IDENTIFICATION AND MANAGEMENT OF A FUNGAL DISEASE COMPLEX IN MELONS

PROJECT VM22001

Crop disease monitoring in 2023

Project VM22001 seeks to improve productivity for the Australian melon industry through improved knowledge and management of soilborne fungal diseases. This includes research into options for diseases such as gummy stem blight, charcoal rot, fusarium wilt and vine decline.

As part of this project, in 2023 commercial watermelon and rockmelon crops located in Bundaberg, QLD were monitored for disease over time. Crops from two distinct planting windows were rated for soilborne fungal diseases and the pathogens present identified. Disease progress over time was evaluated against local weather data to detect potential triggers for disease development and spread.

For each site, the same 100-150 plants per site were monitored each visit and the disease incidence and severity recorded. Representative diseased plants were sampled and tested for fungal soilborne pathogens. The detected fungi were identified using traditional methods with some confirmed by DNA sequencing.

Local weather data was obtained and included relative humidity (RH), rainfall and temperature. Conditions conducive for gummy stem blight disease include a leaf wetness period of at least one hour and is promoted by high RH (i.e at least 85%) [1] with an optimum temperature of 20-25 °C [2,3]. By contrast, charcoal rot is favoured by higher temperatures (i.e 28-35 °C) and low soil moisture (i.e 10-20%) [4–6]. Fusarium in watermelon has an optimum temperature range of 20-30 °C [7].

The monitoring showed that disease impacts are site specific and can vary a lot within a growing district or even a property. Key observations included:

- Weather parameters strongly influence impacts of gummy stem blight, particularly conditions that promote leaf wetness (i.e high humidity, cool temperatures, and rainfall).
- High gummy stem disease incidence does not always mean large yield impacts.
- Fusarium impacts are significant and less influenced by weather conditions than other diseases.
- Charcoal rot is an underestimated factor of vine collapse in melon.

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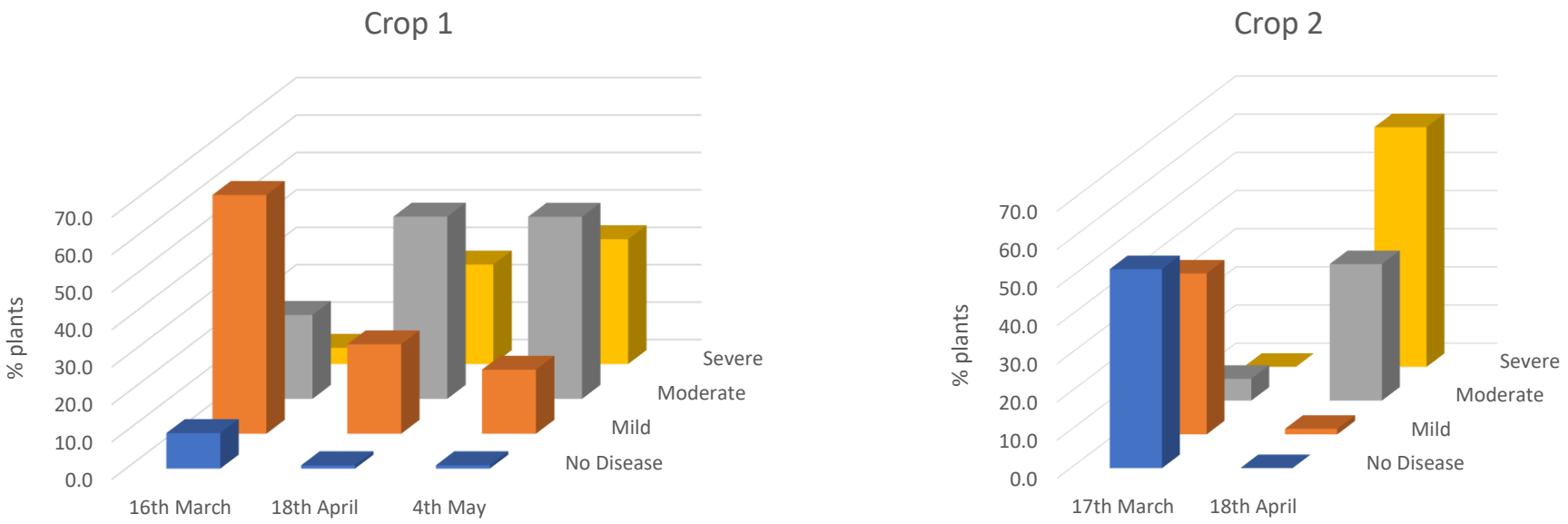
Watermelon – Autumn Crops

Gummy stem blight disease incidence was almost 100% in Crop 1, but yield was not badly affected. By contrast, yield from Crop 2 was badly affected by fusarium disease at any incidence of almost 100% with severe symptoms.

Severity of gummy stem blight increased quickly in Crop 1 between March and April, probably due to weather conditions at that site. Rain mid and late March with high relative humidity contributed to initial disease development. Subsequently, with no follow-up rain and lower relative humidity, disease severity stabilized and didn't progress further. The plants had sufficient vine remaining to fill fruit thus the disease didn't impact yields.

Within one-month fusarium disease in Crop 2 went from mild to severe, plants were unable to recover and subsequently yields were significantly impacted. The temperature was optimum for fusarium infection and development at this site during the whole crop cycle. The progress in disease development was most likely due to stress from fruit load on already infected plants.



Disease development in Autumn plantings of watermelon. The percent of plants in each rating category from no disease to severe disease is shown for the two commercial crops monitored. There was no rating recorded on the 4th of May for Crop 2 as it was no longer a viable crop by that time.

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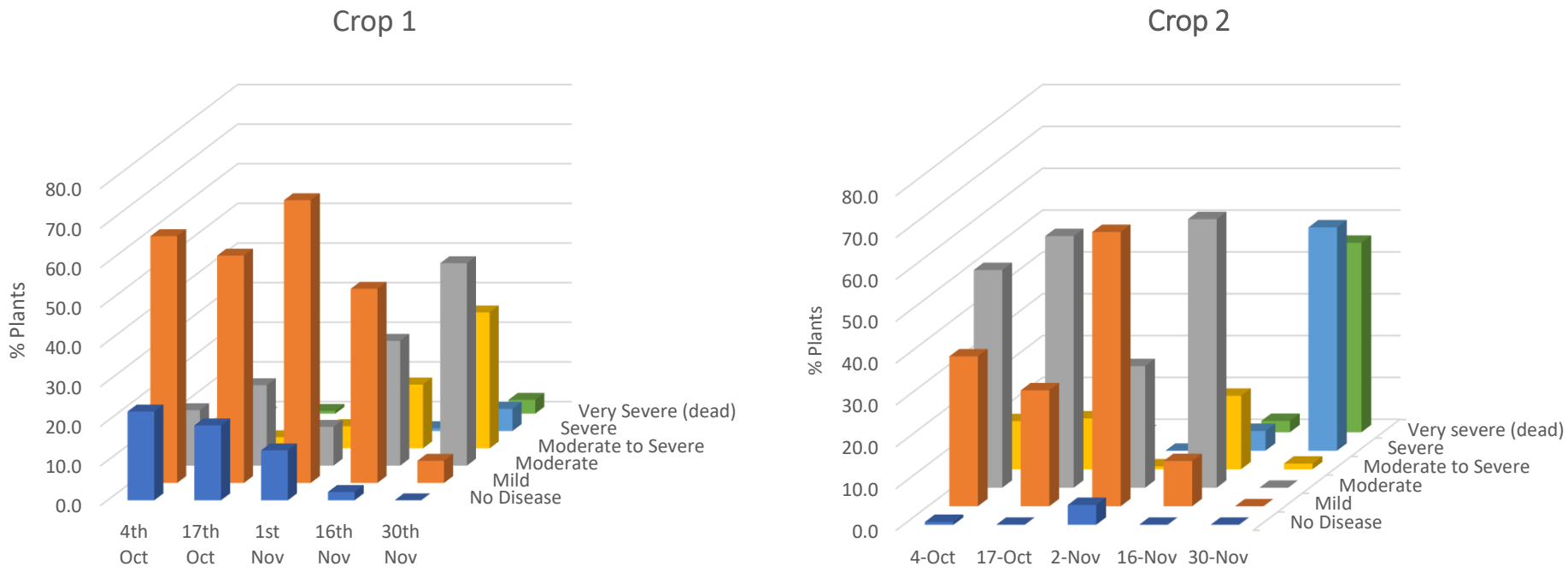
Watermelon – Spring Crops

The spring watermelon crops were affected by different combinations of gummy stem blight, fusarium, pythium, Alternaria and charcoal rot. Crop 1 showed gradual disease progress whereas Crop 2 it was a more rapid vine collapse, close to harvest. Charcoal rot was also detected in association with other collapsed watermelon vines in a block adjacent to Crop 2. Disease incidences in both Crop 1 and 2, was almost 100% by 30th of November and yield impacts in both were significant. Fusarium and charcoal rot were suspected to be the main contributors to plant collapse of these crops. Local conditions were favourable for fusarium for most of the growing period and the higher temperatures in late November likely increased impacts from charcoal rot. Again, fruit load stress probably contributed to vine collapse of already infected plants. The drier conditions experienced during this season most likely explain the lower impact from gummy stem blight.



Disease development in Spring plantings of watermelon. The percent of plants in each rating category from no disease to very severe disease is shown for the two commercial crops monitored.

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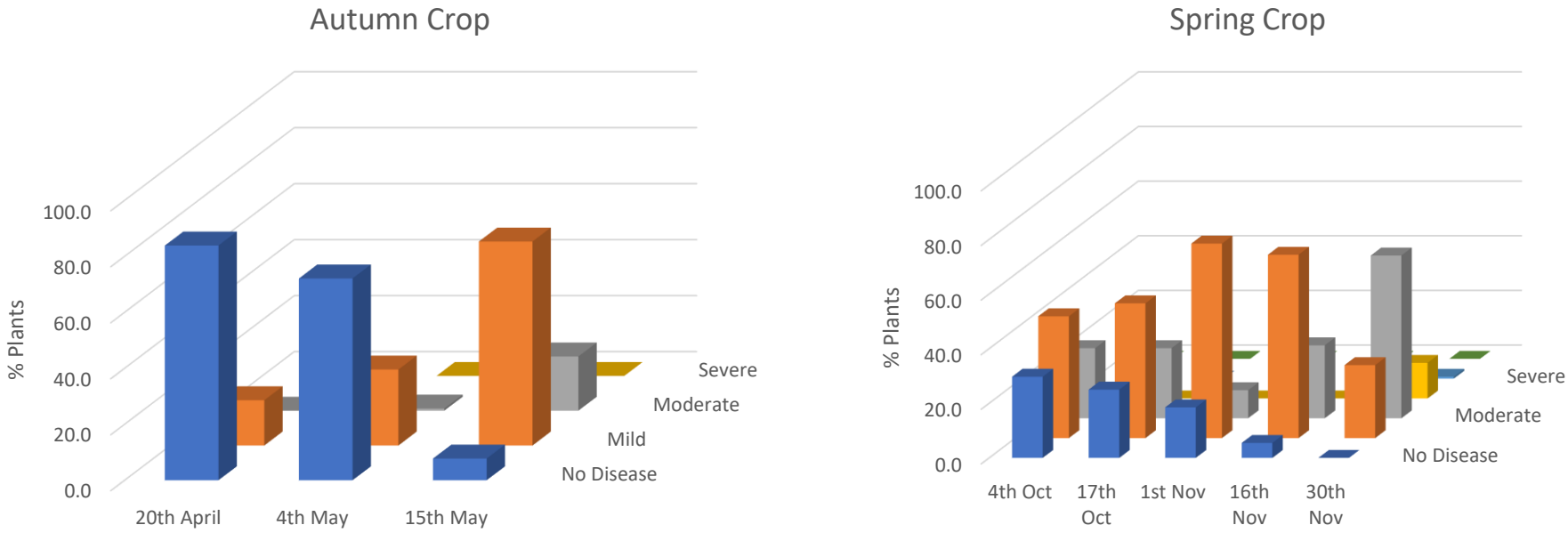
Rockmelon Crops

Gummy stem blight and *Diaporthe phaseolorum* were detected in the Autumn rockmelon crop, no fusarium wilt was detected. Fusarium, gummy stem blight and Alternaria were detected in the Spring crop. Although disease incidence was almost 100% in both crops by harvest, the disease severity was mild to moderate and didn't impact yield significantly. The rapid change in disease severity in the Autumn crop was due to weather conducive for gummy stem blight development.

Disease progress in the Spring crop mostly followed a typical pattern with increases in severity overtime. There was faster progress towards the end with the mild disease of most plants becoming moderate in severity. This coincided with a significant rain event (83mm) followed by high relative humidity which provided ideal conditions for gummy stem blight disease development. Despite this increase in disease progress, yield wasn't adversely affected as the vines were sufficiently mature to complete the fruit cycle. Although fusarium was detected in this crop it didn't appear to cause concerns.



Disease development in Autumn and Spring plantings of rockmelon. The percent of plants in each rating category from no disease to severe disease is shown for the two commercial crops monitored.

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How can I be involved with the project?

Contact the project research team if you are interested in us visiting your property to check crops for soilborne fungal diseases or to discuss options for having samples tested. Identifying which combination of pathogens are present in your crops will help you manage disease outbreaks better in the future. It will also assist in clarifying what of theses fungal diseases of melon are the most important in Australia. The VM22001 project team will be evaluating a range of management options for vine decline and welcome input from industry to do this.

References:

(1) Arny, C.J. & Rowe, R.C. *Phytopathology* 81, 206–209 (1991), **(2)** Van Steekelenburg, N.A.M. *Neth. J. Plant Pathol.* 89, 75–86 (1983), **(3)** Sitterly, W.R. & Keinath, A. P. *Gummy Stem Blight*. https://www.apsnet.org/edcenter/apsnetfeatures/Pages/GummyStemBlight.aspx (2000), **(4)** Sheikh, A.h. & Ghaffar, A. *Pak. J. Bot.* 11, 185–189 (1979), **(5)** Marquez, N., Giachero, M. L., Declerck, S. & Ducasse, D. A. *Front. Plant Sci.* 12, (2021), **(6)** Chaudhary, H., Kumar, P. & Dubey, R. C. 133–154 (Elsevier, 2023). doi:10.1016/B978-0-443-15443-0.00010-3 and **(7)** Keinath, A. P. *Fusarium oxysporum* f.sp. *niveum (Fusarium Wilt of Watermelon)*. https://doi.org/10.1079/cabicompendium.2466 (2020).

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