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GRDC GROWNOTES™

GRDC™ GRAINS RESEARCH & DEVELOPMENT CORPORATION

SAFFLOWER

SECTION 14

ENVIRONMENTAL ISSUES

FROST ISSUES FOR SAFFLOWER | WATERLOGGING AND FLOODING ISSUES | OTHER ENVIRONMENTAL ISSUES

Environmental issues

14.1 Frost issues for safflower

Sowing too early can result in frost damage during stem elongation, branching and even budding. Risk is greatest in northern areas, where the generally warmer climate causes plants to begin stem elongation in winter.

Very early sowing followed by good early-season growing conditions may cause excessive vegetative growth, increasing crop water use, which may restrict seedfill if soil water reserves are depleted.

Sowing too late reduces yield potential by shortening the duration of vegetative fill and pushing flowering and seedfill into late spring and summer, often coinciding with higher temperatures and decreasing chance of rainfall. Late-sown crops may also be at greater risk of seed staining and sprouting in regions prone to significant summer rainfall events. [1]

14.1.1 Risk management for frost

The variability in the incidence and severity of frost means that growers need to adopt a number of strategies as part of their farm management plan. These include pre-season, in-season, and post-frost strategies. [2]

See GRDC Tips and Tactics Managing frost risk for general principles of establishing a frost management plan.

Growers need to consider carefully whether earlier sowing is justified in seasons where warmer temperatures are predicted. Warmer temperatures may reduce the frequency of frost events but also increase the rate of crop development bringing crops to the susceptible, post heading stages earlier. [3]

14.1.2 The changing nature of frost in Australia

The length of the frost season has increased across much of the Australian grainbelt by between 10 and 55 days between 1960 and 2011. In some parts of eastern Australia, the number of frost events has increased.

CSIRO analysis of climate data over this period suggests the increasing frost incidence is due to the southerly displacement and intensification of high pressure systems (subtropical ridges) and to heightened dry atmospheric conditions associated with more frequent El Niño conditions during this period.

The southern shifting highs bring air masses from further south than in the past. This air is very cold and contributes to frost conditions.

In the eastern Australian grainbelt the window of frost occurrence has broadened, so frosts are occurring both earlier and much later in the season. In the Western Australian grainbelt there are fewer earlier frosts and a shift to frosts later into the season.

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1 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, http://www.grdc.com.au/BetterSafflowerAgronomy

2 GRDC (2016) Managing frost risk. Northern, Southern and Western Regions. GRDC Tips and Tactics, http://www.grdc.com.au/ManagingFrostRisk

3 J Christopher, B Zheng, S Chapman, A Borrell, T Frederiks, K Chenu (2016) An analysis of frost impact plus guidelines to reduce frost risk and assess frost damage. GRDC Update Papers 20 July 2016, https://grdc.com.au/Research-and-Development/GRDC-Update-Papers/2016/07/An-analysis-of-frost-impact-plus-guidelines-to-reduce-frost-risk-and-assess-frost-damage

The frost window has lengthened by three weeks in the Victorian grainbelt and by two weeks in the NSW grainbelt. The frost window in Western Australia and Queensland has remained the same length, while sites in eastern South Australia are similar to Victoria and sites in western South Australia are more like Western Australia. Northern Victoria seems to be the epicentre of the change in frost occurrence, with some locations experiencing a broadening of the frost season by 53 days. [4]

14.2 Waterlogging and flooding issues

Safflower does not tolerate waterlogging; it can predispose the crop to diseases such as Phytophthora root rot.

The effect of waterlogging on safflower crops appears to be worse under warming temperatures later in the season. Experience suggests that irrigation should stop after flowering, allowing water demands during seedfill to be met from soil reserves. Care needs to be taken with overhead irrigation to minimise the duration of humid conditions in the canopy, which favour the development of leaf and head diseases. Irrigated safflower does best on raised beds with good drainage.

14.3 Other environmental issues

The aggressive root system of safflower penetrates further into soil than roots of many other crops. The roots create channels in the subsoil, improving water and air movement as well as root development in subsequent crops. For this reason, some growers use safflower as an entry crop in rotations.

Safflower can also be used to dry wet soil profiles, such as after irrigated cotton. This facilitates the natural shrinking and cracking of compacted layers, which can be further shattered by deep ripping.

Because safflower is a long season crop with a deep taproot, it has the ability to use surplus water from deep in the soil profile, lowering water tables with dissolved salts and reducing the expansion of saline seeps. Similarly, some growers use safflower to dry soil profiles to reduce waterlogging in subsequent crops.

The prickly nature of safflower later in its growing season means that it is occasionally grown in situations where other crops may fail under high kangaroo, bird or feral pig pressure. It is relatively unpalatable to these animals and growers can achieve an economic return with minimal maintenance of the crop. [5]

MORE INFORMATION

Crop canopy temperature as an explanation for early flowering of safflower in response to water stress

4 GRDC (2016) Managing frost risk. Northern, Southern and Western Regions. GRDC Tips and Tactics, http://www.grdc.com.au/ManagingFrostRisk

5 N Wachsmann, T Potter, R Byrne, S Knights (2010) Raising the bar with better safflower agronomy. Agronomic information and safflower case studies. GRDC, http://www.grdc.com.au/BetterSafflowerAgronomy