milk with improved Omega-3 content and the animals themselves show significant benefits. For example, dairy cows using this product show:

- Improved milk yield
- Increased fertility
- Reduced acidosis
- Improved body condition
- Reduced methane output

All the winter linseed varieties currently available are brown and have conventional ALA content. There is far more variation in spring-sown linseed available with brown and yellow seeded varieties and standard or very high ALA types.

Unlike many cereal crops or oilseed rape, there is no futures market for linseed and like all markets, daily prices are a function of supply and demand. This causes a lack of transparency and liquidity in the spot market and growers are advised to market their linseed to avoid the risks by locking into a secure, fixed price contract or one linked to a crop with the transparency of a futures trade, such as oilseed rape, rather than struggling to sell into a market place already well supplied with pre-contracted material.

Linseed seed is either brown or yellow and the colour has some impact on the final end-use of the crop.

Valorex is a French animal feed company that buys over 55,000t of high ALA Linseed.

Breeding insight

Linea Semences

Linea is a breeding company located in France that creates both winter and spring-type fibre-flax and linseed varieties. Thanks to the many winter linseed trials locations: – five in France, three in UK and some others in Europe – Linea has registered more than 10 different winter linseed varieties, since 2001.

With more than 70 new different crosses made each year and more than 1200 plots of inbred lines in our various trials, our goal is to offer farmers the maximum income with the best genetics.

Reynald Tevernier, breeder

The breeding aims are yield, oil and linolenic fatty acid content, diseases tolerance, winter hardiness, lodging resistance and earliness. Due to the particular weather conditions in UK the breeding program pays more attention to lodging and disease resistance. Our current winter linseed offer is essentially based on **Alpaga** and **Angora**, which have the best market share with a high yield and frost tolerance in the official trials in France.

Linea is also a breeder for spring linseed, our second market for linseed. Our trials based in France and UK allow us to work on the quality traits of the seed (colour and thousand grain weight), as well as the other criteria of the winter types. As we are also a fibre-flax breeder we focus the linseed breeding on low fibre content to obtain easy cut varieties. **Altess**, **Marquise** and **Empress** – varieties specially bred for UK market – bring with them an early and secure harvest.

In future, we plan to bring to UK farmers yellow grain varieties of spring and winter linseed and new varieties with different fatty acid profiles that permit new uses of the grain and subsequently new markets.

Laboulet

Laboulet semences is a family-owned company located in Somme, to the north of Paris. We work on protein pea, maize (especially ultra-early varieties), sunflower and linseed breeding.

Situated close to England, our climatic conditions in Picardy allow us to breed varieties well adapted to the UK: early and resistant to lodging and diseases.

In addition to grain yield, oil and Omega-3 contents remain major criteria, to meet agri-food industry expectations.

Our strength also lies in introducing atypical products such as **Orival**, the first winter yellow linseed variety in Europe, and very high Omega-3 linseed.

Id Grain

Located in the south of France, near Toulouse, Id Grain's core business is the development and marketing of specialist crops and seeds for agriculture and industry: bird food, oil crushing industry, human food.

Id Grain breeds, tests and develops a large portfolio of varieties in speciality crops. With our strong connection to the industry and to the plant-breeding sector, our research and agronomist team take into account the needs of all links in the chain, from the farmers to the final consumers. All our varieties are largely tested in the different European countries before being launched on the market.

Due to its agronomical and market interests, linseed is a key crop in our portfolio, so we have developed a full range of varieties: spring and winter brown linseed, and yellow linseed, that suit UK farmers:

- **Omegalin** is one of our top performers in spring brown types: very good yield potential, good agronomics (standing power/disease tolerance), and with a very high Omega-3 content.
- **Scorpion** assures a very high yield potential on the yellow spring segment.
- Our winter brown variety **Volga**, combines winter hardiness, lodging resistance, and a good ratio between yield and oil content, making it suitable to be grown in the UK.

Our breeding of new varieties is focused on improving yield potential as well as oil content with a high Omega-3 content. Earliness and disease resistance are also high priorities for our research team.

Winter Linseed

“ A diverse crop rotation aims to break cycles of pests and diseases, improve weed control options and improve nutrient cycling and soil condition ” AHDB Research Paper

Winter Linseed ticks a lot of the boxes as a true break crop in a cereal-based rotation.

Breaking cycles

Pests – The winter linseed crop is not a target for Cabbage Stem Flea Beetle (*Psylliodes chrysocephala*) that causes so many of the problems associated with establishing oilseed rape and the Flax Flea Beetle (*Aphthona euphorbiae*) is active in the spring, so an autumn-sown crop avoids that pest too.

Linseed is not particularly attractive to slugs either and many growers report significant reduction in slug populations following linseed crops.

Diseases – Linseed suffers from relatively few diseases, in particular for those with oilseed rape in the rotation it will provide a valuable break from clubroot (*Plasmodiophora brassicae*) and stem canker (*Leptosphaeria maculans*). Unlike OSR, linseed does not suffer from Turnip Yellow Mosaic Virus (TYMV) either.

Improving weed control

As a dicotyledonous crop, control of grassweeds in winter linseed is good and there is a wide range of broadleaf herbicide products with EAMU approvals for use on winter linseed, providing control of difficult weeds such as runch, charlock and cranesbill. There are even some EAMU approved products with good activity on blackgrass. You can find a full list of EAMU products on the HSE Pesticide Register at ***https://secure.pesticides.gov.uk/pestreg/*** or at ***http://www.premiumcrops.com/winter-linseed/useful-documents.html***

Nutrient cycling and soil condition

Linseed provides an excellent entry into wheat leaving a friable seedbed ideal for min-till situations and, as winter linseed is not related to any of the other major break crops, the nutrients it does use and the root profile in the soil is significantly different to allow a proper break for the soil to recover.

In a recent survey of winter linseed growers, conducted by Premium Crops, one in three of the growers who responded said that the crop that followed winter linseed performed ‘better’ than similar crops grown after another break crop.

Varieties

In recent years, advances in plant breeding have brought forward varieties with improved winter hardiness and standing power and this has seen the area sown in the UK grow significantly in 2016 and 2017.

There are no ‘official’ trials for winter linseed in the UK so in 2016/17 Premium Crops commissioned trials with NIAB-TAG and Scottish Agronomy to enable UK growers to compare the performance of varieties under UK conditions. The first of these trial results are available at ***http://www.premiumcrops.com/crop-trials/winter-linseed-trials.html*** (see chart opposite).

The main varieties in the market are shown in the table opposite.

Premium Crops has commissioned winter linseed trials with NIAB-TAG and Scottish Agronomy so UK growers can compare the performance of varieties.

Gross Margins

Regardless of the benefits associated with winter linseed as a true break crop, the opportunity to earn cash from the non-cereal part of any arable rotation is vitally important.

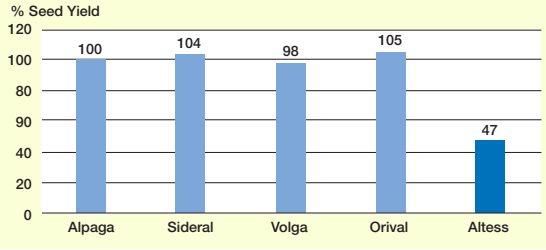
As brown linseed, the winter crop can typically earn in the region of £350/t in commercial contracts and UK yields average around 2.75t/ha, which means that growers can expect to earn a gross income in the region of just under £1000/ha.

Typical costs for seed and crop inputs including fertilisers are usually around £400/ha, leaving a gross margin of around £570/ha, which compares well with most of the other major winter-sown break crop options.

Winter linseed cost calculator

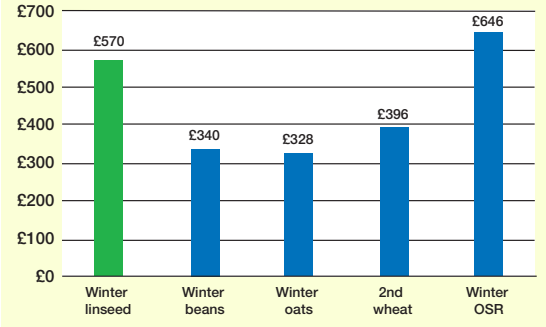
	Value (/ha)
Yield	2.75t
Gross return @ £350/t	**£963**
Variable costs	
Seed	£95
Fertiliser	£138
Crop protection	£160
Total variable costs	**£393**
Gross margin	**£570**

Winter linseed variety trial 2016/17



Source: Premium Crops trial conducted by NIAB-TAG at Sutton Scotney, Hants; 100%=2.5t/ha; CV=5.94; Altess is a spring variety sown in the winter trial for comparison purposes

Typical gross margins of winter-sown break crops



Source: Premium Crops

Main UK winter linseed varieties

Name	Breeder	Notes
Alpaga	Linea Semences	The UK's most popular winter linseed variety, Alpaga, offers a strong combination of good winter hardiness, short, stiff stems, early maturity and reliable yields
Sideral	Laboulet	An older variety than Alpaga, Sideral, offers similar yields on a slightly taller stem with similar standing power and winter hardiness
Volga	id Grain	New to the UK, Volga is a taller, slightly weaker stemmed variety with later maturity and a high yield capability. Early indications are that this variety is well suited to lighter land or drought prone locations.
Orival	Laboulet	A brand new, yellow seeded variety with taller stems than Alpaga and medium maturity. Early indications are that this variety has good yield potential

Spring linseed

Linseed is a different crop under the three-crop 'greening' rule for diversification, offering lots of opportunity for blackgrass control and excellent entry into subsequent wheat crops.

Like winter linseed, the spring-sown crop is unattractive to slugs, doesn't suffer from cabbage stem flea beetles and the diverse range of different market options from standard brown seed to high omega-3 grain means that there is plenty of opportunity for premiums.

Typical yields from spring linseed are in the range 1.7-2.5t/ha, many growers will budget for "1t/acre", although yields of more than 3.7t/ha have been reported in the UK.

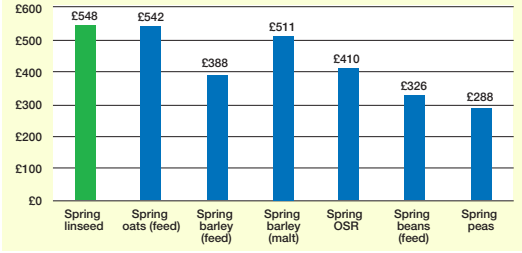
Varieties

The UK crop in 2017 was around 25,000ha and given this relatively small area there are a surprisingly large number of varieties for UK growers to choose from.

AHDB publishes a Descriptive List of varieties every year based on the material that is available to them for testing and that list can be found on the AHDB website at ***https://cereals.ahdb.org.uk/media/1209639/Table-20-Spring-linseed-AHDB-Descriptive-List-2017.pdf***

To supplement the List, Premium Crops commissions a network of spring linseed trials each year with a range of third party providers including Envirofield and NIAB-TAG. This trial network allows the additional comparison of Common Catalogue varieties that aren't included in AHDB data.

Typical gross margins of spring-sown break crops



Source: Premium Crops

Premium Crops' Descriptive List of spring linseed varieties 2017/18

	Candidate														
	Juliet	Empress	Brighton ©	Marquise ©	Batsman ©	Scorpion	Abacus	Eurodor	VT50 (Nulin)	Altess	Comtess	Omegalin	Festival	Aries	Duchess
Mean		Control	Control	Control											
Variety Type	Brown	Brown	Brown	Brown	Brown	Yellow	Brown	Yellow	Yellow	Brown	Brown	Brown	Brown	Brown	Brown
1st Commercial Harvest Year in UK	2001	2017	2011	2014	2012	2016	2006	2015	2016	2009	2016	2015	2012	2009	2012
Seed Yield as a % Control 2.54	103%	102%	101%	100%	99%	97%	98%	96%	96%	95%	95%	91%	90%	90%	90%
Agronomic Features*															
Plant Height (cm)	62	58	63	58	63	56	59	49	61	52	58	58	62	62	59
Earliness of Maturity	4	6	5	7	6	7	7	6	7	8	5	6	7	6	7
Breeder	GK Hht. Hungary	Linea Semences	Van de Bilt Netherlands	Linea Semences	Van de Bilt Netherlands	Terre de Lin, Fr	John Turner SD	Linea Semences	Cro Prodt'n Svcs, Can	Linea Semences	Linea Semences	Terre de Lin, Fr	Labouret Semences	Limagrain	Linea Semences
UK Agent	Agrii	Premium Crops	Elsoms	Premium Crops	Elsoms	Premium Crops	John Turner SD	Premium Crops	Premium Crops	Premium Crops	Premium Crops	Premium Crops	Premium Crops	Limagrain	Premium Crops

*Source: Data from trials commissioned by Premium Crops and run by independent operators; Yield is a mean of five trials across four harvest years (2013-2016 inclusive); *1 to 9 scale – 9 = character expressed to a high degree; Yield differences of less than 8% should be treated with reserve, 'Candidate' varieties are based on very limited data.*

Apart from choosing a variety with the grain qualities to suit the end market, most UK growers will choose their variety based on the likely growing conditions e.g. higher fertility sites will favour shorter, earlier varieties, and on the intended harvest date and following crop e.g. growers looking to harvest in late August will select earlier types.The main varieties in the market are shown in the table opposite.

Gross Margin

Spring linseed stacks up well for profitability compared with most of the other spring cropping options (see chart on p10).

Spring linseed cost calculator

	Value (/ha)
Yield	2.4t
Gross value @ £350/t	**£840**
Variable costs	
Seed	£95
Fertiliser	£112
Crop protection	£85
Total variable costs	**£292**
Gross margin	**£548**

Main UK spring linseed varieties

Name	Breeder	Notes
Marquise	Linea Semences	One of the UK's most popular spring linseed varieties, Marquise is a brown-seeded type offering a strong combination of reliable yield, very early maturity and short stiff stems with the 'easy-cut' low fibre character for ease of harvest.
Empress	Linea Semences	A new medium /early brown seeded variety with short, stiff stems and very high seed yield.
Altess	Linea Semences	The earliest variety available, Altess, is similar to Marquise in it's 'easy-cut' stem characteristics.
VT50 (aka Nulin)	Crop Production Services	The ultra-high Omega-3 variety, VT50 is a yellow seed type with medium/early maturity, short stiff stems and a good yield in trials.
Omegalin	Terre de Lin/ id Grain	An elevated ALA content just below VT50 this brown-seeded variety offers good yields, medium/early maturity and short stems.
Scorpion	Terre de Lin/ id Grain	A yellow-seeded variety with short stems and early maturity.
Brighton	Van de Bilt	A very high yielding medium/late maturing, brown-seeded variety with medium/tall plant height.
Batsman	Van de Bilt	A high yielding medium maturing, brown-seeded variety with medium/tall plant height.
Juliet	GK Hht	The highest yielding variety with the latest maturity. It has brown seeds and a medium/tall plant height.

Linseed agronomy

Linseed establishment and nutrition

Sowing and establishment

Soil type and geographic area:
Both winter and spring linseed will grow in all parts of the UK and on most soil types.

Seedbed:
Like most small seeded crops, linseed will require a firm fine seedbed. To conserve moisture, min-till and direct drilling techniques can be used.

Seed rate:
For winter linseed, the aim is to establish around 400 plants/m^2, so in normal autumn conditions a sowing rate of 450 seeds/m^2 is advised. For most varieties this will be around 32kg/ha of seed. For spring linseed, the aim is to establish 600 plants/m^2 by sowing between 650 and 800 seeds/m^2 depending upon conditions.

Sowing date:
Winter linseed: September. The rule of thumb is to sow after oilseed rape but before wheat.

Spring linseed: March and April, once soil temperature is 7°C and there are mild weather conditions forecast. The rule of thumb is to sow after barley but before maize.

Sowing depth:
Sow into moisture at a depth of 2-3cm.

Weed control

Best control is achieved through applying a sequence of products through the season. Various sequences, both pre and post-emergence for broadleaf weeds and grasses can be used. See the chart below for key products and target weeds.

Crop nutrition

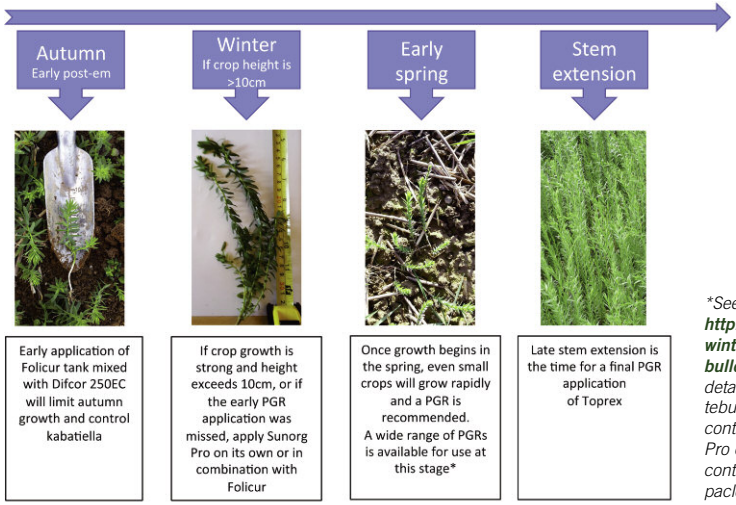
Nutrient management for linseed is primarily about feeding the crop for yield and performance and not just feeding the stems. In practice this means that it is important to target applications of nitrogen so that it is available to the plant from flowering onwards as any earlier applications will be wasted in promoting excessive stem growth and increased lodging risk.

Linseed key herbicide products and their activity

	Product/Control Level					
	Avadex Excel (pre-em)	Calisto (pre-em)	Falcon (post-em) < Growth stage 1.3	Bullion (post-em) (winter crops only)	Centurion Max	Crawler (winter linseed only)
Target Weeds						
Blackgrass *(Alopecurus myosuroides)*	Good	Additional control if used with Avadex			Good	Good
Wild Oats *(Avena Fatual)*					Good	Good
Brome *(Bromus spp.)*					Good	Medium
Ryegrass *(Lolium spp.)*					Good	Good
Annual Meadow Grass *(Poa annua)*		Good				Good
Volunteer Cereals			Good			Good
Annual Broad LeafedWeeds		Good	Good control of non-resistant grasses when used alone up to G5 22	Good especially for charlock, runch and cranesbill		Medium

The Linseed herbicides listed have EAMU approval only. Details of these and the full list of other products available can be found at ***http://www.premiumcrops.com/winter-linseed/useful-documents.html***
Avadex Excel contains triallate; Callisto contains mesotrione; Falcon contains propaquizafop; Bullion contains flupyrsulfuron-methyl; Centurion Max contains clethodim; Crawler contains carbetamide

Winter linseed canopy management timeline



*See **http://www.premiumcrops.com/winter-linseed/winter-linseed-bulletins.html** for the latest details Folicur contains tebuconazole; Difcor 250EC contains difenoconazole; Sunorg Pro contains metconazole; Toprex contains difenoconazole+ paclobutrazol*

Micronutrients:

Micronutrient applications must include manganese and zinc. To address any deficiency requirements, applications should be adjusted to correct for pH levels restricting availability - examples are shown in the table right.

Canopy management

Managing the height of a linseed crop is more important for winter linseed because of lodging risk from flowering onwards. Along with the careful timing of N applications (detailed below) applications of Plant Growth Regulators (PGRs) in the autumn and again in the spring will be necessary to deliver a standing crop to the combine. A range of fungicides with PGR activity is available and, as fungicides, they offer the additional benefit of providing control of diseases (see chart above).

Canopy management is not as critical in spring linseed; by limiting the amount of N applied in the first application and delaying the second application until green bud, when most of the stem growth is complete, excessive stem growth can be controlled without the use of PGRs.

Micronutrient applications	
Soil pH under 6.0	Soil pH over 7.7
Magnesium (Mg)	Copper (Cu)
Calcium (Ca)	Iron (Fe)
Molybdenum (Mo)	Boron (Bo)

Macro nutrient applications

As a general guide and depending upon local conditions, spring linseed will require around 30kg/ha of N, P, K and S in the seedbed followed by around 70kg/ha N at green bud stage. Winter linseed applications are dependant upon crop growth, so require more attention and are detailed below.

Winter linseed

	Seedbed (August / September)	Early spring (March)	Green bud (April)
Phosphate (P)	50 kg/ha	-	-
Potassium (K)	50 kg/ha	-	-
Nitrogen (N)	Nil	50kg/ha if crop height is <15cm 40kg/ha if crop height is 15-20cm 30kg/ha if crop height is >20cm	Quantity remaining to take total crop N applied up to 125kg/ha maximum
Sulphur (S)	-	30kg/ha (min) to 60kg/ha (max)	

Linseed agronomy

Diseases

The main diseases of winter linseed are:

- Kabatiella in the autumn
- Septoria in the spring, and
- Botrytis during flowering

Kabatiella (*Kabatialla lini*) is a disease similar to phoma in oilseed rape.

Infection occurs in the autumn and lesions develop on the stems that can cause restricted growth and plant loss.

Kabatiella lesions develop on the stems.

Control is through prophylactic application of fungicides, such as Difcor250EC. This is usually tank-mixed with the first PGR application in the autumn.

Septoria (aka pasmo) (*Septoria linicola*) is a foliar disease causing dark brown to black lesions on the leaves that reduce photosynthetic area, reducing yields.

Inoculum starts in warm wet spring conditions and spores are distributed by rain splash throughout the canopy.

Control is usually achieved through application of fungicides at late stem extension/green bud stage. Many of the fungicides applied for their PGR activity will also have an effect on septoria.

Botrytis spp. typically develop as a grey mould on the surface of bolls and leaves.

The disease occurs most frequently in damp weather conditions and increases as bolls begin to senesce towards maturity. Infection will cause premature drying of bolls and may penetrate the bolls to infect seed.

Septoria, or pasmo, causes dark brown to black lesions on the leaves.

Pests

Pigeons pose a risk in terms of grazing in winter and early spring. So long as the plants are sufficiently large and robust, the birds tend to take out the main growing point leaving the roots and part of the stem in the ground. This usually re-grows with new side branches.

Slugs are less of a problem in wheat following linseed than after OSR.

Botrytis is typically seen as a grey mould that develops on the surface of bolls.

Slugs do not like the environment of a linseed crop and tend only to be an occasional problem at early establishment when slug populations from the previous crop are high.

In a survey of 125 growers who grew wheat after oilseed rape and after linseed, two out of three reported 'few or no' slugs in the wheat after linseed compared with four out of five who reported slugs in wheat following OSR. This translated into five times more growers applying two or more doses of pellets to their wheat following OSR compared with the wheat following linseed.

Linseed management timeline

Timing – Winter linseed	Autumn Aug, Sept, Oct	Winter Nov, Dec, Jan	Early spring Feb, March	Late spring April, May	Summer June, July, Aug
- Spring linseed	Spring March, April	Early summer May	Summer June, July		Late summer August
Growth stage	Cultivations and sowing → Leaf development	→ Stem extension	→ Flowering	→ Boll fill	→ Senescence → Harvest
BBCH scale	Stage 0 to stage 14 Sowing to 4 true leaves	Stage 14 to stage 19+ 4 true leaves up to 9 true leaves +		Stage 51 to 69 First buds visible to end of flowering	Stage 71 to 79 First bolls full to all bolls full	Stage 81 to 89 Early ripening to fully ripe
Variety, seed, nutrition & PGRs						
Planning	Choose variety, establishment method and seed rate	Keep crop to a maximum height of 10cm, monitor growth regularly	Monitor crop for early signs of spring growth	Calculate remaining N requirement (i.e. 120kg/ha less any N already applied)		
Action	Sowing and N, P & K if needed. Apply S (spring crops only)	Apply PGR as required (winter crop)	Apply PGR as required Keep N applications to a minimum Apply P,K and S plus trace elements as required	Apply remaining N at green bud/early flowering		
Weeds						
Planning	Assess weed risk, plan cultivations and weed control strategy. Monitor for cereal volunteers	Monitor for resistant grass weeds				Check the crop for ripening.
Action	Pre-em herbicides Post-em herbicides	Apply late season grass herbicides				Apply (diquat only) desiccant when bolls are dark brown and most seeds are light brown
Pests & diseases						
Planning	Monitor for slug damage at establishment	Prophylactic control of *Kabatiella linicola*	Monitor for pasmo and kabatiella		Monitor for late infections of pasmo and botrytis	
Action	Treat if required	Tank mix fungicide with PGR	Tank mix fungicide with PGRs		Apply late season fungicide when there are more bolls than flowers	

Linseed harvesting

Winter linseed should be ready for harvest from mid-July to mid-August

Spring linseed should be ready for harvest from mid-August to mid-September

Ask regular growers of linseed and they will tell you that they harvest linseed faster than any other crop. How do they do this?

- Harvest EARLY, as soon as the crop is ready, even if the stems are still green
- A DRY day, anecdotally the humidity should be 65% or less
- A SHARP knife is needed and one that is in good condition, and
- The knife needs to sit tight on the fingers to ensure a good shearing action.

Desiccation

Desiccation of the linseed crop is as much about conditioning the stems for harvest and removing excess green material from weeds as it is about actually accelerating the natural senescence of the crop. With that in mind, diquat is the preferred desiccant as it doesn't present the same issues with the timing of application as glyphosate, which requires green leaves to be active for take up.

The optimum time for the application of diquat is when the bolls are brown and the seeds inside are a light brown colour.

Harvest

Typically, linseed crops should be ready to harvest 5-10 days after the application of diquat or 10-14 days after an application of glyphosate (a minimum of 14 days between applying glyphosate and harvesting the crop is a legal requirement).

If harvested at the optimum time:

- The top half of the stem will be dead, although the lower half is still likely to be yellowy/green.
- Capsules will be 'parchment' colour.
- Seeds will be dark brown and will easily rub out from the capsules.
- Moisture content of the seed will be 7-11% (preferably 9%).
- When the linseed stem is ready to cut, the fibres (which are arranged in bundles on the outside of the stem) are tightly 'glued' to the inner woody core, making the straw easy to cut.

The optimum time to apply diquat is when the bolls are brown and the seeds inside are a light brown colour.

As the stem ages, the 'glue' that binds the fibres gradually breaks down – a natural process known as retting. This allows the fibres to separate from the stem easily. Retting makes the stem becomes more difficult to cut, more likely to wrap in the combine and a lot more difficult to chop.

Cut at the first opportunity. In the case of winter linseed never be tempted to leave the crop until after you have finished your wheat harvest. While linseed does not shed easily, leaving linseed too long will result in the stems retting.

Combines will cut green linseed straw provided the knife and fingers are in good condition. Use seed maturity/moisture content as your combining guide. Linseed cuts more easily nearer the ground.

The combine is the best judge of whether to harvest linseed and it's not unusual to find with linseed that harvesting will be unsuccessful on one day while the combine will fly through the crop on the next.

Drying and storage

Linseed will typically be harvested at 8.5-12% moisture, with the market standard being 9%. Linseed can be dried in any system that will handle OSR, with similar temperature settings. Care needs to be taken when drying linseed on-floor or in a bin system. Linseed, being a flat seed has a very high resistance to airflow, so the drying front can stall after about a metre or so, resulting in a hard, wet layer. To avoid this, do not dry linseed on-floor above a metre in depth, or in a bin system rotate seed with an empty bin.

Linseed straw disposal

Linseed straw can be disposed of either by chopping or by burning in the swath (it is exempt from the burning ban, unlike cereals). Linseed straw can be chopped some years depending on the season and on the condition of the straw chopper. If the material coming out of the chopper is fluffy and fibrous "like a sheep's fleece" then disengage the chopper – this material is difficult to handle and may cause problems for the drill.

As the stem ages, retting causes the fibres to separate from the stem, making it more difficult to cut.

The most common method is to either push the straw into heaps, or bale in round bales and set alight in situ. Linseed straw burns very hot and clean with very little ash residue. Linseed straw is ideal for on farm straw burners. It is not liked by the straw burning power stations because, perversely, it burns too hot!

Harvesting tips

Tim Hunt, managing director of R Hunt, John Deere dealers in Hants, Wilts and Isle of Wight, takes an active role in combine optimisation and the setup of different crops during harvest.

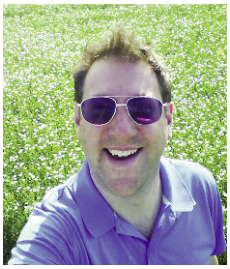
The key to an easy linseed harvest is all about preparation, he says:

- Always start with a new knife
- Keep fingers in good order (if it cuts well, it will flow well)
- If wrapping of the auger occurs, remove feathering fingers (this hardly had to be done in harvest 2017).

"From a John Deere combine point of view, the rest is easy, with tight concaves and a fast drum. Watch the returns carefully, as linseed requires fine adjustment of the bottom sieve to get a balanced and acceptable sample without overloading the returns," he advises.

"The next uncontrollable variable is the sun. Don't push too late into the evening, as linseed, like grass seed, is much easier to harvest with sunshine. If the crop is clean and the sun is shining you can cut similar acres as you would a field of barley."

Grower experience



Tom Clarke
TWH Clarke and Son

Tom Clarke is a fourth-generation farmer with 400ha of peaty fenland and organic silty clay loams near Ely in Cambs. Previously, the rotation relied on root crops with some marrowfat peas. But the loss of "vital" chemistry for weed control in pulses, and a growing weed burden, brought the potential benefits of oilseeds into focus.

"Our rotations were maxed out for root crops such as sugar beet and potatoes. OSR didn't suit our land and I felt the crop had poor prospects. I also didn't want to invest in new kit so it had to be something that could be combined," he explains.

"We tried linseed and it worked pretty well the first year or two. We then had a couple of disappointing years and the contract price fell, so we dropped the crop in 2015. But now we've brought it back with a new approach which has worked fantastically."

At first, linseed was used as a break between wheats when they couldn't fit beet or potatoes into the rotation. But spring-sown wheats following roots have struggled to make a good net margin.

"Our breakthrough was to drill linseed in late Feb – we're lucky that our soils allow this. We tried it out last year and it was a triumph, yielding just under 3t/ha, while the early sowing meant we missed the Flax Flea Beetle."

As a result, Feb-sown linseed has made around twice the gross margin of spring wheat for two years now. "Next year we'll be trying some of it after beet as we think the deep roots will help restructure the soil."

Three different varieties have been grown – Valoal, Altess and Marquise. Marquise is the current favourite being "Easycut" and fast maturing, he notes. "We've actually grown it for seed for Premium Crops too, which brings in an extra premium."

Wheat stubbles are sprayed off and then given one pass with a subsoil/disk combo. A Lemken Solitair Combi drill does the rest. "We don't put on any nitrogen – on our soils the biggest risk is that the crop will get too tall and lodge, and it wouldn't be a break crop if you didn't get to save money somewhere." One herbicide and up to two fungicide sprays are applied, with tebuconazole also acting as a PGR.

Drilled in Feb, linseed is ready for combining in early to mid-Aug, says Tom. "When it comes to

harvest, I won't lie – I can never really relax until the linseed is in. Harvest is make or break for the crop and you have to harvest it dry, otherwise you risk the combine header choking on old rope."

With 2017 being a "catchy" year, the crop was harvested in between fields of spring wheat as soon as the moisture got below 10% and the sun was shining. "You have to bale the straw – it won't chop. The bales are fantastic for beet clamps, lasting three years or more where wheat straw bales crumble in months," notes Tom.

He puts the yield at around 2.5t/ha, which will bring a gross margin of over £500/ha. "That's better than our spring wheat by some way, and might even beat our winter wheat in what has been a very poor year," he adds.

"Linseed is a true break crop. The available actives and weed burden are different to everything else we grow and our current system allows us to establish and grow it with minimal inputs and costs. It leaves the land in very good nick with the soil structure afterwards very light and friable. It also looks pretty – farmers need all the good PR we can get at the moment."

Tim Payne
Robert Payne Partners

Farming 120ha with another 100ha under a management agreement in South Lincs, Tim Payne has recently widened his rotation to include winter linseed in amongst wheat, oilseed rape, spring barley and sugar beet.

"Winter linseed has higher growing costs than the spring crop, but half of the farm doesn't suit spring drilling, so an early to drill, early to harvest crop is a big attraction," he says.

"I was also keen to get away from second cereals in the rotation as they seem partially responsible for the build-up of grassweeds. The farm also suffers from beet cyst nematode in certain fields, so linseed offers a replacement for oilseed rape – a BCN host."

BASIS and FACTS-qualified, Tim Payne looks after the agronomy of the crop, which for 2017 harvest was the variety Alpaga, drilled in mid-Sept with the farm's 34-year-old Moore Unidrill. This went into land prepared with a Tillso Sabre with Ultralight legs, followed up by a Cultipress.

The herbicide strategy comprised of a pre-emergence application of Callisto, Centurion Max (clethodim) when blackgrass was at two leaf, followed by either amidosulfuron or bromoxynil, "A spray miss highlighted how well the Centurion had worked," he reports.

"One field was planted after a destroyed crop of wheat, which was followed by a cover crop. The phacelia that was in the mix gave us a few headaches and extra costs."

The fungicide program cost a little more than anticipated, with an autumn application of difenconazole, a metconazole and prothioconazole brew going on mid March with trace elements, Toprex (difenoconazole+ paclobutrazol) applied mid April for growth regulation, followed by tebuconazole in June after flowering to keep the bolls clear of disease.

Nitrogen was split into two applications, continues Tim. "The first of 40kgN/ha with 25kg/ha of SO3 was applied in early March for canopy building. The second dose of 55kgN/ha was applied at green bud stage, purely for yield. Higher yields appeared to come from shorter areas of crop, suggesting the nitrogen split needs to be carefully managed."

Diquat was applied two weeks before harvest that started on 17 July. "Despite a new knife and fingers on the combine, it soon became clear that all vertical play on the knife needed to be eliminated for efficient cutting. Straw was baled and removed, mainly for reducing extensive cultivations needed to incorporate poorly chopped residues."

With the final yield looking to come in around 2.25t/ha, it's less than what Tim had hoped for, but is a "good place to start," he says. "The establishment behind the Moore was lower than I would have liked, ranging from 55-70%. The 186mm row width was wider than the crop was happy with, and too much intra-row competition led to leggy plants that competed with each other." He's hoping a change of the drill to one with 125mm row width will lead to a better spatial distribution.

"Winter linseed at 2.25t/ha isn't going to set any gross margin records, but given the right management and fine tuning, I think the crop has good potential. It seems to fit well on the farm for many reasons and the benefit from growing it will be felt elsewhere in the rotation. The soil is in very good condition after linseed, so the Tillso Sabre tine and press combination creates an excellent seedbed for the following crop of wheat, with minimal cycling of blackgrass seeds through the soil profile," concludes Tim.

For further information contact:
Premium Crops Ltd
Whitedale Farm, East Street, Hambledon, Hampshire.
PO7 4RZ
Tel: 02392 632883
E-mail: info@premiumcrops.com
Website: www.premiumcrops.com

Acknowledgements

Avadex Excel (triallate) is a Gowan Crop Protection Ltd product
Callisto (mesotrione), Toprex (difenoconazole+ paclobutrazol) are Syngenta Group products
Falcon (propaquizafop), Crawler (carbetamide) are Adama Group products
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Centurion Max (clethodim) is an Arysta LifeScience product
Folicur (tebuconazole) is a Bayer CropScience Ltd product
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