Original thinking... applied

Fera Science Ltd
National Agri-Food Innovation Campus
Sand Hutton
York, YO41 1LZ
United Kingdom

crophealth@fera.co.uk
+44 (0)300 100 0321

www.fera.co.uk

@FeraScience @feraplantclinic
/FeraUK1
/fera-science
SC thescientistschannel.com/fera-science-uk
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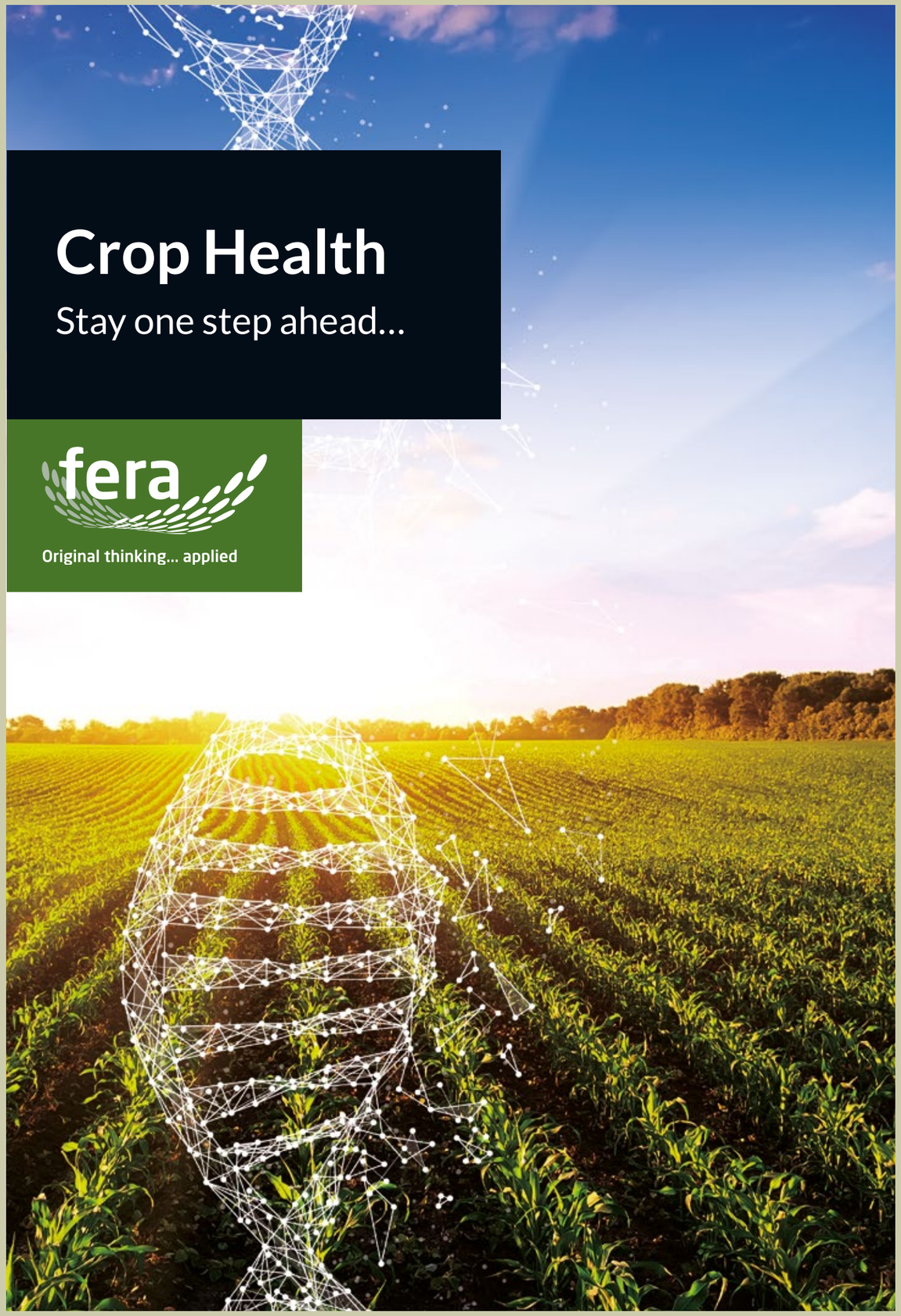
Crop Health

Stay one step ahead...

Original thinking... applied



Fera Science Ltd. is an international centre of excellence providing expert knowledge and innovative scientific services that address some of today's biggest challenges, including coping with the impact of global population growth and the efficient, sustainable use of natural resources.

Our mission is to help our partners bring products and services to market more quickly and to respond to existing global challenges, and preparing for the future.

Agriculture is facing many crucial challenges in terms of improving crop productivity against ever-changing climate conditions. Balancing the demands of a post-Brexit era and changing diet habits of the population are all having an impact on food production.

Together we aim to tackle the challenges of food insecurity as our work explores new ways to improve yields, the efficiency of using resources, stress tolerance, and the nutritional and economic value in crops. In a world where options for controlling pests and pathogens have been dramatically reduced, and in which weeds grow increasingly resistant to existing controls; we apply an inter-disciplinary approach to understand and deliver additional value to farmers and society.

By determining relationships between gene traits within an environment in order to aid with targeted crop improvement and future yields, through to molecular level studies on efficacy of pesticides, fertilisers and bio fertilisers; we can help by using data from soils, in -field monitoring and crop varieties to build an informed picture to quantify the true environmental and economic impacts and costs of different farming approaches.

Crop Health

Our work supports healthy plants and crops, increasing sustainable food production and protecting the environment. We focus on strategic research into the biology and control of diseases impacting agricultural, horticultural and tree health.

Our core areas are disease surveillance and risk forecasting, which is supported by our expertise in epidemiology, pathogen and disease identification, molecular diagnosis, spatial aspects of disease spread, and knowledge management and transfer.

We work with growers and agronomists to develop methods to enable better detection of plant pathogens in propagation material, soil, water and air.

Early detection of crop pathogens and early control measures prevent the spread of diseases and reduce their impact. We are dedicated to the development of technologies that enable stakeholders to make decisions across the agri-food chain and the environment. We use generic solutions such as the polymerase chain reaction, isothermal amplification and high throughput sequencing techniques. We also have expertise in developing new diagnostics for front line use.

"We care about the world and the environment. We are driven by a need to address important global issues such as sustainably feeding a growing population and food security challenges. That's why we use our original thinking and innovation to develop early stage detection to solve the big issues facing the agri-food industry."

Our scientists conduct research and development studies to identify ways to improve crop health, yield, efficiency, and value. In addition, we offer a suite of resources, testing facilities, and expertise to help industry develop sustainable solutions. We undertake high-quality research and monitoring to provide robust evidence, solutions, and advice on the epidemiology and control of plant diseases in agriculture, horticulture, and the natural environment.

We understand the needs of our customers and have over 100 years' experience delivering pest and disease identification services to a wide range of commercial growers and Government departments, both in the UK and overseas.

Potato Diseases

Powdery Scab

Powdery scab *(Spongospora subterranea)* is a soil-borne fungal blemish disease of potatoes characterised by raised pustules containing a powdery mass of spores. The fungus is also able to transmit the Potato *mop top virus* (PMTV), which itself causes a disease known as spraing. There are no above ground symptoms of powdery scab but tuber infections in seed potatoes lead to downgrading or rejection.

Cultivar resistance and long rotations are the most effective ways to combat infected land. Clean land should be planted with clean seed. Testing will enable you to understand if the land you are intending to use is infected. Annual losses due to powdery scab in ware potatoes have been estimated at £1 million.

£1m
Estimated annual losses due to powdery scab

Common scab can be caused by many different soil-borne *Streptomyces* species of which the most important is *Streptomyces scabies*. Symptoms such as erumpent, pitted or superficial lesions can develop on potato tubers and several root crops, including carrot, radish, beet, parsnip and turnip. Annual losses in ware potatoes due to common scab have been estimated at £3 million.

Fera's tests target all of the pathogenic *Streptomyces* species in one test but can also identify individual pathogenic species if required.

Potato Disease Tests

Virus Testing in Potatoes

Viruses are some of the most economically damaging diseases affecting potatoes and a major reason for crops failing seed certification.

The potential yield loss may be up to 85% dependant upon potato variety and growing conditions.

At Fera, we use standard growing on tests to test for virus strains in potatoes. We have also developed a Rapid Direct Tuber testing service using real-time PCR methods. Both services test for PVY (all strains) as standard. Other strains/viruses that can also be analysed using these methods include PLRV, PVYO, PVYN, PVA, PVV, PVX, PVM, PVS and PMTV; for which there is an additional charge for each virus/strain.

£5m
Estimated annual losses by black dot and silver scurf

Black Dot

Black dot is caused by the geographically widespread fungus *Colletotrichum coccodes*, which can survive freely in soil for up to 8 years. Black dot symptoms appear as a dark brownish-grey blemish of potato tubers, progressing to lesions covered with minute black dots of resting spores (sclerotia). At present, most widely grown cultivars of potato are susceptible to the pathogen. Combined annual losses due to the blemish diseases black dot and silver scurf *(Helminthosporium solani)* in ware potatoes have been estimated at up to £5 million.

Desiccated stems due to *Verticillium wilt*

Verticillium wilt is a fungal disease of the vascular tissue of potato and most commercial cultivars are susceptible. There are two species causing disease in potato; *V. albo-atrum* and *V. dahliae*. They can persist as saprotrophic soil organisms for up to 25 years. *Verticillium wilt* affects a wide range of plant species and accounts for significant crop losses globally as it causes dieback of the plant and the leaves to wilt, curl or discolour. It thrives in temperate climates and its distribution can be sporadic within fields. Before planting your crop it is important to understand the risk of this soil borne fungal disease as an early infection can significantly damage crop yield.

Plant Clinic Services

Our crop testing and molecular facilities deliver expert diagnostics on a range of plant issues from all over the world. We have extensive expertise in the fields of bacterial, fungal, viral, insect, nematode identification. We can identify plant pests and pathogens found in arable crops, vegetables, trees, ornamental plants, protected edibles, seeds, soft fruit, turf and water. We also have a UKAS accredited nematology testing facility for PCN and free-living nematodes as well as the facility to test for pests and diseases of bees and mites in relation to food storage.

Crop Testing

fera.co.uk/crop-testing

We are world renowned for providing excellence in crop testing and diagnostic services offering the most comprehensive range of services throughout all sectors of the supply chain. Our leading expertise and outstanding facilities can help you understand and identify your agricultural challenges; helping you to deliver more economically and environmentally resilient farming solutions for the sustainable intensification of arable systems.

- Potatoes and field vegetables
- Arable Crops
- Soft Fruit
- Seeds
- Trees
- Turf and Water
- Protected edibles

Nematology Testing

fera.co.uk/nematodes

Nematodes are microscopic pests responsible for billions of pounds of yield loss each year. Potatoes Cyst Nematodes (PCN) are considered the most damaging pest of potato crops in the UK with losses up to 35%. However, Plant-Parasitic Nematodes (PPNs) can be just as damaging as they can parasitize nearly every plant species, resulting in devastating adverse effects on the quality and yield of host crops.

Fera offers a unique free-living nematode analysis service that provides identification to species level as well as nematode identification and consultancy advice for any sector of agriculture or horticulture.

fera.co.uk/crop-health/introducing-the-big-soil-community

Soil Health Unit

fera.co.uk/soil-testing

We are helping farmers and industry to understand how different soil properties influence the development and spread of pests and diseases. We help by developing more effective soil-management strategies to mitigate these risks.

We help to:

- Improve soil-management practices to combat crop pests and diseases.
- Understand pesticide behaviour in different soil conditions.
- Develop more effective control measures for different soil types.
- Undertake tests for soil health, pathogens and diseases
- Indicator Species - Species are identified as natural indicators when their presence or abundance, within sites of a particular habitat or a conservation area are high.
- Microbial Loads - Testing of microbial loads provides the ability to identify levels of micro-organisms within a sample.

This also helps crop-protection companies develop more effective control products, based on a greater understanding of pesticide behaviour in different types of soil.

Insect Identification & Monitoring

fera.co.uk/insect-monitoring

Our team of world leading entomologists offer multidisciplinary expertise in terms of design and management of insect monitoring schemes. This ensures your crop management strategy is fit for purpose and is able to address any potential viruses within your crop, mitigating the potential economic risk to your harvest. We also use applied entomological research into virus transmission in glasshouse and field plots, together with research into the physiology and behaviour of disease vectors using laboratory behaviour tests and electro-penetration graphs (to measure feeding behaviour). With our service you can monitor and forecast the spread of pests, weeds and diseases in real time; combining chemical, and agronomic strategies for smarter crop protection.

Virology Diagnosis

fera.co.uk/virology

Accurate plant virus diagnosis is integral to effective crop management. Fera's virology diagnosis team utilises a range of testing measures to assess crop health issues.

Our extensive range of tests, including ELISA, and molecular methods such as PCR and high throughput sequencing detect and identify a range of plant affecting viruses, viroids, and phytoplasmas. These tests can be used for diagnosing symptomatic plants and for screening for latent infections. Immunological and molecular methods for virus testing of crops for known viruses are used for the identification of new viruses.

Crop Research & Development Services

Grower Support Tools

Fera has developed a range of tools, online databases and technology to support farmers, growers and the agricultural sector produce more crops more efficiently, whilst using fewer resources and pesticides:

Crop Monitor® - fera.co.uk/crop-monitor
Live monitoring of untreated crops and disease updates.

In field diagnostics - fera.co.uk/in-field-diagnostics
Rapid in-field testing for crop pests and pathogens (Genie III).

LIAISON - fera.co.uk/liaison
UK and EU pesticide approvals, label information, and maximum residue levels.

Homologa - fera.co.uk/homologa
Global database of pesticide approvals and maximum residue levels.

Invertebrate Pest Management R&D

Our expertise covers pest species including insects, mites, slugs, and nematodes. Our specialists can help you to detect, identify, monitor and control pests in growing crops and stored produce. Our work also supports the development of novel biological and chemical pesticides, and includes research on pests such as house flies, blow flies, midges, and parasitic mites.

If you are developing new pest control measures our team has the expertise to support you every step of the way – from early stage pre-commercialisation research, through to preparing registration dossiers and product stewardship. Our interdisciplinary approach and access to specialist facilities enable us to adapt our research to meet the specific requirements of your project.

Pathology R&D

Fera provides research and development for a wide range of government departments and authorities, as well as commercial businesses, farmers and growers. Our work focuses on disease surveillance and risk forecasting, supported by our expertise in epidemiology, pathogen and disease identification, molecular diagnosis, spatial aspects of disease spread, knowledge management and transfer.

This helps to achieve more sustainable crop production while protecting the environment from disease threats.

National Collection of Plant Pathogenic Bacteria (NCPPB)

fera.co.uk/ncppb

Fera hosts the NCPPB; an internationally recognised collection, housing nearly all known bacterial plant pathogens.

Insect Supply Unit

At Fera we can support entomologists by breeding and maintaining invertebrate colonies. Our Invertebrate Supply Unit (ISU) maintains over 30 different invertebrate species to GLP standards, the majority of these species are available for purchase subject to availability.

fera.co.uk/insect-supply-unit

Plant Parasitic Nematodes (PPNs)

Problem

Damage caused by PPNs has been estimated at £48 billion per year worldwide. These nematodes can parasitize nearly every plant species, resulting in devastating adverse effects on the quality and yield of host crops. Populations of these microscopic invertebrates can quickly build to damaging levels, sometimes in a single season. They often produce symptoms on above ground plant parts which are assumed to be a nutritional deficiency, disease or even a lack of water. For this reason, many infestations can go unrecorded allowing serious problems to develop over time causing considerable damage to crops, and major economic and social impacts worldwide.

Solution

Effective management of plant-parasitic nematodes in soils should be based on accurate detection and identification. Fera's team of nematode experts provide a unique nematode identification service which can confirm the identity to species level within a field population. Understanding the biology of the species is important during crop management; for example, time of hatch, preferred habitat, location within the soil profile, ability to vector plant viruses or facilitate the entry of disease can all vary greatly with the species of PPN present. Our nematode detection and consultancy advice covers all sectors of agriculture and horticulture and can potentially help reduce yield loss, allowing appropriate management practices to be identified and introduced. This service is supported by Fera holding the world's largest nematode collection which includes type specimens and live culture standards.

Insect Monitoring

Problem

Each year insects cause significant damage to crops through virus transmission or feeding damage. Understanding the risks to crops helps growers and agronomists to make informed decisions on pest management, including timing and choice of insecticide applications. Each year up to 76% of the winter oilseed rape (WOSR) crop is affected by cabbage stem flea beetle (CSFB) damage. Seed potatoes vegetables and salads are also threatened by aphids. Potato viruses Y and A (PVY and PVA) are serious threats to the quality of seed potatoes. About 40 aphid species transmit PVY and PVA with varying efficiency.

Solution

Insect Monitoring Service for potato, salad, carrot and oilseed rape growers. Fera's insect monitoring services assess potential virus-transmitting aphids and CSFB adults flying into crops, thereby enabling better informed decision making. Our complete yellow water trap kits provide results quickly for timely agronomic decisions on how and when to treat a crop. Fera's Insect Monitoring Service supports seed potato, salad, carrot and WOSR growers to increase yield whilst reducing costs with a more targeted approach to pest management. It also allows growers to demonstrate good quality and environmental management practice to their customers.

Diagnose My Crop Problem

www.fera.co.uk/crop-problem.html

We understand that every case is different, which is why we take a personal approach to our services; so an initial assessment of an unknown problem can be from as little as £125.

- Visual examination of your sample by our plant pathologists to assess the most probable cause and appropriate method of testing (please be aware this does not include screening for viral pathogens)
- In the event of more than one probable cause (e.g. bacterial & fungal) or specific testing being required we will contact you to discuss the additional work & costs
- We will report back to you in the majority of cases within 5 working days of receiving your sample, giving our initial examinations findings & if appropriate, a timescale for completion of work

Ensuring Optimum Growing

Surveillance & Detection

To eradicate plant pests, pathogens and weeds accurate identification is a crucial element of any effective arable management strategy.

Consultation

Our extended consultation service, expert laboratory examination of samples and high-level molecular diagnostics for species and strain identification allows growers, agronomists and consultants alike to assess the source and symptoms of the problem. This enables our customers to effectively identify the source of the problem in question, ensuring faster turnaround of solutions.

A recent example is carrot internal browning where 7 viruses were discovered in one case, 2 of which were new – with this diagnosis now established efficiently it allows the scientists more time to identify how to control/prevent these issues in the future, therefore increasing quality and reducing the risk of further rejection from buyers.

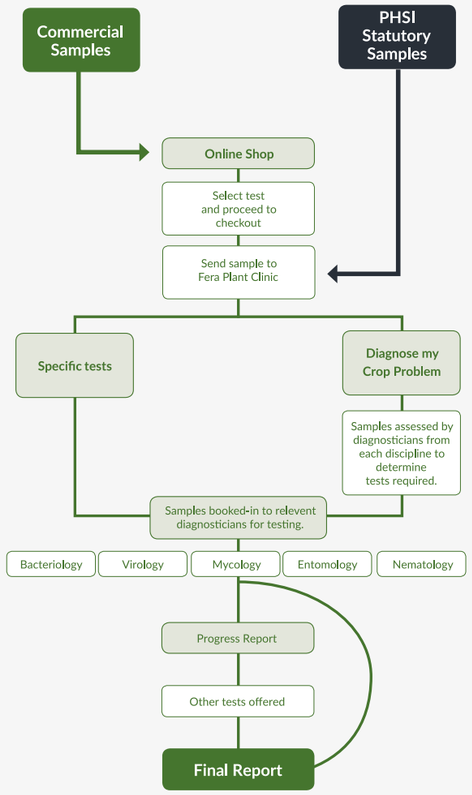
For more information about Fera, visit **fera.co.uk/crop-health**

Our breadth of plant health knowledge means we can provide growers and agronomists with a range of additional services including:

- Full crop health check audits
- Fungicide resistance screening of pathogens
- Diagnostic packages designed specifically for individual crop types
- Pest and disease risk assessments for crop production and sourcing

For more information on tests, prices and how to submit a sample for analysis please visit www.fera.co.uk/crop-health

Typical Journey of a Plant / Crop Sample

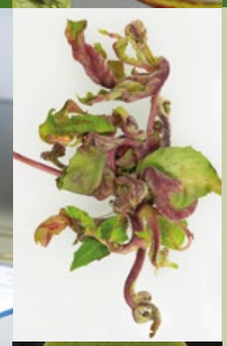


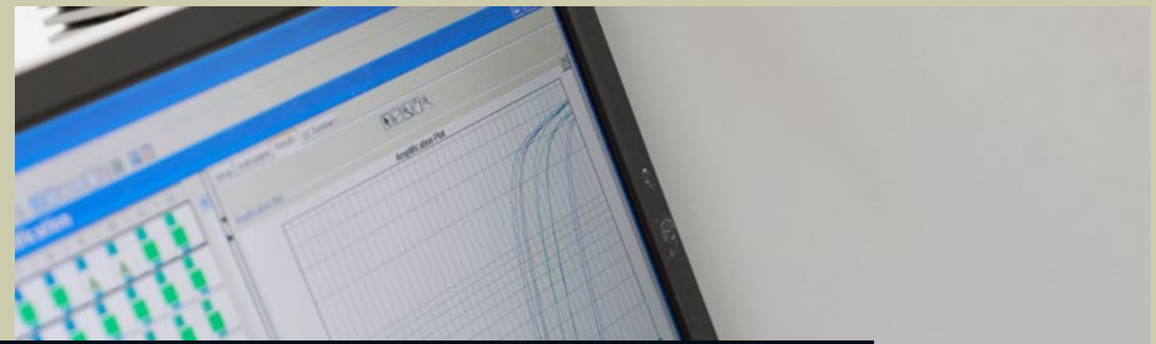
*Plant Health Service - There are many pests and diseases that can seriously damage crops and plant in the UK. Assessing and understanding these threats is essential to informing the actions needed to protect plant health set out in 'Protecting Plant Health - A Plant Biosecurity Strategy for Great Britain'. Tackling threats to plant health is not just a matter for government; we work closely with government to ensure ultimate delivery and success of this strategy.

You Can Now Order Online

Visit:

fera.co.uk/shop





Molecular Technology Unit (MTU)

The Fera Science Molecular Technology Unit (MTU) is a centralised service which provides molecular diagnostic and analytical services for a wide range of sample types. The MTU has the capability to process and extract DNA from a wide range of tissue sample types; from angiosperms to the 'lowest' single-celled plants, from seeds and plant tissues and plant based products; from mammals to single-celled organisms.

The MTU can provide a high throughput testing service with a capacity of several thousand samples per week and, where necessary, a priority, rapid response service. Formal quality mechanisms (ISO 9001 and ISO 17025) are implemented for processes carried out within the laboratories.

These services are supported by a sophisticated laboratory information management system to ensure all samples are individually tracked throughout the testing process, from sample receipt to results provision and archiving.

For further discussion of how Fera can help you, please contact us.