



FUNGICIDAL SEED TREATMENTS AND USE IN REGENERATIVE AGRICULTURE

Why treat seed?

- **Seed and soil-borne diseases are often forgotten about because for many years they have been effectively controlled by the routine use of fungicidal seed treatments. They have the potential to devastate crops.**
- Seedling blights are common and impact crop establishment and yield, and in the case of *Fusarium* can lead to mycotoxins. The weather, previous cropping, cultivations and seedbed conditions all have an impact on seedling blight disease levels.
- Other key diseases such as bunt in wheat, and loose smut and leaf stripe in barley can have serious impact on grain yield and quality. If untreated seed is routinely grown and re-sown these diseases can multiply exponentially potentially resulting in complete crop loss after just a few generations. When disease symptoms are seen it is too late to do anything about them and they can easily spread to and infect neighbouring crops.
- Spores can remain viable in the soil for up to 10 years. Disease levels that might look acceptable in the first few years can become a real issue.
- Testing for seed-borne diseases is good practice but doesn't take into account diseases in the soil, on root debris or stubble from the previous crop. Therefore, use of a seed treatment is advised even on clean seed.
- [The University of Nottingham](#) recently published work measuring a high incidence of soil-borne diseases such as *Rhizoctonia* and *Microdochium* in UK soils.



Fusarium sp.



Loose smut

Are seed treatments safe to the crop?

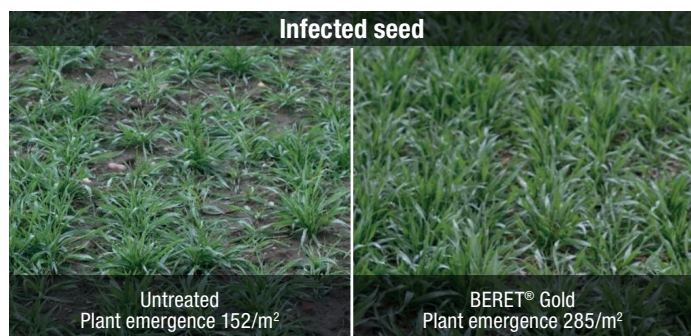
- **Seed treatments are rigorously tested to ensure they are safe to the crop and don't negatively impact plant establishment, vigour and yield.**
- In diseased seed trials, the benefits on crop establishment and yield are clear.
- However, as well as controlling diseases, certain seed treatments can improve crop establishment, stimulate rooting and improve drought tolerance even in the absence of seed-borne disease. This

helps build more resilient crops against extremes of weather and other stresses. For example, in clean seed trials in both wheat and barley, VIBRANCE® Duo treated seed compared to untreated seed has shown increased plant establishment, improved rooting and increased yield highlighting the safety of the dressing.

- In over 60 trials in wheat VIBRANCE Duo treated seed has given an average 0.56 t/ha yield response versus untreated seed.

Seed treatments provide protection from key diseases like *Fusarium*.

Even in clean seed, VIBRANCE Duo seed treatment brings additional benefits such as increased root mass.





Are seed treatments safe to non-target organisms and the soil?

- The regulatory process is extremely rigorous to protect non-target organisms and the soil.
- Soils are protected in the regulatory framework for pesticides and all registered products have to pass these high standards.
- Risk assessments must be produced on the following terrestrial non-target groups:
 - Terrestrial vertebrates
 - Bees
 - Other non-target arthropods
 - Earthworms
 - Soil micro-organisms (measured by soil nitrification and carbon mineralisation assessments)
 - Soil macro and meso-fauna (anything contributing to organic matter breakdown)
 - Non-target plants
- These risk assessments combine risk of exposure to the non-target organism with toxicity. A conservative approach is taken whereby exposure is assumed to happen immediately after application. All the chemical applied is assumed to be available, and the lowest concentration that causes an effect in any tested species is used. Further additional safety factors are then applied.
- **Seed treatments are highly targeted on the seed, and are active at low doses.** In general, these registered chemicals do not persist or move in the soil and therefore have low environmental exposure making them a safe option for use.

How do seed treatments fit within regenerative agriculture?

- Soil is physically vulnerable, so conservation is essential. Soil organic matter is a valuable indicator of soil function and activities that increase soil organic matter are likely to have wider benefits.
- It is important to note that everything you do will have an impact on the soil. From drilling a different crop, cultivation method, chemical inputs, fertiliser inputs changing pH, everything will have an impact, including the weather.
- It is widely accepted that the adverse impact from cultivation on soil and soil microbes is far more significant than effect from seed treatment use and pesticides in general. Studies have shown ploughing compared to direct drilling/min-tilling can significantly reduce earthworm populations and destroy the habitat of microbes.
- **Use of VIBRANCE Duo seed treatment in a minimum soil disturbance cultivation system such as direct drilling brings real benefit through improved crop establishment and rooting. In these systems crop trash on the surface can also increase risk of seedling blights such as *Microdochium* which the use of a seed dressing will protect against.**
- Cover cropping can also increase disease risk – again, use of a seed dressing will provide protection against this.
- Improved seed and soil-borne disease control, improved establishment and rooting, and increased yield leads to increased carbon capture.
- Academic literature indicates seed treatment use is safe to mycorrhizal fungi due to the targeted, low doses applied to seed.
- **To better understand seed treatment effects on soil health, microbial activity and carbon cycling, a five site project was set up in 2021 in collaboration with NIAB and the Game and Wildlife Conservation Trust. The findings are summarised on the next two pages.**
 - Soil microbiology is accelerating our understanding of how soils function and will enable many exciting innovations in the future.

Seed treatment effects on soil health, microbial activity, and carbon cycling project

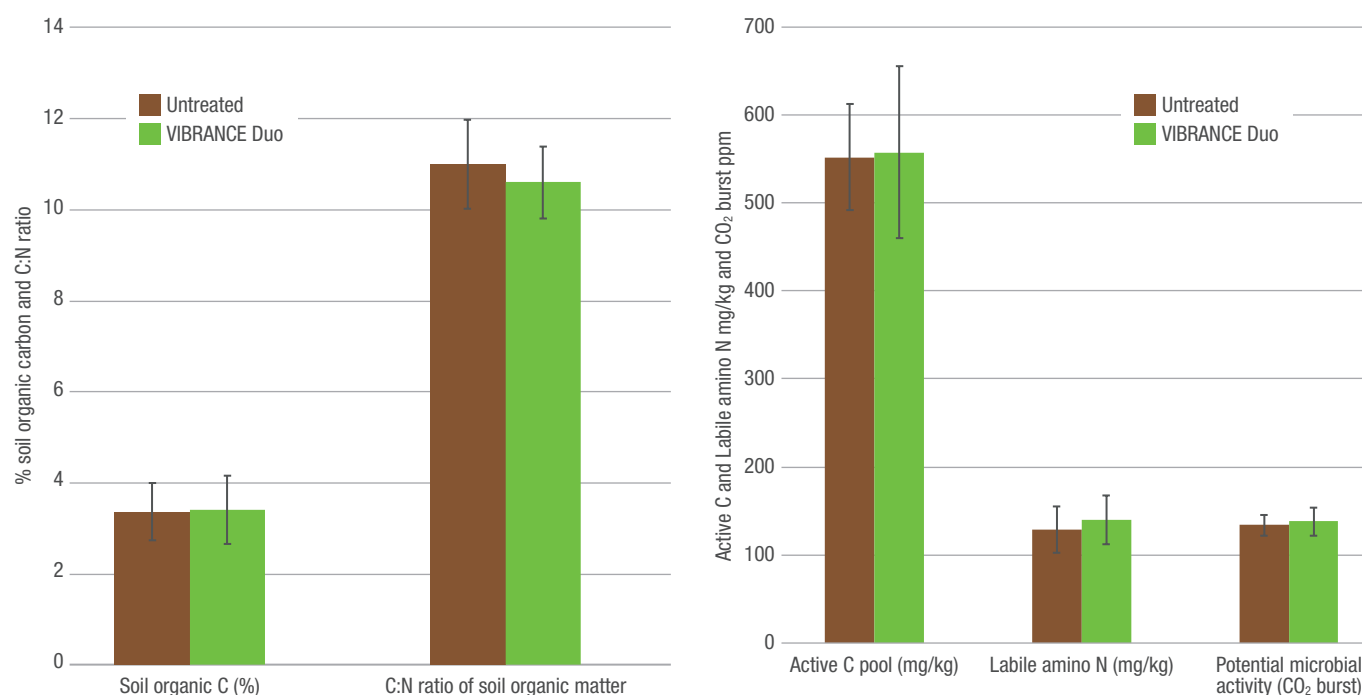
Five sites across the UK were drilled in the season 2020/21 comparing untreated to VIBRANCE Duo treated seed. Soil samples were collected at stem extension directly from around the plant roots from untreated plants and plants treated with VIBRANCE Duo seed treatment. Soil properties were analysed for carbon and microbial activity at Lancrop Laboratories Pocklington, York (Yara-UK). The resulting data was analysed by NIAB.

At the Barton site in Cambridgeshire, impacts of seed treatment were also examined in combination with crop establishment methods; plough, min-till and direct drill.

Fresh soil samples were also delivered on the day of collection to Game and Wildlife Conservation Trust at Loddington for MicroResp™ analysis which measures soil microbial activity and functional diversity.

The results showed no significant effect of seed treatment on soil properties

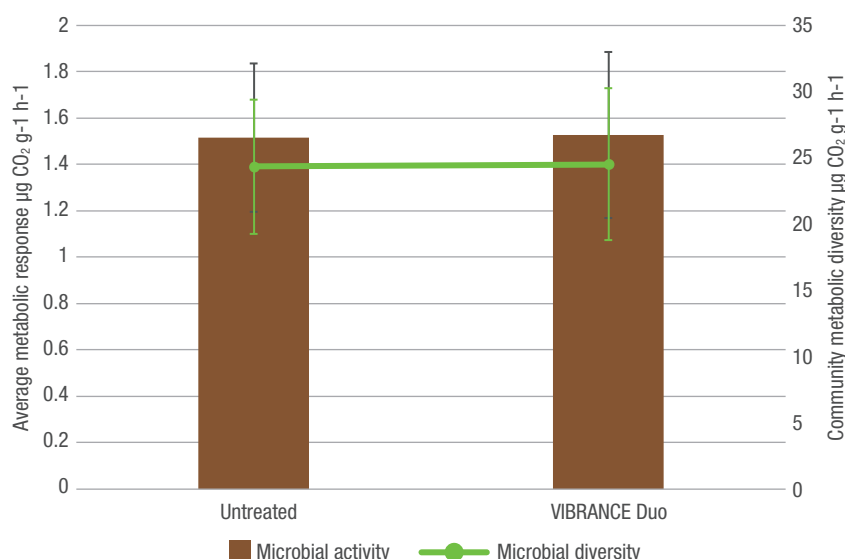
VIBRANCE Duo treated cereal seed had no significant effect on soil properties linked to microbial activity and carbon cycling compared to untreated seed across the 5 sites analysed by Lancrop Laboratories (Yara-UK).



5 site average of 2 winter wheat (Newark, Banbury), 1 winter barley (Shropshire) and 2 spring barley (Newark, Barton) sites 2021.

The results showed no significant effect of seed treatment on soil microbial community

VIBRANCE Duo treated cereal seed had no significant effect on soil microbial activity or diversity compared to untreated seed across the 4 sites analysed by MicroResp.



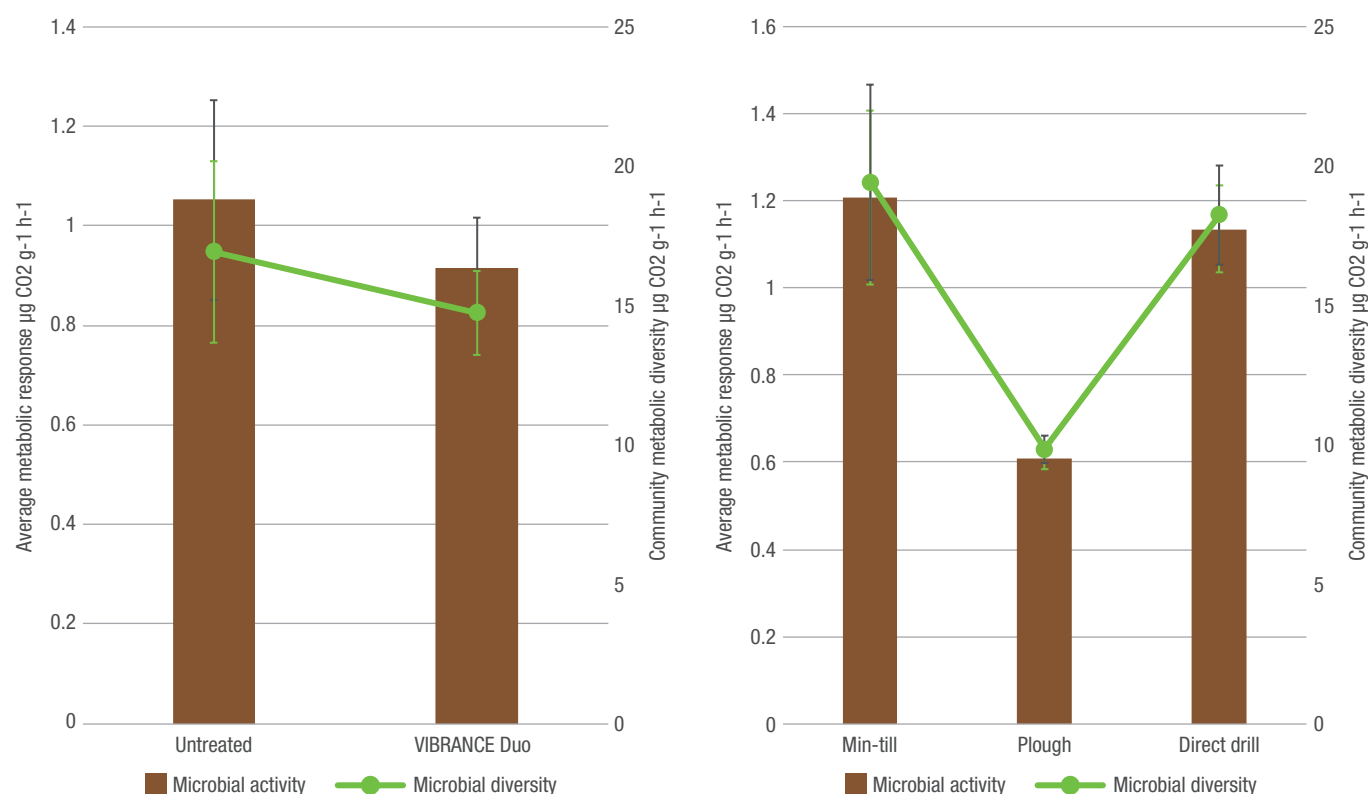
The MicroResp™ system measures soil microbial activity and functional diversity:

- It measures the capacity of fresh soil to break down a range of 14 substrates commonly found in soil
- Microbial activity is measured by the speed at which the soil breaks down the range of substrates
- The more substrates that can be broken down, the more functionally diverse the soil microbial community is

MicroResp measurement of Microbial Activity and Diversity. 4 site average of 2 winter wheat (Newark, Banbury) and 2 spring barley (Newark, Barton) sites 2021.

The effect of cultivation was much greater than the effect of seed treatment on the soil microbial community at Barton, Cambridgeshire

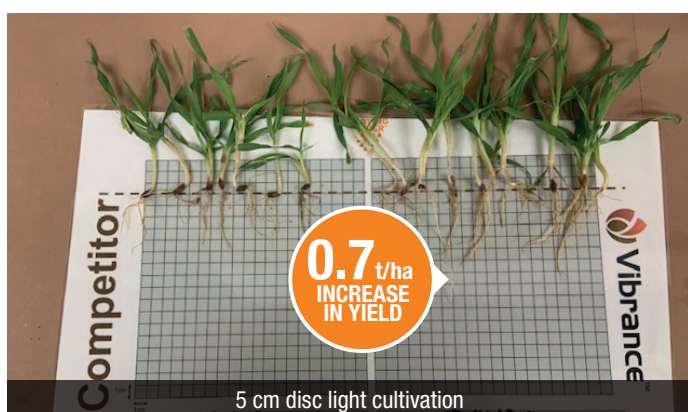
There was no significant effect from the use of a seed treatment, but a significant decrease in soil microbial activity and diversity was found under the plough cultivation system.



MicroResp measurement of Microbial Activity and Diversity at Barton spring barley site 2021

Seed treatments fit within a sustainable farming approach

VIBRANCE Duo seed treatment improves establishment and rooting across reduced cultivations in both wheat and barley. An example is shown below from 2021 in hybrid barley. Where practical, many farming systems use minimum tillage or direct drill for environmental, cost and time saving reasons. Improving establishment and rooting using VIBRANCE Duo seed treatment in these scenarios is a real benefit to build crop resilience and protect yield.



Rougham, Suffolk. Medium soil. SY KINGSBARN hybrid winter barley drilled 1st October 2020. VIBRANCE Duo + Rancona i-MIX versus Raxil Star assessed 13th November 2020.

syngenta