NORTHERN
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GRDC GROWNOTES™

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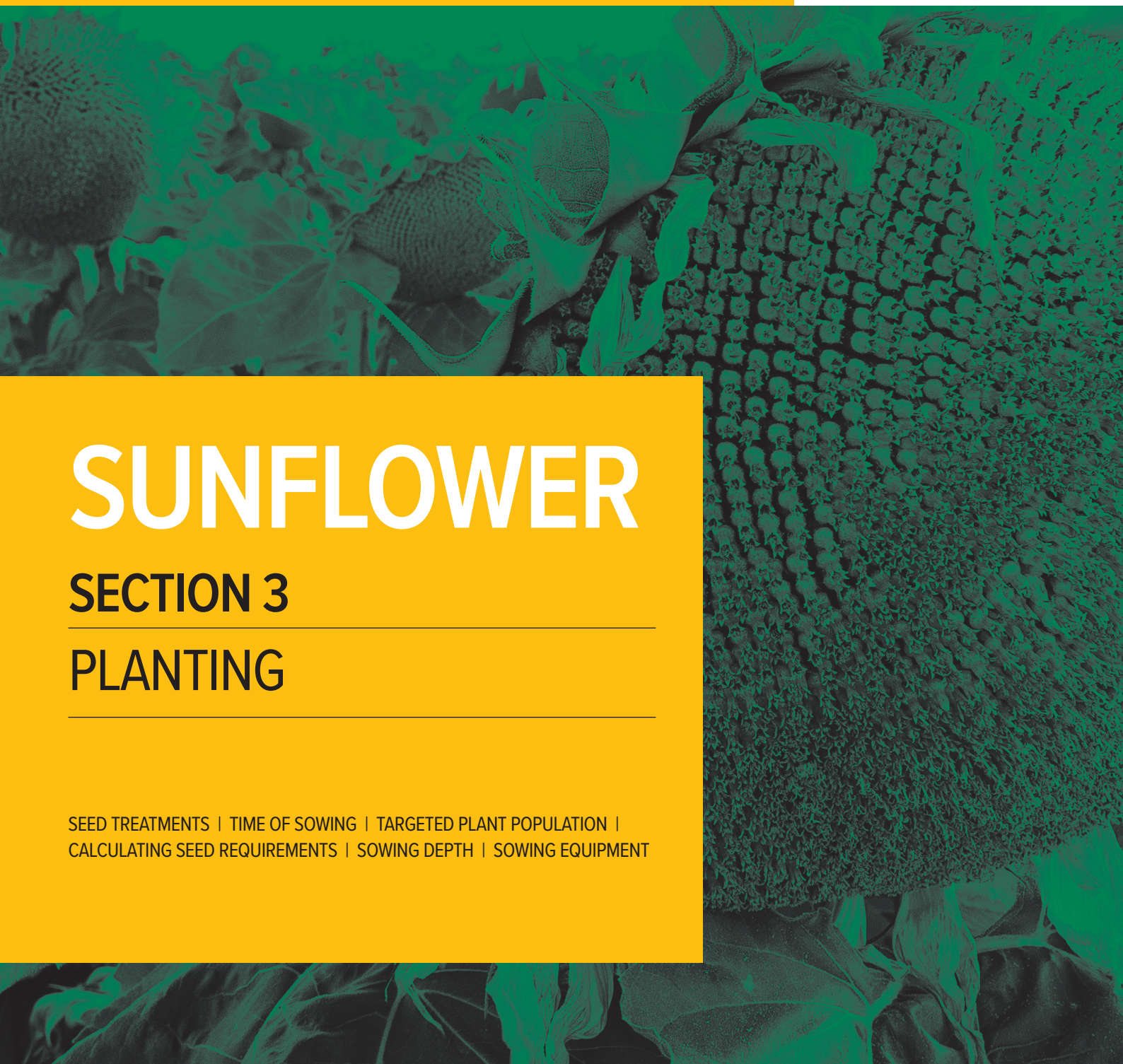
GRAINS RESEARCH & DEVELOPMENT CORPORATION



SUNFLOWER

SECTION 3

PLANTING

SEED TREATMENTS | TIME OF SOWING | TARGETED PLANT POPULATION | CALCULATING SEED REQUIREMENTS | SOWING DEPTH | SOWING EQUIPMENT

Planting

3.1 Seed treatments

Seed used for sowing is often treated with insecticide to provide protection against soil-dwelling insects (Table 1).

Table 1: *Insecticide seed dressings registered for use in sunflowers.* [1]

Example seed treatment trade name and manufacturer #	Active ingredient	Group	Rate to apply to each 100 kg of seed*	Approx cost to treat 100 kg ($) ##	Sorghum	Sunflowers	Maize
Cosmos® – Cropcare	fipronil (500 g/L)	2C	400 mL (canola) 150 mL (sorghum, sunflowers)	336.60 126.30	False wireworm. Protection from black field earwig	False wireworm. Protection from black field earwig	–
Senator® 600 Red – Cropcare Gaucho® 600 – Bayer CropScience	imidacloprid (600 g/L)	4A	400 mL (canola, lucerne) 300 mL (lupin) 120–240 mL (cereals) 1.4 mL/1000 seeds (maize) 430 mL (sorghum, sunflower, sweetcorn)	22.00 16.50 6.60–13.20 0.10/1000 seeds 23.70	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab
Imidacloprid 600 – TitanAg	imidacloprid (600 g/L)	4A	400 mL (canola, lucerne) 300 mL (lupin) 120 or 240 mL (cereals) 1.4 mL/1000seeds (maize) 430 mL (sorghum, sunflower, sweetcorn)	34.50 25.90 13.20–26.35 0.12/1000 seeds 37.10	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab	True wireworm (*Agrypnus variabilis*), eastern and southern false wireworm, striate false wireworm, black field earwig, wingless cockroach, field cricket, black sunflower scarab

1 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

Example seed treatment trade name and manufacturer #	Active ingredient	Group	Rate to apply to each 100 kg of seed*	Approx cost to treat 100 kg ($) ##	Sorghum	Sunflowers	Maize
Cruiser 350 FS® – Syngenta	thiamethoxam (350 g/L)	4A	400 mL (sorghum) 260–400 mL (sorghum – corn aphids) 1.4 mL/1000 seeds (maize and sweetcorn) 0.31 mL/1000 seeds (sunflower)		Eastern and southern false wireworm, corn aphids. Protection from black field earwig and true wireworm (*Agrypnus variabilis*)	Eastern and southern false wireworm, true wireworm (*Agrypnus variabilis*)	Eastern, southern and striate false wireworm. Protection from true wireworm (*Agrypnus variabilis*)
Cruiser 600 FS® – Syngenta**	thiamethoxam (600 g/L)	4A	230 mL (sorghum) 0.18 mL/1000 seeds (sunflower) 0.82 mL/1000 seeds (maize and sweetcorn)	NA	Eastern and southern false wireworm. Protection from black field earwig and true wireworm (*Agrypnus variabilis*)	Eastern and southern false wireworm, true wireworm (*Agrypnus variabilis*)	Eastern, southern and striate false wireworm. Protection from true wireworm (*Agrypnus variabilis*)

* Check water rates on the label as they may vary.

** Only available to accredited applicators. Price is included in seed costs.

Major products readily available in NSW. Other trade names may also be available.s

Prices quoted are GST inclusive at January 2011 and approximate only. Prices will vary depending on product, pack size purchased, seed treatment services i.e. imidaclorprid + fluquinconazole, and special marketing arrangements.

Caution: Observe stock witholding periods on crops produced from treated seed.

MORE INFORMATION

NSW DPI Management Guide. Summer crop production guide. Sunflower.

GRDC. Raising the bar with better sunflower agronomy – Sunflower case studies and demonstration site activities.

https://bettersunflowers.com.au/

https://bettersunflowers.com.au/documents/access/docs.ashx?id=110

http://search.informit.com.au/documentSummary;dn=536835516534021;res=IELHSS

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3905943/

http://www.grdc.com.au/uploads/documents/2010ASGCEditedPapersPDF/Thompson_PhomopsisStemCancer_edited_paper.pdf

3.2 Time of sowing

Sunflower is adapted to a wide range of sowing times. Sowing times are grouped into an early and a late sowing window. Aim to sow at the times shown in Table 2. [2] Sunflowers have distinct advantages, with the opportunity to plant in two sowing windows. The early plant enables sowing of a percentage of the summer crop before the main sowing window opens. Conversely, the late planting window allows double-cropping in favourable seasons and the ability to plant after other summer-crop sowing windows have closed. [3]

The early sowing or spring planting window commences in mid–late August in areas north of Gunnedah, NSW and closes at the end of October. In the southern parts of the northern region, early planting generally commences in October and extends through to November. The late planting window begins at the start of December and finishes at the end of January, except in the Central Highlands, where late planting continues through to the end of February. [4] In southern Queensland the early and late plant windows are often similar to Moree, NSW and Goondiwindi, Queensland. [5]

Sowing time will always be a compromise. The early planting window risks frost and low soil temperatures during establishment and heat during flowering and seed-fill. The late planting window often experiences extreme temperatures during establishment, whereas sowing after the end of January increases the risk of disease.

2 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

3 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

4 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

5 Australian Oilseeds Federation (2012), Better Sunflowers Agronomy Training Package (Big Yellow Sunflower Pack), Agronomy including Irrigation Management https://bettersunflowers.com.au/bysp/surveyinfo.aspx?sid=5

This applies to diseases such as *Sclerotinia* and powdery mildew, which are favoured by rain, cool temperatures and/or high humidity. The risk of frost damage and slow crop dry-down is also exacerbated for late plantings. Sowing time also influences water use, with crops sown later in the spring using more water because of the summer heat. [6]

Sunflowers are tolerant of light frosts in the early and late stages of growth, and of high temperatures, except during the critical stages of flowering and seed-fill.

For early sowings, the soil temperature at 10 cm depth should exceed 10–12°C at 08:00 (8.00 am) Eastern Standard Time and the period of heavy frosts should be finished. While 10°C is the minimum, it is important to plant on rising soil temperatures.

Sunflower establishment will be best when 7–10 days of favourable growing conditions immediately follow planting. Extremes of heat or cold may result in patchy plant stands.

Monounsaturated sunflowers (>85% oleic acid) are preferred for spring sowings, as high temperatures during seed-fill have a relatively small effect on the oleic acid content.

Polyunsaturated sunflowers (>62% linoleic acid) are best suited to the late planting window (December–January) so that crops are filling seed in the cooler autumn months. If sowing is in spring, the oil quality of polyunsaturated hybrids is significantly reduced, as the high temperatures during seed-filling often cause the linoleic acid levels to fall below the 62% minimum required for margarine production.

Sowing after mid–late January in cooler areas such as the southern Liverpool Plains increases the risk of reduced yields from Sclerotinia stem and head rot, which are favoured by autumn rain. Late planting also increases the risk of frost damage and slows grain dry-down. [7]

MORE INFORMATION

https://bettersunflowers.com.au/documents/access/docs.ashx?id=127

Table 2: *Suggested sowing times for sunflowers.*

	Early plant												Late plant													
Region	**Aug**				**Sep**				**Oct**				**Nov**				**Dec**				**Jan**				**Feb**	
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Goondiwindi, Moree, Narrabri	>	>	/	/	/	/	/	/	<	<							>	>	/	/	/	/	/	/	<	<
Gunnedah, Quirindi					>	>	/	/	/	/	/						>	>	/	/	/	/	/	<	<	
Southern irrigation areas									>	>	/	/	/	/	/	/	/	/	<	<						

> Earlier than ideal; / optimum sowing time; < later than ideal

3.3 Targeted plant population

Establishment of a uniform plant stand of adequate density is a critical first step to a successful crop. Precision planters place seed more accurately than air seeders. This usually results in better and more even establishment within the row, resulting in more uniform head size, stalk size and soil water use across a paddock.

Aim for a suitable plant population based on the depth of wet soil at sowing, the likely in-crop rainfall and growing conditions in your area, as shown in Table 3.

6 L Serafin, S Belfield (2008) Sunflower production guidelines for the Northern Grains Region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

7 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

Table 3: *Guide to target plant population (no. of plants/m²).*

	Polyunsaturated/ Monounsaturated	Confectionery/ Birdseed
Dryland		
Marginal	2–2.5	2
Favourable	2.5–3.5	2.5–3.5
Irrigation		
Limited	3.5–5.0	3.0–4.0
Full	5.0–7.0	3.5–4.5

Seed for sowing averages 15,000 seeds/kg but can vary from 10,000 to 22,000 seeds/kg, depending on seed size (Table 4). Always check the seed count on the bag. The minimum germination percentage is usually >90% but check the percentage on the bag or consult seed merchants. [8]

Table 4: *Approximate numbers of seeds per kg.*

ASA seed sizes	Description	Seeds/kg
6/7	Very small seed	18000–25000
7/8	Small seed	15000–22000
8/10	Medium seed	12000–16000
10/14	Large seed	10000–14000
14/18	Very large seed	8000–11000

Small (7/8) and medium seed (8/10) is preferred for the spring planting, as smaller seed generally establishes better in cooler conditions. Medium and large seed (10/14) should be used in warmer conditions or when planting deeper into moisture. Larger seed is more suited to precision planters because smaller, lighter seed may result in doubles in one hole of the planter plate. [9]

Established plant population has a large effect on several factors, including yield. Establishing more plants than suggested in Table 5 risks lower yields, as head sizes are smaller and there is more competition for water.

The 'Sunflowers in Northern NSW and Southern Qld—Tools for Success' benchmarking study showed that excessively low plant populations lead to thick stalks, which damage machinery and limit potential yield. Measured plant populations varied greatly across the three regions as shown in Table 6, and plant populations were often much higher than the recommended or targeted population. [10]

Table 5: *Dryland plant population guide.*

Region	Target plant population ('000/ha)
Moree	25–30
Gunnedah	25–35
Southern Queensland	25–35

8 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

9 L Serafin, D McCaffery, S Thompson DPI (2011) Sunflower. Summer crop production guide. pp. 74–86. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

10 GRDC (2009) Raising the bar with better sunflower agronomy – Sunflower case studies and demonstration site activities, https://grdc.com.au/~/media/8e74986cc5de4f1c868713cdb0d643ec.pdf

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p. 7. Better Sunflowers Demonstration Site Results—Plant population and row configuration in dryland sunflowers on the Liverpool Plains, NSW.

Table 6: *Measured plant populations, 2003–06.*

Region	Average plant population (/ha)	Plant population range (/ha)
Moree	32,672	16,000–59,000
Gunnedah	38,867	23,000–60,000
Southern Queensland	34,415	20,000–54,667

Sowing rates should be calculated to target optimal populations for each region. Sunflower seed has the germination percentage and the number of seeds per kg marked on each bag. Check the testing date for currency. It is also advisable to plant with treated seed to protect against seedling pests and diseases. [11] There can be subtle differences in population requirements of some hybrids. Check recommendations with your seed supplier or seed company representative.

3.4 Calculating seed requirements

When calculating seed requirements, allow on average 25% for establishment losses. Depending on planting conditions and machinery, losses can range from 10 to 50%. However, you may be guided by experience when assigning a value for establishment losses.

Seed size can also affect established populations as very small seed may allow doubles or triples to be planted in each hole. [12]

Calculating a planting rate (kg/ha), using seeds/kg from Table 4:
(Target plant population/ha × 10,000) ÷ [(seeds/kg × germination% × (100 – establishment loss%)]

Example calculation:
(35,000 × 10,000) ÷ (15,000 × 93 × (100 – 25) = 3.35 kg/ha

To determine the number of bags of seed required:
[Planting rate (kg/ha) × area (ha)] ÷ bag weight (kg)

3.5 Sowing depth

Sowing depth is dictated largely by available moisture, the planter and the soil type. Sowing depth may range from 2.5 to 7 cm, but most commonly is 3–5 cm. [13]

Sunflowers are highly suited to no-tillage, with 68% of paddocks included in this study sown into no-tillage situations. Smaller proportions had minimum-tillage (17%) and conventional tillage (15%). [14]

Row spacing

Sunflowers may be sown on row spacing ranging from 36 to 100 cm. Row spacings of 75–100 cm allow inter-row cultivation or shielded spraying as additional weed control options. In the Gunnedah and Quirindi areas, the most common row spacing is 75 cm, whereas at Moree, 100 cm row spacings are more typical.

Research at Moree has shown that sowing on 100-cm solid-plant or single-skip row spacings will achieve similar yields to 75-cm single-skip. By contrast, at Gunnedah,

11 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

12 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

13 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

14 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

MORE INFORMATION

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http://www.australianoilseeds.com/__data/assets/pdf_file/0011/7787/1984_Sunflower_Plant_Population_in_Central_Qld.pdf

http://www.australianoilseeds.com/__data/assets/pdf_file/0006/7782/1978_Central_Qld_Sunflower_Workshop_Biloela.pdf

http://www.regional.org.au/au/asa/1992/poster/cropping-systems/p-07.htm

MORE INFORMATION

The Big Yellow Sunflower Pack
https://bettersunflowers.com.au/bysp/surveyinfo.aspx?sid=5

sowing on 75-cm solid-plant or single-skip, or 100-cm solid-plant, will achieve similar yields.

Double-skip or wide row (150 cm) spacings, although a sound risk-management strategy, carry a yield penalty in the main sunflower-growing regions.

Single-skip row configurations are an option if there is limited stored soil moisture or when planting in marginal dryland environments (e.g. Walgett), although they usually incur a yield penalty. Weed control is more critical and hybrid height should be considered to avoid lodging. [15]

3.6 Sowing equipment

Press-wheels are essential for obtaining good seed–soil contact. Press-wheel selection is also important to ensure that cracking of soil down the seed row does not occur. Where this occurs, seedbeds dry out too quickly, resulting in variable establishment. [16]

The use of precision planters with press-wheels will provide more even and uniform crop establishment, which is why 72% of crops in the 2008 benchmarking study 'Sunflowers in Northern NSW and Southern Qld—Tools for Success' were established by this method. [17]

A press-wheel pressure of 2–4 kg/cm width (of press-wheel) is recommended. Use the greater pressure when sowing moisture is marginal, but be careful about over-pressing the seed and trench, as damage to the seed may result or the trench may become compacted and emergence will be reduced. [18]

Airseeders can be used to sow sunflowers; however, seed placement is highly variable, resulting in uneven plant stands, which are less efficient at utilising moisture, sunlight and nutrients. Stands with gaps allow weeds to establish and create variable maturity within the crop. [19]

Expect an 80% emergence with a row crop planter and 70% for an airseeder equipped with press-wheels, provided planting conditions are favourable and soil insect activity low. [20]

Disc or tyned seeders are suitable for crop establishment but have different applications depending on sowing conditions. Tynes enable moisture seeking (if good quality seed is used) but cause more soil disturbance, leaving a wider seed slot, which results in more rapid moisture loss in the seed furrow than a disc.

Discs cause less disturbance in the seed row and result in the best establishment under ideal conditions; however, their performance will be suboptimal in extremely wet (smearing) or dry (depth-limited) conditions. [21] A seed slot that has cracked open is a real issue, and can be alleviated by using closing harrows or a chain to cover the trench with loose soil, slowing drying out of the trench or row.

15 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

16 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

17 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

18 L Serafin, D McCaffery, S Thompson (2014) Sunflower. Summer crop production guide 2014. pp. 80–92. NSW DPI Management Guide. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/agriculture/broadacre-crops/guides/summer-crop-production-guide

19 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf

20 Australian Sunflower Association (2004) Planting recommendations. The New Big Black Sunflower Pack. Australian Oilseeds Federation

21 L Serafin, S Belfield (2008) Sunflower production guidelines for the northern grains region—northern NSW and southern Qld. NSW Department of Primary Industries, http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0011/249779/Sunflower-production-guidelines-for-the-northern-grains-region.pdf