

BIOFUMIGATION

...is the incorporation of fresh plant material into the soil, which then releases several beneficial substances to suppress soil-borne pests and pathogens.

These substances include glucosinates – a chemical agent that makes certain members of the Brassica family hot and spicy – which are at their highest concentration when the plant is flowering. When the plants are finely chopped (chaffed) and worked into the soil, the glucosinates are converted enzymatically into MITC (methyl isothiocyanates) which are the actual active ingredients and are highly toxic to pests and pathogens.

Plants from the Cruciferae family (Brassicaceae) release large amounts of these toxic compounds in the soil and are considered the best species to use for biofumigation, as they target pests such as fungal mycelia, mobile nematodes and germinated weeds.

Biofumigation is an effective method of disinfecting soil and increases the uptake of nutrients by plants, as with soil solarization. It is also a similar process to green manuring, as biofumigation incorporates nitrogen back into the soil, increasing the yield of the cash crops that follow.

Biofumigation is an effective, all-natural alternative to chemical insecticides and herbicides, helping to keep toxic chemical run-off out of the water supply and protecting the health of growers and consumers.

The Process of Biofumigation

Incorporation of the fresh plant material into the soil is most effective when done directly, if the plant matter is coming from a crop grown in that particular field, but it can also be brought into the plot from elsewhere.

The soil is then irrigated at its field capacity, then covered tightly with a transparent plastic film. After 3-4 weeks, the film is removed and the soil agitated to allow any gas produced to escape, with planting of the next crop to commence any time from 24 hours later.



Why should I do it?

- Reduce fertiliser and pesticide costs
- Recycle & redistribute nitrogen in the soil
- Produce Organic seed, which can then be used for sustainable farms
- Eliminate – or at least reduce – toxic chemical usage
- Improve the long-term health of soil by adding organic matter (up to 5% of the soils organic matter is used by crops each year)
- Increase yield and add versatility to the crop rotation

Beyond Biofumigation

Certain cover crops, such as Mustard, have the ability to suppress certain nematode species when applied as a green manure, by means of the biofumigation effect – a variety called ‘Rumba’ is a particularly good nematode resistant variety, while Type 1 and Type 2 Fodder (Oil) Radishes go even further, reducing nematode populations.

The roots of these plants secrete pheromones which entice the nematode larvae from their cryptobiotic state in the cysts. Once in the roots, the larvae are unable to develop to maturity and die. Type 1 varieties are more successful, reducing nematode populations by up to 90%, whereas Type 2 varieties reduce nematode populations by only up to 85%. For maximum nematode control, sowing rates are recommended to be increased to 25Kg/ha in order to produce a higher biomass and closer root proximity.

Since chemical pesticides are being increasingly regulated, biofumigation is becoming more and more important as an organic pest management technique. It can also bring more flexibility to crop rotations by enabling certain species to follow one another that would not be otherwise worthwhile.

Sowing a pro-biofumigant green manure crop will give the farmer the best of both worlds, reducing pests whilst incorporating fresh organic matter to improve soil structure, mineral composition and beneficial microbial activity. It also aids soil aeration and locks in nitrogen to maximise the growth of following crops.

Our neighbours on the continent are using green manure and biofumigant techniques to their full potential and while we in the UK are a little behind, British farmers are starting to realise just how valuable these methods really are to the future of arable farming.

