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GRDC GROWNOTES™

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

PEANUTS

SECTION 14

ENVIRONMENTAL ISSUES

CLIMATE | TEMPERATURE | RAINFALL | DAYLENGTH | SOILS

Environmental issues

14.1 Climate

Based on climate alone, peanuts can be grown from Victoria, through NSW to North Queensland, the Northern Territory and Western Australia. However, commercial peanut production in areas south of Narrabri in NSW and in the north-west of Australia has been limited.

In the USA, peanuts are mostly grown at much higher latitudes.

Growers in different locations need to choose different varieties and management strategies if they are to maximise crop yields.

In some areas, planting times are critical. For instance, in southern regions, crops must be planted to mature before cold weather in autumn. Early-maturing varieties will perform better in these areas. In northern regions, crops should be planted so they will be ready for harvest after the main wet season.

Irrigation is necessary in most areas to produce reliable economic peanut yields. [1]

14.2 Temperature

Warm temperatures of ~25–30°C will prompt vegetative growth, whereas the optimum temperature for reproductive growth is ~22–24°C. Planting should be scheduled so that crops experience warm temperatures early in the season followed by cooler weather for flowering and then mature before there is any risk of frost (Photo 1). Hot soils can also damage peanut plants (Photo 2).

1 PCA/DPIF (2007) Climate and soils. Peanut Company of Australia/Department of Primary Industries and Fisheries Queensland, http://www.pca.com.au/bmp/pdfs/3a_climate.pdf

Photo 1: *Upper panel: yellowing between the veins of leaves is typical of cool night temperatures <9°C. Lower panel: frost kills the leaf tips but plant growth and pod-filling cease long before it is cold enough to frost.*

Photo 2: *Hot soil can cause leaf distortion and thickening as well as pollen sterility in peanuts during flowering.*

To determine when to sow, measure the soil temperature at planting depth at 9 a.m. each day. When temperatures of 18–20°C are recorded 3 days in a row, it is time to plant provided adequate soil moisture is present. If seeds are sown into cool soil, emergence will be slow because the seeds and seedlings are more susceptible to disease attack. Rain within 2–3 days of planting will lower soil temperature and may affect emergence if the soil temperature falls below 18°C.

Length of the growing season ranges from 110 to 170 days (16–24 weeks), depending on location and variety. For example, Early Bunch, an early-maturing variety, matures in ~170 days in Victoria, 140 days in Kingaroy and 120 days in Bundaberg. This delay in maturity is due to cooler temperatures in elevated and southern regions. Very dry conditions can also delay maturity.

You can predict the crop life cycle quite accurately using the heat-sum approach. Thermal time is calculated as the accumulation of heat units above a base temperature of 9°C up to an optimum of 29°C. Thus, a typical day of 35°C maximum and 23°C minimum will yield a mean daily temperature of (35 + 23)/2 = 29°C, and a thermal time of 29 – 9 = 20°C degree-days. The thermal times for each of the days throughout the season are then added together to give the total heat units for a particular environment.

Virginia and Runner types require thermal time of ~550 degree-days to progress from planting to the beginning of flowering, 950 degree-days to the beginning of podfill and 2150 degree-days to maturity for most locations in Queensland.

Crops can flower in ~35 days in Bundaberg but take up to 45 days in Kingaroy, as the critical 550 degree-days are accumulated much faster under Bundaberg's higher temperatures.

Temperature can also influence growth rates through its effects on photosynthesis. Low night temperatures have a large effect on growth rates. Kingaroy's night temperatures are ~5°C lower than Bundaberg's, and crops take about 30 days longer to mature in Kingaroy. However, Virginia Bunch produces similar dry matter amount and pod yield in both locations. Although growth rates are lower in Kingaroy, the crop has longer to compensate, and so yields are similar.

As minimum temperatures drop to <17°C, peanut growth begins to slow down. Dry matter production drops by about 25% when night temperatures reach 15°C and by 50% at 9°C. The plants virtually cease growing and filling pods long before it is cold enough for frost, so crops must be harvested before frost is likely. In inland southern Queensland, this means that crops should be ready for harvest before the end of April. [2]

14.2.1 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. [3]

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. [4]

14.2.2 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.

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. [5]

14.3 Rainfall

Peanuts are moderately drought-tolerant but, like all crops, need readily available moisture throughout the season to produce high yields. Where rainfall is reasonably distributed through the growing season, crops produce about 5–10 kg/ha of pods per mm of rainfall.

For dryland peanuts in Queensland and northern NSW, average rainfall of ≥400 mm from September to March is needed to produce a reasonable crop.

2 PCA/DPIF (2007) Climate and soils. Peanut Company of Australia/Department of Primary Industries and Fisheries Queensland, http://www.pca.com.au/bmp/pdfs/3a_climate.pdf

3 GRDC (2016) Managing frost risk. Northern, Southern and Western Regions. GRDC Tips and Tactics, https://grdc.com.au/resources-and-publications/all-publications/factsheets/2016/02/managingfrostrisk

4 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

5 GRDC (2016) Managing frost risk. Northern, Southern and Western Regions. GRDC Tips and Tactics, https://grdc.com.au/resources-and-publications/all-publications/factsheets/2016/02/managingfrostrisk

For optimal yields, ~600 mm of water is required. This means irrigation requirements may be 2.5–6 ML/ha depending on variety, location, rainfall and irrigation method.

Areas with high rainfall (>900 mm annually) or consistently high humidity generally have more problems with leaf diseases. A well-managed fungicide program is needed in these areas to control leaf spot, rust and net blotch.

Dry conditions at harvest are essential. Harvest losses can result from extended rain either just before or just after digging the peanuts. High-rainfall areas have a greater risk of harvest losses due to delayed harvest. [6]

14.4 Daylength

Peanuts are not affected by changes in daylength to the same extent as some other crops (e.g. soybeans). The growth stages of peanuts are mainly controlled by temperature. However, reproductive growth may be reduced when daylength is >14 h if night temperatures are also >20°C. Areas in southern Australia may therefore be affected, but there are no research data to confirm this.

The amount of sunlight can strongly influence peanut growth. In wet tropical areas, such as north Queensland, peanuts often show rank growth where the vegetative growth far outweighs pod growth. This appears to be an effect of moisture and temperature. Short days and cloudy conditions combine to reduce the amount of light each day. [7]

14.5 Soils

Soil type is a most important aspect of growing peanuts.

Peanuts yield best in well-drained, friable (loose) soils (Photo 3). Even though peanuts have traditionally been grown in red soils, texture rather than colour that determines whether a soil is suitable for peanut production. Peanuts will grow and produce a crop in most soils, but the ability to harvest the crop with minimal losses determines the soil's suitability for peanuts.

Soil type is probably one of the two most limiting factors for peanut growth, along with the type of irrigation.

Peanuts tolerate a wide range of soil acidity levels, however ideally the pH should be between 6.0 and 7.0. Soils that are more acidic than this (below pH 6.0) should be limed. Make sure your soil test is properly interpreted by a qualified agronomist.

Heavy clay and poorly drained soils may not be suitable, because waterlogging at harvest makes it difficult to extract the pods gently and cleanly.

Black cracking clay soils used for irrigated cotton and other crops are generally not suited to peanuts. As a rule of thumb, a soil is suitable for peanuts if harvesting equipment can operate effectively 4–5 days after heavy rain or irrigation.

6 PCA/DPIF (2007) Climate and soils. Peanut Company of Australia/Department of Primary Industries and Fisheries Queensland, http://www.pca.com.au/bmp/pdfs/3a_climate.pdf

7 PCA/DPIF (2007) Climate and soils. Peanut Company of Australia/Department of Primary Industries and Fisheries Queensland, http://www.pca.com.au/bmp/pdfs/3a_climate.pdf

Photo 3: *Some black soils are suitable for peanut production, but they must be friable and well drained.*

The type of soil can influence the variety grown, because some varieties can be harvested from heavier soils with fewer problems. Spanish varieties, which have strong pegs and pods tightly clustered around the taproot, can be successful in heavier soils. However, wet soil at maturity will cause Spanish types to germinate and split. By contrast, some Virginia types have weaker pegs and their pods are spread over ≥30 cm. These types can have high yield losses in soils that set hard at harvest.

Irrigation management can be used to soften the soil and help harvesting on some heavier or hardsetting soils, provided the soil does not become waterlogged.

Soils must be free of sticks, stumps and large stones that can interfere with harvesting and damage equipment working below and on the soil surface.

Peanuts are relatively tolerant of low-fertility soils compared with other crops. However, for irrigated crops, a moderate fertiliser program is usually needed. A soil test will provide a guide to the nutrient status of the soil.

Iron deficiency is a problem on soils of pH >7.5, usually more so on heavy soils, especially in wet conditions.

Soil calcium is a critical nutrient in peanuts. Lighter sandy soils usually have low calcium levels in the pod-zone and growers must correct any deficiency (Photo 4).

Pesticide residues and heavy metals can contaminate peanuts. Organochlorines (e.g. dieldrin, endrin, BHC, heptachlor and DDT) are the most common problems. A soil test, along with the pesticide history, will indicate likely problems. [8]

8 PCA/DPIF (2007) Climate and soils. Peanut Company of Australia/Department of Primary Industries and Fisheries Queensland, http://www.pca.com.au/bmp/pdfs/3a_climate.pdf

Photo 4: *Light-textured soils are often deficient in calcium.*