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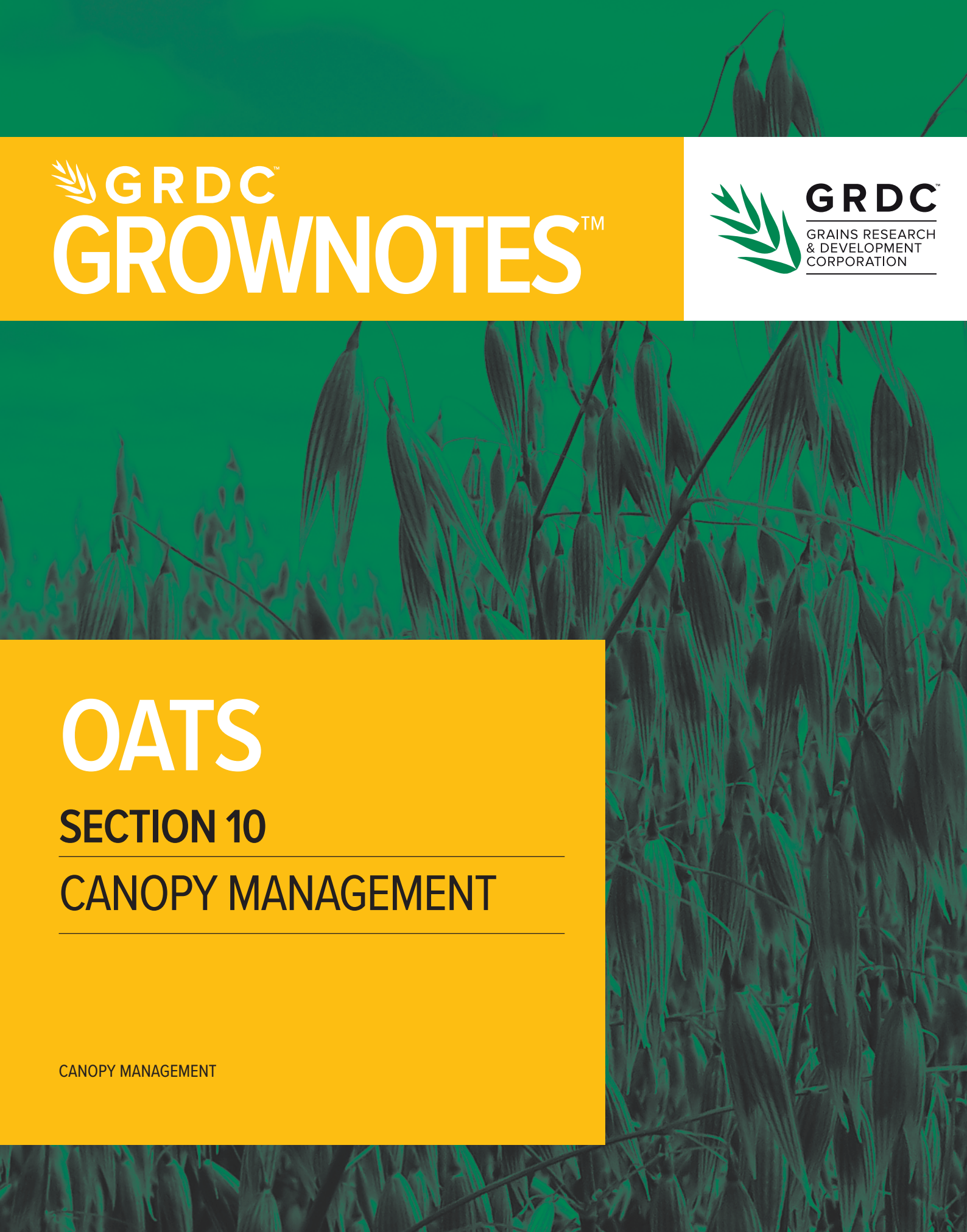

OATS

SECTION 10

CANOPY MANAGEMENT

SECTION 10

Canopy management

More information

DAFWA (2015): Oats: fertilisers and plant nutrition

GRDC: Disease management and crop canopies

GRDC (2013) Moddus Evo: Controlling plant growth for reduced lodging and improved yields

A Tam, S Mooney, P Berry (2004) The Effect of Lodging in Cereals on Morphological Properties of the Root-Soil Complex, SuperSoil 2004: 3rd Australian New Zealand Soils Conference

B Dear, A Kaiser, J Piltz (2005) Yield and digestibility of legume and oat forages, Primefacts Nov. 2005

10.1 Canopy management

Canopy management is the manipulation of the green surface area of the crop canopy to optimise crop yield and inputs. It is based on the premise that the crop's canopy size and duration determine its photosynthetic capacity and therefore its overall grain productivity.

Adopting canopy-management principles and avoiding excessively vegetative crops may enable growers to achieve a better match of canopy size with yield potential, as defined by the available water. Other than sowing date, plant population is a starting point for the grower to influence the size and duration of the crop canopy. [1]

The concept of canopy management has been primarily developed in Europe and New Zealand—both different production environments from those typically found in most grain-producing regions of Australia.

Canopy management includes a range of crop-management tools for crop growth and development, to maintain canopy size and duration, thereby optimising photosynthetic capacity and grain production. One of the main tools available to growers to manage the crop canopy is the rate and timing of applied fertiliser nitrogen (N). [2]

10.1.1 Importance of canopy management

If the canopy becomes too big, it competes with the growing heads for resources, especially during the critical 30-day period before flowering. This is when the main yield component (grain number per unit area) is set. Increased competition from the canopy with the head may reduce yield by reducing the number of grains that survive for grainfill.

After flowering, temperature and evaporative demand increase rapidly. If there is not enough soil moisture, the canopy dies faster than the grain develops and results in small grain.

Excessive N application and high seeding rates are the main causes of excessive vegetative production. Unfortunately, optimum N and seeding rates are season-dependent. Under drought conditions, N application and seeding rates that would be regarded as inadequate under normal conditions may maximise yield, whereas higher input rates may result in progressively lower yields. Alternatively, in years of above-average rainfall, yield may be compromised with normal input rates.

The extreme of this scenario of excessive early growth is haying-off, where a large amount of biomass is produced, using a lot of water and resources. Then, later in the season, there is insufficient moisture to keep the canopy photosynthesising and not enough stored water-soluble carbohydrates to fill the grain. Therefore, grain size and yield decrease.

[1] N Poole (2005) Cereal growth stages. GRDC, http://www.grdc.com.au/uploads/documents/GRDC%20Cereal%20Growth%20Stages%20Guide1.pdf

[2] G McMullen (2009) Canopy management in the northern grains region—the research view. Northern Grains Alliance, July 2009, http://www.nga.org.au/results-and-publications/download/31/australian-grain-articles/general-1/canopy-management-tactical-nitrogen-in-winter-cereals-july-2009-.pdf

To attain maximum yield, it is important to achieve a balance between biomass and resources. The main factors that can be managed are:

- plant population
- row spacing
- inputs of N
- sowing date
- weed, pest and disease control
- plant growth regulation with grazing or specific plant growth regulator products

Of these, the most important to canopy management are N, row spacing and plant population. [3]

10.1.2 Grazing cereal crops as a management tool

Well-managed, dual-purpose cereals provide producers with an opportunity for increased profitability and flexibility in mixed farming systems by enabling increased winter stocking rates and generating income from forage and grain. Typically, these crops are earlier sown, longer season varieties that provide greater DM production for grazing. Research has shown that to avoid grain-yield penalties, stock must be removed from cereals before the end of tillering (GS30). However, the timing and intensity of grazing during the season can incur yield penalties, particularly when grazing pressure is high and late in the grazing period.

More information

GRDC Update Papers: Grazing wheat and barley—impacts on crop management, lodging and grain yield

Grazing can sometimes be beneficial to grain production by reducing lodging; in seasons with dry springs, grazing can increase grain yields by reducing water use in the vegetative stages, leaving more soil water for grainfill. The challenge for growers is to find the balance of optimising DM removal without compromising grain production. [4]

10.1.3 Key stages for disease control and canopy management

The optimum timing for foliar-applied fungicides in cereals is from the start of stem elongation to ear emergence (GS30–59).

The optimum time for spraying a fungicide to protect a leaf is at full emergence. Leaves not emerged at the time of application will not be properly protected. Leaves will usually be free from foliar disease on emergence. The time between when the disease spores land on the leaf and when an infection point is visible is called the latent period or latent phase. This period is temperature driven and differs between diseases. It can be as short as seven days for diseases such as powdery mildew. [5]

More information

GRDC Driving Agronomy Podcasts: Disease management and crop canopies

It was common 5–10 years ago to make decisions on fungicide applications for foliar disease based on thresholds of infection. These thresholds varied from 1% to 5% of plants infected. However, growers and advisers found that in the paddock it was difficult to calculate when this disease threshold had been reached, not least because of the sporadic nature of the initial foci of the disease. In addition, by the time growers realised that the threshold had been reached and carried out the spray operation, the crops were badly infected. When crops that are badly infected with stripe rust are treated with fungicides, the control is poor because fungicides work better as protectants than as curatives.

[3] N Fettell, P Bowden, T McNee, N Border (2010) Barley growth & development. PROCROP Series. Industry & Investment NSW/NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/516180/Procrop-barley-growth-and-development.pdf

[4] GRDC (2102) Grazing wheat and barley—impacts on crop canopy management. GRDC Update Papers, 23 March 2012, http://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2012/03/Grazing-wheat-and-barley-impacts-on-crop-canopy-management-lodging-and-grain-yield

[5] N Poole (2005) Cereal growth stages. Grains Research and Development Corporation, http://www.grdc.com.au/uploads/documents/GRDC%20Cereal%20Growth%20Stages%20Guide1.pdf