



NORTHERN

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SOYBEAN

SECTION 2

PRE-PLANTING

VARIETAL PERFORMANCE AND RATINGS YIELD | PLANTING SEED QUALITY

SECTION 2

Pre-planting

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2.1 Varietal performance and ratings yield

2.1.1 Variety selection

Well established soybean growing areas have a range of agronomically suitable varieties available for planting. Growers normally select a preferred variety according to planting window, disease resistance, maturity, yield potential and suitability for the target market.

The Australian Soybean Breeding Program (GRDC/CSIRO/NSW DPI) is ongoing. It is likely that new clear hilum varieties with improved yield, grain quality and broader regional adaptation will soon join the existing industry standards.

In terms of risk management, if a large area of soybean is planned, consider selecting varieties of different maturity to spread planting, maintenance and harvesting operations. In regions affected by *Phytophthora* it is also important that the industry does not become reliant on one variety only, as resistance to *Phytophthora* could break down through the occurrence of new races.¹

The soybean production regions of Australia cover a wide range of latitudes and climates. Thus, a range of varieties has been developed to suit these varied environments. To give your crop the best chance for success it is critical to select a variety that is recommended for your region and to sow it in the recommended planting window.

In addition to regional adaptation, processors in the human consumption sector of the market (e.g. soy milk, tofu, flour) are becoming more specific about the varieties they wish to use. The rapid expansion of this sector of the soybean market in Australia in the past decade has driven the change in soybean breeding toward clear (colourless) hilum varieties with larger seed size and higher protein to supply human consumption markets, in addition to the traditional crushing markets for oil and animal feed, which will accept varieties of any hilum colour.

In general terms, clear hilum varieties can supply all the market sectors provided that grain quality specifications are achieved by the grower. Dark hilum varieties are restricted to the crushing sector only, irrespective of grain quality.

If a large area of soybean crop is planned, consider selecting two of the varieties recommended for your region so as to spread the planting, maintenance and harvesting operations.²

2.1.2 Photoperiod

Soybean plants commence flowering and mature in response to increasing length of darkness (i.e. shorter number of daylight hours). Current commercial soybean varieties are photosensitive and in general the later they are sown in their recommended planting window the fewer days until flowering commences. Conversely, sowing a variety much earlier than its recommended window (or at latitudes much further south than its

¹ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

² Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

zone of adaptation) can result in the crop spending too long in the vegetative phase and growing too tall and bulky. This can then lead to lodging and the development of fungal diseases (e.g. white mould caused by *Sclerotium rolfsii*), difficulty in harvesting the crop, increased chance of dirt in the sample and reduced grain quality. Bacterial blight may infect some varieties. Sowing too early is particularly risky in humid coastal environments.

Varieties sown later than their recommended sowing time (or at latitudes north of their zone of adaptation) will commence flowering very soon after planting and will likely have shorter plants with pods set closer to the ground.

Sowing in the early part of the recommended window is preferred where early growth is likely to be slower, such as where soil fertility is low, cool nights, or where crops are direct drilled.

The Australian Soybean Breeding Program has introduced breeding lines with reduced sensitivity to photoperiod, which will assist to broaden the north-south range of new varieties in the future.³

2.1.3 Regional adaption

Soybean has many varieties with specific ranges of adaptation. Planting a variety that is recommended for your region assists the crop to achieve maximum dry matter pre and post flowering, setting the crop up for maximum yield and assisting it to be fully mature at the correct time for harvest.

Varieties are also recommended for a region based on their tolerance to the particular diseases or environmental stresses of that region (e.g. acidic soil, weathering tolerance, lodging resistance, phytophthora, etc.). Many years of regional evaluation underpin the variety recommendations for Queensland, New South Wales and Victoria. Lists of the currently recommended varieties for the major soybean production regions are available through the agriculture departments in each state.

When varieties are sown outside their range of adaptation they are unlikely to perform to their best and optimum yield is unlikely.⁴

2.1.4 Southern NSW and Victoria

The main varieties suitable for southern NSW and northern Victoria are Curringa, Djakal, and Snowy.⁵

Curringa

Curringa superseded Bowyer for the premium human consumption, yellow hilum market. It had better yield, lodging and disease resistance than Bowyer. It is resistant to Phytophthora races 1 and 15, and has field tolerance to races 4 and 25. It has similar growth habit, maturity and seed size to Bowyer, but has higher yield potential in the MIA and Lachlan Valley. Curringa has been accepted into tofu and milk markets with similar processing quality to Bowyer. However, Curringa has a significantly lower yield and longer maturity than both Djakal and Snowy.⁶

³ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

⁴ / Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

⁵ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

⁶ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

Djakal

Over the last six seasons at Leeton (mid November) Djakal has out-yielded Curringa by 20% and Snowy by 7%. On average it matured 11 days earlier than Curringa and six days earlier than Snowy. Djakal is suited to early season plantings in southern NSW irrigation areas only (no further north than the Lachlan Valley). Djakal is a strong performer, providing growers with consistent high yields, early maturity, lodging resistance and generally good agronomic package.

Djakal carries resistance to phytophthora races 1 and 4 but lacks resistance to the newer race 25, which is present in parts of the Riverina but is not widespread. Commercial experience indicates Djakal has field tolerance to race 25. Whilst this is a risk, good grower management can reduce the likelihood of this disease. Testing to date has shown Djakal to be equivalent to Curringa for tofu and soymilk. Protein content of Djakal is slightly lower than Curringa and Snowy.⁷

Snowy

Snowy is an early-mid maturing high yielding human consumption variety. It was the first clear hilum culinary quality soybean combining good tofu-making qualities with good agronomic traits.

Snowy is resistant to all commonly found races of phytophthora in the Riverina, including race 25.

Snowy has yielded about 7% less than Djakal, but significantly out-yields older varieties. It out-yields Curringa by 14% and has out yielded Empyle by 5%. It matures slightly later than Djakal, similar to Empyle, but notably earlier than Curringa. Snowy has slightly larger seed size and higher protein than Djakal and significantly larger seed size than Empyle. A premium may be available in the culinary market for this variety. Snowy is available from Soy Australia.⁸

2.1.5 Central NSW

The main varieties currently recommended for the Macquarie and Lachlan irrigation areas are Cowrie and Ivory.⁹

Cowrie

Cowrie was released in 2002 by NSW DPI for northern NSW, including rain-grown coastal and inland irrigation areas. It is a medium-quick maturing, group 5 type variety. It has a colourless (clear) hilum, good protein content and large seed size (approx. 23 g/100 seeds or 4350 seeds/kg), making it very acceptable to the soymilk, tofu and soyflour markets. Weathering tolerance is moderate (70% of Zeus). It is susceptible to phytophthora Race 15 but is resistant to Race 1. Due to its very early maturity in the Queensland production environment, Cowrie should be planted two or three weeks earlier than other varieties and no later than the first week of December in southern Queensland.¹⁰

Ivory

Bred by NSW DPI at Narrabri, Ivory is now being widely grown by irrigators in northern NSW from the Macquarie Valley north to the Queensland border.

It is a yellow hilum type, making it suitable for some segments of the human consumption trade as well as for crushing. It is a high yielding variety. Ivory is resistant

⁷ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

⁸ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

⁹ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹⁰ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

to races 1 and 4 of phytophthora with field tolerance to race 15. It also has resistance to bacterial pustule and bacterial blight. It is highly recommended for all irrigated and late dryland sowings.¹¹

2.1.6 NSW Northern Tablelands

The main varieties currently recommended on the Northern Tablelands are Moonbi, Richmond, Soya 791, Intrepid, Hale and Hayman for silage or hay.

Intrepid

Intrepid, bred by NSW DPI at Narrabri, is a dryland variety recommended for northern inland NSW. It has less tolerance to Phytophthora races 1 and 15 than Hale and Valiant. It has vigorous vegetative growth, making it a good competitor with weeds and it seems suited to minimum tillage. Its lowest pods are also slightly higher than Valiant and Hale. Intrepid is highly regarded by growers in this region.¹²

2.1.7 Northern NSW (dryland and irrigation)

The preferred varieties for the human consumption market are Moonbi, Ivory, Soya 791, Cowrie, Surf and Bunya. For crushing the main varieties are Hale, Valiant and Intrepid.

Hale

Hale was bred by NSW DPI at Narrabri, and released in 2000. It has improved yield potential and disease resistance. It has shown excellent yields under both irrigated and dryland conditions and has immunity to races 1, 4 and 15 of phytophthora.

In northern NSW, Hale has out-yielded Valiant under irrigated conditions by 8.5% averaged over nine trials and across six seasons. Its yield under dryland conditions is 2% higher than Valiant and 13.5% higher than Intrepid over six seasons of testing. Maturity, seed size, oil and protein content are very similar to Valiant.

Hale is the preferred variety for dryland situations. It is also promoted to irrigation cotton growers in northern river valleys as an early maturing alternative to the traditional full season varieties.¹³

2.1.8 NSW North Coast

Characteristics important for reliable production in these coastal environments and soils include:

- consistently high yield and grain protein content, above 40% (dry matter basis) for access to human consumption markets
- weathering tolerance at harvest
- good mature plant height (80–100cm) for the relevant sowing time without lodging
- tolerance to high soil manganese levels, common in soils with low pH and waterlogging
- tolerance to sclerotinia stem rot disease
- tolerance to downy mildew leaf disease
- tolerance to phytophthora root rot (not a common problem in the North Coast region to date).

Varieties currently recommended for the North Coast include Moonbi, Soya 791, Cowrie and Surf for human consumption markets and Zeus, Manta, Poseidon and A6785 for crushing markets. Varieties that are not recommended for the North Coast do not

¹¹ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹² Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹³ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

have all the traits desirable for coastal environments. If grown outside their region of adaptation, varieties recommended for other regions (e.g. Bunya and Warrigal, which are recommended for the inland production regions of Queensland and NSW) have a greater risk of not performing to their full potential.¹⁴

A6785

A6785 is a medium-maturing variety, group 6. Originally released by Asgrow, A6785 has a brown hilum, small seed size and moderate to high weathering tolerance. It is suited to soy flour and some soymilk manufacturing, although the seed size is smaller than this market prefers and protein is often below 40% dry matter. Some manufacturers are now tending towards varieties with a clear hilum and larger seed size and higher protein than A6785.

A6785 is resistant to the two main races of phytophthora root rot in Queensland. It can produce high yields if sown at the correct time and can tolerate less-than-ideal crop management.¹⁵

A6785 has a tendency to lodge in coastal climates, particularly if planted too early in the planting window or at too high a plant population.¹⁶

Hayman

Hayman sets a new benchmark for high yield, high quality and improved disease resistance for many areas. In some areas it is also the best variety for silage and hay – an important soybean role in many mixed grain and livestock farms. It is most suited for grain in the NSW north coast in the latest planting window (from the end of January to early February). At the early or mid-season planting windows it has too much biomass for a grain crop, but this is ideal where the objective is hay or silage production.

Hayman has improved protein content and quality, including clear hilum and large seed size. It also possesses the 11sA4 protein null (like Bunya) that is valued by tofu processors for its gelling qualities. Hayman is suitable for hay and silage production in the NSW north coast and Northern Tablelands areas because of its slower maturity and longer period of pod filling. This can be especially beneficial where delays due to wet weather are common.¹⁷

Manta

Manta was released in 1991 by NSW DPI for coastal environments. This variety combines high yield, tolerance to manganese, sclerotinia and race 1 of phytophthora. It also has a good level of weathering tolerance. Manta produces grain with above average protein content, but is only suitable for the crushing market due to its dark coloured hilum.¹⁸

Moonbi

Moonbi (Line 98053-3) is a variety from the Australian Soybean Breeding Program, available through Soy Australia. As a short season variety (ready to harvest 12 days earlier than Soya 791 from the same planting date), it is particularly suited to double cropping systems on the North Coast where timeliness of planting winter crops or pastures is critical. It is suited to the early season planting window on the North Coast from late November to early December. It also suits inland irrigated areas of northern

¹⁴ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹⁵ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹⁶ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

¹⁷ GRDC (2014) Australian soybeans come of age: <http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-113-NovDec-2014/Australian-soybeans-come-of-age#sthash.vnggwGHJ.dpuf>

¹⁸ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

NSW, where its short season will be beneficial in minimising irrigation requirements. It is likely to be adapted to production regions further south (e.g. Lachlan River valley) but further testing is required to confirm this.

Moonbi has excellent grain quality with a clear hilum, high protein, attractive round seed and better weathering tolerance than Cowrie and Soya 791. It is a compact plant with a much lower tendency to lodge than Soya 791. The grain quality is well suited for human consumption grade with its clear hilum making it suitable for use in the higher value tofu/soy milk markets. Seed size is around 22 g/100 seed or 4550 seeds/kg. Moonbi is resistant to powdery mildew.¹⁹

Poseidon

Poseidon was bred by NSW DPI for northern coastal NSW and released as a public variety in 1999 as a higher yielding replacement for Manta. Weathering tolerance and protein content are similar to Manta. Tolerance to Sclerotinia is less than in Manta. Poseidon has good tolerance to race 15 of Phytophthora. It has a black hilum, which makes it suitable only for the crushing market.²⁰

Richmond

Richmond is also a high-yielding release with a high-quality clear hilum that suits the early to mid-season planting window in northern NSW. It is a compact plant with minimal lodging, and has clean leaf drop and even ripening. It is resistant to powdery mildew, tolerates manganese toxicity, which is common in coastal soils, and has the highest weathering tolerance of all clear hilum varieties.²¹



Figure 1: During fields trials, Richmond (right) yielded an extra 0.2 t/ha compared to the popular Manta variety (left). (Photo: Natalie Moore)

¹⁹ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

²⁰ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

²¹ GRDC (2014) Australian soybeans come of age: <http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-113-NovDec-2014/Australian-soybeans-come-of-age#sthash.vnggwGHJ.dpuf>

Soya 791

Soya 791 is a medium-maturing public variety, group 5, released by Pioneer Hi-Bred under PBR and is available through a range of resellers. It has a buff hilum, good protein content and moderate weathering tolerance. Soya 791 is suitable for the flour, soymilk and tofu markets. It is not resistant to Race 15, one of the two main races of phytophthora root rot in Queensland.

The best time to plant Soya 791 is from November to mid-December. Delays to sowing may considerably shorten the crop height, reducing vegetative growth and so limiting yield potential and harvestability. Soya 791 is susceptible to both downy and powdery mildew.²² A variety evaluation trial was conducted on a farm at Oakwood near Bundaberg, Qld, in 2012-13. It has two replicates. That season was very conducive to bacterial blight (cool rainy weather during January). The varieties were scored for susceptibility to bacterial blight.

Key: 1 = no disease, clean leaves; 9 = severe disease all leaves affected.

The ratings were as follows:

Moonbi 2.5

Richmond 1.5

Soya 791 4

Surf

Surf is a medium-maturity variety, group 6, released for northern New South Wales from DPI&F material reselected by NSW DPI at Grafton. It has a clear hilum with moderate to high weathering tolerance. It is suited to soy flour and soymilk manufacturing. Surf appears to possess either high field tolerance or resistance to both the main races of phytophthora found in Queensland.²³

Zeus

Zeus was bred by NSW DPI for northern coastal NSW environments and was released in 1999 as a higher yielding and more weathering tolerant replacement for Dune. Zeus has the highest level of weathering tolerance of all the current commercially available varieties and useful tolerance to the fungus *Sclerotinia* (white mould), which makes it a popular choice for areas with high rainfall and high humidity. Zeus has a dark coloured hilum and is therefore suitable only for the crushing market. Zeus is susceptible to downy mildew.

2.1.9 Southern Queensland

Many varieties suitable for northern inland NSW can be successfully grown in southern Queensland. These include:

Bunya

Bunya is quick-maturity variety in most regions, group 5-6. Bred by CSIRO, Bunya was released in 2006 under PBR and is licensed to Soy Australia. It is well suited for southern Queensland. It is a large-seeded human-consumption type with a clear hilum. It is a preferred variety for tofu markets. Bunya is resistant to the two main races of phytophthora root rot in Queensland. The seed size of Bunya is very large, which can increase the risk of damage at harvest time. Germination checks and careful attention to seed-handling at planting is essential. Bunya is highly susceptible to powdery mildew.²⁴

²² Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

²³ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

²⁴ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy-australia/Soybean_Production

Fraser

Fraser is a slow-maturing variety, group 7, released by CSIRO in 2007 under PBR and is licensed to Soy Australia. It is suitable for southern Queensland from Gladstone to the New South Wales border. Fraser is a medium-seed size and is used in soy flour and soymilk manufacturing. It may also be used in tofu markets. Fraser is resistant to the two main races of phytophthora root rot in Queensland.²⁵

Hayman

Hayman sets a new benchmark for high yield, high quality and improved disease resistance for many areas. In some areas it is also the best variety for silage and hay – an important soybean role in many mixed grain and livestock farms. It is most suited for grain in areas such as the Darling Downs and Lockyer Valley, northwards to the Burnett and Mackay regions of Queensland. Hayman has improved protein content and quality, including clear hilum and large seed size. It also possesses the 11sA4 protein null (like Bunya) that is valued by tofu processors for its gelling qualities.²⁶

Jabiru

Jabiru is a slow-maturing variety, group 7, that was released by QDPI&F in 1998 under PBR and is licensed to PB Agrifoods. It has a buff hilum and good lodging resistance. It is suitable for flour milling and crushing. It is another of the older varieties that are still produced by some growers who retain seed, but has been largely superseded by newer varieties.

Jabiru has resistance or high tolerance to the two major races of phytophthora root rot found in Queensland.²⁷

Oakey

Oakey is a unique variety and suitable for the specialist natto-trade as well as other human-consumption markets. It was developed by CSD and CSIRO and operates in a closed loop marketing system. It is widely adapted from southern to central Queensland and is a tall determinant plant with a medium-slow maturity.²⁸

Richmond

Richmond is also a high-yielding release with a high-quality clear hilum that suits the early to mid-season planting window in southern Queensland. It is a compact plant with minimal lodging, and has clean leaf drop and even ripening. It is resistant to powdery mildew, tolerates manganese toxicity, which is common in coastal soils, and has the highest weathering tolerance of all clear hilum varieties.²⁹

Warrigal

Warrigal is a slow-maturing variety, group 7, developed by DPI&F and released in 1992 under PBR. It is licensed to Pacific Seeds, and is marketed by PB Agrifoods. It has a clear hilum with moderate weathering tolerance. It is suited to soy flour and soymilk manufacturing although the seed is smaller than this market prefers.³⁰

²⁵ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

²⁶ GRDC (2014) Australian soybeans come of age: <http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-113-NovDec-2014/Australian-soybeans-come-of-age#sthash.vnggwGHJ.dpuf>

²⁷ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

²⁸ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

²⁹ GRDC (2014) Australian soybeans come of age: <http://www.grdc.com.au/Media-Centre/Ground-Cover/Ground-Cover-Issue-113-NovDec-2014/Australian-soybeans-come-of-age#sthash.vnggwGHJ.dpuf>

³⁰ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

2.1.10 Tropical Queensland

Leichhardt

Leichhardt is a slow-maturing variety, group 9, suited to northern and coastal Queensland. Its growing season is approximately 10 days longer than the Stuart variety when grown during the wet season. In southern coastal regions, plant Leichhardt later than the local shorter duration varieties to restrict vegetative growth. Leichhardt is generally not recommended as a human-consumption type but quite acceptable for crushing.³¹

Stuart

Stuart is a long-duration variety adapted to the tropics, group 8-9. Stuart was released by CSIRO in 2006 under PBR, it is licensed to Soy Australia and is produced by North Queensland Tropical Seeds. It is the first, light-coloured hilum variety suited to coastal and tropical Queensland. Stuart is a slow-maturing variety and should not be planted in areas south of Mackay. It is also adapted to dry season planting in the tropics. If sown at the correct time, Stuart is slightly less vegetative than Leichhardt. In rotation with sugarcane, this variety has the advantage of higher resistance to root nematodes than other soybean varieties. It also has resistance to the current rust races causing problems in cool, wet years on the Atherton Tableland.³²

2.1.11 Yielding ability

[Summer pulse agronomy including plant population row spacing varieties yields and nitrogen fixation.](#)

FAQ 2.2 Planting seed quality

Soybean seeds are relatively short-lived and even when produced under optimum conditions can lose germination and vigour after a few months in storage. Obtain a reliable germination and vigour test after harvest to make sure seed is worth keeping and test it again 4–8 weeks before sowing to ensure it has not deteriorated.

Prolonged wet weather before harvest reduces seed quality by the alternate wetting and drying of seed in the pods. Seed with high moisture levels will lose germination capacity after only a few months storage. Seeds have only a thin seedcoat, making them more susceptible to damage than other crop species. Incorrect seed handling, the use of spiral augers, and long drops of seed onto hard surfaces will damage the thin seedcoat. Larger seeded types, grown for human consumption markets, are at greater risk of mechanical damage than the smaller-seeded crushing types.³³ Only keep seed with an after harvest germination test of more than 90% to plant the next crop. Consider purchasing industry approved seed from suppliers at least every three years.

2.2.1 Seed size

Seed size can vary considerably so adjust the seeding rate accordingly. Refer to the seed packaging label for an accurate count, usually around 5000 to 7000 seeds/kg for most varieties.³⁴

2.2.2 Seed storage

Soybean seed is very fragile and cannot cope with seed coat damage. The use of spiral augers is not recommended and belt shifters or vacuums are much gentler on seed.

³¹ Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

³² Australian Oilseeds Federation (2013), Better Soybeans manual http://www.australianoilseeds.com/soy_australia/Soybean_Production

³³ NSW Soybean Grower Guidelines: http://www.australianoilseeds.com/_data/assets/pdf_file/0009/7668/Inland_NSW_Soybean_Grower_Guidelines.pdf

³⁴ Qld DAF, Growing soybeans: <https://www.daf.qld.gov.au/plants/field-crops-and-pastures/broadacre-field-crops/soybeans/growing-guide>

Even though beans should be harvested at 15% moisture content to minimise seed damage, the seed should be stored at below 13% and preferably at 10% moisture content and kept cool to maintain viability.³⁵

2.2.3 Safe rates of fertiliser sown with the seed

MAP is generally used as the planting fertiliser.

It is concentrated (21.9% P) and has high water solubility.

It contains 10% nitrogen (N) in the ammonium form.

The small amount of nitrogen it supplies can help meet crop demands for nitrogen up to the time the crop's root system is properly nodulated, i.e. supply starter nitrogen during the first few weeks after planting.

The combination of positively charged ammonium ions (NH₄⁺) with negatively charged phosphate ions (H₂PO₄⁻) may also help promote root uptake of the latter.

This may be of importance in tap rooted crops such as soybean, that may not take up phosphorus from fertiliser bands as effectively as fibrous rooted cereal crops.

The nitrogen in MAP may become of concern if the planter is not set up to apply the fertiliser and seed through separate delivery hoses (i.e. they are placed in direct contact with each other in the soil).

This should not be of concern at narrow row spacings (e.g. 20 cm) at the rates at which phosphorus (and MAP) are typically used.

In row crops planted in one metre rows, the suggested maximum rate at which MAP is used at planting in direct contact with the seed under good moisture conditions is 50 kg/ha. This rate should be reduced on loams.³⁶

³⁵ Agriculture Victoria, Growing Soybean: <http://agriculture.vic.gov.au/agriculture/grains-and-other-crops/crop-production/growing-soybean>

³⁶ Incitec Pivot Limited, <http://www.incitecpivot.com.au/>