Optimising fungicide timing to control botrytis diseases in pulse crops by monitoring canopy microclimate with Narrow Band IoT data telemetry

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Chocolate spot disease of faba beans and grey mould of lentils, caused by *Botrytis fabae* and *B. cinerea*, can be difficult to control in the south east region of South Australia (SA) due to extended growing seasons that require several fungicide spray applications. The requirement for more than two fungicide sprays has a major effect on the economics of growing these crops. The colder temperatures in south east regions also confound our understanding of botrytis diseases since the latent periods can be increased and the onset of disease symptoms can be delayed compared to more northerly cropping areas. This potentially renders the current strategy of applying fungicides at early flowering ineffective and may be an unnecessary expense. However, it could be possible to optimise fungicide application by combining field observations (germination of fungi sclerotes, sporulation and disease symptom initiation) with in situ, near real-time monitoring of the local environment conditions (in-canopy temperature, relative humidity and near-surface soil moisture). Recent advances in Internet of Things (IoT) connectivity, referred to as Low Power Wide Area Networks (LPWANs), presents opportunities to affordably acquire near real-time environmental field data that can be used to help mitigate the risks associated with agricultural pests. These networks are based on wireless technology that connects devices and sensors deployed in the field. The LPWAN technology that will be utilised for this project is called Narrow Band IoT (NB-IoT) and is currently operated in Australia by Telstra and Vodafone (deployed within the last 6 to 12 months). These networks are ideally suited to agricultural applications and currently provide blanket coverage to all regions in SA, south of the Goyder Line. Compared to traditional mobile networks (3G/4G), NB-IoT operates at a lower cost, has greater power efficiency (devices with years of battery life), transfer small packets of data (e.g. temperature, humidity ad soil moisture for this project), and support more devices over a greater area (10s km2). By using Narrow Band data transmission technology we are going to remotely monitor these data in faba bean and lentil canopies at several sites in south east, mid north and Yorke Peninsula of SA. This will provide a better understanding of microclimate elements and their effects on botrytis disease initiation and progression during the season. It seems that using NB-IoT data telemetry to monitor microclimate within crop canopies incorporated with monitoring agricultural pests and fungal diseases in the field can potentially be applied to many other crops and diseases. This can lead us to more precise application of the management options available to minimise the risk of these diseases and pests in many crops and areas.