Sesame Grower Guide

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Quick Grower Facts

Time of Sowing – Sow when soil temperatures at the depth of sowing are 20°C or greater, air temperatures are unlikely to fall below 15°C during the growing season, and harvest is unlikely to coincide with rain.

Sowing Rate – 2.5 to 3.0 kg/ha for standard planters or 300K – 600K seeds/ha for precision planters.

Sowing Depth – 10 – 25 mm.

Row width – 25 to 100 cm, to adapt with existing farming system. Where a 100 cm row spacing is used weed control is more challenging.

Soil Types – Can grow in a wide variety of soils, however, prefers medium textured well drained soils. Attention needs to be paid to crusting soils as these can affect emergence.

Crop Nutritional Requirements for N, P & K

- Pre-plant or at planting apply 40 kg/ha of Nitrogen, 20 kg/ha of Phosphorus, 60 kg/ha of Potassium. This can be applied in the lead up to sowing.
- Approximately 4 to 6 weeks after crop emergence top up with an additional 40 kg/ha of Nitrogen.

Water Management & Irrigation – Sesame requires good soil moisture around the seed for 3 to 5 days after sowing for good crop establishment. Can be grown as a rainfed crop where there is 500 – 650 mm of rain distributed across the growing season; otherwise, supplementary irrigation is required, particularly at establishment and grain fill. After crop establishment apply quick light irrigations or if limited water available apply a heavy irrigation prior to sowing and 6 to 7 weeks after crop emergence.

Weed Management – There is a limited range of chemicals for weed control in sesame. Ensure that a field with low weed pressure is chosen. Ideally, prepare the field in advance and allow weeds to germinate and control these with a knockdown herbicide prior sowing.

Diseases – Major diseases are charcoal rot and pythium. Conduct a PredictaB prior to sowing to identify disease risks.

Insect Management – Sesame Leaf Roller is a major pest. Monitor the crop regularly and act when required.

Harvest Management – If there is residual soil moisture at physiological maturity, apply a desiccant to dry the crop down in preparation for harvesting.

Harvest Timing – Harvest when seed moisture is at or below 6%, as sesame is difficult to dry post-harvest.

Harvesting equipment – Use a standard grain header with a draper style or platform front. The ideal gap between the drum and the concave is approximately 25 to 30 mm.

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Introduction

Sesame (Sesamum indicum L.) is an ancient oilseed and one of 36 species within the Sesamum genus, a member of the Pedaliaceae family. Among these species, sesame it is the most widely cultivated (Seid & Mehari 2022). Sesame is currently cultivated between the latitudes of 40°N and 40°S (Lakhanpaul et al. 2012) in Africa, Asia, South America and the southern parts of the United States of America across tropical and temperate zones (Islam et al. 2016). Recognized as a promising crop with significant production potential, sesame is also particularly valuable for growers in northern Australia (Rahman et al. 2020), as a break crop in existing farming systems.

Production Potential and Markets

Sesame demand in Australia is forecasted to reach 9,800 t by 2025, with Australia importing about 6,500 t of sesame, valued at A$15 M in 2022 (Trotter & McDonald 2024). Globally sesame production is expected to increase to 12.28 mt/year by 2040, however this is expected to leave a shortfall of 3.02 mt/year (Rahman et al. 2020), providing an opportunity for Australia to export sesame in the future.

Australia currently imports sesame seeds and oil to produce a wide range of products for domestic and international markets. Products made by Australian manufacturers using sesame seed includes tahini, hommus, sesame oil, roasted sesame seeds, flour, halva, chilled falafels, ice-cream, cereals, snacks, crackers, biscuits and bakery goods such as bread, bread rolls and pies.

Crop Establishment

Sesame prefers in medium textured, well drained fertile soils, however can be grown in a wide range of soil types (Lakhanpaul et al. 2012). Sesame grows in a range of soil types in Australia, including the Cununurra clay (vertosol) in the Ord region, Tipera soils (kandosol) in the Katherine region, Coom (hydrosol) and Hillview (kandosol) soils in the North Queensland Wet Tropics, Annandale (kandosol) and Rolleston and Rockhampton (vertosol) soil in Central Queensland. The texture of these soils varies from heavy cracking clays to light loams, all of which are well drained.

Good crop establishment and accurate sowing depth, requires careful field preparation. Sesame is a small seed preferring a fine soil tilth, cloddy soils make it difficult to achieve a consistent sowing depth and good soil to seed contact required for uniform germination. Sesame can also be direct drilled into stubble in a no-till farming system (Case Study 1) provided that the stubble is not so tall as to cause shading (Langham et al. 2008).

Case Study 1: Direct drilling of sesame seeds into Sabi grass stubble in Katherine Summer 2022-23.

In the 2022/23 wet season, a crop of sesame was successfully established in Katherine when direct drilled into a sprayed out Sabi grass fallow (Figure 1).

Figure 1: *Direct drilling of sesame into Sabi grass stubble using a cone seeder in summer 2022-23 in Katherine, NT.*

A wide range of planters can be used to sow sesame, including a Connor Shea disc seeder, cone seeders with tynes and discs (Figure 2) and a Monosem precision planter with 120 or 60 hole plate with 0.8 or 1.0 mm holes. Sesame seeds can become statically charged when using plastic seed plates, causing the seed to remain attached to the plate. The Monosem plates are stainless steel which are less prone to static build up and therefore feed the seed through the planter more consistently compared to the plastic seed plates. Any planter that can meter out the small seed at the correct sowing rate with accurate depth control is suitable.

A wide range of row configurations are possible for sesame production, with row spacing selected to complement the cropping system where sesame is being integrated. In Central Queensland, sesame is grown in a single row on 1 m beds to fit the existing cotton production system. Where 1 m row spacing are used, the crop may not achieve full canopy coverage between rows making weed management critical. Row spacings between 25 and 50 cm used in other regions work well, allowing the crop to branch and fill in between rows.

The target seeding rate is 2.5 – 3.0 kg of seed per hectare for traditional planters, or 300,000 to 600,000 seeds per hectare for precision planters. Standard viability of elite Australian lines available for commercial production are typically over 85% germination viability. There are natural losses in the soil due to predation, seed size and sensitivity to residual herbicides in the soil. Seeding rate is important, however, populations between 100,000 and 260,000 plants per hectare achieved similar yields, as sesame will branch when there is a low population and self-thin when populations are too high to be sustained (Langham et al. 2008). International research has shown that the number of seeds that germinate and emerge is generally a third to a half of the seeds that are sown (Langham et al. 2008).

Sowing depths range from 2.5 cm on very light soils to broadcasting on the surface and tickled in with tynes on heavy clays. Sesame should be sown into soil moisture, and a depth of 1 cm is most common.

Figure 2: *Planters used for sesame. Top Right: Cone seeder sowing four rows in Kununurra, WA; Top Left: Connor Shea disc seeder sowing four rows in Tully, QLD; and Bottom: Monosem precision planter sowing four rows in Emerald, QLD.*

Time of sowing

The ideal time of sowing will vary across regions and seasons. Understanding varietal traits, season length and varietal attributes, heat and cold tolerance in sesame and water management practices, will enable informed decision for individual situations.

Variety Selection

In a mechanised broadacre farming system, non-shattering varieties are key to ensuring the entire yield is captured during harvest through minimising harvest losses. Black and white sesame is grown in Australia, with successful production in small trials above the Tropic of Capricorn. The genetics for the elite, non-shattering black and white varieties are sourced from Equinom in Israel and Sesaco in the USA.

ES 103 - "Highway"

A white, long season, non-shattering sesame variety, ES103 also known as Highway (Figure 3) takes 34 - 87 days for 50% of plants to flower and 107 to 171 days to harvest (Table 1). This variety was developed by Equinom in Israel and has shown potential yields of up to 1945 kg/ha.

Figure 3: *ES103 - 'Highway', white sesame at late maturity growing in Katherine NT.*

Table 1. *White sesame (ES103) greatest performance recorded at each trial site and season, including days to 50% flowering, days to harvest, plant height (cm) and yield potential (kg/ha).*

Region	Season	Days to 50% Flowering	Days to Harvest	Plant Height (cm)	Yield Potential (kg/ha)
Emerald	Summer	46	107 - 110	87 - 109	795
Tully	Summer	34	137	89	177*
	Winter	87	166	100	1945
Katherine	Summer	34	119	59	1127
	Winter	54	171	98	1223
Kununurra	Summer	63	153	115	1448

*This data is not representative of what is possible at this site. This trial experienced significant weed infestation.

Figure 4: *S57B, black sesame at late maturity growing in Katherine NT.*

S57B

A black long season variety (Figure 4) that takes 39 - 103 days for 50% of plants to flower and 107 to 171 days to harvest (Table 2), this variety was developed through Sesaco in the USA. It is best grown during the summer season, where a dry finish in addition to a chemical desiccant is used to prepare for harvest. Where soil moisture is available at time of desiccation, this variety has proven to be difficult to dry-down, so aligning maturity with the onset of the dry season or withholding irrigation is essential to achieve the moisture levels required in the grain to harvest the crop.

Table 2. *Black sesame (S57B) greatest performance recorded at each trial site and season, including days to 50% flowering, days to harvest, plant height (cm) and yield potential (kg/ha).*

Region	Season	Days to 50% Flowering	Days to Harvest	Plant Height (cm)	Yield Potential (kg/ha)
Emerald	Summer	53	107 - 110	94 - 114	732
Tully	Summer	40	137	97	200*
	Winter	103	189	80	918
Katherine	Summer	39	147	54	812
	Winter	54	171	99	937
Kununurra	Summer	69	167	122	1869

*This data is not representative of what is possible at this site. This trial experienced significant weed infestation.

Heat and Cold Tolerance

The optimum air temperature for sesame development and yield is 25°C to 37°C during the growing season (Terefe et al. 2012). Sesame is sensitive to chilling stress (Case Study 2) resulting in growth suppression when air temperatures drop below 20°C, and inhibition of growth and germination when air temperatures drop below 10°C (Lakhanpaul et al. 2012). Sesame sowing should occur only when the soil temperature at sowing depth is at or above 20°C at 7 am in the morning (Langham et al. 2008).

The northern part of Australia from Mackay north on the east will generally support the sowing of both a summer and a winter or early spring crop as the soil temperature during the winter months may be too cold for germination in some areas. The regions where the average monthly minimum air temperature for the 20th percentile is above 15°C, sesame should be able to be sown every year with minimal risk (Figure 6). However, if the average monthly minimum air temperature for the 20th percentile is below 15°C there may be some years where sesame crops in these months may be at risk from chilling stress affecting both germination and crop growth (Figure 6).

The minimum temperatures in Central Queensland are too low for a successful establishment or growth of a winter crop. Frosts will terminate a crop (Langham et al. 2008), which in areas such as Central Queensland could be beneficial for dry down and harvest of late sown summer crops.

Case Study 2: Soil and air temperatures during germination in Tully Winter 2024.

In 2024, the Tully winter crop sown on 3rd July emerged but due to the minimum air temperatures being below 10°C from the 18th to 22nd July inclusive this planting failed to progress past the cotyledon stage. The crop sown 24th July failed to emerge as the soil temperature in the top 10 cm was generally below 20°C at 7 am during the germination period and at 7 days after sowing both air and soil temperature reached a minimum of 15°C (Figure 5).

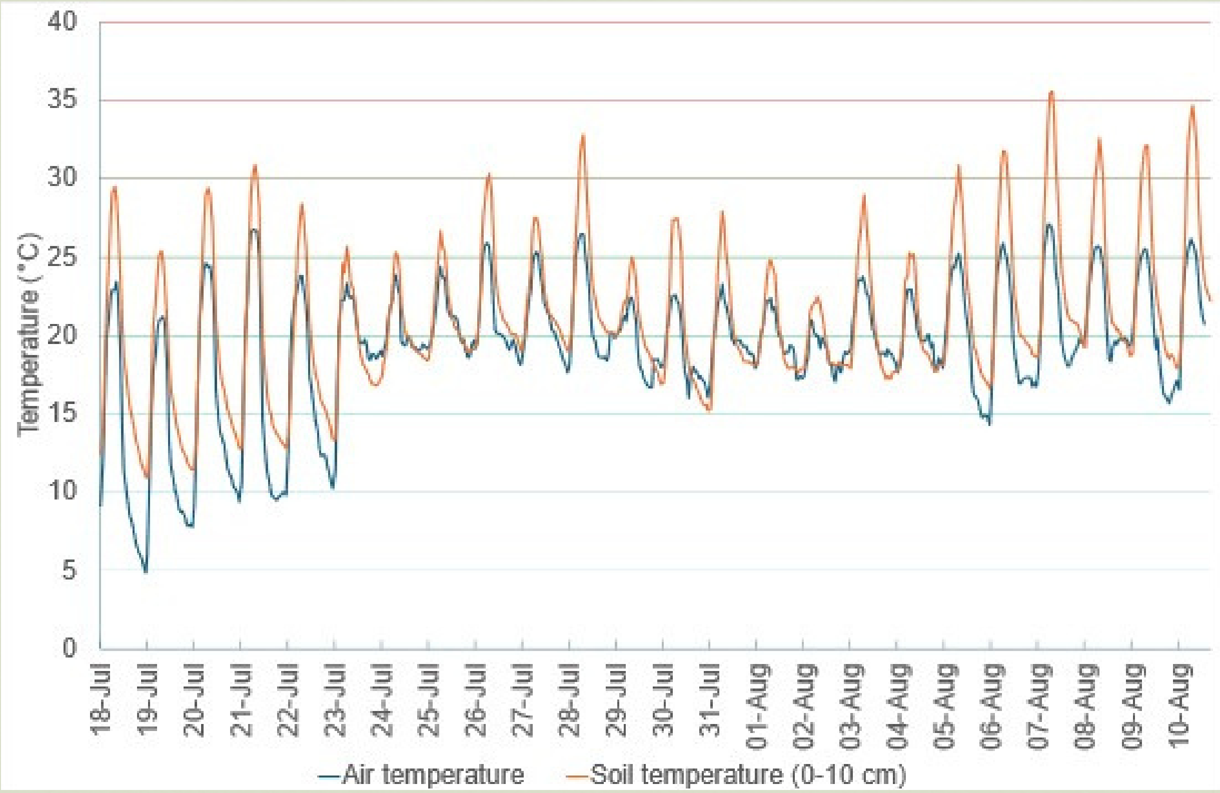

Figure 5: *Daily soil and air temperature at 7am experienced at the Tully winter sesame trial site between 19 July 2024 and 10 August 2024.*

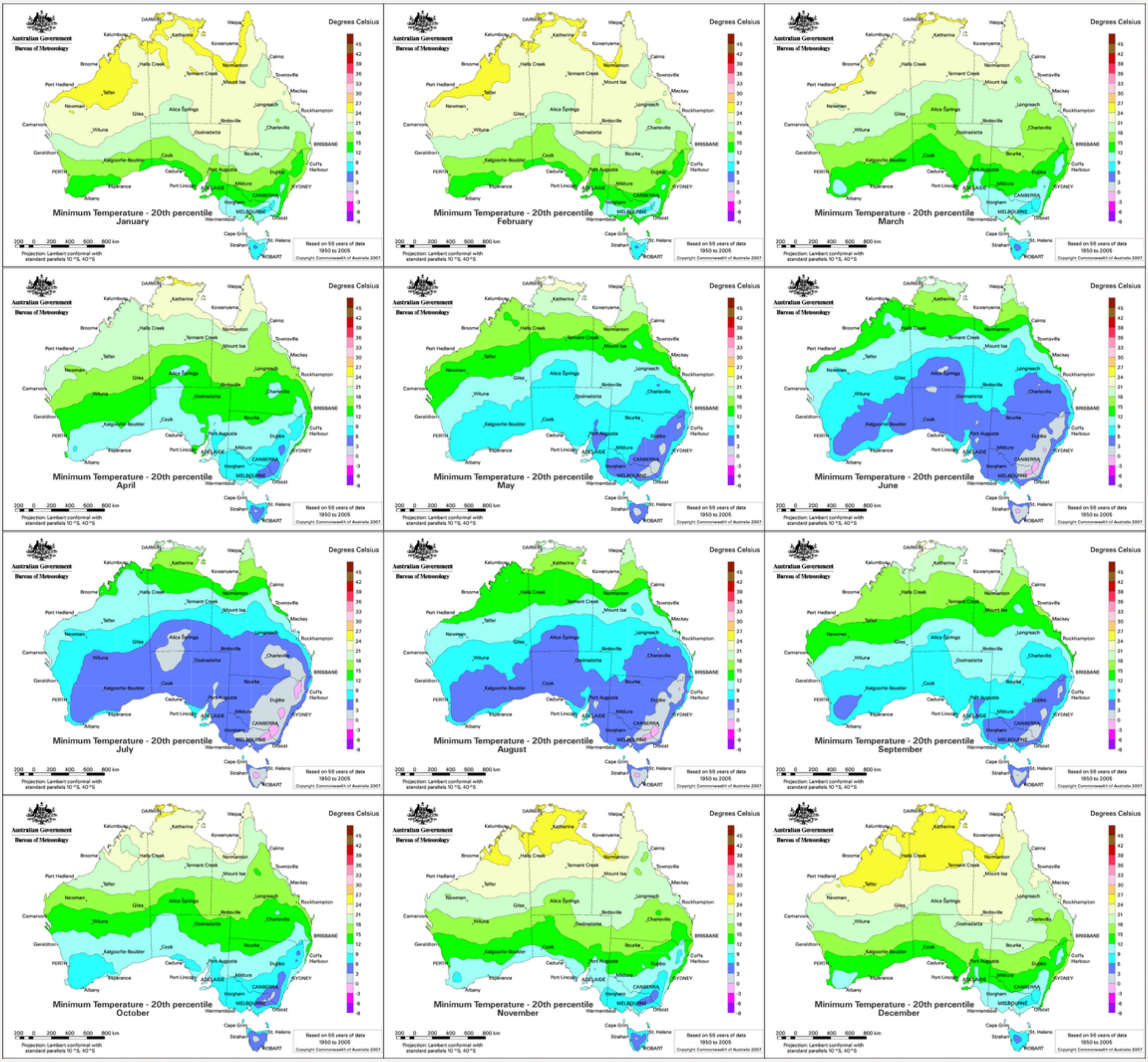

Figure 6: *Average monthly minimum temperatures from 1950 - 2005 for the 20th percentile. Source BoM (2024)*

Water Management

Sesame, although a drought resilient crop, performs better with good water management. Sesame should be sown into good soil moisture that can be maintained around the seed for 3 to 5 days to facilitate even crop establishment (Langham et al. 2008). Excessive moisture should be avoided as sesame is sensitive to water logging.

Sesame can be grown as a dryland crop in areas receiving 500 – 650 mm of rainfall evenly distributed across the growing period (FAO 2023). Where rainfall is greater than 1100 mm or less than 300 mm, crop yields can be reduced (Terefe et al. 2012). Katherine in the NT has grown rainfed summer crops, and Tully has grown rainfed summer and winter crops, achieving yield potentials above 1 tonne/ha. The greatest disadvantage of growing a rainfed crop is the potential for waterlogging (Case Study 3).

When sesame experiences 2 to 3 days of waterlogging, crop growth and crop yields can decrease (Myint et al. 2020), this is particularly evident in young crops, with more mature crops able to withstand longer periods of waterlogging.

Where rainfall is not reliable, the crop is grown using either full irrigation or supplementary irrigation. When irrigation is used, apply a heavy irrigation prior to sowing to ensure the soil profile is full, and once the crop emerges use fast light irrigations as required. If there is insufficient water to have a completely irrigated crop, use a heavy irrigation pre-sowing and then apply a second irrigation 6 to 7 weeks after crop emergence (Langham et al. 2008). Stop irrigating when the crop reaches late bloom, determined when 90% of the plants do not have an open flower (Langham et al. 2008).

Case Study 3: Effects of a monsoon trough on a rainfed crop in Tully, Summer 2023-24.

In January 2024, the summer sesame trial in Tully received 800mm of rainfall (Figure 7) in the 7 days after sowing, causing waterlogging and failed to germinate due to the waterlogging (Figure 8).

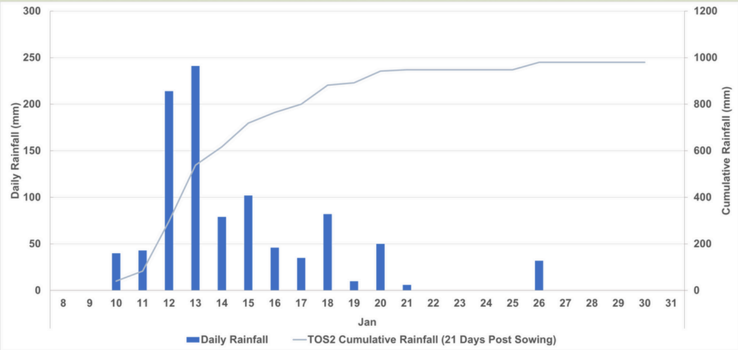

Figure 7: *Daily and cumulative rainfall for 21 days post sowing of Tully 2023-24 summer season trial.*

Figure 8: *Waterlogging in the field in Tully 2023-24 summer season trial*

Crop Rotation

Sesame can integrate into existing crop rotations in a variety of regions across Northern Australia. Examples are given for Central Queensland, Katherine/Douglas Daly region in NT, North Queensland and the Ord Region in WA.

Central Queensland

Sesame has proven to be a viable summer crop for Central Queensland, used in rotation with cotton. Sesame would be a suitable alternative summer crop when water allocations are limited, due to its drought resilience and ability to be grown with reduced water inputs, would be a viable crop when water allocations are limited. Sesame can be sown from early October to mid-February, with harvest from mid-February to end of June depending on variety sown and time of sowing (Figure 9).

Katherine / Douglas Daly Region, NT.

Sesame is successfully grown in Katherine as an irrigated winter (dry season crop), and as a rainfed or supplementary irrigated summer (wet season) crop. A short season variety of sesame could be grown after cotton, and then followed by a Mungbean or Soybean crop. In a forage-based system, where irrigation is available (full or supplementary), sesame could be grown as a winter crop in rotation with Sorghum or hay (Figure 10).

Kununurra and Ord Region, WA

Sesame is a viable irrigated winter crop (dry season) and rainfed or supplementary irrigated summer crop (wet season), that can follow cotton or planted prior to chickpeas. It can be grown as a maize alternative (Figure 11).

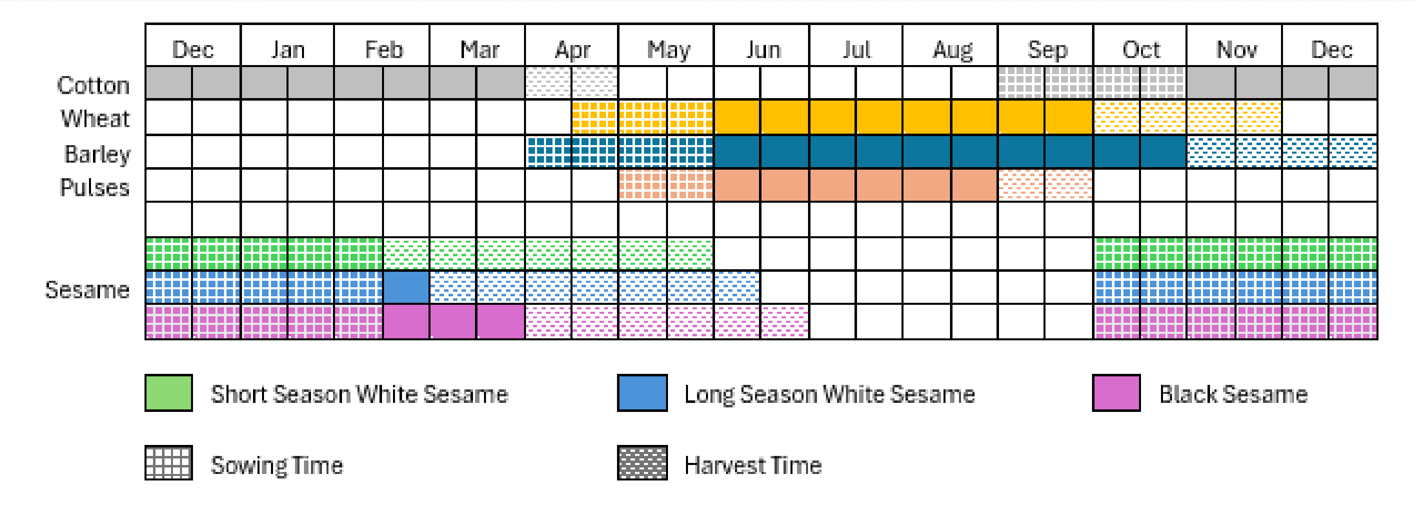

Figure 9: *Sowing and harvest calendar of key crops and sesame in Central Queensland.*

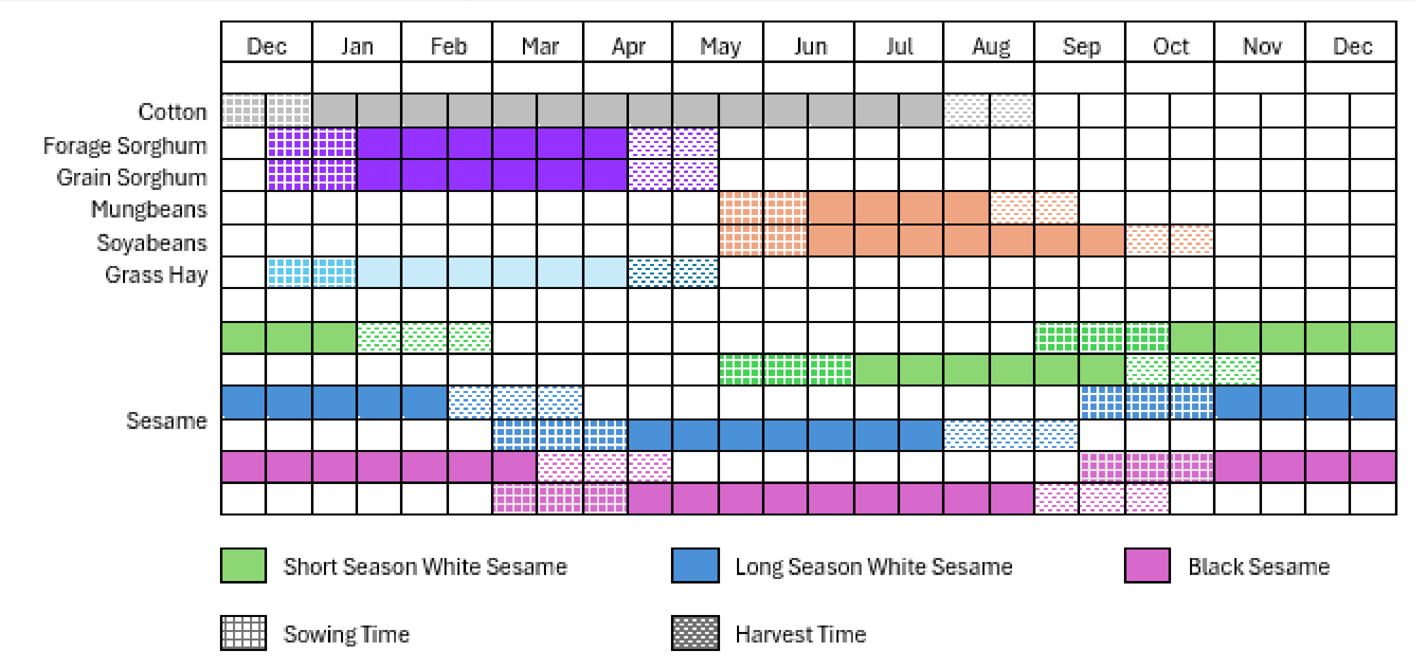

Figure 10: *Sowing and harvest calendar of key crops and sesame in Katherine/Douglas Daly Region of NT.*

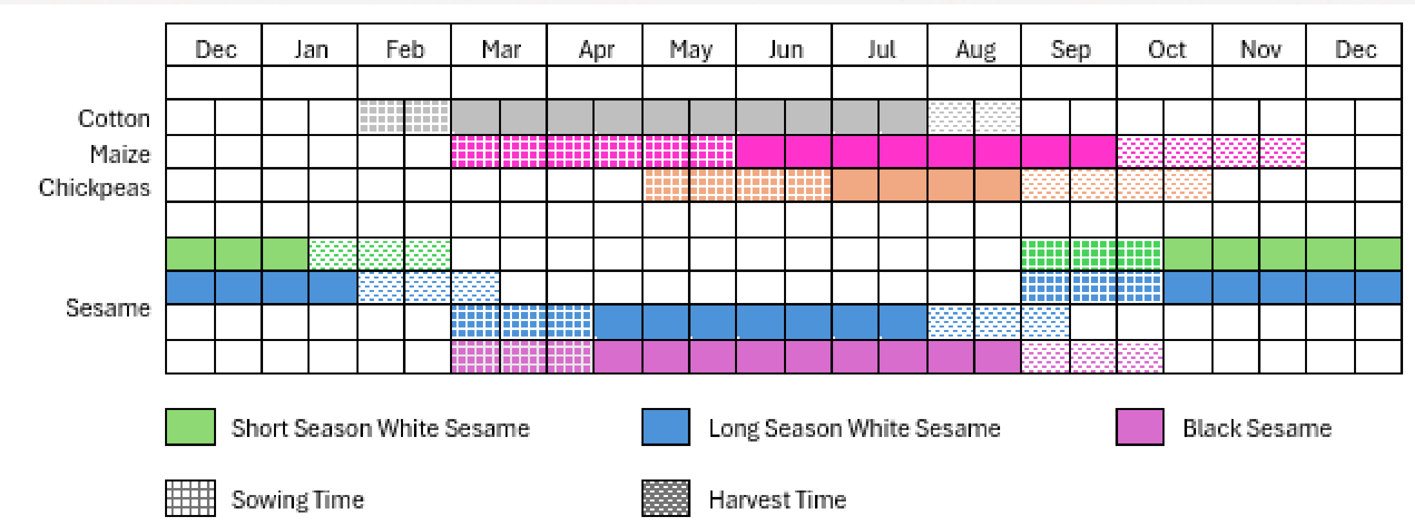

Figure 11: *Sowing and harvest calendar of key crops and sesame in Kununurra/Ord Region of WA.*

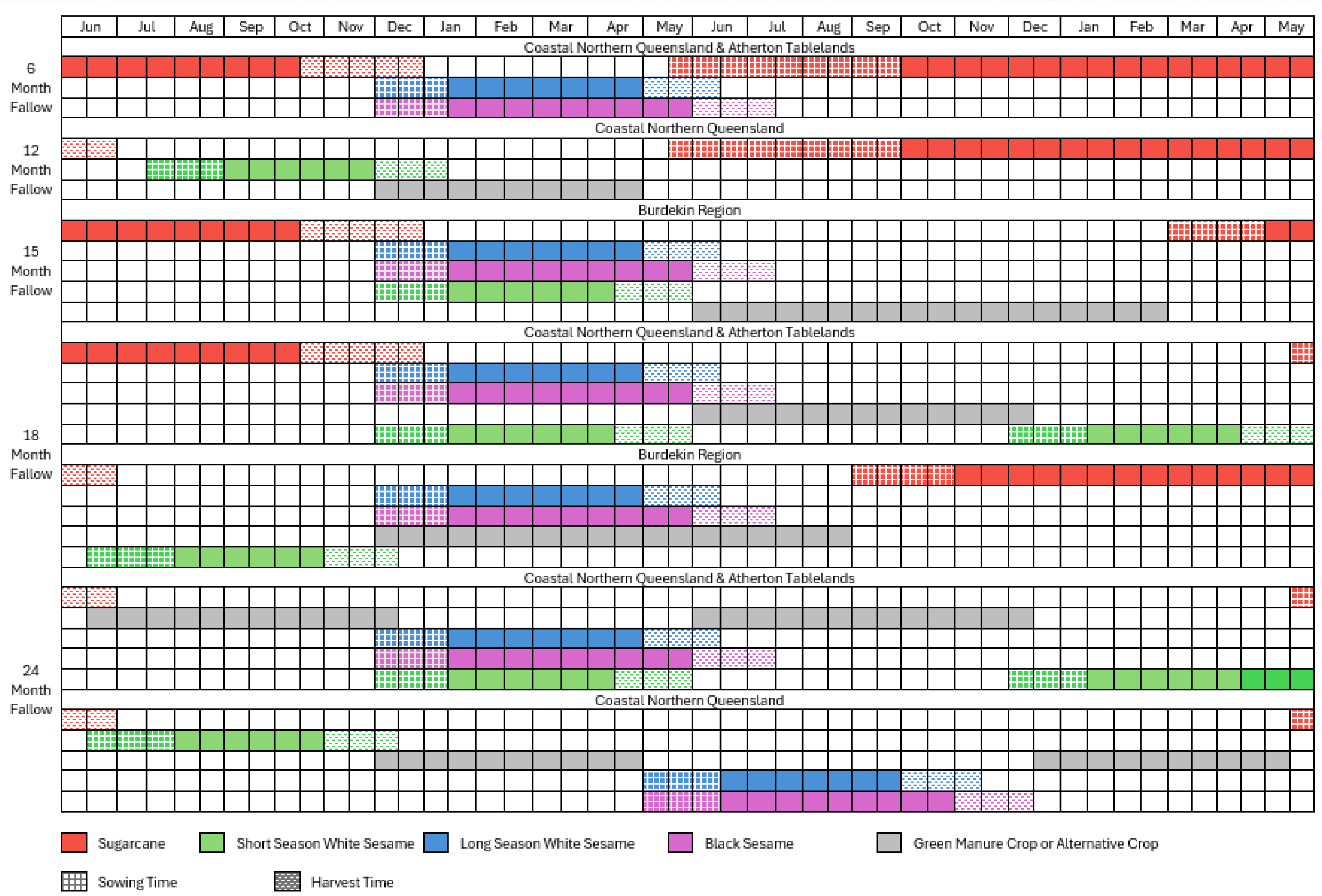

Figure 12: *Sowing and harvest calendar of key crops and sesame in North Queensland.*

North Queensland

Sesame has shown to be viable as a rainfed summer and winter crop in the coastal wet tropic regions of North Queensland, and an irrigated summer crop on the Atherton Tablelands, and an irrigated or supplementary irrigated summer and winter crop in the Burdekin and Mackay.

Sesame can be integrated into the existing sugarcane cropping system, grown as either a winter crop where there is an early fallow block, or in the summer in the traditional fallow (Figure 12). The introduction of sesame into the sugarcane farming system also enhances the viability of long fallows.

Crop Nutrition

The plant nutrient requirements are minimal for the first 30 days of growth and then demand increases rapidly with nitrogen uptake peaking at 74 days, phosphorus from 60 to 90 days and potassium from 35 days until the end of the crop (Ribeiro et al. 2019). Ribeiro et al. (2019) reported that 50 kg/ha of nitrogen, 14 kg/ha of phosphorus and 60 kg/ha of potassium is required on average to produce 1 t/ha of seed.

Currently, Australian recommendations are that between 60 and 120 kg/ha of nitrogen, up to 40 kg/ha of phosphorus and 80 kg /ha of potassium is applied to the sesame crop to maximise yields. This is typically applied at time of sowing. Early trial evidence in northern Australia suggests there is little to no yield response when the nitrogen rate is above 80 kg/ha (Pers. Comm Bhattarai 2024). A split application of nitrogen, half at sowing and half 30 days after emergence may further improve nitrogen use efficiency. When placing fertilizer at time of sowing, ensure the seed is not in direct contact with Urea and Muriate of Potash forms of fertilizer, as this can damage the seed.

Harvest Management

Figure 13: *Heading a mature dry sesame crop with a plot header with a platform front.*

Sesame can dry down for harvest on its own, however, the preference is to use a desiccant to speed up the rate of desiccation in preparation for harvest. In rainfed systems where soil moisture is not able to be depleted by the crop once it is mature, the use of desiccants is essential. A rainfall event during maturation can slow down desiccation of the crop, and if there is persistent heavy rain that delays harvest, seed quality may decline. Where there has been available soil moisture at the crop dry down stage, S57B has side shot and proceeded to grow on, even after the application of a desiccant. Several desiccants are under permit or registered for use in sesame (Appendix 1).

Direct harvesting with a conventional grain header with a draper style or platform front or similar, maximises commercial grain yields when using mechanical harvesting (Figure 13). The key to ensuring a good clean harvest sample is to maintain a weed free crop, with seed moisture at or below 6% at harvest.

The ideal gap between the drum and the concave is approximately 25 to 30 mm. If the seed sample in the bin has a large quantity of smashed pods, the drum is too closed, if there are seeds still within the pods when they come out the back of the machine, the drum is too open. Sesame is more difficult to clean in a header compared to maize and sorghum. To maximise yields, trash levels are usually between 6 and 12%. The use of catch trays is critical to monitor effectiveness of harvester adjustments and to minimise seed harvest losses.

Sesame is hygroscopic and will absorb ambient moisture from the air once harvested. If the seed moisture levels are too high at harvest, the humidity is high, or there is green weed plant material present in the grain, it may be necessary to put the sesame on air to prevent heat buildup in the sample, which can cause the sample to spoil. Drying is complete when the seed moisture reaches 6%. Drying sesame after harvest is difficult and not economical.

Diseases and their Management

There are a range of soilborne and foliar diseases identified that could affect sesame production in Northern Australia (Figure 14).

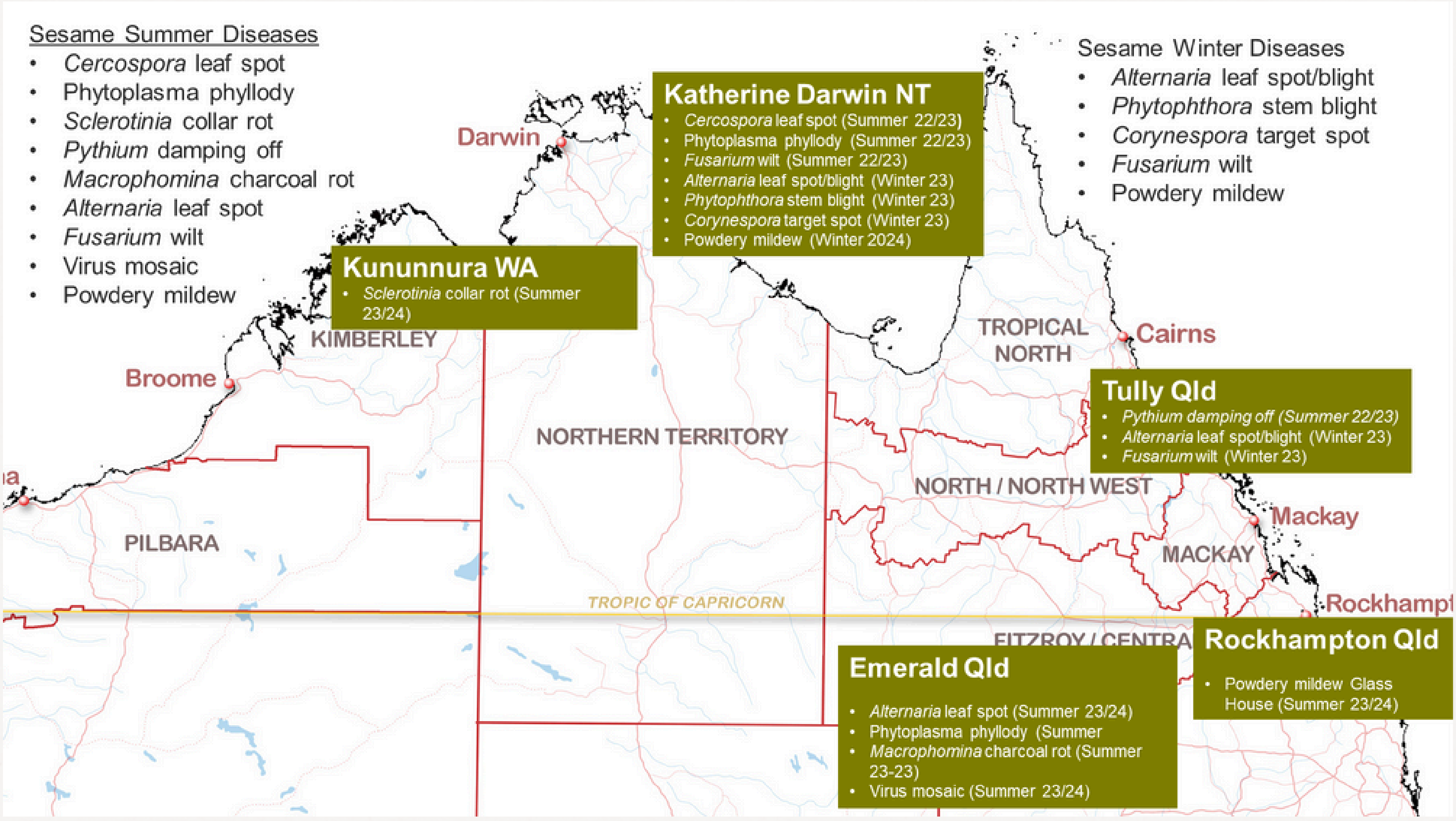

Figure 14: *Sesame diseases identified at various locations across Northern Australia (Image provided by Dr Dante Adorada).*

Figure 15: *Fusarium wilt in winter 2023 crop of sesame in Tully, NQ.*

Figure 16: *Sclerotinia in summer 2023-24 crop of sesame in Kununurra, WA.*

Figure 17: *Macrophomina charcoal stem rot in summer 2023-24 crop of sesame in Emerald, CQ.*

The level of inoculum for a number of these diseases can be determined by taking a soil sample and conducting a Predicta B Test, which serves as a grower's disease risk management decision tool. Predicta B test results can tell a grower which diseases are of great concern, allowing suitable management plan to be implemented which considers variety choice, rotations, chemical management or whether or not to even plant a sesame crop.

Pythium seedling rot, Fusarium wilt (Figure 15) and Macrophomina charcoal/stem rot (Figure 17) are all disease that can affect crop establishment, and detectable through a Predicta B test. If high levels of Pythium sp. or Fusarium oxysporum are present, it is important not to overwater the crop during establishment. If high levels of Macrophomina sp. are present, avoiding a dry spell causing moisture stress to the plant could minimise the disease, since charcoal/stem rot is a drought-induced disease. The use of fungicide and/or biological seed treatment may help in reducing the effect of these diseases on the crop, alternatively another site may be more suitable.

An established sesame crop can become infected with leaf spot, sclerotinia (Figure 16, powdery mildew or phytoplasma phyllody (Figure 18). Of these diseases, only powdery mildew has required the application of fungicides.

PREDICTA B TESTING AND DISEASE IDENTIFICATION

For more information on where to get a Predicta B test done and how to interpret the results visit:- https://pir.sa.gov.au/research/services/molecular_diagnostics/predicta_b#toc_Pathogens-tested

If disease symptoms are observed within the crop, establish the incidence and severity of the disease, take photos of the disease symptoms and send a sample of the diseased plant along with the photos to a nearby plant pathologist for identification, or to:-

Dr. Dante L. Adorada,
Centre for Crop Health,
University of Southern Queensland,
Toowoomba Qld 4350.
T: 0477718593
E:dante.adorada@unisq.edu.au.

***a)** Phyllody symptoms on flowers* ***b)** Phyllody symptoms on pods* ***c)** Phyllody symptons on leaves*

***Figure 18:** Phyllody symptoms on (a) flowers, (b) pods and (c) leaves on the sesame plant.*

Pests and their Management

Sesame leaf roller (SLR), is a lepidopteran pest which rolls up young leaves, and sticks them together with silk, then feeds from the inside where it is protected from most chemicals (Figure 19). In addition to causing severe defoliation, SLR caterpillars can also feed on flowers and bore into the pods causing a yield reduction.

Upon the identification of SLR in a crop, the crop needs to be monitored closely and be prepared to apply an insecticide spray, as SLR moves very quickly and is very damaging. SLR has been identified during the germination phase, not just during the vegetative or reproductive phase. An IPM strategy for the management of SLR in sesame is critical, as chemical control measures alone will not be sufficient moving forward.

Figure 19: *Sesame leaf roller, the typical webbing and damage observed on sesame in Summer 2023-24 in Emerald, CQ.*

Heliothis sp. and green vegetable bug are considered a serious problem in Australian Sesame. Thrips have also been observed but are not considered a major threat.

Heliothis sp. (Figure 20) are a common lepidopteran pest that lay their eggs on the sesame flowers and pods. Once the eggs hatch the caterpillars feed on the flowers and pods, reducing grain yields.

The green vegetable bug (Figure 21) has the potential to sting the pod and the seeds causing malformation of the seeds and pods, discolouration of the seeds, which in high numbers could reduce crop yields.

Figure 20: *Damage to the leaves of a young sesame plant caused by Heliothis sp. Inset is a photo of a Heliothis sp. larvae.*

Thrips are a sucking pest that can stunt plant growth and cause injury to the flower buds, thus preventing the development of pods and reducing crop yields.

In most instances, chemical control may be unnecessary, as effective crop monitoring has shown the pest populations to be low or stable, there has been sufficient beneficial insects to control these pests, or the pests have occurred at a crop stage where the damage they may have caused was not critical. The currently registered insecticides are shown in Appendix 1.

Figure 21: *Green Vegetable Bugs at various stages. Top is early instar nymphs, bottom left is later instar nymphs, and bottom right is an adult beetle. Summer 2023-24 Emerald, CQ.*

Weeds and their Management

Sesame is highly susceptible to yield losses through poor weed management. Currently there are two grass selective herbicide actives and one pre-emergent herbicide active under permit for use in sesame in Australia (Appendix 1). To ensure good weed control, select a paddock that has low weed pressure, and very few broadleaf weeds and no vines. Prepare ground in advance and allow a germination of weeds prior to sowing. This germination can then be controlled with herbicide prior to sowing. Sesame fits well in a GM cotton rotation where the use of glyphosate in season during cotton production creates ideal field preparation through the depletion of broadleaf weeds during the cotton growing season.

Where there is an expectation of high weed pressure, a pre-emergent herbicide can be applied just prior or soon after sowing. Sesame however is very sensitive to pre-emergent herbicides, and their use can further slow emergence and affect germination if the crop is exposed to temperature stress, nutrient stress or moisture stress. If using a pre-emergent herbicide, it would be advisable to sow at the higher recommended seeding rate to ensure good crop establishment.

In crop, interrow cultivation can be undertaken 3 to 4 weeks after sowing, and soil can be thrown up on the stems without creating disease issues or damaging the plant. Grass weeds can be controlled using a grass selective herbicide (See Appendix 1).
Into the future, diuron and pendimethalin have been identified as potential pre-emergents, however, sesame is extremely sensitive to pre-emergents and these products need to be evaluated further. In crop, diuron and Lontrel Advance have been used in trials and internationally and have proven to be safe after the crop reaches the 4-leaf stage.

Whenever any product under permit is used, be advised that often the sensitivity of the crop being treated has not been fully evaluated, and the recommendation is to only treat a small area to ascertain the reaction before treating the whole crop.

Key Weeds

Pink Convolvulus (*Ipomea triloba*) is a fast-growing vine with thin stems and ivy-like leaves (Figure 22a) that is common in North Queensland, particularly in the coastal regions. It has a tubular bell-shaped flower that varies in colour from pink to lavender. This vine will usually become established later in the crop, and due to its rapid growth can spread very quickly and will climb up the fennel plant. Pink convolvulus if present, causes issues for harvesting and if thick, can become entwined around the reel, or even stall the header.

Calopo (*Calapogonium mucunoides*) is another fast growing vine that is common in North Queensland. It is a vine with an almost round leaf and is extremely hairy (Figure 22b), which spray droplets have difficulty penetrating making it difficult to control. It generally emerges later in the crop and can be an issue for harvesting.

Crowsfoot Grass (*Eluesine indica*) also commonly known as crabgrass is a grass commonly found across most of Northern Australia (Figure 22c). Many populations of crowsfoot grass are resistant to group 1 (fops and dims) and group 9 (glyphosate) herbicides which makes them difficult to control in the fallow and incrop. It is identifiable by its flat white stem, strappy smooth leaves and its spiked flower which is similar in appearance to a crows foot, thus its name.

Tridax Daisy (*Tridax procumbens)* is a perennial herb common across most of Northern Australia. It produces roots at the joints and curves upwards at the tip with daisy like flowers (Figure 22d). This weed can form a dense mat which can smother a slow growing sesame crop and competes for nutrients, soil moisture and sunlight.

Wild Sunflower (*Verbesina enceloides)* also commonly known as Crownbeard is an erect branching plant that grows up to 130 cm in height and is a common weed in Central Queensland (Figure 22e). It has yellow daisy like flowers that resembles a sunflower, which forms a globular seed head in spring and summer. This weed will compete for nutrient, soil moisture and sunlight.

a) *Pink Convolvulus (Ipomea triloba)*

b) *Calopo (Calapogonium mucunoides)*

c) *Crowsfoot Grass (Eluesine indica)*

d) *Tridax Daisy (Tridax procumbens)*

e) *Wild Sunflower (Verbesenia encelioides)*

e) *Common Pigweed (Portulaca oleracea)*

Figure 22: *Key weeds identified in sesame crops in Northern Australia.*

Common Pigweed (*Portulaca oleracea*) is a prostrate succulent weed (Figure 22f) that forms a thick mat that can smother out young plants during crop establishment and compete for nutrients and soil moisture later in the crop. It produces a small black seed about 1mm in diameter, which is difficult to separate from the sesame seeds. Black sesame should be avoided if this weed is present.

Appendix 1 - Chemicals registered or under permit for use in sesame.

These details are correct at the time of publication. Always refer to the product labels or the relevant permits for full details, prior to recommending or using any products.

For permit details go to – https://portal.apvma.gov.au/permits

Pre-emergent Herbicides

Product	Group	Rate	WHP	Critical Comments
Metolachlor and s-metolachlor PER94810 (Valid to 30 Sep 2029)	15	720 g/L metolachlor product 3 – 4 L/ha OR 960 g/L metolachlor product 2.25 – 3 L/ha OR 960 g/L s-metolachlor product 1.5 – 2.0 L/ha		• Apply by calibrated boom spray in a minimum spray volume of 60 L/ha. • Apply to the soil as a pre-emergent spray before, at or immediately after planting and before crops and weeds have germinated. • Apply in sufficient water to ensure complete coverage of the soil surface. Increase the rate of metolachlor as the expected density of the weeds increases. • DO NOT make more than one metolachlor or s-metolachlor application per year. • DO NOT apply by pivot irrigator or other forms of chemigation.

Grass Selective Herbicides

Product	Group	Rate	WHP	Critical Comments
Clethodim (Various) PER86796 (Valid to 31 July 2029)	1	360 g/L Product 100 – 330 mL/ha OR 240 g/L Product 175 – 500 mL/ha PLUS 2L/100L Liase, 1L/100L Hasten or 0.5 L/100L Uptake	Harvest – Nil Grazing – 21 Days	• Apply one foliar application only via calibrated ground boomspray or aerial equipment. • DO NOT apply after flower buds become visible. • For best control, target grass weeds at the 2 – 5 leaf stage that are actively growing and free from temperature or water stress,
Haloxyfop (Various) PER92824 (Valid to 04 Oct 2029)	1	520 g/L product 75 – 100 mL/ha OR 900 g/L product 45 – 60 mL/ha	Harvest – Nil Grazing – 28 Days	• Apply at 2nd leaf to 8 leaf stage of crop. DO NOT apply after 8 leaf stage of the crop. • Target grass wee=ds at the 2-leaf to early tillered stage that are actively growing and free from temperature or water stress. • Ground application: use a minimum spray volume of 80 L/ha. • Aerial application: use a minimum spray volume of 30 L/ha. • Use the higher spray volume for dense grass populations. Apply in sufficient water to ensure complete and thorough coverage of grass weeds. • Increase the rate of haloxyfop as the size, age and/or density of the weeds increase. • Use with spray oil as per label instructions. • DO NOT apply more than 1 application per crop.

Dessicants

Product	Group	Rate	WHP	Critical Comments
NUFARM WEEDMASTER DST HERBICIDE	9	2.0 – 3.3 L/ha	7 Days	Apply as a foliar spray when at least 70% of the seed capsules have changed colour from dark green to light green or yellow.
NUFARM CRUCIAL Herbicide	9	1.6 – 2.6 L/ha	7 Days	Apply as a foliar spray when at least 70% of the seed capsules have changed colour from dark green to light green or yellow.
NUFARM WEEDMASTER ARGO HERBICIDE	9	1.8 – 2.9 L/ha	7 Days	Apply as a foliar spray when at least 70% of the seed capsules have changed colour from dark green to light green or yellow.
Diquat dibromide monohydrate (Various) PER94919 (Valid to 28-Feb-2026)	22	200 g/l product 2 – 3 L/ha	Harvest – 4 Days Grazing – 1 Day	• Apply as a foliar spray as soon as the crop has reached full physiological maturity. • Apply one application only per crop, via calibrated boom sprayer or similar equipment, in a minimum water volume of 100 L/ha. • Add Agral Spray adjuvant at the rate of 200 mL/100L or BS1000 Bio-degradable Surfactant at 150 mL/100L.

Insecticides

Product	Group	Rate	WHP	Critical Comments
Methomyl (Various)	1A	225 g/L product Corn Earworm 1.5 – 2.0 L/ha Green Vegetable Bug 1.5 L/ha	14 Days	• Apply when significant populations are noted. • Apply at the recommended rates when the insects first appear and repeat as needed. Apply the lower rates on small caterpillars and light infestations of insects. Use the higher rates on larger caterpillars and heavier infestations. Best control is obtained when spray schedules are initiated on young insects.
Nuclear polyhedrosis virus (Various)		100 mL/ha Helicoverpa sp.		• Thorough coverage of the crop is essential as it needs to be ingested to be effective. • Apply when temperatures are between 25°C and 35°C when larvae are actively feeding. • This product is more effective on smaller larvae. Target application to coincide with neonate larvae emerging from their eggs. This product should not be applied on larvae larger than 13 mm in length. • This product will provide between 60 and 90% control. Under extremely high pest pressure or sub-optimal application conditions, or when protection against damage is vital, additional control options should be considered.
Pirimicarb PER94884 (Valid to 31 October 2026)	1A	500 g/kg product 250 – 300 g/ha 800 g/kg product 160 – 190 g/ha Aphids Including Cowpea aphid and Green peach aphid	21 Days	• Closely monitor for aphids and time the foliar spray application to target adults and nymphs when the first appear. Reapply based on pest monitoring. • Apply via ground boom or equivalent or aerially via fixed-wing, helicopter or drone. • DO NOT Apply more than 2 applications per crop. • DO NOT apply less than 14 days after the initial treatment • Add summer spray oil at recommended rates.

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