THE ESSENTIAL ABOUT RAPESEED

Technical guide
for successful growing

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GENERAL INFORMATION ABOUT RAPESEED

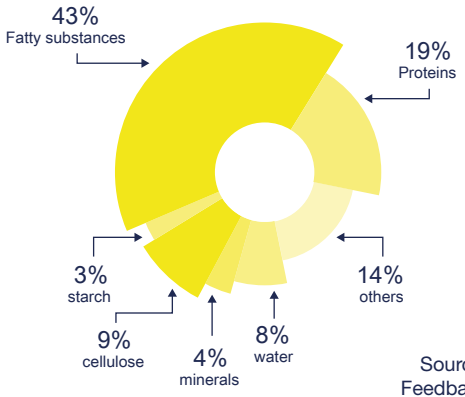
What are the benefits?

Why do we use hybrids?

A BIT OF HISTORY

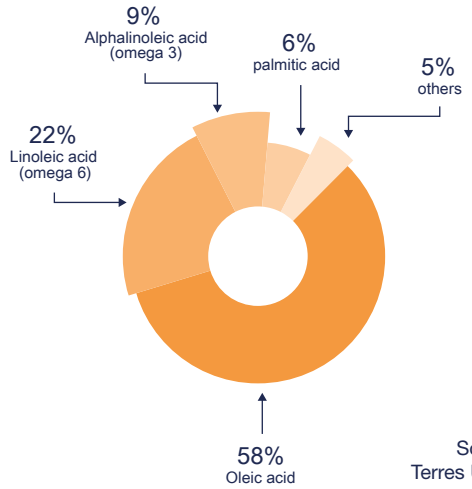
- Brassica napus napus.L. is a natural cross between a cabbage (Brassica oleracea L.) and a turnip rape (Brassica rapa L.). The centre of diversification for rapeseed would be at the intersection of the areas for the turnip rape (Europe, Asia) and the cabbage (Western Europe and North West Africa).
- Oilseed rape is explicitly mentioned in Sanskrit texts dating from 2000 to 1500 BC and in Greek, Roman, and Chinese writings dating back to between 500 and 200 BC. Since antiquity, rapeseed or turnip rape has been grown in China and used as edible oils. Its cultivation and trade developed in the Netherlands from the 16th century onwards.
- At that time, rapeseed oil was mainly used as lamp fuel. Later it was used as a lubricant for steam engines. It was not until the 18th century, when processing techniques improved that its oil was used for human consumption in Europe and that its cultivation developed there. Its introduction to Canada is more recent (circa 1942).

The composition of a rape seed



Source: Feedbase

The fatty acid composition of rapeseed oil



Source: Terres Univia

- It was not until the selection of erucic acid-free and low-glucosinolate types of rapeseed was made, in 1975 and 1980 respectively, that its food use was recognised and appreciated by the general public and farmers.
- The use of its oil in developing biofuels, along with Europe's protein deficit, makes rapeseed a crop with a bright future despite strong competition from other types of oil or protein sources.

DIFFERENT TYPES OF RAPESEED

The classic rapeseeds (00)

This category includes rapeseed with various types of acids: lauric acid, stearic acid, oleic acid, linoleic acid. It accounts for the majority of the areas where rapeseed is grown in the world. This rapeseed is used for the production of edible oils (mainly for seasoning, as the oils produced cannot be heated). They also enable the production of biofuel after esterification. Some lubricants, solvents and cosmetics are also made from these oils.

High oleic acid and low linoleic acid rapeseed (000 or HOLL rapeseed)

The areas put into production are limited and subject to specific contracts. The oil from this type of rapeseed contains more than 80% oleic acid. These oils have the particular feature of having an omega 6 and and omega 3 ratio close to 5, the standard recommended by nutritionists. The main use of these oils is in food as they can be heated. They are therefore good frying oils in the catering industry. They are also found in seasoning oils and lubricants.

Erucic rapeseed

This rapeseed is positioned in a niche market. The areas with erucic rapeseed represent only a few thousand hectares across the world. The oils from this production are unfit for human consumption because they contain more than 50% erucic acid. Its outlets are exclusively for industrial applications: detergents (soaps, antifoams, softeners, etc.), lubricants, solvents, cosmetics, agrochemicals, pharmaceuticals and paints.

Rapeseed cakes

Once the oil has been extracted from the seeds, the pressed fragments remain, which are dried and then compacted into granules. In France, consumption of rapeseed cake increased by 53% between 1981 and 1998 and is still growing steadily. This is mainly due to the lowering of glucosinolate levels through genetic selection. Indeed, the degradation products of glucosinolates were responsible for symptoms of loss of appetite or physiological disorders, which greatly reduced the possibilities for its use. As a result of selection work, the level of glucosinolates has been reduced from 80 µmol to less than 20 µmol today, with the limit for marketable seeds being 25 µmol. At present, the substitution of soya cakes with rapeseed cakes is frequent and advantageous in several respects.

We can see:

- An increase in the gross quantity of milk produced daily without any change in the quantity of ingested forage corn
- A decrease in the butyrous rate in milk
- An increase in the protein content of the milk

Another not insignificant aspect is the economic aspect; even if it is necessary to substitute 1 kg of soya cakes with 1.5 kg of rapeseed cakes, the gain in gross margin remains in favour of rapeseed.

Origin of the 00 rapeseed

In the late 1960s, erucic acid in rapeseed was suspected of causing cardiovascular disease. By crossing European varieties with an erucic acid-free cultivar discovered in Canada, INRA researchers succeeded in creating the first erucic acid-free variety, called 0 rapeseed (for zero erucic acid), grown from 1973 onwards. At the beginning of the 1980s, using the same method, varieties without glucosinolates, sulphur compounds that give a bitter taste to rapeseed cakes used in animal feed, were developed. These are what we call 00 varieties.

WHY USE HYBRIDS?

Winter rapeseed comes from a natural cross between turnip rape and cabbage. But it wasn't until the 1980s that the first hybrids appeared. Before that, the only types of rapeseed grown were popular varieties and then pure lines from the 1950s onwards.

Better productivity

Sowing hybrids in most cases allows the plot's yield to be significantly increased (up to more than 10%).

Stability and reliability

In addition to yield, the advantages of hybrids are numerous:
- Better regularity of yield
- Better disease tolerance
- Better stress tolerance
- Best technological qualities (protein content, oil content, etc.)

The heterosis effect, also known as hybrid vigour, translates into a performance gain. The hybrid displays the best of both parent plants and also has some enhanced agronomic traits. The more distant the starting populations are, the greater the heterosis effect. The heterosis effect (performance of the hybrid compared to that of its parents) allows up to 20% more productivity to be achieved.

Heterosis effect

Line A

♂

Traits
Yield +
Precocity
Diseases +
Oil content

Pollen

Line B

♀

Traits
Yield ++
Cold tolerance
Diseases ++
Lodging tolerance

Cross-fertilisation

AB Hybrids
fertile sown by farmers

Traits
Yield ++++
Precocity
Cold tolerance
Diseases +++
Oil content
Lodging tolerance

2-2.5 T/ha

Yield x 2

3.5-4 T/ha

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PHYSIOLOGY OF RAPESEED

What is the rapeseed cycle?

What are the key stages of rapeseed?

THE RAPESEED CYCLE

Rapeseed cultivation lasts 10 to 11 months. The cycle of this crop is marked by a vegetative rest during the winter period, which outlines 2 distinct phases: a first phase from sowing at the beginning of winter (or vegetative rest) and a second from the end of winter or vegetative recovery until harvest.

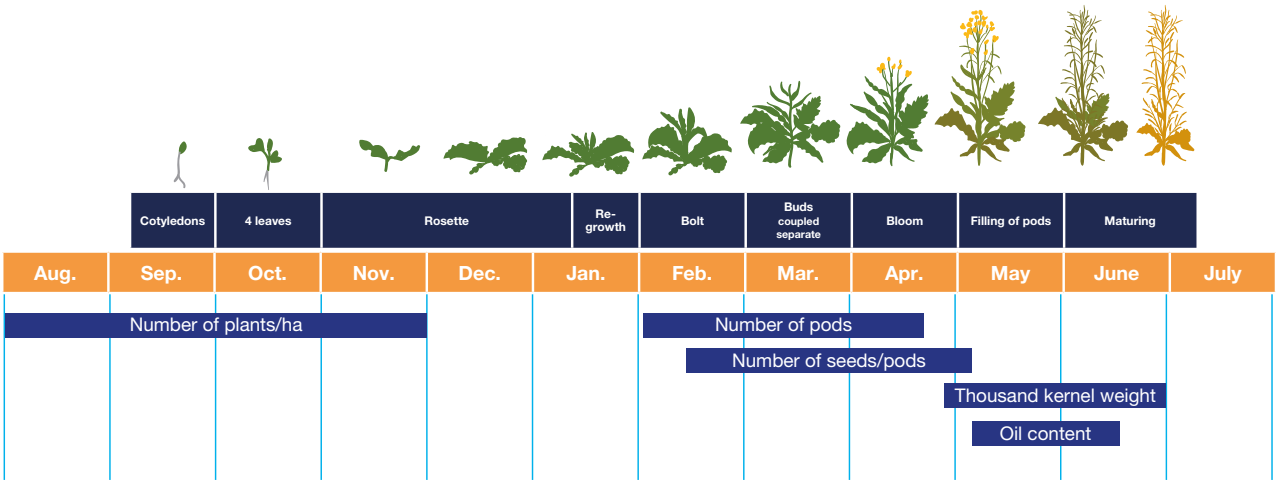
Each of these 2 phases plays a major role in the implementation of the yield. The yield is calculated as follows: Number of pod per plants x Number of pod per plant x Number of seeds per pod x Thousand kernel weight (TKW).

Simple action levers play a role on each of the yield components. To optimise the number of plants, preparing the seedbed is the most important factor, but the choice of variety, with varieties that have a good early vigour or the sowing date, are also decisive.

The number of pods is determined by the temperature between the bud and the bloom. Indeed, cool temperatures during this period will enable a maximum of flowers to be transformed into pods.

The filling of the pods but also of the seeds is determined by fertilisation with nitrogen, phosphorus, phosphate, sulphur and boron. In addition, a strong post-flowering radiation is necessary to feed the seeds with assimilates regularly until maturity.

The success of rapeseed cultivation therefore depends not only on a mastery of the crop itinerary but also on favourable weather conditions during key stages of the cultivation.


Cotyledons
4 leaves
Rosette
Re-growth
Bolt
Buds coupled separate
Bloom
Filling of pods
Maturing
Aug.
Sep.
Oct.
Nov.
Dec.
Jan.
Feb.
Mar.
Apr.
May
June
July
Number of plants/ha
Number of pods
Number of seeds/pods
Thousand kernel weight
Oil content

THE 4 KEY STAGES OF RAPESEED

1. Germination and emergence:

- Sow between 2 and 4 cm depending on the weather conditions of the year
- Aim for a stormy period to facilitate germination
- Use a precision single-seed drill for better emergence quality

2. Autumn growth:

- Reach at least the 8-leaves stage before entering vegetative rest
- Control the risk of elongation
- Possible risk of nitrogen deficiency
- Reach the 4-leaves stage as quickly as possible to limit the impact of autumn pests

3. Flowering:

- Flowering between 3 and 7 weeks depending on the weather conditions of the year
- Sclerotinia sensitivity phase
- Setting the number of pods

4. Maturation:

- Filling of pods and seeds (thousand kernel weight)
- Determination of oil content up to 60 days after the start of flowering
- 9% moisture standard for a harvest

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GROWING RAPESEED

Growing operations:

When and how?

SOWING

Rapeseed is a pivot root plant with a long growing cycle that requires a number of requirements to be met from sowing to harvest in order to be productive.

Sowing should be begun according to several elements which will allow a better emergence dynamic and thus a homogeneous and well-developed population.

What is a good sowing?

Respecting oilseed crop rotation: at least 1 year out of 3.

Sowing at a slow to moderate speed (max 7km/h) because sowing at too high a speed will cause a greater number of gaps and an uneven sowing depth.

Having a good soil structure to promote rooting and development of the pivot root.

Soil preparation plays a decisive role in the germination quality. The soil should be worked early, especially in clayey situations, to avoid further drying of the soil. Early tillage will help facilitate the remoistening and recompacting of the soil.

The objectives of sowing

- **Fast and homogeneous emergence:** to reach the 8-leaves stage at least before entering the vegetative rest stage
- **Installing the pivot root around 10 to 15 cm** deep without deformation
- **Density of 25 to 35 plants/m2:** the density is to be adapted according to the situation of the field. NB: rapeseed can compensate for low densities
- **Rosette stage flattened to the ground** before the beginning of winter: avoid pre-winter elongation

Thanks to its high capacity for compensation, the loss of plants does not have a detrimental effect on rapeseed yield. In case of loss of plants, it is advisable not to rush into destroying the plot. Wait until after winter before making a final decision.

Spacing between row	Sowing density (seeds/m2) according the risk of loss at emergence (Low/High)
Cereal seed drill	**45/60**
40 cm (single-seeded)	**35/50**
60 cm (single-seeded)	**30/45**
80 cm (single-seeded)	**30/40**

The best time to sow? Finding a compromise

- If possible, take advantage of a stormy or rainy period
- Sowing too early can reduce the implantation quality (situation is too dry)
- Sowing too late can lead to underdeveloped rapeseed before winter

For a good sowing:

- Aim for 15 to 40 plants at the end of winter (sow 30 to 60 seeds/m2)
- Prefer a single-seed drill to a cereal seed drill for greater yield
- Sow between 2-4cm depending on the humidity in the soil
- Adjust the density to the spacing between row (see table above)

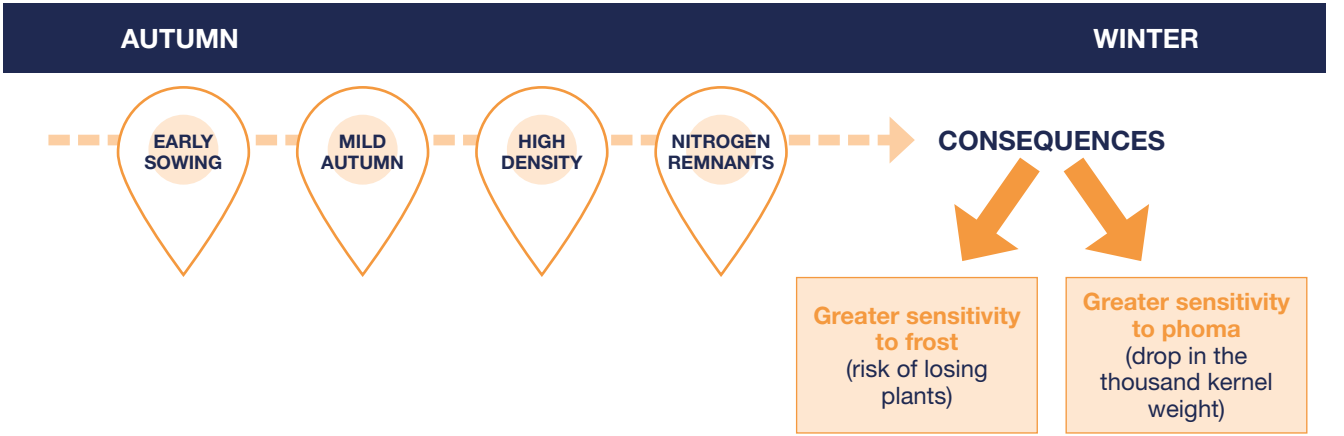
What are the steps for adjusting the seed drill?

- Check the sowing coulters for wear
- Examine the disc for wear
- Monitor tire pressure
- Reinspect the blowing system
- Clean the micro granulator

REGULATION

- One of the main risks from sowing to the beginning of winter is elongation. The elongated part of rapeseed is particularly sensitive to cold. Some agronomic methods can limit this risk:
  - Decreasing the sowing density
  - Using a variety that is not very sensitive to elongation
  - Limiting nitrogen application at sowing time
- It is also possible to use a chemical regulator to limit elongation. In this case, the regulator must be used at the 6-8 leaves stage for it to be effective. If the regulator is used later, it will be ineffective.

No elongation Elongation



Notes

WEEDING

Weeding is a key element of the rapeseed field itinerary. Indeed, if there are too many weeds on the field, this may slow down the development of young rapeseed and increase competition on water and nutrients, which can therefore lead to a loss of yield.

Mechanical weeding

- Mechanical weeding on rapeseed is possible but the risk of damaging young plants is high (up to 10% loss of plants). Do not hesitate to increase the density and seeding depth if mechanical weeding is planned.
- It is also important to use the right tool at the right stage. A spiked harrow or a hoeing harrow are not recommended before 3 leaves stage.

Advice on mechanical weeding operations

	Pre-emergence	A Cotyledons	B1 1 leaf	B2 2 leaves	B3 3 leaves	B4 4 leaves
Rotary hoe	⊕	⊕	⊕	⊕	⊕	⊖
Spiked harrow	⊕	⊗	⊗	⊗	⊖	⊕
Hoeing machine	⊗	⊗	⊖	⊖	⊕	⊕

Green: Advised
Yellow: Advised with caution
Red: To be avoided

Chemical weeding

Limited to a pre-emergence weeding strategy, rapeseed today benefits from a wide range of weeding possibilities. From false sowing to post-emergence weeding, the weeding strategy is reflected on a plot level and a farming level.

Clearfield®
Production System for Oilseed Rape

Among the various possible weeding strategies, the use of imazamox has been growing for several years. The appearance on the market of Clearfield rapeseed varieties has allowed the development of this type of weeding, which is very effective in situations with a high pressure of crucifers, geraniums, Galium species, umbellifers and (non-Clearfield) rapeseed regrowth.

As with sunflowers, certain rules of good practice must be observed:

- A rapeseed/wheat rotation is not recommended (risk of strong phytoxicity on wheat)
- Weeding solution application stage: 3-4 leaves
- Dose to be applied: 2 l/ha for Cleranda and Cleravis and 1 l/ha for Cleravo (which results in 35g of imazamox per hectare)
- Use an imazamox-based weeding programme routinely when planting Clearfield rapeseed to avoid crosses with mustards, turnip rapes and other crucifers

To make rapeseed herbicides sustainable:

- Before: **Secure** the mixture preparation to prevent back-flow into the drinking water supply, overflows and leaks into the water system
- During: **Treat** in conditions which avoid or limit drift phenomena. Use air injection nozzles within the recommended pressure range
- Afterwards: **Distribute** the container bottoms around the plot after 1/100th dilution or use approved equipment on the field. Rinse, drain well and collect empty containers

FERTILISATION

Many mineral elements are essential to successively grow rapeseed. A deficiency in any one of these elements can have a significant impact on final performance.

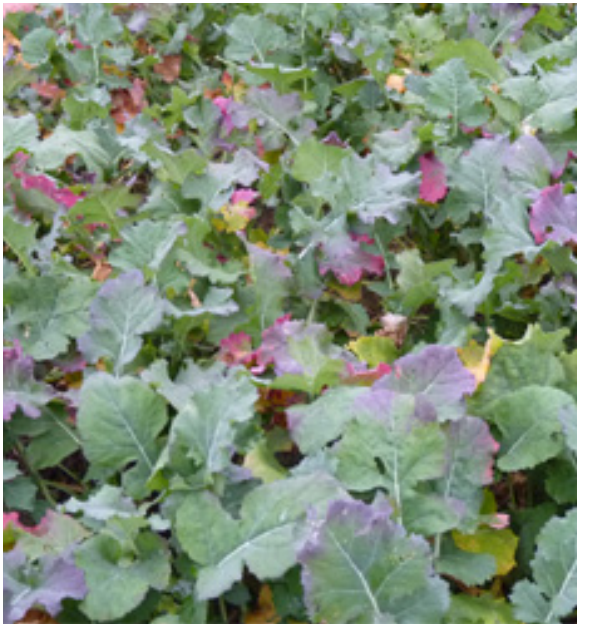
Nitrogen fertilisation

Rapeseed needs 7kg of nitrogen per hundredweight produced. Nitrogen requirements are mainly grouped together at the end of winter.

The nitrogen supply must not exceed 100kg/ha over a single period, otherwise part of the nitrogen supply will be washed away and part of the investment will be lost.

Be careful in some regions as nitrogen fertilisation is banned after August 31.

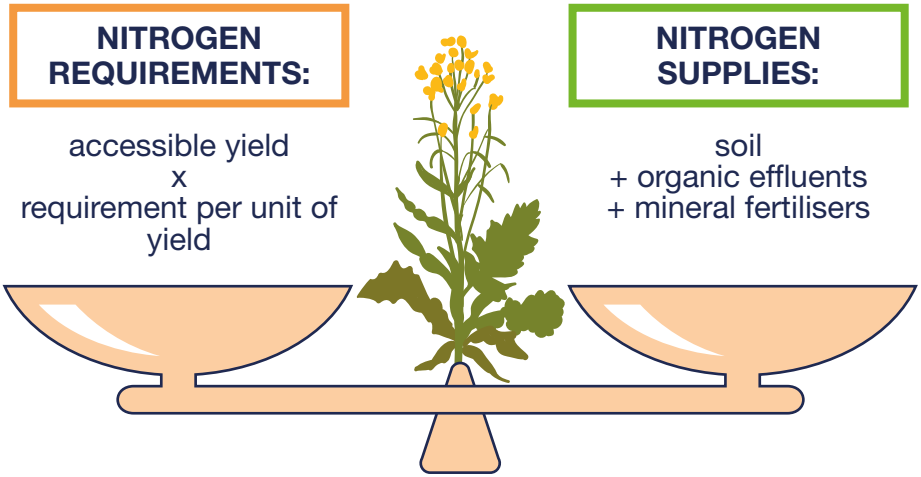
To bring the right amount of nitrogen to the winter outlet, it is important to weigh the biomass. It is possible to use a conversion table, an application, a decision support tool or a drone to estimate the biomass and the amount of nitrogen to be supplied.



Nitrogen Deficiency

Nitrogen is an easily washable element. The key to success is to provide the right amount at the right time to allow the rapeseed to assimilate the maximum amount of nitrogen supplied. It is therefore recommended to split up the supplies made after the winter and not to exceed 100kg/ha per supply. By observing these rules, you maximise the efficiency of your fertilisation investments while reducing your environmental impact by limiting losses through volatilisation in the form of NH3 and pollution of groundwater in the form of NO3 nitrates through washing out and leaching.

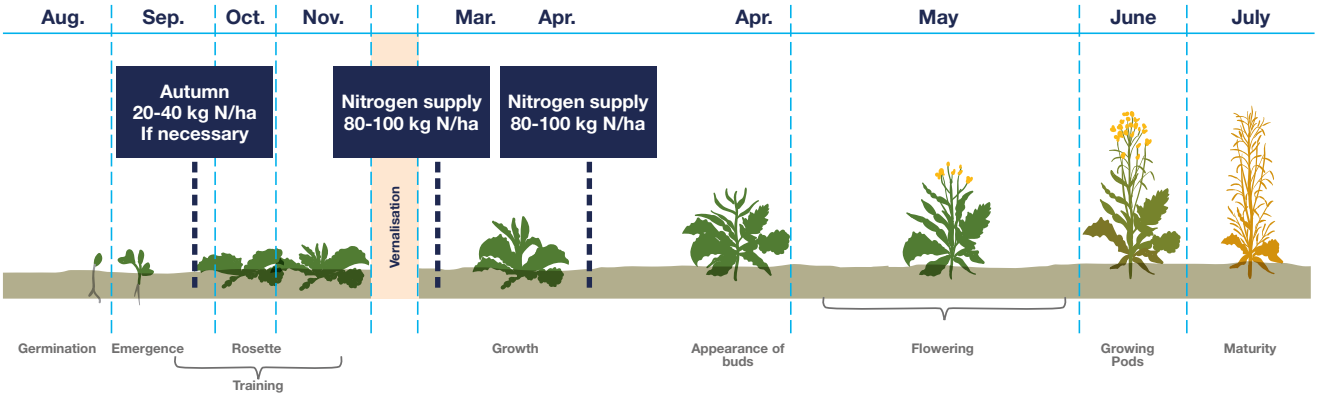
Balance between crop requirements and mineral nitrogen supplies



How do I calculate a nitrogen dose?

The nitrogen dose = **Yield target (in q/ha)** X **7 kg** − **Provision of nitrogen in the soil, previous crops and companion plants**

When should you supply the nitrogen?



Phosphorus and potash fertilisation

- Rapeseed is a very demanding plant in terms of phosphorus. However, it is less so in potash
- If no fertiliser was applied in the year before the rapeseed was planted, it is advisable to apply both components before sowing
- To estimate the amount of phosphorus and potash to aim for, you can refer to the table below

Advice on phosphorus and potash fertilisation according to the type of soil

	P205			K20		
	Poor soil	**Well supplied soil**	**Rich soil**	**Poor soil**	**Well supplied soil**	**Rich soil**
Target 3T/ha						
Amount for the last year	90	50	0	50	30	0
Amount for 2 years or more	120	70	30	60	40	20
Target 3.5T/ha						
Amount for the last year	100	60	0	50	30	0
Contribution 2 years or more	150	80	30	60	40	20
Target 4T/ha						
Amount for the last year	110	70	0	50	40	0
Amount for 2 years or more	160	100	40	70	50	20

Sulphur fertilisation

- Rapeseed is a demanding crop in terms of sulphur. A deficiency can have serious consequences on the final yield
- Rapeseed values only the sulphur input in the form of sulphate
- It is important to bring 75kg/ha of sulphate (S03) at the beginning of bolting
- If organic fertilisers have been spread on the field, take into account the amount of Sulphur already applied among it in the calculation of the Sulphur dosis

Sulphur Deficiency

Notes

THE HARVEST

When is the right time to harvest?

Harvesting too early will affect the quality of the oil. Conversely, harvesting too late will result in a loss of yield despite genetic progress to combat shelling.

The ideal harvesting range is between 7 and 10% humidity. This harvesting range corresponds to the moment when the plant is completely dry and there are no more green pods.

The harvest machine settings have an influence on the final yield. Harvesting should be done at a moderate speed and ventilation should be reduced to avoid losses at the rear of the machine.

	Marketing standard
Amount of water	9%
Impurities	2%
Oil content	40% (9% moisture and 2% impurities)
Glucosinolate rate	25µg max.

How to deal with rapeseed regrowth!

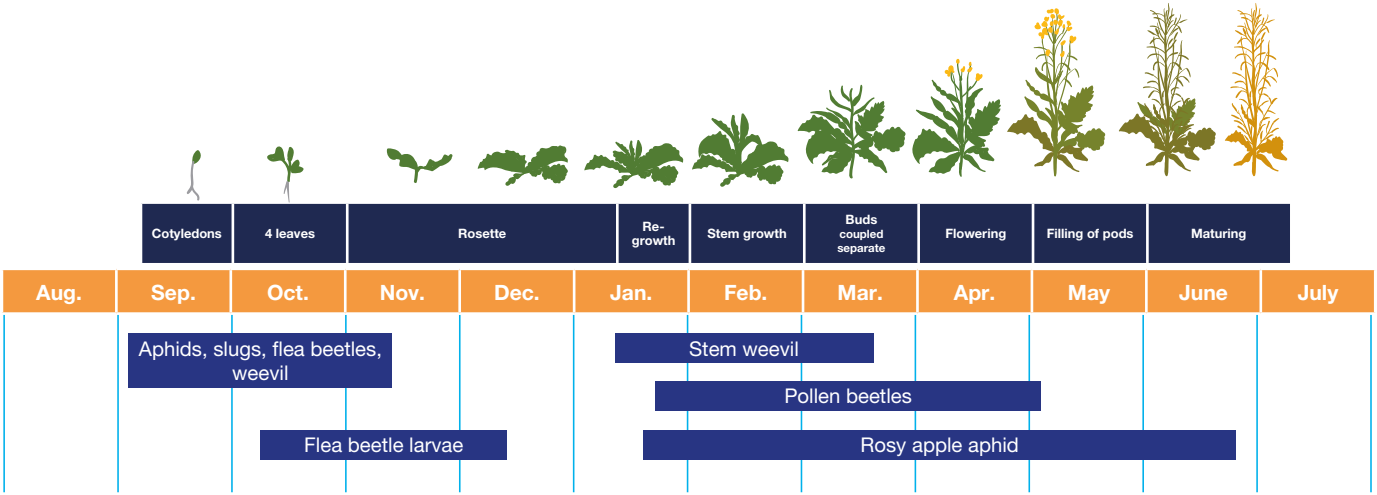
- Rapeseed regrowth can be a major problem (soil contamination, nitrogen consumption, pests) for the next crop if it is poorly controlled. But it can be a useful cover if it is well controlled.
- If the field does not have a strong weed pressure, allow regrowth to develop 3 or 4 weeks and destroy it mechanically or chemically. During the first month, the regrowth traps and stores the remaining nitrogen, which will be released later.
- If your field is under heavy weed pressure, stubble ploughing and recompacting should be carried out to stimulate the germination of regrowth and destroy weeds. Then follow the same protocol as for a weed-free plot to destroy regrowth.
- If your field is under clubroot pressure, destroy the rapeseed regrowth as soon as it emerges and repeat the operation as many times as necessary. The goal is to stop the cycle of clubroot development.

Notes

PESTS AND DISEASES

What are the most common pests and diseases for rapeseed?

RAPESEED INSECT PEST CALENDAR



SLUGS

CABBAGE MAGGOTS

APHIDS

FLEA BEETLE LARVAE

WEEVILS

WEEVIL LARVAE

FLEA BEETLES

SAWFLIES

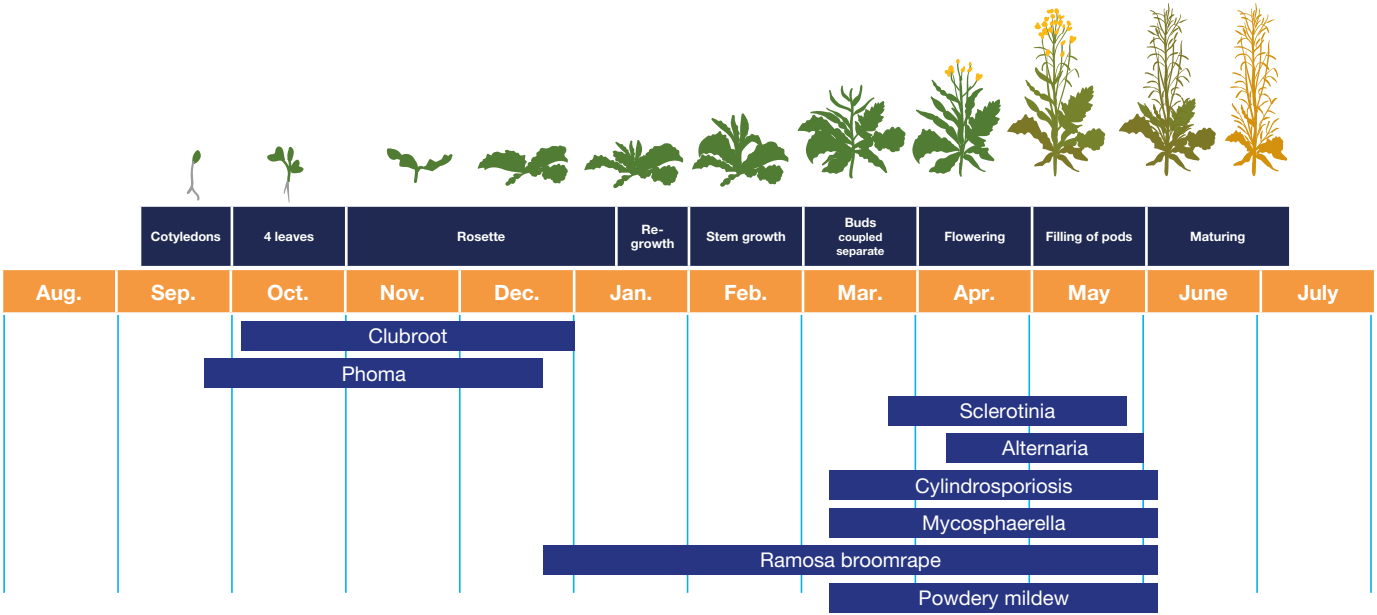
POD WEEVILS

APHIDS

STEM WEEVILS

POLLEN BEETLES

RAPESEED DISEASE CALENDAR



CLUBROOT

PHOMA

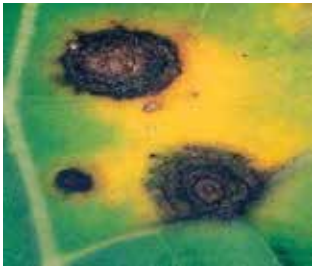
SCLEROTINIA

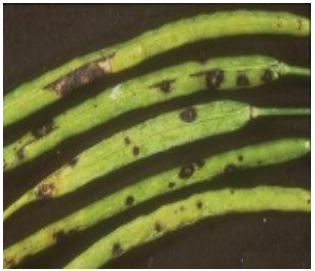
RAMOSA BROOMRAPE

CYLINDROSPORIOSIS

POWDERY MILDEW

ALTERNARIA





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PRICE : 15€

sources: shutterstock, istock, Terres Inovia, feedbase, quick-agro, arvalis, web-agri