# Proposal title

## Monitoring and diagnosis of the most dominant barley foliar fungal diseases in Erbil Province

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# Introduction

Barley (*Hordeum vulgare* L.) is one of the world's most important crops providing food and related products for millions of people. Barley ranks fourth among the cereals in terms of total world production. Barley occupies 57 million hectares of the world's agricultural land area, and is a staple food for many people globally, in addition to its uses in malting and as an animal feed. Diseases represent a major constraint to barley production globally, despite considerable effort to control the pathogens responsible.

A number of biotic and abiotic factors pose a challenge to increase production of barley. Barley diseases prominently are powdery mildew (*Blumeria graminis* f.sp. hordei), Anthracnose (*Colletotrichum cereal*) Common root rot and seedling blight (*Cochliobolus sativus* (*Bipolaris sorokiniana*)), net blotch (*Pyrenophora teres*), Covered smut (*Ustilago hordei*), Downy mildew (Crazy top) (*Sclerophthora rayssiae*), Dwarf bunt (*Tilletia controversa*), Ergot (*Claviceps purpurea*), loose smut (*Ustilago* spp.) Kernel blight (Black point) (*Alternaria* spp.), Leaf (brown) rust (Puccinia hordei), and barley scald (*Rhynchosporium secalis*).

Research and technological advances in the field of remote sensing have greatly enhanced our ability to detect and quantify physical and biological stresses that

affect the productivity of agricultural crops. Reflected light in specific visible, near- and middle-infrared regions of the electromagnetic spectrum have proved useful in detection of nutrient deficiencies, disease, and weed and insect infestations. Multispectral vegetation indices derived from crop canopy reflectances in relatively wide wavebands can be used to monitor the growth response of plants in relation to measured or predicted climate variables. Any deviation from the expected seasonal pattern signals a potential problem and warrants further investigation by agricultural resource managers. Plant disease management practices can be improved by putting epidemiological information in the same format as other farm information using a geographic information system (GIS). A GIS is a computer system capable of assembling, storing, manipulating, and displaying data referenced by geographic coordinates. GIS can be adapted to any size operation, and data can be incorporated at any scale from a single field to an agricultural region. New tools, including global positioning systems (GPS) and geostatistics, are available to use in connection with GIS.

# Aims

1. Survey to know the abundance of foliar diseases and their distribution.
2. Diagnosis of the diseases and the pathogens that contribute to disease occurrence
3. Monitoring the diseases using remote sensing (GIS) systems and on-site measurements

# Methods

## Survey and sampling

Locations of the survey will include different sites of Erbil Province where barley is grown. This is to record the incidence and severity of the disease. Samples of suspected plants will also be taken for diagnosis of the pathogens.

## Isolations and diagnosis

The fungal pathogens will be isolated, purified, and then diagnosed by integrating conventional methods with the use of molecular methods. PCR is the most appropriate technique for this purpose.

## Disease Monitoring

1- Locations and crops will be detected for monitoring the diseases that appear.
2- Measuring the disease progress:
    a. Measuring disease severities over time intervals and then detection disease progress by detecting the area under the disease progress curve (AUDPC) in which multiple observations will be combined
    b. Monitoring through remote sensing (GIS) system and compare with the real data.

# References

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