Environment affects maturation of yellow spot on wheat stubble.

Jean Galloway, Pip Payne and Moin Salam, Department of Agriculture and Food, Western Australia

KEY MESSAGES

Continuous wheat has a high risk of developing yellow spot from multiple primary infections by sexual spores (ascospores) that develop on the previous season's stubble.

The timing of yellow spot spore maturation differs at different locations in the wheat belt and is dependent on temperature and rainfall conditions at those locations. Spore maturation, and the primary infection period, occurred earlier in Albany compared with the warmer, drier areas of Northam and Eradu.

AIMS

To quantify how environment affects the development of yellow spot fruiting bodies on wheat stubble.

METHOD

Wyalkatchem wheat stubble infected with yellow spot during the growing season was collected after harvest from DAFWA trials at Eradu in November 2010 and 2011. In December of each of these years' sub-samples of stubble were placed on the soil surface at Albany, Northam and Eradu and left to weather under natural environmental conditions at these three locations over the summer, autumn and winter of the following year.

At fortnightly intervals from 19 May 2011 and 28 March 2012, sub-samples of stubble from each treatment were collected and inspected for sexual fruiting bodies (pseudothecia). The maturation stage of the spores (ascospores) within these fruiting bodies was assessed using a microscope. Based on these assessments, the percentage of fruiting bodies that contained mature spores (i.e. those with the potential to cause primary yellow spot infection) was determined.

RESULTS

Rainfall and temperature was recorded at all three sites (figures 1 and 2). In both 2011 and 2012 the three month period between March and May was wetter in Albany than in Northam and Eradu (figure 1). Mean monthly temperatures in Albany were within a 5°C range of the optimum for ascospore production (15°C) throughout the trial period. The mean monthly temperatures for Northam and Eradu were not in an optimal range for ascospore production until April-May (figure 2).

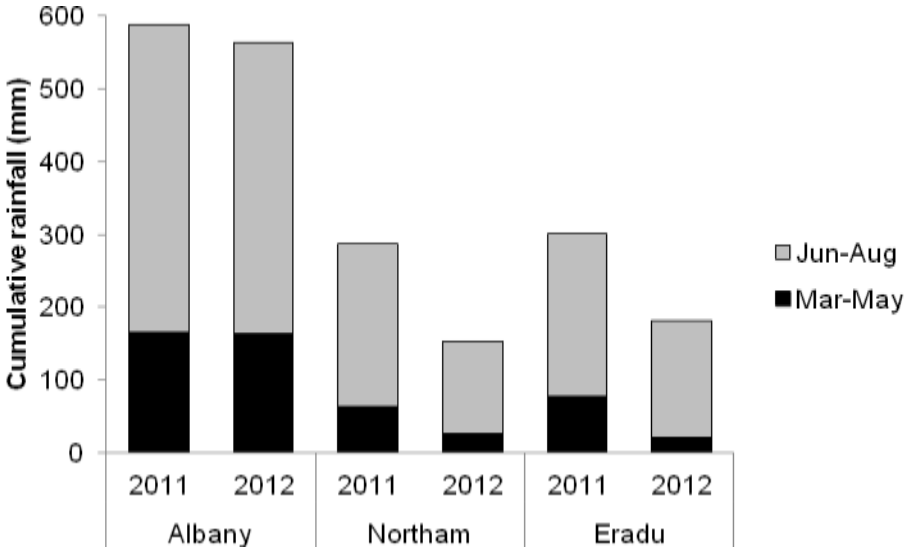

Figure 1. **Cumulative rainfall for three month periods between March – May and June – August in 2011 and 2012 at three locations in WA (mean monthly rainfall data for January and February is not shown as it is skewed for Northam and Eradu by localised thunder storms).**

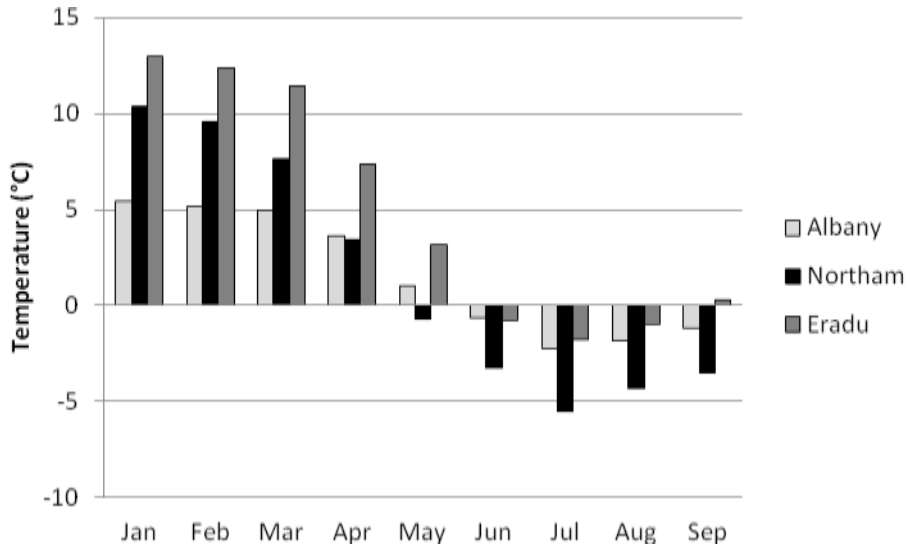

Figure 2. **Mean monthly temperatures (2011 and 2012) above or below the optimum temperature (15°C) for yellow spot ascospore development at three locations in WA.**

The spore maturation process within the fruiting bodies started earlier in Albany compared with Northam and Eradu (figure 3). When assessments first started in mid-May 2011, mature spores were present in 48% of fruiting bodies on stubble weathered in Albany compared to 0% in Northam and Eradu. In 2012, stubble from Albany was inspected earlier (starting at the end of March) and it was found that mature spores were already present in 6% of fruiting bodies with the peak spore maturity period occurring during mid-May. In both 2011 and 2012 the percentage of fruiting bodies that contained mature spores gradually declined until mid-June. No mature spores were present in the fruiting bodies by July 2011 and August 2012 in Albany.

At Northam and Eradu mature spores developed 2.5–3 months later than in Albany. In both years, at Northam and Eradu, mature spores were not present in the fruiting bodies until mid- to late June. The peak spore maturity period occurred in Northam and Eradu mainly during July, with the peak spore maturity period occurring in Northam up to a fortnight earlier than in Eradu in both years. Mature spores were still present in the fruiting bodies on the previous season's stubble at both Northam and Eradu in mid-September 2011and early-September 2012 when the final sub-samples were assessed (figure 3).

CONCLUSIONS

Ascospores produced on the previous season's wheat stubble are the source of primary inoculum that initiates yellow spot outbreaks in WA. Moisture determines when the fruiting bodies form and temperature determines the rate at which the spores mature. The wetter, cooler conditions in Albany favour an earlier spore maturation process compared with Northam and Eradu. The data from these trials suggest that in Albany, a high proportion of the spores are released from the fruiting bodies on the stubble before wheat crops are sown or have emerged. The temperature and moisture conditions at Northam and Eradu favour ascospore development from May through to September with the temperature conditions at Eradu particularly favourable to the development of ascospores during this time (figure 2). At both Northam and Eradu peak spore release is likely to coincide with early crop growth stages. This provides some explanation why yellow spot is usually more prevalent in the northern agricultural regions compared with the southern agricultural regions.

A model is being developed based on this data that will predict the timing of yellow spot spore maturity for different locations in WA.

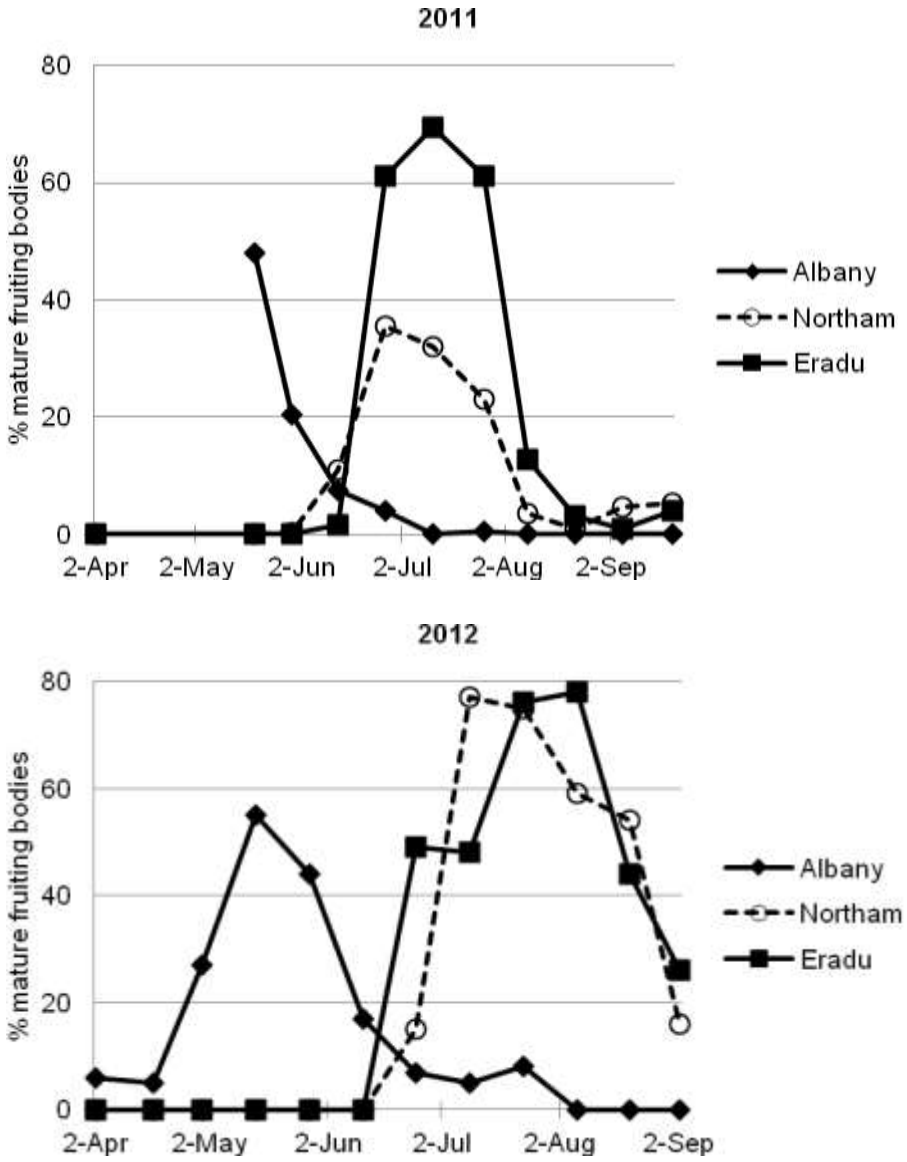

Figure 3. Effect of location on yellow spot fruiting body maturity on wheat stubble in 2011 and 2012.

KEY WORDS

Yellow spot, wheat, stubble, ascospores

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