Cover crop programme

Scoring with cover crops.

FIND OUT MORE:
WWW.PHPETERSEN.COM
Cover crops from a reputable supplier

P.H. PETERSEN is the market leader for cover crops, specialising in organic nematode control in Europe. Practice-orientated varieties and first-class seed quality.

In Northern Germany, P. H. PETERSEN develops cover crops, cereals, legumes and special varieties as well as seed blends with the highest-quality seeds.

By registering the world’s first nematode-resistant varieties, P. H. PETERSEN redefined a completely new scope for cover crops. Since then, the company has remained a market leader in Europe, standing for innovative products. Extensive contact with research institutes, specialist consultants and forward-thinking farmers ensures the efficiency and actuality of variety development and practically applicable solutions.

Today, the P.H. PETERSEN cultivation facility boasts around 60 hectares of land for nurseries, performance testing and the cultivation of preliminary crops. Climate-controlled greenhouses are available all year round for resistance testing and cultivation tests. Samples are prepared and tested in-house laboratories. At over 15,000m² each, the storage and processing facilities in Lundsgaard, Schleswig-Holstein and Sárbogárd, Hungary use state-of-the-art cleaning and processing systems as well as high-performance packaging systems. In all areas, motivated employees apply their experience to produce high-quality seeds.

The products are successfully marketed in Germany and Europe in collaboration with SAATEN-UNION GmbH, of which P.H. PETERSEN Saatzucht Lundsgaard GmbH has been a shareholder for many years.

Today, this multi-faceted family company is run by Matz Petersen, the third generation. P. H. Petersen is the right place for excellent-quality, innovative and reliable cover crops. You can find out more about us at www.phpetersen.com.

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Cover crops can grow through impacted soil thanks to intense root-ing. They can also stabilise the loosened soil after mechanical soil cul-tivation. When the roots rot in spring, hollows are created for better ventilation and heating. Water absorption capacity is increased and frost-wedging creates additional tilth. Various root types complement each other: oilseed radish, broad bean and lupins form deep taproots, while bristle oat forms a network of roots in the topsoil. Radish-form-ing oilseed radish STINGER is a one-off, as it perforates the topsoil with its strong taproots. The cover crop roots therefore stabilise the topsoil and increase the soil’s load-bearing capacity.

Cover crops can effectively collect nutrients in the autumn, store them in biomass and retain them in the top layer. The nutrients re-maining in the soil after harvest and that are mineralised from crop residue may be lost over winter as they are washed away or steep to surface run-off. Alongside easily displaced nitrogen, further key nu-trients such as potassium, magnesium and sulphur may be washed away with leachate, depending on soil type and pH value. Some cover crops also have the ability to bind nutrients, making them available for the following main crop. For example, phacelia binds organic phosphorous and buckwheat binds inorganic phosphorous, while oil flax mobilises silicon. Some plants enter into symbiosis with fungi to ensure an effective phosphate supply. These mycorrhiza fungi release phosphates from organic compounds, in return using the root exudates (organic carbon compounds) produced by plants. Other cover crops, such as oilseed radish and white mustard, don’t need symbiotic fungus as they are able to produce enzymes to digest phosphates (phosphatases) themselves.

When incorporating green manure in the following spring, the nu-trients stored in the cover crops are re-mineralised so they can be made available to a main crop such as corn during the peak growing season. Find out more about nutrients, fertilisation and water pro-tection on pages 30 and 58.

Nitrogen conservation in the soil and nitrogen binding over winter to prevent leaching.

Cover crops let you add additional organic material to your soil as green manure. This means you can make the most of extra sunlight and heat for photosynthesis. In general, one kilo of plant biomass binds 2kg CO₂ and creates 1.5kg O₂. In the soil, the plant mass feeds soil life and supports the formation of humus.

As well as the amount of biomass from the cover crop, the ratio of carbon to nitrogen in the crop residues is important. Legumes have a narrow C/N ratio, so their biomass is easily digestible for soil life. Lignifying varieties such as early sown white mustard, oil flax and bristle oat have a higher C/N ratio, so they are more resistant to de-generation. This effectively contributes to the formation of long-lasting humus. Roots have a different C/N ratio from leaves and stems. So varieties with lots of underground biomass (such as oilseed radish and grasses) contribute a lot to lasting humus.

Encourages useful soil life e.g. earthworms

A handful of topsoil is home to more soil organisms than there are humans on Earth. Soil life is incredibly diverse in terms of variety and forms. It includes bacteria, fungus, worms, arachnids, countless insects and more. Most of these soil dwellers feed on organic sub-stances, so are the driving force behind all nutrient cycles. They en-sure the soil is balanced and can act as a buffer.

Cover crops contribute to continuously supplying these small beings with sufficient nutrition. An easily visible example is the earthworm: it takes in plant residue as well as mineral soil elements, sticking them together and excreting highly stable particles.

Earthworm castings contain

5 x more nitrogen 7 x more phosphorous 11 x more potassium than the surrounding soil.

Worm farms make it very easy to see the clay humus complexes and earthworm secretions within soil composition.

Castings are 1mm to 5mm thick and are extremely water-resistant.
Freezes off for easier soil preparation in spring

Cover crops that freeze off are easy to incorporate in spring, leaving optimal conditions to sow the summer crop. Mulch and direct sowing are easier with cover crops that freeze off. Crops such as white mustard, bristle oat and phacelia generally freeze off in light frosts when sown at the right time. The choice of variety also has an impact. Oilseed radish COMPASS is more sensitive to frost than similar oilseed radishes (see page 13).

Winter-hardy for continuous protection of soil and soil life

Winter-hardy cover crops protect the soil and any fixed nutrients until spring. Soil life is provided with constant nutrition. Depending on the use system and cultivation process, soil protection and biomass production can be combined. Hence, viterra® UNTERSÄT, viterra® LUNDSGAARDER GEMENGE and viterra® WINTERQUARTETT ÖKO are ideal for regenerative agriculture, which aims to activate and strengthen the soil life connected with humus enrichment by greening all year round.

Contains legumes that fixate atmospheric nitrogen

Thanks to their symbiosis with rhizobia, legumes can fix nitrogen from the atmosphere and use it for plant growth. This means that legumes provide any following crops with additional nitrogen. Properly used, this reduces the need for mineral fertiliser and its energy-intensive production. See page 26 and onwards for more information on which legumes make the best cover crops.

Can be used as biomass

Many cover crops produce biomass that can be used in biogas plants. Forage rape (e.g. PROTECTOR and TRAKTOR) in particular grows over winter and can be cut in spring. Fast-growing blends of summer grains such as viterra® GRANOLEG and viterra® GRANOPUR can also be cultivated after earlier cereals, facilitating another biomass harvest: see page 28.

Closes fodder gaps

Cover crops offer you the opportunity to close cattle fodder gaps and produce more fresh fodder rations. Forage rape, rye grasses, legumes and cereals are suitable for this purpose. See page 24 and onwards. Grass blends with legumes, such as viterra® LUNDSGAARDER GEMENGE and viterra® FUTTER, can be harvested before or after winter, and encourage soil fertility through intense root formation, see page 47.

Provides a habitat and grazing for wild animals

Local wildlife will also benefit from cover crop cultivation. Wild forage blends viterra® HORRIDO and viterra® HOCHWILD have been especially designed for this purpose (page 51). They offer local wildlife cover, suitable grazing and protection from predators.

Ensures biodiversity

Cover crops offer the farmer an additional opportunity to expand diversity in subsequent crops. As well as diverse varieties especially developed for particular purposes and conditions, there are old varieties that are increasingly valued for their benefits. Depending on the subsequent crop, soil type and cultivation period, purposefully greened cover crop fields not only contribute to a high-yield main crop, but also improve soil fertility through managing and encouraging healthy soil life. See pages 22 to 25 for the diversity of cover crops.

Plenty of flowers to provide honey bees and other insects with nectar

Honey and wild bees have great ecological benefits and significance in society. Field greening with flowering cover crops can encourage bees and other insects by closing any gaps in crop cover. Farmers can have some of their additional expenses reimbursed by programmes to encourage flowered land. People also appreciate flowering varieties such as phacelia, sunflowers, Persian clover and more, resulting in an image boost for agriculture.
Cover crops for sugar beet rotations

Recommended varieties

Nematode-resistant oilseed radish from page 13
  level 1  AMIGO, COMET and more
  level 2  DEFENDER, COMPASS, AGRONOM, CARUSO and more
Nematode-resistant white mustard from page 12
  VERDI, MASTER, ACCENT, PROFI, SCOUT, TOPAS and more
Nematode-neutral
  Bristle oat PRATEX, CODEX page 21
  Phacelia ANGELIA page 23

Recommended Cover crop blends

Nematode-reducing
  viterra® cover crop blends from page 38
  viterra® RÜBE, viterra® MULCH
Nematode-neutral
  viterra® cover crop blends from page 38
  viterra® RÜBENGARE, viterra® UNIVERSAL, viterra® BODENGARE, viterra® TRIO, viterra® RAPS and more

Cover crops for potato crop rotations

Recommended varieties

Multi-resistant oilseed radish page 15
  DEFENDER, CONTROL, ANGUS, CARUSO, CONTRA
Oilseed radish against internal rust spot page 20
  SILETTA NOVA, BENTO, AGRONOM
Oilseed radish AKIRO, SILETINA page 22
  Bristle oat PRATEX, OTEX page 21

Recommended Cover crop blends

viterra® cover crop blends from page 38
  viterra® INTENSIV, viterra® POTATO

Cover crops for rapeseed crop rotations

Recommended varieties

Phacelia ANGELIA page 23
  Bristle oat PRATEX, OTEX page 21
Rye page 28
  OVID, MATADOR, PROTECTOR, TRAKTOR, LUNATOR
Oil flax JULIET, ZOLTAN page 25
Persian clover FELIX page 26
Egyptian clover OTTO page 26

Recommended Cover crop blends

viterra® cover crop blends from page 38
  viterra® RAPS, viterra® BODENGARE, viterra® UNIVERSAL, viterra® TRIO, viterra® MULCH, and more
In large-scale rapeseed crop rotation (25% and below)
  viterra® cover crop blends from page 38
  viterra® INTENSIV, viterra® MULCH, viterra® TRIO, viterra® MAIS and more

Cover crops for maize crop rotations

Recommended varieties

White mustard ALBATROS, CLASSIC, COVER page 23
  Oilseed radish SILETINA, AKIRO page 22
Taproot-forming oilseed radish STINGER page 22
Forage rape FONTAN 00, EMERALD and more page 24
Winter turnip rape JUPITER page 24
Phacelia ANGELIA page 23
  Bristle oat PRATEX, OTEX page 21
Rye PROTECTOR, TRAKTOR and more page 28

Recommended Cover crop blends

viterra® cover crop blends from page 38
  viterra® MAIS, viterra® WASSERSCHUTZ, viterra® MAIS STRUKTUR, viterra® SCHNELLGRÜN, viterra® SCHNELLGRÜN LEGUMINOSENFREI, viterra® UNIVERSAL WINTER, viterra® BODENGARE, viterra® MULCH and more
Beet cyst nematodes impact yield

Beet cyst nematodes (Heterodera schachtii) are still the most important sugar beet pest from an economical perspective. Hence, tackling nematodes in affected areas must be a top priority. Especially in tight sugar beet rotations, resistant cover crops contribute to forcing nematodes in affected areas must be a top priority. Especially in tight sugar beet rotations, resistant cover crops contribute to forcing nematodes under the damage threshold and creating optimal growth conditions. Even when cultivating tolerant or resistant sugar beets, resistant cover crops not only reduce the nematode population, but also promote the long-term beet and sugar yield, and therefore the viability of the beet cultivation.

Resistant oilseed radish and white mustard activate larval hatching and migration to the roots.

Unlike host plants, resistant plants restrict the formation of the nurse cell system. The nematodes cannot get sufficient nutrients, so the major die prematurely. As the females require around 40 times more nutrition during their development than the males, the sex ratio is skewed in resistant plants to 100 (up to 1,000) males to 1 female. The lack of females leads to population decline.

Resistant cover crops are classified into resistance levels according to their reproduction rate (final population final population / initial population initial population). Resistance level 1 entails a reduction of more than 90% (reproduction rate <0.1). Plants that can serve as host plants for nematodes increase nematode numbers by around 4 times in the same period. Among plants that are not host plants (neutral plants, such as phacelia or bristly oat), the nematode population decreases by around 30 percent annually.

Beet nematode cysts can survive in soil for more than 10 years, and decreases by around 30 percent annually.

Even after 40 years of using resistant cover crops, and even in stress situations, no resistance-breaking nematodes have developed.
Nematode-resistant white mustard

**VERDI**

**A CLASS OF ITS OWN**
- Tested in France and allocated to resistance level H1 (over 90% reduction in sugar beet nematodes)
- Exceptionally low flowering tendency allows early sowing dates without the formation of mature seeds
- Easy sowing, fast ground cover and long vegetative growth phase

**ACCENT**

**FIELD-TESTED HIGH LEVEL OF CONTROL**
- Up to 90% reduction of nematodes in official tests - resistance level 2
- Quick and easy sowing, rapid and uninterrupted soil coverage

**PROFI**

**PROFESSIONAL NEMATODE CONTROL**
- The generous ground shade provided by PROFI white mustard intensively promotes weed suppression and tilth.
- Late flowers allow long vegetative development and long-lasting hatching stimulation

**SCOUT**

**FLEXIBLE SOWING - EFFICIENT AGAINST NEMATODES**
- Exceptionally rapid initial development (highest classification in the Descriptive List), good late sowing tolerance with effective weed suppression
- Late bloomer

**TOPAS [NEW]**

**GOOD NEMATODE REDUCTION THANKS TO LONG CONTROL PERIOD**
- Combination of rapid initial development and late flowering ensures a long period of vegetable growth
- Reliably freezes off, ideal for mulch tilling

**MASTER**

**RAPID START - STRONG FLOWERING DELAY**
- Especially rapid initial development - highest classification in the Descriptive List
- Resistance level 2 in official tests in Germany
- High resistance to late sowing, good yield can still be achieved when sowed up to mid September
- Weeds are effectively suppressed and valuable nutrients organically protected from displacement into deep soil layers

**COmPASS**

**THE OILSEED RADISH THAT FREEZES OFF MORE EASILY**
- High resistance to beet cyst nematodes in the upper area of resistance level 2+
- Freezes off more easily and faster than traditional oilseed radish varieties
- Fast soil warming in spring due to the low mulch layer allows early sowing of sugar beet and maize
- No additional work or costs required to work in - ideal for mulching and direct sowing of following crop

**Sensitivity to frost**

Due to the low winter hardness of COMPASS, a very high percentage of the plants freeze off during winter. The remaining plants can be destroyed cost-effectively by rolling the crop on frozen ground in a process that is both soil-friendly and environmentally-friendly. A clean crop in spring proves good weed suppression.

**Nematode-resistant oilseed radish**

**AMIGO**

**A SUGAR BEET’S BEST FRIEND**
- Beet cyst nematode control at the highest level, over 90% reduction in *heterodera schachtii* (resistance level 1)
- AMIGO encourages beet cyst nematodes to hatch and actively reduces the population to under the damage threshold
- Improved initial development with fast ground cover for excellent tilth and effective weed suppression
- Dense root system fixes nutrients and prevents displacement into deep soil layers
- Plenty of organic mass promotes humus balance and activates soil life

**Verdi**

**A good grower for good nutrient conservation**

**Clint**

**Impresses with exceptional initial growth**

**Lucida**

**The latest white mustard with high nematode resistance**

**Gaudi**

**A treat before sugar beet**

Variety | Profile
---|---
Veto | A good grower for good nutrient conservation
Clint | Impresses with exceptional initial growth
Lucida | The latest white mustard with high nematode resistance
Gaudi | A treat before sugar beet
**Nematode-resistant oilseed radish**

**DEFENDER**
- Best variety for vegetable and arable farming
- Disrupts disease cycles in vegetable, potato, sugar beet and cereal crops
- up to 90% reduction of beet cyst nematodes (resistance level 2+)
- no multiplication of stem nematodes (*ditylenchus dipsaci*)
- Efficient reduction of root-knot nematodes and free-living nematodes
- Reduces viral internal rust spot in potatoes
- Strong initial development and rapid ground cover for thorough weed suppression
- Deep-reaching, fine root system improves soil structure
- DEfEnDEr has proven its top position in countless tests and practice cultivations.

**CONTROL**
- Effective control of various nematodes and diseases
- Resistance to beet cyst nematodes in the upper area of grade 2
- State-confirmed resistance to root gall nematodes
- Multi-resistant genes: developed from DEfEnDEr
- Excellent initial development with good soil coverage to suppress weeds
- strong vegetative growth with intense root formation
- no propagation of stem and bulb nematodes, reduces viral rust
- selectively encourages positive soil life
- Worsens survival conditions for rhizoctonia
- Medium frost susceptibility for long-lasting nutrient binding and soil protection

**COSMOS**
- Highly resistant late bloomer
- Low flowering tendency allows early sowing
- COSMOS is the ideal variety for effective nematode control in light beet rotations
- Low growth for energy-saving mulching

**ANGUS**
- Multi-resistant powerhouse
- Multi-resistance - effective control of various nematodes and diseases e.g. *heterodera schachtii* and root-knot nematodes
- Rapid ground shade for effective suppression of secondary growth and weeds
- Fast, healthy initial development, increases organic substance and supports soil fertility
- Deep, intense root system
- COMET’s deep, finely structured root system covers the entire soil volume
- High yield of green plant matter for adding to organic mass, especially important at light, sandy sites

**MULTI-RESISTANT POWERHOUSE**
- Multi-resistant - effective control of various nematodes and diseases e.g. *heterodera schachtii* and root-knot nematodes
- Rapid ground shade for effective suppression of secondary growth and weeds
- Fast, healthy initial development, increases organic substance and supports soil fertility
- Deep, intense root system
- COMET’s deep, finely structured root system covers the entire soil volume
- High yield of green plant matter for adding to organic mass, especially important at light, sandy sites

**Caruso**
- Efficient against nematodes and frost-sensitive
- Multi-resistant to beet cyst nematodes and root knot nematodes, reduces viral rust spot, no propagation of stem nematodes
- Excellent initial development for secure establishment
- CARUSO is more susceptible to frost than other oilseed radish varieties

<table>
<thead>
<tr>
<th>Resistance level 2 Profile</th>
<th>Top variety for reliable nematode control</th>
</tr>
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<tbody>
<tr>
<td>ADAGIO</td>
<td></td>
</tr>
<tr>
<td>CONCORDE</td>
<td>Promotes beet yield and quality</td>
</tr>
<tr>
<td>DACAPO</td>
<td>For active biological nematode control</td>
</tr>
</tbody>
</table>
More nematodes and diseases

As well as beet cyst nematodes, other nematodes are increasingly causing problems. Crop rotations with a high proportion of root crops and vegetables are especially affected. In addition to beet cyst nematodes, multi-resistant oilseed radish varieties also reduce other nematodes and have been tested for their impact on many diseases of the following crop. The cultivation of cover crops must be carefully considered so that the cover crop varieties used do not exacerbate the infestation and endanger the main crop. A reduction in chemical treatment options and warmer climatic conditions are aggravating the problem. Subsequent crop planning, cultivation and field hygiene form the basis for successful pest management.

**Trichodorus and viral internal rust spot**

As free-living nematodes, trichodorus are hard to treat directly as they are also found deep in the soil, waiting to attack new plants. So far, only rough classification of host plant status for plant varieties has been possible up to now. It is important to encourage the initial development of main cultures through optimal growth conditions so that they can quickly develop out of their vulnerable initial phase.

Cover crops can however transfer the tobacco rattle virus, which causes viral internal rust spot. In particular, the cultivation of oilseed radish has been possible up to now. It is important to encourage the initial development of main cultures through optimal growth conditions so that they can quickly develop out of their vulnerable initial phase.

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As many weeds and self-seeded potatoes provide an opportunity for nematodes to reinfect themselves with the virus, these agricultural measures form the foundations of treatment. Cover crops with rapid ground cover and good weed suppression support these measures.

**Lesion nematodes (pratylenchus ssp)**

These migratory root nematodes are often found in lightweight soil and can lead to significant losses in potato, vegetable and grain yields, usually forming nests. Plants that are attacked experience stunted growth and are more susceptible to fungal infections such as verticillium and fusarium.

French marigold tagetes patula is a real specialist when it comes to reducing lesion nematodes, as it actively tackles the nematodes by excreting thioteperenes. Once tagetes patula has successfully established, the population will only slowly recover, so this impact lasts for several years. Seeds should be sown in June with special sowing machinery, which is relatively expensive. As French marigold multiplies internal rust spot, potato farmers have limited options.

The cultivation of bristle oat is a practical compromise. Bristle oat doesn’t multiply lesion nematodes and reduces rust spot. It is an easy-going cover crop that suppresses weeds as an alternative host for nematodes with its plentiful foliage and roots, while stimulating positive soil life.

Multi-resistant oilseed radish is also a bad host for lesion nematodes. When infested with lesion nematodes, the components of seed blends should be carefully considered: even a small ratio of host plants can be used by nematodes for mass reproduction, endangering yield.

**Root gall nematodes (meloidogyne chitwoodi, meloidogyne hapla)**

The Columbia root knot nematode (meloidogyne chitwoodi) has an immensely large range of host plants and should not be underestimated, as this is a quarantine disease in Europe. High-performance oilseed radish varieties are available that suppress infestation to under the detection level. The oilseed radish DEFENDER was selected in the EU Project DREAM (Durable Resistance Against Meloidogyne) and was the first oilseed radish used to reduce this quarantine-worthy pest. In the meantime, this property is being reviewed at official variety assessments in Germany and the Netherlands on request, and is documented in variety lists. Take the opportunity to regulate this pest with oilseed radish!

The northern root knot nematode (meloidogyne hapla) only attacks dicotyledonous plants. As legumes are good host plants, this pest is often found in organically cultivated soil. As well as the thorough avoidance of dicotyledonous plants, the CONTRA and ANGUS oilseed radish varieties can be used to suppress nematodes. Both root gall nematodes need host plants to survive. A purposefully unsuitable cover crop can almost completely eliminate an infestation.

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**Impact of various cover crops on potato yield and infection of viral internal rust spot** (private test carried out by LWK NRW)

**Impact of cover crops on pratylenchus pentrans and potato yield** (PPS GROEN, Valthermond 2016-2017)

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**Our recommended varieties against viral internal rust spot**

- **Multi-resistant oilseed radish**: DEFENDER, ANGUS, CONTRA, CONTROL, CARUSO
- **Oilseed radish, conventional**: SILETTA NOVA, BENTO
- **Oilseed radish, resistant to beet cyst nematodes**: COMPASS, AGRONOM

More cover crops (blend partner for oilseed radish): Flax, bristle oat PRATEX and CODEX, common vetch and blue lupin.
Rhizoctonia

Fungal Rhizoctonia causes damage and loss of yield in potato, sugar beet, broad bean and soy crops.

Rhizoctonia can be split up into various host spectrums (anastomosis groups). Sugar beet, legumes, maize and grasses are mostly affected by group AG 2-2, while potatoes are mainly impacted by AG 3 and a more general group (AG 4) that only causes minimal damage.

All rhizoctonia groups thrive in conditions including waterlogging and ground compaction, tight crop rotations and lots of unrotted, lignin-rich organic material.

Cover crops that encourage root penetration and soil ventilation make it harder for this fungal disease to survive. Furthermore, many crucifers directly suppress rhizoctonia thanks to their distinct roots and sulphur content.

Clubroot

One particularly important disease that must be taken seriously in winter oilseed rape cultivation is clubroot (plasmodiophora brassicae). Clubroot is a slime mould and affects the roots of crucifer plants, on which it forms swollen masses (hernias). Clubroot can survive for up to 20 years in the soil, meaning complete carnage for winter oilseed rape. If oilseed rape is cultivated in soil infected with clubroot, crucifers should not be used as cover crops as they can further exacerbate the infection. As well as white mustard, brown mustard and forage rape, camelia and cress are among the crucifers. Oilseed radish is less susceptible than other cover crops from the crucifer family, but even oilseed radish should only be used as a cover crop in later crop rotations without clubroot infection. The oilseed radish variety with the lowest clubroot infection rate is DEFENDER.

Cover crops that do not act as host plants for clubroot, such as phacelia, bristle oat, flax, legumes and others, avoid the risk of exacerbating a clubroot infection.

To sum it up:

Tackling individual nematodes and diseases requires targeted cultivation management, as nematodes usually don’t appear as individual groups, rather as a mixture of various groups. In order to effectively reduce diseases with cover crops, it is helpful to know as much about the nematodes in the soil as possible. The best time to take soil samples is during a cool, moist phase (generally November to February). In warm and dry conditions, free and migratory root nematodes withdraw to deeper soil layers and cannot be seen. If you suspect pratylenchus, it is advisable to have plant roots tested, as nematodes can overwinter there. Many agricultural bodies carry out nematode tests. Some independent labs in the Netherlands have even specialised in soil samples before potato crops.

If the reduction of nematodes and disease is the focus when choosing a suitable cover crop, it is generally advisable to limit yourself to a few varieties. Within these varieties, take advantage of the immense progress made within cultivation. Even agronomic properties such as rapid initial development, late sowing suitability and easy freezing off can help to improve treatment. Diverse blends increase the risk that nematodes and diseases could use individual components to reproduce. It is therefore important to only use these if the subsequent crop is not vulnerable.

Nematodes and diseases

Nematodes

<table>
<thead>
<tr>
<th>Nematodes</th>
<th>Root-knot nematodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tackles weeds through rapid ground penetration</td>
<td>• Resistance to meloidogyne hapla</td>
</tr>
<tr>
<td>• Also protects potatoes and sugar beet</td>
<td>• For organic crop rotation with a high proportion of clover and carrot cultivation</td>
</tr>
<tr>
<td>• Controls rhizoctonia in beets</td>
<td>• Also protects potatoes and sugar beet</td>
</tr>
<tr>
<td>• Controls root-killing disease and dry core in potatoes</td>
<td>• For crop rotation with potatoes, vegetables and flowering bulbs</td>
</tr>
<tr>
<td>• Controls rhizoctonia in beets</td>
<td>• Tackles weeds through rapid ground penetration</td>
</tr>
<tr>
<td>• in lettuce, cabbage and many other vegetables including maize, grass, beans and flowering bulbs</td>
<td>• Also protects potatoes and sugar beet</td>
</tr>
<tr>
<td>• Promotes structure, pore volume and soil aeration</td>
<td>• Tackles weeds through rapid ground penetration</td>
</tr>
<tr>
<td>• Promotes natural antagonists</td>
<td>• Also protects potatoes and sugar beet</td>
</tr>
</tbody>
</table>

Diseases

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Viral internal rust spot</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduces viral internal rust spot (tobacco rattle virus) in potatoes</td>
<td>• Reduces damage caused by pythium fungi</td>
</tr>
<tr>
<td>• Suppresses free bicho dorus nematodes that transfer the virus</td>
<td>• In crop rotation with peas, potatoes and flowering bulbs</td>
</tr>
<tr>
<td>• Tackles weeds through rapid ground cover</td>
<td>• No multiplication of athylenchus dipsaci as a cover crop</td>
</tr>
<tr>
<td>• Tackles weeds through rapid ground cover</td>
<td>• in beet, vegetable and flowering bulb rotations</td>
</tr>
</tbody>
</table>

To sum it up:

Tackling individual nematodes and diseases requires targeted cultivation management, as nematodes usually don’t appear as individual groups, rather as a mixture of various groups. In order to effectively reduce diseases with cover crops, it is helpful to know as much about the nematodes in the soil as possible. The best time to take soil samples is during a cool, moist phase (generally November to February). In warm and dry conditions, free and migratory root nematodes withdraw to deeper soil layers and cannot be seen. If you suspect pratylenchus, it is advisable to have plant roots tested, as nematodes can overwinter there. Many agricultural bodies carry out nematode tests. Some independent labs in the Netherlands have even specialised in soil samples before potato crops.

If the reduction of nematodes and disease is the focus when choosing a suitable cover crop, it is generally advisable to limit yourself to a few varieties. Within these varieties, take advantage of the immense progress made within cultivation. Even agronomic properties such as rapid initial development, late sowing suitability and easy freezing off can help to improve treatment. Diverse blends increase the risk that nematodes and diseases could use individual components to reproduce. It is therefore important to only use these if the subsequent crop is not vulnerable.
Bristle oat (**avena strigosa**) is a commonly used cover crop thanks to its undemanding nature. Grown for nematode reduction, erosion protection, as a biomass producer or in cover crop blends, it covers a large range of needs.

Especially in light soil, damage caused by *pratylenchus* can lead to considerable impact on quality and yield. Not only do the nematodes themselves damage the plants, but they also enable fungi such as *fusarium* and *verticillium* to easily access the plants. The large number of possible host plants includes both cultivation crops and weeds, which makes control even more difficult.

**PRATEX** has proven its suppression skills in many tests and practical planting. New bristle oat varieties **CODEX**, **TRADEX** and **OTEX** also reduce *pratylenchus penetrans*.

Uses for bristle oat

1. **Nematode reduction**
   Tackles migratory root nematodes (*pratylenchus penetrans*) without any breeding of trichodoridus species - especially important in sandy and light soil for potato and vegetable production. Sowing density: 80 - 100 kg/ha

2. **Erosion protection**
   As erosion protection in autumn sowing - very rapid and leafy development with good weed suppression (allelopathy). Bristle oat freezes off reliably, offering optimal conditions for mulching and direct sowing of the following crop. Sowing density: 25 - 50 kg/ha

3. **Biomass production**
   For the production of biomass - also for the soil, as silage or fresh fodder and for biogas. Sowing density: 50 - 125 kg/ha

4. **Cover crop blends**
   All-purpose blend partner that is ideal for combining

**SILETTA NOVA**

**REDUCES INTERNAL RUST SPOT IN POTATOES**

- Reliable and tested for quality potatoes
- **SILETTA NOVA** alleviates virus transfer by trichodoridus nematodes
- Rapid and especially leafy ground shade suppresses weeds that the virus could use to multiply
- The organic matter vitalises soil activity, keeps nutrients in the topsoil and provides valuable humus
- The deep root system creates optimal soil conditions and reduces soil compaction
- **SILETTA NOVA** contributes to long-term, sustainable potato yields

**BENTO**

**PROMOTES POTATO YIELD AND QUALITY**

- Reduces viral internal rust spot
- Excellent vegetative growth
- High level of organic matter as additional contribution to humus formation
- Ideal protection from wind and water erosion and improvement of soil structure thanks to dense root penetration of the soil
- The pragmatist knows: closes early and flowers late!

**Sticky nightshade against potato cyst nematodes**

Sticky nightshade is resistant to *globodera rostochiensis* (pathotypes 1 to 4) and *globodera pallida* (pathotypes 2 and 3) and is part of the *solanaceaen* family (nightshades). Sow: Mid May to mid July.

**WHITE STAR**

- Dense root penetration to control *globodera*

**DIAMOND**

- Strong growth and strong control

**PRATEX**

**CONTROLLING PRATYLENCHUS PENETRANS**

- Tackles lesion nematodes (*pratylenchus penetrans*) without any multiplication of trichodoridus species
- Easily cultivated with simple sowing and as a cover crop without sacrificing the main crop
- Has very rapid initial development and good competition against weeds that could be potential multipliers for *pratylenchus*.
- High production of organic mass, dense root penetration of soil
- Cover crop that freezes off well

**OTEX**

**COVER CROP WITH STRONG INITIAL DEVELOPMENT**

- Flexible use - as green manure and for fodder production
- Rapid soil coverage and weed suppression

<table>
<thead>
<tr>
<th>Profile</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CODEX</strong></td>
<td>The late bristle oat</td>
</tr>
<tr>
<td><strong>TRADEX</strong></td>
<td>Highest biomass yield</td>
</tr>
</tbody>
</table>
Oilseed radish for green manuring

As a deep-rooting cover crop with rapid ground coverage, oilseed radish can be sown up to the beginning of September. Oilseed radish provides long-term soil shade, ensuring good soil tilth and weed suppression.

The abundance of organic matter supports humus formation and promotes positive soil microorganisms.

Taproot-forming oilseed radish is used in blends to add structure.

**AKIRO**
- Promotes soil structure and activates soil life
- Leafy initial development with rapid ground shade, promoting the formation of valuable tilth
- Competes well with weeds

**SILETINA**
- Biologically highly effective green manure
- Reliable and easy to grow - even when sown late and in unfavourable soil conditions
- Especially rapid initial development for effective weed suppression

**MINER**
- Intermediary radish variety: fast development, forms radishes
- Burrows into the soil and improves soil structure
- Birds freely available nitrogen in autumn and prevents displacement

**STINGER**
- Strong, distinct radishes
- Leafy initial development and low growth height
- The roots form large holes in the soil, encouraging spring soil warming.
- Radish dies off and rots over winter

**ALBATROS**
- Rapid and strong initial development even when sown late
- Valuable above-ground greens and dense, deep roots form a stable, humus-rich soil structure
- Reliable freezing off in winter - plant remains provide good erosion protection even after dying off
- The nutrients conserved in the organic matter are protected from erosion during winter and are available in the following spring
- Tried and tested for smooth mulch sowing - especially in maize rotations

**ANGELIA**
- High-yielding honey plants, can be used to fill the summer gap
- Leaves an easy-to-work and dark fine-stemmed mulch layer in spring that promotes soil warming
- Additional organic substance stabilises the soil’s humus content
- Unlocks organically bound phosphorus

**AMERIgO**
- Dense growth
- Drought-tolerant

**COVER**
- Intensive healthy initial development for a flexible sowing window

**CLASSIC**
- Especially long vegetative growth phase due to good initial development and late flowers
- Excellent weed suppression
- Recommended for water protection, mulch sowing and agricultural blends

White mustard for greening

White mustard is an undemanding greening plant that quickly achieves ground coverage and can be sown until the end of September (e.g. ALBATROS white mustard).

More benefits are its drought tolerance and reliable freezing off, making for ideal mulching conditions for maize. Late-blooming varieties such as COVER and CLASSIC are ideally suited to agricultural blends with other varieties.

**ALBATROS**
- The classic among the high-quality varieties
  - Rapid and strong initial development even when sown late
  - Valuable above-ground greens and dense, deep roots form a stable, humus-rich soil structure
  - Reliable freezing off in winter - plant remains provide good erosion protection even after dying off
  - The nutrients conserved in the organic matter are protected from erosion during winter and are available in the following spring
  - Tried and tested for smooth mulch sowing - especially in maize rotations

**ANGELIA**
- Striking and attractive flowers
  - High-yielding honey plants, can be used to fill the summer gap
  - Leaves an easy-to-work and dark fine-stemmed mulch layer in spring that promotes soil warming
  - Additional organic substance stabilises the soil’s humus content
  - Unlocks organically bound phosphorus

**AMERIgO**
- Dense growth
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Phacelia

As a neutral plant for beet nematodes and clubroot, phacelia is a suitable cover crop for beet crop rotation with rapeseed. In all crop rotations, phacelia impresses with its undemanding nature and drought tolerance.

As a popular pasture plant for bees, it improves the landscape when sown alone or as part of a floral blend, then reliably freezes off and protects the soil from erosion damage.
**Forage rape**

Forage rape is a tasty winter fodder for cattle. It offers very good green matter and dry matter yields with high a protein content. As green manure, the organic matter helps humus formation and promotes optimal soil quality. A high capacity to bind nutrients makes both winter and summer forage rape an excellent species for water protection. The network of fine roots covers large areas of soil, stabilising soil structure and promoting air exchange within the soil.

**Winter turnip rape**

As a winter-hardy green manure for erosion protection and nitrate binding with dense root penetration and a high potential for nitrate return to the subsequent crop. It can be cut or grazed off.

**Nitrogen storage and release. A comparison of oilseed radish and winter turnip rape**

<table>
<thead>
<tr>
<th>Source: Richter, 1992-96</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>August before sowing</th>
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<th>April before maize sowing</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40</td>
<td>20</td>
<td>60</td>
<td>80</td>
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<td>0</td>
<td>100</td>
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</tbody>
</table>

**Oil flax**

This traditional plant for oil production is also excellently suited to growing as a cover crop. Oil flax is a perfect neutral plant in cover crop blends. Flax has deep root penetration and can develop silicon as a nutrient for the subsequent crop.

**Marrow stem kale**

Marrow stem kale is used for cattle fodder, on gameland and in winter-hardy cover crop blends.

**JUPITER**

- Green fodder or fresh fodder
- Suitable for late sowing up to mid September
- When sown early, can first be used after 6-8 weeks
- High nutrient uptake capacity
- Effective water protection measure

**JULIET**

- Easy and reliable cover crop

**ZOLTAN**

- Undemanding with fine but deep-reaching taproots

**Buckwheat**

Buckwheat is a fast-growing cover crop that freezes off reliably. Thanks to its early flowers and seed ripeness, common buckwheat (Fagopyrum esculentum) is often used in gameland blends. Because of the risk of self-seeding and difficult control, we do not recommend buckwheat for use in sugar beet crop rotations.

**Common buckwheat**

**HAJNALKA**

- Robust and neutral regarding subsequent crop

**ESQUIRE NEW**

- Very late to mature, versatile crop

**ESKALAR NEW**

- Fast-growing, also used to produce grains

**Tartary buckwheat**

Tartary buckwheat flowers significantly later than common buckwheat and contains bitterns.

**TABEA NEW**

- Flowers extremely late, stores phosphorous

**TABOR NEW**

- Good rapid ground cover, late flowering

**PRESTIGE 00**

- Fast-growing and leafy
- Can be sown early or late

**Summer forage rape**

**JUMBO 00**

- Favourable leaf/stalk ratio
- Relatively frost-tolerant
- Good stability

**EMERALD**

- Tasty, with high fodder value
- Effective green manure

**FONTAN 00**

- Fast-growing and efficient supplier of feed
  - Early fodder reserve
  - High-quality protein fodder
  - Fast ground cover as erosion protection

**ENERGY**

- Fast initial development, medium-early flowering
- High isothiocyanate content

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**TERRAFIT**

- Fast young growth, earlier onset of flowering
- Very high active substance content

**Indian mustard - brown mustard**

High levels of glucosinolates in the leaves and grains make this species (Brassica juncea) excellently suited to use in biofumigation to combat soil-borne diseases.

**ENERGY**

- Fast initial development, medium-early flowering
- High isothiocyanate content

**TERRAFIT**

- Fast young growth, earlier onset of flowering
- Very high active substance content

**KAMARO**

- Protein-rich feed source for agriculture and gameland

**ANGLIAN GOLD**

- Very high mass yield with balanced leaf ratio
- High vitamin, nutrient and protein content
- Reliable basic feed up to autumn

**EMERALD**

- Tasty, with high fodder value
- Effective green manure

**PRESTIGE 00**

- Fast-growing and leafy
- Can be sown early or late

**NORMAL**

- Favourable leaf/stalk ratio
- Relatively frost-tolerant
- Good stability

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The heavily branched root system and the striking flowers, which are an important source of nutrition for wild bees, make common vetch a contributor in freezing-off cover crop blends.

Winter vetch is mostly found in winter-hardy biomass blends such as viterra® LUNDSGAARDER GEMENGE and viterra® WICKROGGEN.

As a large-grain legume, the blue lupin introduces additional nitrogen into crop rotations when used as a cover crop, as its pronounced taproot penetrates deep layers of the soil.

With its low TKW (thousand kernel weight), seradella is especially well suited as a sole cover crop in light soils, for fodder or as an addition to blends to produce nitrogen.

Persian and Egyptian clover
This undemanding, small-grained clover is often used as a cover crop. In cover crop blends, the other plants benefit from clover’s nitrogen production. Clover flowers are also attractive nectar sources for honey production.

Crimson clover
Winter-hardy crimson clover is ideal in grassy blends for biomass production. Through symbiosis with rhizobacteria, crimson clover delivers additional nitrogen, penetrates the soil densely with its roots and is therefore an excellent and impactful preceding crop.

Blue lupin
As a large-grain legume, the blue lupin introduces additional nitrogen into crop rotations when used as a cover crop, as its pronounced taproot penetrates deep layers of the soil.

Serradella
With its low TKW (thousand kernel weight), seradella is especially well suited as a sole cover crop in light soils, for fodder or as an addition to blends to produce nitrogen.

Vetchling
Protein-rich and colourful for cover crop blends

Field beans for green manuring

AVALON
EXTREMELY SMALL-GRAINED - IDEAL AS A COVER CROP
- Very low thousand kernel weight (300 - 350 g) allows a shallow sowing depth and sowing with other cover crops in a blend
- Also suitable as an additional component in a blend with winter rapeseed
- High N binding through symbiosis with rhizobia bacteria
- Strong taproot with high root mass for dense root penetration and improvement of soil structure
- Large rounded leaves for good weed suppression and encouraging tillage
- Improves stability as an additional component in cereal-legume WPS blends

Common vetch and winter vetch
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Vetchling
Protein-rich and colourful for cover crop blends

Persian clover FELIX
- A honey plant with good root growth

Egyptian clover OTTO
- High value as a preceding crop and fodder
- Multi-shear

Alfalfa
This deep-rooting legume is known as the “queen of forage plants”, as it is persistent and winter-hardy. Ideal as a blend partner for protein-rich fodder or cover crop

PROTEUS NEW
- Protein-rich and fine stems

POSEIDON NEW
- Versatile and high-yield

CONTEA
- For increasing nitrogen, loosening soil and use as fodder

ILDIGO
STRONG GROWTH, IMPROVES SOIL WITH DEEP IMPACT
- Ideal plant for green manuring that can bind nitrogen in its root knot
- Can grow regardless of soil’s nitrogen content and also provides neighbouring plants in the blend with the nutrient for growth

Field pea RUBIN
Fast-growing field pea is an ideal partner in cover crop blends: small-grained, leafy and provides nitrogen

Winter field pea NS PIONIR
PIONIR is especially small-grained (field pea) and winter-hardy, making it an ideal supplement for winter-hardy blends. Both people and insects love the striking flowers.
Forage rye for biomass

Over the last few years, tight crop rotation with a high proportion of maize has caused a decrease in humus and therefore made our soils less able to provide a reliable yield. Innovative farmers recognised forage rye as a supplement to biomass crop rotations a few years ago.

Forage rye is suitable for use in fodder and biogas. It tillers more strongly and quickly begins to grow vigorously in spring so it can be harvested before the maize. Dense root penetration helps stabilise humus.

PROTECTOR

EUROPE'S LEADING FORAGE RYE

- Longstanding number 1 in German evaluations
- Biomass and fodder provider with excellent return on invested time
- Double usage: for cattle and biogas
- Excellent winter growth, exceptional erosion protection
- Very good tolerance to late sowing: up to late October for greening after maize

Wild rye

Ancient rye is growing in popularity, as it is not only suitable as a partner in wildlife feed plots, but also for producing grain for use in floursome, healthy baked goods.

PROTECTOR - Top forage rye

Yield performance of winter rye varieties in cover crop cultivation

<table>
<thead>
<tr>
<th>Dry matter yield</th>
<th>Mass production after vegetation begins</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: from data from the Descriptive Variety List 2018

JOHAN

- Small grains and strong tillers
- Extremely winter-hardy and persistent

Tractor

MODERN FORAGE RYE FOR BIOMASS AND EROSION PROTECTION

- Modern forage rye for biomass and erosion protection
- Top performance in dry matter yield
- Good weed suppression and protection from wind and water erosion

Forage/WPS rye

GENERATOR

- For early use in WPS

Greening rye

MATADOR

- Can be sown late, offers erosion protection
- Ideal as an overwintering cover crop after maize and before maize
- Efficient water protection measure

Summer forage rye

OVID

- Robust population rye
- Can be used as a main crop for grain production or as a secondary crop for WPS production

SUVIRGIL

- Steady and stable yield

Annual and Italian ryegrass

As a fast-growing cover crop after the cereal harvest, luscious crops form just 6-8 weeks after the preceding crop is harvested. It can be used as fresh fodder or ensilaged and used in biogas plants. The dense roots provide additional organic matter to improve humus and stabilise the soil’s structure.

ALISCA

- Tetraploid
- Medium late - very flexible harvest window
- High-yield and healthy

DIPLOMAT

- Early and fast
- Upright growth for easy cutting
Avoid leaching early on

Nitrogen is an essential nutritional element for plants and plays an important role in agriculture today. Nitrogen enters the soil via mineral and organic fertilisers or the binding of atmospheric nitrogen by legumes.

Nitrate (NO₃), which is very mobile in the soil, can easily be taken up by plants but it can also be easily leached out in unfavourable conditions. Large amounts of nitrate from fertilisation or the mineralisation of organic substances, weakly absorbent soils, and high levels of precipitation encourage movement into deeper layers of the soil and the groundwater.

Levels of leaching loss over bare ground are considerably higher over the winter months than in summer due to increased precipitation. Once the nitrate has made its way into deeper layers of soil, many plants can no longer reach it.

As well as transport via leachate water, nutrients can also make it into surface water through erosion. The level of precipitation and relief as well the soil’s infiltration capacity and structural stability play a role here.

The solution - growing cover crops

Cover crops use free nutrients to form biomass and their good root penetration supports the soil’s structural stability and ability to store water. The organic matter and shade prevent erosion and encourage biological activity in the soil.

The different root shapes in viterra® cover crop blends intensively cover the soil’s volume and ensure good nutrient uptake. Nitrogen is therefore efficiently protected from erosion until spring. The same applies to other nutrients. As well as nitrates, there are also ecological limits for phosphorous and sulphur. Due to the high biological activity of the soil, they are available again to the subsequent crop in mineralised form. A suppressive soil also breaks down agricultural chemicals more quickly.

Vigourously growing cover crops are particularly suitable for water protection with their dense root systems and a certain level of resistance to cold temperatures. The viterra® WASSERSCHUTZ blend is especially designed for this purpose. The viterra® MAIS STRUKTUR or an under-sown layer of grass with viterra® UNTERSAT would also be suitable for maize sites with a high N supply potential. In trials, water protection advisors were won over by viterra® INTENSIV and its very low N₂O content in late autumn. The crucifer-free blend viterra® UNIVERSAL WINTER would be ideal for tight rapeseed crop rotations. For effective nutrient storage in October, we recommend viterra® DEPOT ÖKO.

Water protection and nutrient conservation
**Sowing and use at a glance**

**Fertilisation according to local recommendations.**

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Sowing window</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Pure seed kg/ha</th>
<th>Weight of a thousand seeds in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>White mustard nematode resistance level 2*</td>
<td>LUCIDA, VERDI, CLINT,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20 - 25</td>
<td>6 - 10</td>
</tr>
<tr>
<td></td>
<td>PROFI, GAUDI, VETO,</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>ACCENT, MASTER, SCOUT</td>
<td></td>
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<tr>
<td>Oilseed radish nematode resistance level 1*</td>
<td>AMIGO, COMET</td>
<td></td>
<td>25-30</td>
<td>10-15</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Oilseed radish nematode resistance level 2*</td>
<td>ADAGIO, DACAPO,</td>
<td></td>
<td>25-30</td>
<td>10-15</td>
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<tr>
<td></td>
<td>AGRONOM, COMPASS,</td>
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<tr>
<td></td>
<td>CONCORDE, COSMOS</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Oilseed radish multi-resistant level 1*</td>
<td>ANGUS</td>
<td></td>
<td>25-30</td>
<td>10-15</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Oilseed radish multi-resistant level 2*</td>
<td>CONTROL, DEFENDER,</td>
<td></td>
<td>25-30</td>
<td>10-15</td>
<td></td>
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<tr>
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<tr>
<td>Oilseed radish</td>
<td>BENTO, SILETTA NOVA,</td>
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<td>18-25</td>
<td>10-15</td>
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<td></td>
<td>AKIRO, SILETINA</td>
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<tr>
<td>White mustard</td>
<td>ALBATROS, COVER, CLASSIC</td>
<td></td>
<td>15-20</td>
<td>6-10</td>
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<tr>
<td>Tagroot-forming oilseed radish</td>
<td>MINER, STINGER</td>
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<td>6-8</td>
<td>10-15</td>
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<tr>
<td>Bristle oat</td>
<td>PRATEX, CODEX, TRADEX,</td>
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<td>80</td>
<td>15-30</td>
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<tr>
<td></td>
<td>OTEX</td>
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<tr>
<td>Phacelia nematode-neutral</td>
<td>ANGELIA, AMERIGO</td>
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<td>10-12</td>
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<td>Summer forage rape</td>
<td>JUMBO</td>
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<td>10-20</td>
<td>3-4</td>
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<tr>
<td>Winter forage rape</td>
<td>EMERALD, FONTAN, PRESTICE</td>
<td></td>
<td>8-20</td>
<td>3-4</td>
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<tr>
<td>Marrow stem kale</td>
<td>GRUNER ANGELITER,</td>
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<td>3-5</td>
<td>3.5-5.6</td>
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<td>ANGLIAN GOLD, CAMARO</td>
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</table>

**Species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Variety</th>
<th>Sowing window</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Pure seed kg/ha</th>
<th>Weight of a thousand seeds in g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forage rye</td>
<td>PROTECTOR, LUNATOR,</td>
<td></td>
<td>90-120</td>
<td>27-35</td>
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<tr>
<td></td>
<td>GENERATOR, TRAKTOR</td>
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<tr>
<td>Summer forage rye</td>
<td>OVID, SU VERGIL,</td>
<td></td>
<td>90-120</td>
<td>27-35</td>
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<tr>
<td>Greening rye</td>
<td>MATADOR</td>
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<td>90-120</td>
<td>27-35</td>
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<tr>
<td>Wild rye</td>
<td>JOHAN</td>
<td></td>
<td>140-150</td>
<td>17-18</td>
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<tr>
<td>Winter turnip rape</td>
<td>JUPITER</td>
<td></td>
<td>8-20</td>
<td>5-10</td>
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<tr>
<td>Annual ryegrass</td>
<td>ALISCA, tetraploid,</td>
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<td>35-45</td>
<td>2-4.5</td>
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<td></td>
<td>DIPLOMAT</td>
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<tr>
<td>Sticky nightshade</td>
<td>WHITE STAR, DIAMOND</td>
<td></td>
<td>3</td>
<td>3-4</td>
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<tr>
<td>Brown mustard</td>
<td>ENERGY, TERRAFIT</td>
<td></td>
<td>10-12</td>
<td>2-3</td>
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<tr>
<td>Oil flax</td>
<td>JULIET, ZOLTAN</td>
<td></td>
<td>30-35</td>
<td>7-8</td>
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<tr>
<td>Broad bean</td>
<td>AVALON</td>
<td></td>
<td>40/seed</td>
<td>300-350</td>
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<td></td>
<td></td>
<td></td>
<td>40/seed</td>
<td>300-350</td>
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<tr>
<td>Persian clover</td>
<td>FELIX</td>
<td></td>
<td>15-20</td>
<td>1.3-1.8</td>
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<tr>
<td>Egyptian clover</td>
<td>OTTO</td>
<td></td>
<td>30-35</td>
<td>2.4-6</td>
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<tr>
<td>Crimson clover</td>
<td>CONTEA</td>
<td></td>
<td>25-35</td>
<td>3.5</td>
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<tr>
<td>Buckwheat</td>
<td>HAJNALRA, TABOR,</td>
<td></td>
<td>50-60</td>
<td>20-35</td>
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<tr>
<td></td>
<td>ESQUIRE, ESKALAN</td>
<td></td>
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<tr>
<td>Common vetch</td>
<td>ARCON, NEON</td>
<td></td>
<td>80-160</td>
<td>40-70</td>
<td></td>
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</tr>
<tr>
<td>Winter vetch</td>
<td>LATIGO</td>
<td></td>
<td>80-160</td>
<td>20-50</td>
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<tr>
<td>Blue lupin</td>
<td>ILDIGO</td>
<td></td>
<td>80-160</td>
<td>160-200</td>
<td></td>
<td></td>
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<tr>
<td>Serradella</td>
<td></td>
<td></td>
<td>30-50</td>
<td>3.5</td>
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<tr>
<td>Alfalfa</td>
<td>PROTEUS, POSEIDON</td>
<td></td>
<td>25-30</td>
<td>1.5-2.5</td>
<td></td>
<td></td>
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<tr>
<td>Summer field pea</td>
<td>RUBIN</td>
<td></td>
<td>80-90 seeds/cm²</td>
<td>120-180</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter field pea</td>
<td>NS PIONIR</td>
<td></td>
<td>80-90 seeds/cm²</td>
<td>120-180</td>
<td>27</td>
<td></td>
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<tr>
<td>Vetchling</td>
<td></td>
<td></td>
<td>90-120</td>
<td>90-130</td>
<td></td>
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</tr>
</tbody>
</table>

*Resistance levels are based on resistance to *heterodera schachtii* and were determined by way of official tests in Germany.

**Fertilisation according to local recommendations.**
Our blends are grouped by various uses:

**Soil fertility blends**

**viterra® soil fertility blends** contribute to humus formation and improve soil fertility. They encourage root penetration and offer protection from erosion. Nitrogen and other nutrients are fixed over winter and remain available in the top layers near the roots. They increase the quality and yield of main crops.

**Biomass blends**

**viterra® biomass blends** are ideal for biomass production for biogas facilities or for cattle fodder. Summer cereal blends are cultivated as secondary crops after early harvest grains. Winter-hardy blends can provide biomass as a cover crop or main crop. Fodder gaps can be effectively closed with **viterra® grass blends**.

**Special blends**

**viterra® special blends** are used for special applications, such as greening buffer strips and wildlife grazing plots, undersowing with maize or biofumigation. These groups include bee and honey crop blends.

**Organic blends**

**viterra® organic blends** are a valuable basis for good crop rotation in organic farming. The main focus is on optimising the flow of nutrients within crop rotations. The need for good weed suppression is met by fast-growing components in the reliable blends.
Soil fertility blends are especially suitable and recommended for appropriate crop rotations. Symbiotic nitrogen binding as well as nutrient conservation come into effect. In organic farming, efficient weed suppression is especially important. The vigorously-growing components in reliable viterra® organic blends meet these needs.

### Overview of viterra® blends

<table>
<thead>
<tr>
<th>Blend</th>
<th>Suitable for crop rotation with</th>
<th>Contents as abbreviation</th>
<th>Seed quantity kg/ha</th>
<th>Sowing window</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENSIVE</td>
<td>Healthy blend</td>
<td>HS, OR</td>
<td>40–50</td>
<td>Page 38</td>
</tr>
<tr>
<td>POTATO</td>
<td>Beans potatoes</td>
<td>OR, HS, LN, WIS, USB</td>
<td>50</td>
<td>Page 38</td>
</tr>
<tr>
<td>MULCH</td>
<td>Frost sensitive blend without clover</td>
<td>HS, OR</td>
<td>40–50</td>
<td>Page 38</td>
</tr>
<tr>
<td>RUBE</td>
<td>Professional agonistic remnant</td>
<td>OR, SF</td>
<td>26–25</td>
<td>Page 38</td>
</tr>
<tr>
<td>ROBENGAGE LUX</td>
<td>The versatile best blend</td>
<td>SC, WIS, OR, PHA, AKL, HS</td>
<td>25</td>
<td>Page 40</td>
</tr>
<tr>
<td>TRIO</td>
<td>Frost sensitive blend with clover</td>
<td>PHA, ARG, OR</td>
<td>18</td>
<td>Page 40</td>
</tr>
<tr>
<td>NAIZE</td>
<td>Fast-growing blend without legumes</td>
<td>PHA, OR, HS, SDL, CM</td>
<td>20–25</td>
<td>Page 40</td>
</tr>
<tr>
<td>NAIS STRUCTUR 90</td>
<td>Lessors stressed soil</td>
<td>PHA, AR, HS, SDL</td>
<td>30</td>
<td>Page 40</td>
</tr>
<tr>
<td>SCHNELLGRÜN</td>
<td>Suitable for late sowing, with clover</td>
<td>SF, AR, LN, SFB</td>
<td>15</td>
<td>Page 40</td>
</tr>
<tr>
<td>SCHNELLGRÜN LEGWINDENFREI</td>
<td>Suitable for late sowing, without clover</td>
<td>SF, AR, LN, SFB</td>
<td>15</td>
<td>Page 40</td>
</tr>
<tr>
<td>UNIVERSAL</td>
<td>Crucifer-free and fast growing</td>
<td>PHA, HS, PHA, PHA, WIS</td>
<td>25</td>
<td>Page 40</td>
</tr>
<tr>
<td>UNIVERSAL LECUMIN-GENFREI</td>
<td>Crucifer-free and fast growing</td>
<td>PHA, HS, LN</td>
<td>25</td>
<td>Page 40</td>
</tr>
<tr>
<td>UNIVERSAL WINTER</td>
<td>Crucifer-free and evergreen</td>
<td>WO, PHA, HS</td>
<td>25–45</td>
<td>Page 40</td>
</tr>
<tr>
<td>BODENGARE</td>
<td>A powerhouse for many crops</td>
<td>PHA, PHA, AR, KR, OR, BS, SDL, LN, BA</td>
<td>50</td>
<td>Page 44</td>
</tr>
<tr>
<td>RAPS</td>
<td>Fast-sensitive blend without cracks</td>
<td>PHA, LN, AR, PHA</td>
<td>15</td>
<td>Page 45</td>
</tr>
<tr>
<td>WASSERSCHUTZ</td>
<td>For effective groundwater protec tion</td>
<td>PHA, RUB, KOF</td>
<td>10–12</td>
<td>Page 45</td>
</tr>
<tr>
<td>GRANPUR</td>
<td>Summer cereal mix for WPS use before winter</td>
<td>TGL, RS, HS</td>
<td>135–150</td>
<td>Page 46</td>
</tr>
<tr>
<td>GRANLEG</td>
<td>Summer legumes mix for WPS use before winter</td>
<td>TGL, RS, HS, ET, HS</td>
<td>135–150</td>
<td>Page 46</td>
</tr>
<tr>
<td>WICKROGEN</td>
<td>Winter-handy WPS blend</td>
<td>WO, WKM</td>
<td>100–120</td>
<td>Page 47</td>
</tr>
<tr>
<td>LINDENSAARDER GERMENGE</td>
<td>European greenmanure compatible with optional use as fodder</td>
<td>WO, WKM, WKM, EF</td>
<td>50</td>
<td>Page 47</td>
</tr>
<tr>
<td>FUTTER</td>
<td>Grass closer blend for harvest after winter</td>
<td>WO, WKM</td>
<td>35</td>
<td>Page 48</td>
</tr>
<tr>
<td>SOMMERFUTTER</td>
<td>Feed mix, can be used in greening year</td>
<td>WO, WKM</td>
<td>25</td>
<td>Page 48</td>
</tr>
<tr>
<td>SOMMERFUTTER AZ</td>
<td>Grass blend for harvest in greening year</td>
<td>WO, WKM</td>
<td>40</td>
<td>Page 48</td>
</tr>
<tr>
<td>UNTERSARTA</td>
<td>For sustainable maize cultivation</td>
<td>PHA, WRD</td>
<td>10–15</td>
<td>Page 49</td>
</tr>
<tr>
<td>BIENE</td>
<td>Annual brass-fenney fallow without cracks</td>
<td>PHA, PHA, ARG, BS, OR, LS, WIS, SDL, OR, BS</td>
<td>25</td>
<td>Page 50</td>
</tr>
<tr>
<td>MULTIRUTI</td>
<td>Annual brass-fenney fallow</td>
<td>PHA, PHA, ARG, BS, OR, LS, WIS, SDL, OR, BS</td>
<td>25</td>
<td>Page 50</td>
</tr>
<tr>
<td>HORDINO</td>
<td>Biennial gamelaid pasture blend</td>
<td>PHA, PHA, ARG, BS, OR, LS, WIS, SDL, OR, BS</td>
<td>25–30</td>
<td>Page 51</td>
</tr>
<tr>
<td>HOCHRINDL MAZ</td>
<td>Biennial gamelaid pasture blend without clover</td>
<td>PHA, PHA, ARG, BS, OR, LS, WIS, SDL, OR, BS</td>
<td>30–40</td>
<td>Page 51</td>
</tr>
<tr>
<td>BIOFUSIGRATON</td>
<td>For biolodification, tackles soilborne pests</td>
<td>SF, AR</td>
<td>15</td>
<td>Page 52</td>
</tr>
<tr>
<td>BLÜHZAUBER</td>
<td>The flowering mixture</td>
<td>Not recommended for arable farming</td>
<td>Over 40 flowering varieties</td>
<td>5–7 g/m²</td>
</tr>
</tbody>
</table>

**Sow by 01.10 for growing.**

### Organic blends

viterra® organic blends are a valuable basis for good crop rotation in organic farming. One main focus of viterra® organic blends is optimising the flow of nutrients within crop rotations. Symbiotic nitrogen binding as well as nutrient conservation come into effect.

As well as the targeted use of individual blends to control nematodes or produce fodder, all viterra® organic blends encourage soil life and contribute to increasing soil fertility.

All viterra® organic blends meet the requirements of EU Act 834/2007. The blends are checked by our testing body DE-Oko-003. You can download the certificate at [www.phpetersen.com](http://www.phpetersen.com) or [www.saaten-union.de](http://www.saaten-union.de).

<table>
<thead>
<tr>
<th>Special feature</th>
<th>Suitable for crop rotation with</th>
<th>Amount of seed kg/ha</th>
<th>Sowing window</th>
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</thead>
<tbody>
<tr>
<td>INTENSIV ÖKO</td>
<td>Health blend</td>
<td>++ ++ + + ++ ++ ++</td>
<td>40–50</td>
</tr>
<tr>
<td>BODENGARE ÖKO</td>
<td>Nitrogen supplier</td>
<td>++ ++ + ++ +</td>
<td>60–70</td>
</tr>
<tr>
<td>DEPOT ÖKO</td>
<td>Nutrient reservoir</td>
<td>++ ++ ++ ++</td>
<td>25</td>
</tr>
<tr>
<td>LINDENSAARDER GE-</td>
<td>Evergreen grasses and legumes for fodder</td>
<td>++ ++ + ++</td>
<td>50</td>
</tr>
<tr>
<td>WINTER-QUARTETT ÖKO</td>
<td>For flexible winter greening and fodder</td>
<td>++ ++ + ++</td>
<td>50 or 80</td>
</tr>
<tr>
<td>WICKROGEN ÖKO</td>
<td>Winter-hardy blend for fodder or green manure</td>
<td>++ ++ + ++</td>
<td>100–120</td>
</tr>
<tr>
<td>WICKROGEN FUTTER ÖKO</td>
<td>Winter-hardy blend for fodder or green manure</td>
<td>++ ++ + ++</td>
<td>100–120</td>
</tr>
</tbody>
</table>

**New information about viterra® blends:**


* suitable for appropriate crop rotations ** especially suitable and recommended for appropriate crop rotations  
| Status as of January 2020 |
viterra® INTENSIV

The health blend

- Controls migratory root nematodes (pratylenchus) and reduces viral internal rust spot in potatoes with multi-resistant oilseed radish DEFENDER and bristle oat PRATEX
- Fast-growing with intensive weed suppression
- Plenty of organic matter vitalises soil life
- The fibrous roots of PRATEX and taproots of DEFENDER complement each other in root penetration of the entire soil
- In trials, water protection advisors were won over by viterra® INTENSIV and its very low N₂₀ content in late autumn

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>SUITABLE FOR CROP ROTATION WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTENSIVE</td>
<td>Maize</td>
</tr>
<tr>
<td>Seed proportions</td>
<td>56% bristle oat PRATEX, 44% multi-resistant oilseed radish DEFENDER</td>
</tr>
<tr>
<td>Sowing</td>
<td>Mid July to early September</td>
</tr>
<tr>
<td>Sowing density</td>
<td>40-50 kg/ha</td>
</tr>
</tbody>
</table>

viterra® MULCH

The frost-sensitive blend without clover

- Blend with oilseed radish COMPASS, which freezes off easily, and fast-growing bristle oat PRATEX
- Especially recommended for direct and mulch sowing, especially before maize and sugar beets
- The root channels allow rapid deep root formation in maize
- Activates soil life, loosens and aerates soil for the following crop
- viterra® MULCH binds nitrogen over winter and protects it from displacement
- Bristle oat promotes mycorrhizal fungi to stabilise soil structure

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>SUITABLE FOR CROP ROTATION WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>MULCH</td>
<td>Maize</td>
</tr>
<tr>
<td>Seed proportions</td>
<td>56% bristle oat PRATEX, 44% nematode-resistant oilseed radish COMPASS</td>
</tr>
<tr>
<td>Sowing</td>
<td>Mid July to early September</td>
</tr>
<tr>
<td>Sowing density</td>
<td>40-50 kg/ha</td>
</tr>
</tbody>
</table>

viterra® POTATO

The boost for potatoes

- Substantial blend to improve soil and enrich humus in potato crop rotations
- Blue lupin ILDIGO and multi-resistant oilseed radish CONTROL penetrate large volumes of soil rapidly with their deep roots, improving the structure of the soil
- Oilseed radish CONTROL and bristle oat PRATEX have rapid initial development and offer soil protection as well as tilth
- Blue lupin and common vetch provide nitrogen, while oilseed radish and bristle oat quickly convert nitrogen into organic matter
- Excellent erosion protection, not winter-hardy

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>SUITABLE FOR CROP ROTATION WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTATO</td>
<td>Maize</td>
</tr>
<tr>
<td>Seed proportions</td>
<td>46% oilseed radish CONTROL, 18% bristle oat PRATEX, 16% flax JULIET, 16% common vetch, 4% blue lupin ILDIGO</td>
</tr>
<tr>
<td>Sowing</td>
<td>Early-mid July to mid August</td>
</tr>
<tr>
<td>Sowing density</td>
<td>50 kg/ha</td>
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</tbody>
</table>

viterra® RÜBE

Professional against nematodes

- High-performance blend of two nematode-resistant oilseed radishes (AMIGO and COMPASS) and white mustards (VERDI and MASTER).
- Sufficient plant density of more than 160 plants/m² allows active nematode control at the highest level
- Better growing security and better pest control thanks to complementary varieties and dense roots
- viterra® RÜBE is suited to mid-early to late sowing and suitable for any site conditions
- Oilseed radish roots penetrate deep into the lower layers of soil to reduce nematodes even deep down

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>SUITABLE FOR CROP ROTATION WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>RÜBE</td>
<td>Maize</td>
</tr>
<tr>
<td>Seed proportions</td>
<td>30% nematode-resistant oilseed radish COMPASS, 26% nematode-resistant oilseed radish AMIGO, 24% nematode-resistant white mustard VERDI, 10% nematode resistant white mustard MASTER</td>
</tr>
<tr>
<td>Sowing</td>
<td>Mid July to early September</td>
</tr>
<tr>
<td>Sowing density</td>
<td>20-25 kg/ha</td>
</tr>
</tbody>
</table>
The versatile beet blend

- No multiplication of beet cyst nematodes
- Intensive root penetration of the upper soil through complementary root shapes of deep, flat and cordate rootlings
- Can be sown with a shaker, phacelia seeds are pelleted so can be scattered to germinate in the dark
- Provides easily digestible organic material to activate and strengthen soil life
- Reliably freezes off so that dead plant matter protects soil from wind and water erosion over winter
- Creates optimal conditions for sugar beet mulch seeding

**viterra® RÜBENGARE**

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<tr>
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<tbody>
<tr>
<td>RÜBENGARE</td>
<td>Maize</td>
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</table>

<table>
<thead>
<tr>
<th>Seed proportions</th>
<th>29% phacelia ANGELIA pelleted, 20% flax ZOLTAN, 16% Egyptian clover, 18% white mustard VERDI, 11% bristle oat PRATEX, 6% common vetch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing</td>
<td>July to late August</td>
</tr>
<tr>
<td>Sowing density</td>
<td>25 kg/ha</td>
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</tbody>
</table>

**viterra® TRIO**

The frost-sensitive blend with clover

- **viterra® TRIO** including oilseed radish COMPASS, Egyptian clover and phacelia ANGELIA for easy freezing off
- Beet cyst nematodes cannot multiply due to resistant oilseed radish COMPASS and neutral plants
- Fast initial development and dense penetration of soil with thick and thin roots
- Bees and insects use the late phacelia flowers
- Delicate mulch base offers good erosion protection until spring sowing

**viterra® MAIS STRUKTUR**

Loosens compacted soil

- The combination of winter-hardy components and varieties that freeze off fixes nutrients and protects the soil into spring
- The tapestry of wide and deep roots, along with the enormous taproots of the soil-improving STINGER radish, leaves looser soil with increased infiltration
- Common vetch and crimson clover are high-quality legumes that will provide subsequent crops with new nitrogen
- The diversity of chosen varieties reinvigorates the soil and encourages the development of organic substances

**viterra® MAIS**

Fast-growing blend without legumes

- Fast ground cover with vigorously growing components
- Good processor of slurry and other nutrients, excellent erosion and water protection
- Combination of deep and flat roots for thorough root penetration and stabilisation of soil structure
- The root channels allow rapid deep root formation in maize
- Soil loosening and aeration for optimal maize crops
- Bristle oat promotes mycorrhizal fungi to stabilise soil structure
- Improves image thanks to sunflowers and phacelia flowers

**RECOMMENDATION**

Suitable for crop rotation with:
- Maize
- Corn
- Rapeseed
- Sugar beet
- Peas
- Lentils
- Mustard

**Seed proportions**
- optimised 2020 blend
- 35% oilseed radish SILETINA, 31% phacelia ANGELIA, 16% nematode-resistant oilseed radish ADAGIO, 4% oilseed radish STING ER, 3% common vetch, < 1% sunflower
- Mid July to late August
- 20 - 25 kg/ha

**viterra® MAIS STRUKTUR**

Loosens compacted soil

- The combination of winter-hardy components and varieties that freeze off fixes nutrients and protects the soil into spring
- The tapestry of wide and deep roots, along with the enormous taproots of the soil-improving STINGER radish, leaves looser soil with increased infiltration
- Common vetch and crimson clover are high-quality legumes that will provide subsequent crops with new nitrogen
- The diversity of chosen varieties reinvigorates the soil and encourages the development of organic substances

**RECOMMENDATION**

Suitable for crop rotation with:
- Maize
- Corn
- Rapeseed
- Sugar beet
- Peas
- Lentils
- Mustard

**Seed proportions**
- 25% phacelia ANGELIA, 22% winter turnip rape, 21% crimson clover, 16% bristle oat PRATEX, 8% nematode-resistant oilseed radish ADAGIO, 4% oilseed radish STING ER, 3% common vetch, < 1% sunflower
- Late July to late August
- 30 kg/ha

The weight of seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value. Suitable for fulfilling AUM requirements.
viterra® SCHNELLGRÜN

Suitable for late sowing, with clover

- Fast greening thanks to especially fast-growing components: ALBATROS white mustard and ENERGY brown mustard make for excellent tolerance to late sowing
- Brown mustard contains valuable glucosinolates, which break down into isothiocyanates to tackle soil-borne diseases
- Non-hardy varieties make mulch sowing the following crop much easier in spring
- Ideal before maize and also suitable as a cover crop after early maize harvests
- Low demands on the seedbed and scatter capability make for cheap and easy sowing

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Seed proportions: 43% white mustard ALBATROS, 24% Egyptian clover, 15% camelina, 15% brown mustard ENERGY
Sowing: Early August to mid-late September
Sowing density: 15 kg/ha

Suitable for late sowing, without clover

- Fast greening thanks to especially fast-growing components: ALBATROS white mustard and ENERGY brown mustard make for excellent tolerance to late sowing
- Brown mustard contains valuable glucosinolates, which break down into isothiocyanates to tackle soil-borne diseases
- Non-hardy varieties make mulch sowing the following crop much easier in spring
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Seed proportions: 39% white mustard ALBATROS, 21% camelina, 19% brown mustard ENERGY
Sowing: Early August to mid-late September
Sowing density: 15 kg/ha

viterra® UNIVERSAL

Crucifer-free and fast-growing

- Can easily be added to rapeseed crop rotations, disrupts disease cycles
- Thanks to drought-tolerant components, suitable for universal use
- Quick shade retains tillth and ensures good weed suppression
- Balanced combination of nitrogen binders and feeders, enables the formation of organic mass
- viterra® UNIVERSAL is also available as viterra® UNIVERSAL LEGUMINOSENFREI for crop rotations with rapeseed and legumes
- Phacelia, vetch and clover flowers attract countless insects

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Seed proportions: 50% phacelia ANGELIA, 26% bristle oat PRATEX, 17% Egyptian clover, 10% Persian clover FELIX, 3% common vetch
Sowing: Early July to early September
Sowing density: 25 kg/ha

viterra® UNIVERSAL LEGUMINOSENFREI

Crucifer-free and fast-growing

- Can easily be added to legume crop rotations, disrupts disease cycles
- Good convertor of slurry and other nutrients
- Binds nitrogen left in the soil and other nutrients in zones around the roots
- Thanks to drought-tolerant components, suitable for universal use
- Quick shade retains tillth and ensures good weed suppression
- viterra® UNIVERSAL LEGUMINOSENFREI is also available with clover as viterra® UNIVERSAL

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Seed proportions: 45% phacelia ANGELIA, 29% bristle oat PRATEX, 26% flax ZOLTAN
Sowing: Early July to early September
Sowing density: 25 kg/ha

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value.
Suitable for fulfilling AUM requirements.

viterra® SCHNELLGRÜN

- Fast greening thanks to especially fast-growing components:
- ALBATROS white mustard and ENERGY brown mustard make for excellent tolerance to late sowing
- Brown mustard contains valuable glucosinolates, which break down into isothiocyanates to tackle soil-borne diseases
- Non-hardy varieties make mulch sowing the following crop much easier in spring
- Ideal before maize and also suitable as a cover crop after early maize harvests
- Low demands on the seedbed and scatter capability make for cheap and easy sowing

viterra® UNIVERSAL

- Can easily be added to rapeseed crop rotations, disrupts disease cycles
- Thanks to drought-tolerant components, suitable for universal use
- Quick shade retains tillth and ensures good weed suppression
- Balanced combination of nitrogen binders and feeders, enables the formation of organic mass
- viterra® UNIVERSAL is also available as viterra® UNIVERSAL LEGUMINOSENFREI for crop rotations with rapeseed and legumes
- Phacelia, vetch and clover flowers attract countless insects

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viterra® UNIVERSAL LEGUMINOSENFREI

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- Binds nitrogen left in the soil and other nutrients in zones around the roots
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- Low demands on the seedbed and scatter capability make for cheap and easy sowing

viterra® SCHNELLGRÜN

Suitable for late sowing, with clover

- Fast greening thanks to especially fast-growing components:
- ALBATROS white mustard and ENERGY brown mustard make for excellent tolerance to late sowing
- Brown mustard contains valuable glucosinolates, which break down into isothiocyanates to tackle soil-borne diseases
- Non-hardy varieties make mulch sowing the following crop much easier in spring
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Seed proportions: 39% white mustard ALBATROS, 21% camelina, 19% brown mustard ENERGY
Sowing: Early August to mid-late September
Sowing density: 15 kg/ha

Suitable for late sowing, without clover

- Fast greening thanks to especially fast-growing components:
- Good convertor of slurry and other nutrients
- ALBATROS white mustard and ENERGY brown mustard make for excellent tolerance to late sowing
- Brown mustard contains valuable glucosinolates, which break down into isothiocyanates to tackle soil-borne diseases
- Non-hardy varieties make mulch sowing the following crop much easier in spring
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Seed proportions: 43% white mustard ALBATROS, 24% Egyptian clover, 15% camelina, 15% brown mustard ENERGY
Sowing: Early August to mid-late September
Sowing density: 15 kg/ha

viterra® UNIVERSAL

Crucifer-free and fast-growing

- Can easily be added to rapeseed crop rotations, disrupts disease cycles
- Thanks to drought-tolerant components, suitable for universal use
- Quick shade retains tillth and ensures good weed suppression
- Balanced combination of nitrogen binders and feeders, enables the formation of organic mass
- viterra® UNIVERSAL is also available as viterra® UNIVERSAL LEGUMINOSENFREI for crop rotations with rapeseed and legumes
- Phacelia, vetch and clover flowers attract countless insects

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Seed proportions: 50% phacelia ANGELIA, 26% bristle oat PRATEX, 17% Egyptian clover, 10% Persian clover FELIX, 3% common vetch
Sowing: Early July to early September
Sowing density: 25 kg/ha

viterra® UNIVERSAL LEGUMINOSENFREI

Crucifer-free and fast-growing

- Can easily be added to legume crop rotations, disrupts disease cycles
- Good convertor of slurry and other nutrients
- Binds nitrogen left in the soil and other nutrients in zones around the roots
- Thanks to drought-tolerant components, suitable for universal use
- Quick shade retains tillth and ensures good weed suppression
- Balanced combination of nitrogen binders and feeders, enables the formation of organic mass
- viterra® UNIVERSAL LEGUMINOSENFREI is also available with clover as viterra® UNIVERSAL

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</tbody>
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Seed proportions: 45% phacelia ANGELIA, 29% bristle oat PRATEX, 26% flax ZOLTAN
Sowing: Early July to early September
Sowing density: 25 kg/ha

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value.
Suitable for fulfilling AUM requirements.
viterra® UNIVERSAL WINTER
Crucifer-free and evergreen

• As an evergreen cover crop with the option of using as your own initial spring fertiliser
• Free from crucifers so can easily be used in oilseed rape crop rotations
• Various blend partners allow a broad spectrum of use
• Evergreen ryegrass increases erosion protection and stabilises soil structure up to the subsequent crop
• Binds nitrogen remaining in the soil and protects groundwater

Suitable for fulfilling AUM requirements.

RECOMMENDATION

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<thead>
<tr>
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<tbody>
<tr>
<td>Stoat</td>
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<tr>
<td>Universal Winter</td>
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</tbody>
</table>

Seed proportions
46% Italian ryegrass, 44% phacelia ANGELIA, 10% bristle oat PRATEX

Sowing
Early July to mid September

Sowing density
25 - 45 kg/ha

Also available as an organic blend (see page 54)

viterra® BODENGARE
A powerhouse for the crop rotation

• Promotes soil structure, revegetation and crumb formation to improve soil fertility
• After early preceding crop (e.g. WPS) as a summer cover crop for soil regeneration, free from grasses
• Existing tilth encourages aeration and water flow, preventing capping
• Enriches plant life and habitats for many insects and beneficial organisms
• High proportion of legumes collects additional nitrogen
• Crucifer-free, especially suitable for oilseed rape crop rotation
• Now with small-grained AVALON broad bean for structure

Optimised 2020 blend

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<tbody>
<tr>
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<tr>
<td>Bodengare</td>
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</table>

Seed proportions
38% Persian clover, 18% phacelia ANGELIA, 25% Egyptian clover, 8% oil flax JULIET, 6% common vetch, 2% summer field pea, 1% bread bean AVALON, 1% blue lupin ILDIGO, <1% sunflower

Sowing
Mid June to mid August

Sowing density
50 kg/ha

Also available as an organic blend (see page 54)

viterra® RAPS
Frost-sensitive blend without crucifers

• Crucifer-free blend of phacelia ANGELIA, oil flax JULIET, Persian and Egyptian clover
• Underdemanding blend, no relation to main cultures
• Ideal for cereal and rapeseed crop rotations, as changing the crop type disrupts disease cycles
• Underdemanding and drought-tolerant blend
• Dense root penetration improves the soil’s structure and encourages air exchange in the soil
• Phacelia and flax flowers offer nectar for bees and other insects
• Components that reliably freeze off allow easy sowing of the subsequent culture

Optimised 2020 blend

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<tr>
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<td>Raps</td>
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</table>

Seed proportions
53% phacelia ANGELIA, 23% oil flax ZOLTAN, 15.5% Persian clover FELIX, 8.5% Egyptian clover

Sowing
Early July to late August

Sowing density
55 kg/ha

viterra® WASSERSCHUTZ
For effective groundwater protection

• High nitrogen absorption capacity and good nutrient storage potential in the winter-hardy varieties
• Winter forage rape EMERALD and winter turnip rape JUPITER quickly root into deep soil layers and absorb freely available nutrients
• These nutrients are released at the following maize’s main growth time from June
• Marrow stem kale variety ANGLIAN GOLD is winter hardy and makes the blend an attractive source of nutrition for game as an especially tasty variety

Optimised 2020 blend

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<td>Wasserschutz</td>
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Seed proportions
43% winter forage rape EMERALD, 39% winter turnip rape JUPITER, 18% marrow stem kale ANGLIAN GOLD

Sowing
Mid July to late September

Sowing density
10 - 12 kg/ha
viterra® GRANOPUR

WPS use before winter

- For biomass production after whole plant silage or an early cereal harvest with cutting before winter
- Increased cultivation reliability thanks to a balanced composition of various cereal components
- Soil tilth is maintained over summer
- *viterra® GRANOPUR* is a cereal blend so very well suited to subsequent potato crops

Suitable for fulfilling AUM requirements.

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value.

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<table>
<thead>
<tr>
<th>Weight percentages</th>
<th>Sowing</th>
<th>Sowing density</th>
<th>Harvest window</th>
<th>Harvest</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% spring triticale, 20% spring rye OVID, 20% bristle oat PRATEX, 20% oat</td>
<td>Late March to late May or early July to early August</td>
<td>135-150 kg/ha</td>
<td>June/July when sown in spring, October/November when sown in summer</td>
<td>From existing crop to kernel dough stage</td>
</tr>
</tbody>
</table>

viterra® GRANOLEG

WPS use before winter with legumes

- For biomass production after whole plant silage or an early cereal harvest with cutting before winter
- *viterra® GRANOLEG* contains summer field pea, which provides additional nitrogen for stressed soil and keeps crop greener for longer (optimised harvest window)
- Increased cultivation reliability thanks to a balanced composition of various cereal components
- Good shade promotes tilth and keeps soil life thriving

Suitable for producing fodder of exceptional quality

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value.

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<tr>
<td>30% spring triticale, 20% spring rye OVID, 20% oat, 20% summer field pea, 10% bristle oat PRATEX</td>
<td>Mid July to late September</td>
<td>135-150 kg/ha</td>
<td>June/July when sown in spring, October/November when sown in summer</td>
<td>From existing crop to kernel dough stage</td>
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viterra® LUNDSGAARDER GEMENGE

Winter-hardy fodder blend for greening

- Suitable as a winter cover crop for green manuring and soil improvement
- Balanced combination of nitrogen collectors and consumers has a positive impact on plant growth and soil life
- Italian ryegrass uses growth phases over winter, while winter vetch and winter field pea are valuable protein components in fodder
- High agricultural value thanks to large array of flowers
- Excellent for undersowing with maize at reduced seed concentration (15-20 kg/ha)

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<tbody>
<tr>
<td>52% Italian ryegrass, 43% crimson clover, 4% winter vetch, 1% field pea NS PIONIR</td>
<td>Late August to mid September or in spring at an under-sown crop with maize</td>
<td>50 kg/ha</td>
<td>April to early May</td>
<td>As green fodder with silage trailer, for silage use with silage trailer or harvester after pre-wilting phase</td>
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</tbody>
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Wickroggen

Winter-hardy WPS blend

- Winter-hardy biomass legume blend
- For high-yield WPS use with high protein and energy content
- 25-40 t/ha WPS FM-yields possible depending on location
- Winter-hardy vetch delivers additional nitrogen
- Excellent erosion protection
- Binds valuable nitrogen and converts it into climate-friendly biomass

Suitable for fulfilling AUM requirements.

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<tr>
<td>90% winter rye MATADOR, 10% winter vetch</td>
<td>Mid September to mid October</td>
<td>100-120 kg/ha</td>
<td>Dough stage, mid to late June</td>
<td>From standing crop, side knives recommended</td>
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</tbody>
</table>

Maize

Suitable for undersowing with maize at reduced seed concentration

Cereals

Suitable as a winter cover crop for green manuring and soil improvement

Rapeseed

Sugar beet

Potatoes

legumes

-intensive cultures

Maize

Sugar beet

Potatoes
viterra® FUTTER
Grass clover blend for harvest after winter
- Stable yield and fodder for biogas
- Suitable for dual-culture use systems in combination with maize or millet
- Nutrient uptake before the winter pause and in early spring prevents loss
- Organic substances from roots and stubble improve humus balance and ensure good pre-crop value
- Not recommended for dry sites and soils with low water storage capacity

viterra® SOMMERFUTTER A2
Grass blend for harvest in growing year
- Composition as recommended quality standard blend A2
- Provides additional high-quality fodder when used as a summer cover crop
- Combination of annual and Italian ryegrass delivers well-structured fodder for ruminants
- The vigorous Italian ryegrass allows winter greening after the harvest
- High preceding crop value thanks to good root penetration and soil tillage
- This blend is also available with Persian clover as viterra® SOMMERFUTTER

viterra® SOMMERFUTTER
Feed mix, can be used in growing year
- Provides additional quality fodder when used as a summer cover crop
- Annual ryegrass provides sufficient structure, the Persian clover provides a high protein content
- The vigorous Italian ryegrass allows winter greening after the harvest
- High preceding crop value thanks to good root penetration and soil tillage
- This blend is also available without Persian clover as viterra® SOMMERFUTTER A2
* Only greening-compatible when used in sowing year with exceptional approval from the Chamber of Agriculture

viterra® UNTERSAAT
For sustainable maize cultivation
- Grass blend of Italian (tetraploid) and German (diploid) ryegrass for undersowing in maize crops
- Vigorous Italian ryegrass combined with late German ryegrass ensures good reliability
- After the maize harvest, the grass continues to develop and binds freely available nitrogen
- The humus balance is stabilised in tight maize crop rotations
- Effective protection from wind and water erosion over winter
- The soil’s load capacity is increased and road pollution reduced

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value. Suitable for fulfilling AUM requirements.
viterra® BIENE
Annual bee/honey fallow without crucifers

- Top recommendation as fallow with honey plants for creating ecological compensation area
- Crucifer-free blend with eleven components
- Use of fallow land with honey plants
- Flowering blend with long flowering phase for good biodiversity and positive impact on agricultural image
- Roots penetrate different soil levels and stabilise soil structure
- Grass-free for easy control in subsequent culture
- Buckwheat-free

Suitable for fulfilling AUM requirements.

Optimised 2020 blend

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
<th>SUITABLE FOR CROP ROTATION WITH</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIENE</td>
<td><strong>Maize</strong></td>
</tr>
<tr>
<td>Seed proportions</td>
<td>35% Persian clover FELIX, 28% Egyptian clover, 14% phacelia ANGELIA, 11% oil, 4% serradella, 3% alfalfa, 2% common vetch, 1% marigold, 1% summer field pea, &lt;1% blue lupin, &lt;1% sunflower</td>
</tr>
<tr>
<td>Sowing</td>
<td>Early March to late May (please see AUM sowing requirements)</td>
</tr>
<tr>
<td>Sowing density</td>
<td>25 kg/ha</td>
</tr>
</tbody>
</table>

viterra® MULTIKULTI
Annual bee/honey fallow

- Top recommendation for honey fallow and agricultural environmental measures
- Blend of 12 components for honey plants/fallow greening application
- Blooming blend for good biodiversity and versatile usage
- Roots penetrate different soil levels and stabilise soil structure
- Grass-free for easy control in subsequent culture
- Effective protection from erosion and drying out
- As a cover crop after WPS or cereal harvest or as border green for maize and other cultures

Suitable for fulfilling AUM requirements.

Optimised 2020 blend

<table>
<thead>
<tr>
<th>RECOMMENDATION</th>
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</thead>
<tbody>
<tr>
<td>MULTIKULTI</td>
<td><strong>Maize</strong></td>
</tr>
<tr>
<td>Seed proportions</td>
<td>33% phacelia ANGELIA, 15% Persian clover, 14% Egyptian clover, 12% nematode-resistant white mustard GALAUD, 5% serradella, 11% nematode-resistant oilseed radish AGRONOM, 3% common vetch, 1% blue lupin, 1% sunflower, 1% horage, 1% summer field pea RUBIN, &lt;1% buckwheat HALBNAKA</td>
</tr>
<tr>
<td>Sowing</td>
<td>Early April to late August (please see AUM sowing requirements)</td>
</tr>
<tr>
<td>Sowing density</td>
<td>25 kg/ha</td>
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</table>

viterra® HÖCHWILDL NEW
Biennial gameland pasture blend without crucifers

- Excellent wild grazing with tasty protein plants
- Robust and winter-hardy varieties ensure long-lasting stock
- Varieties rich in nectar and pollen nourish insects, using all flowers and fauna
- Suitable as a cover crop for ecological priority zones as part of greening
- Free from crucifers and grasses

Suitable for fulfilling AUM requirements.

Optimised 2020 blend

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<tr>
<td>HÖCHWILDL NEW</td>
<td><strong>Maize</strong></td>
</tr>
<tr>
<td>Seed proportions</td>
<td>28% red clover, 26% alfalfa, 21% Egyptian clover, 19% crimson clover, 3% winter field pea, 3% lavender</td>
</tr>
<tr>
<td>Sowing</td>
<td>March to June</td>
</tr>
<tr>
<td>Sowing density</td>
<td>30-40 kg/ha</td>
</tr>
</tbody>
</table>

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value. Suitable for fulfilling AUM requirements.

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value. Suitable for fulfilling AUM requirements.
viterra® BIOFUMIGATION
Against soil-borne pests
- For controlling soil-borne diseases such as fusarium and rhizoctonia by using biologically active plant substances (principle of biofumigation)
- Fast-growing blend for crop rotations that only leave a short time for cover crops
- Formation of leafy biomass
- At the time of full flowering (7-8 weeks after sowing), chop the plants as finely as possible and work into the soil
- Phytosanitary effect

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<td>BIOFUMIGATION</td>
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</table>

Weight percentages
- 50% brown mustard ENERGY
- 50% multi-resistant oilseed radish DEFENDER

Sowing
- Early May to mid September

Sowing density
- 15 kg/ha

Legume proportion according to DUVR: 0%

viterra® BLÜHZAUBER
The flowering meadow
- Visually pleasing with a range of more than 40 flowering varieties with different colours and petal shapes
- Source of pollen and nectar for bees, bumble bees, butterflies and many other insects
- Continuous flowering period from late May into autumn
- Larger quantities for councils available on request
- Improves the image of agricultural landscapes

Cultivation tip: Sawdust or sand can be added to easily increase volume and improve seed distribution.

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Varieties
- Marigold, Mexican aster, California poppy, yellow toadflax, baby blue eyes, leucanthemum, field poppy, sunflower... and many more

Sowing
- April to mid June

Sowing density
- 5 - 7 g/m²

Naturally cover crops
The demand for organically grown foods has grown significantly over the last few years. The number of organic farms has grown, along with the demand for suitable organic varieties with special characteristics.

SAATEN-UNION offers varieties as well as blends for use as cover crops and in forage production.

The purity and germination of these high-quality seeds exceed the legal norm and form the basis for successful arable farming - in organic much more than conventional farming. As well as our viterra® organic blends, our organic seed portfolio also includes single crop seeds for the following cultures: Forage rye (e.g. PROTECTOR), spring rye (e.g. OVID), bristle oat (e.g. PRATEX), oilseed radish (e.g. SILETINA), white mustard (e.g. ACCENT), Phacelia (e.g. ANGELIA), common vetch (variety on request), buckwheat (variety on request)

viterra® INTENSIV ÖKO
The health blend
- Controls migratory root nematodes (pratylenchus) and reduces viral internal rust spot in potatoes with multi-resistant oilseed radish DEFENDER and bristle oat PRATEX
- Fast-growing with intensive weed suppression
- Plenty of organic matter vitalises soil life
- The fibrous roots of PRATEX and taproots of DEFENDER complement each other in root penetration of the entire soil
- As the nematode-resistant oilseed radish DEFENDER is used, the blend is also suitable as a cover crop preceding sugar beet

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<td>INTENSIV ÖKO</td>
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Weight percentages
- 70% bristle oat PRATEX
- 30% multi-resistant oilseed radish DEFENDER

Sowing
- Mid July to early September

Sowing density
- 40 - 50 kg/ha

The demand for organically grown foods has grown significantly over the last few years. The number of organic farms has grown, along with the demand for suitable organic varieties with special characteristics.

SAATEN-UNION offers varieties as well as blends for use as cover crops and in forage production.

The purity and germination of these high-quality seeds exceed the legal norm and form the basis for successful arable farming - in organic much more than conventional farming. As well as our viterra® organic blends, our organic seed portfolio also includes single crop seeds for the following cultures: Forage rye (e.g. PROTECTOR), spring rye (e.g. OVID), bristle oat (e.g. PRATEX), oilseed radish (e.g. SILETINA), white mustard (e.g. ACCENT), Phacelia (e.g. ANGELIA), common vetch (variety on request), buckwheat (variety on request)

The weight and seed proportions of the individual components may vary slightly due to different TKWs. If unavailable, varieties may be replaced by varieties of equal value. Suitable for fulfilling AUM requirements.
viterra® BODENGARE ÖKO
The nitrogen supplier for subsequent crops
• Delivers essential nitrogen through symbiotic nitrogen binding for plant growth
• Increased availability of main and trace nutrients through stabilisation in the soil
• Stimulates the activity of soil life with resulting soil bioengineering for improved soil fertility
• Complementary and varied root types encourage soil quality and structure
• After an early preceding crop as a summer cover crop for soil regeneration
• Crucifer-free, so especially suitable for oilseed rape crop rotation
• Now with small-grained AVALON broad bean for structure

Suitable for fulfilling AUM requirements.

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<td>BODENGARE ÖKO</td>
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</table>

| Weight percentages | 20% common vetch, 28% field pea, 28% broad bean AVALON, 15% blue lupin ILRIGO, 6% Egyptian clover, 3% phacelia ANGELIA ÖKO |
| Sowing | Mid June to mid August |
| Sowing density | 60-70 kg/ha |

viterra® DEPOT ÖKO
The nutrient reservoir
• Vigorous varieties bind nutrients, storing them during the winter and making them available to the following crop
• Efficient suppression of weeds thanks to rapid initial development
• Excellent root penetration of the soil by deep and flat rooters stabilises soil structure and improves the soil’s infiltration capacity
• Especially suited to crop rotations with legumes as the main crop

Suitable for fulfilling AUM requirements.

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| Weight percentages | 46% bristle oat PRATEX, 30% oilseed radish SILETINA, 10% white mustard, 10% phacelia ANGELIA, 4% sunflower |
| Sowing | Late July to late August |
| Sowing density | 25 kg/ha |

viterra® WINTERQUARTETT ÖKO
For flexible winter greening and fodder
• Frost-hardy blend interacting components for fodder, soil improvement and soil protection: viterra® WINTERQUARTETT ÖKO can also be used as fresh fodder, late pasture and silage
• For winter greening with a long growth phase for vegetated soil to stimulate soil microbiology and increase soil fertility
• The flat, loose working in of green manure in spring maintains soil structure and creates ideal sowing conditions for maize
• Continuous growth supports valuable soil, putting sunlight to optimal use
• Energy-rich root exudates nourish soil life and promote humus formation

Suitable for fulfilling AUM requirements.

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<td>WINTERQUARTETT ÖKO</td>
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</table>

| Weight percentages | 67% winter rye INSPECTOR, 13.5% Italian ryegrass, 11.5% crimson clover, 8% winter forage rape EMERALD |
| Sowing | June to October: suitable for early and late sowing |
| Sowing density | 50 kg/ha for winter greening 80 kg/ha for fodder use |

viterra® LUNDSGAARDER GEMENGE ÖKO
Evergreen grasses and legumes for fodder
• Suitable as a winter cover crop for fresh manuring and soil improvement or for fodder production
• Balanced combination of nitrogen collectors and consumers has a positive impact on plant growth and soil life
• Italian ryegrass uses growth phases over winter
• Winter vetch and winter field pea are valuable protein suppliers in fodder
• Increase of agricultural value thanks to large quantity of flowers

Suitable for fulfilling AUM requirements.

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| Weight percentages | 31% Italian ryegrass, 29% crimson clover, 20% winter vetch, 20% winter field pea NG PIONIR |
| Sowing | Late August to mid September or in spring as an undersown crop with maize |
| Sowing density | 50 kg/ha |
| Harvest window | April to early May |
| Harvest | As green fodder with silage trailer, for sludge use with sludge trailer or harvester after pre-wilting phase |
viterra® WICKROGGEN ÖKO
Winter-hardy blend for fodder or green manure

- Winter-hardy blend including high-yield, stable and healthy population rye INSPECTOR and winter vetch
- Winter vetch binds nitrogen from the air, contributing to the following crop’s nutrient supply
- Additional fodder source with high protein and energy content
- Winter-hardy vetch provides nectar and pollen, increasing biodiversity
- *viterra® WICKROGGEN ÖKO* helps keep plots free from weeds and improves soil structure

**RECOMMENDATION**

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<td>Maize</td>
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**WICKROGGEN ÖKO**

<table>
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<tr>
<th>Weight percentages</th>
<th>90% winter rye INSPECTOR, 10% winter vetch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sowing</td>
<td>Mid September to mid October</td>
</tr>
<tr>
<td>Sowing density</td>
<td>100 - 120 kg/ha</td>
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viterra® WICKROGGEN FUTTER ÖKO
Winter-hardy blend for fodder or green manure

- Winter-hardy blend including high-yield, stable and healthy population rye INSPECTOR and winter vetch
- Winter vetch binds nitrogen from the air, contributing to the following crop’s nutrient supply
- Additional fodder source with high protein and energy content
- Winter-hardy vetch provides nectar and pollen, increasing biodiversity
- As *viterra® WICKROGGEN FUTTER ÖKO*, the blend also contains crimson clover and Italian ryegrass, which supply additional yield over summer after a WPS harvest and ensure ongoing greening up to the following crop

**RECOMMENDATION**

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**WICKROGGEN FUTTER ÖKO**

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<tr>
<th>Weight percentages</th>
<th>67% winter rye INSPECTOR, 13% Italian ryegrass, 12% crimson clover, 8% winter vetch</th>
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<tr>
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Cultivation recommendation

**Sowing**

The recommended sowing window is provided for each variety and blend. Location and weather also play a role. To save water, the cover crop can be sown flat directly after harvest. Alternatively, the first wave of volunteer grain or rapeseed can be deferred then drilled after the soil has been worked. This is the safest option as long as moisture is sufficient.

A well consolidated seed bed with a fine soil structure and evenly distributed straw encourages rapid development. The ideal sowing depth for most blends is 1 to 2 cm. A cover crop can only achieve its aim when sown at the according density. Dense planting prevents weeds, and ‘green bridges’. Plants compete for light, nutrients and water. This means that the soil is quickly covered and deeply penetrated by roots. This also improves freezing off. A multitude of thin plants is easier to incorporate in spring than a few strong plants.

**Fertilisation**

Generally, cover crops manage well with a poor nutrient supply. Things become critical when there is a disruption to the nitrogen supply after straw has been worked in. A mineral or organic fertiliser can really help promote initial development (Please see regional regulations)

**Cultivation after winter**

Depending on the cover crop, the remaining mulch layer may be very different in spring. Brittle, dry material is ideal for mulching and direct sowing. If cover crops have not frozen off, chemical or intense mechanical measures may be used. Ground frost can be used to roll stock (e.g. Cambridge roller). This is also possible on ecological compensation land, where PSM and soil working are not permitted before 16th February. Rolled stock is weaker in winter, dies off more easily and is easier to process in spring.

Low seed density

- Thick individual plants
- Frost tolerance
- Gaps in thin soil coverage
- Weed proliferation
- Green bridges
- Nutrient loss

Suitable seed density

- Frost sensitivity
- Erosion protection
- Pest reduction
- Soil loosening
- Nutrient reservoir
- Humus formation

56

57
Since its creation in 1965, SAATEN-UNION has been supplying farmers in Europe with high performance varieties that match the markets needs. SAATEN-UNION has already set milestones, and will continue to play a major role in plant breeding in years to come.

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