GWYDIR[Φ]

High-yielding, rust resistant variety for NSW

SOY AUSTRALIA LTD
AUSTRALIAN SOYBEANS

QUICK GUIDE

WHERE
Suited to what regions?

- Similar to Moonbi[Φ]
- North Coast of NSW
- Northern Tablelands and Northern Slopes of NSW
- Liverpool Plains
- Central West NSW

WHEN
Planting windows

- Early sowing window in northern and central NSW

WHAT'S NEW
Key traits

- First NSW variety resistant to soybean leaf rust.
- Resistant to powdery mildew.
- Greater weathering tolerance than other early-sown varieties, Moonbi[Φ] and Soya 791.
- Maturity is approximately 132 days, which is 8 days quicker than Soya 791 and 7 days later than Moonbi[Φ].

Characteristics

Crop: Gywdir[Φ] is a high-yielding, rust resistant replacement variety for Moonbi[Φ] and Soya 791.

The geographic footprint for Gywdir[Φ] in NSW, planting dates and suitability to irrigated or rain-fed farming systems are essentially the same as for Moonbi[Φ].

Gywdir[Φ] is widely adapted to the northern NSW production regions including the North Coast, Northern Tablelands, Northern Slopes and Liverpool Plains. It is likely also suitable to Central Western NSW, although Moonbi[Φ] is a favoured variety in the Central West due to fast maturity.

Rust resistance and improved weathering tolerance provide greater crop security and protect grain quality in coastal environments where heavy rainfall at harvest time is common.

Grain: Gywdir[Φ] has a clear hilum with high protein content suitable for higher value human consumption markets as well as crushing markets. Seed size is slightly smaller than Moonbi[Φ] and Richmond[Φ] and slightly larger than Soya 791. It is highly tolerant to shattering and lodging.

Figure 2. Gywdir[Φ] produces clear hilum, high protein grain suitable for all markets.
Photo: S. Blanch, NSW DPI.

Figure 1. This on-farm evaluation crop of Gywdir[Φ] withstood extremely wet coastal conditions in the 2020-21 season to produce high quality human consumption grain and yielded 3.1 t/ha. Photo: N. Ensbey, NSW DPI.

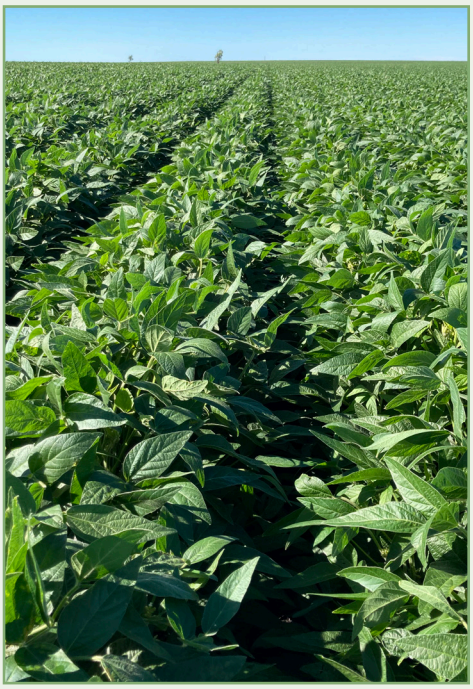

Figure 3. Brad and Kyeron Schwark's Gwydir[Φ] crop at Oakwood near Inverell, January 2022.
Photo: N. Moore, NSW DPI.

GWYDIR[Φ]

High-yielding, rust resistant variety for NSW

Plant characteristics

Gywdir[Φ] is an intermediate maturing soybean variety suited to the early sowing window in northern NSW including the Tablelands, northern slopes and the North Coast. Maturity is approximately 132 days, which is 8 days quicker than Soya 791 and 7 days later than Moonbi[Φ] (Table 1).

Gywdir[Φ] has a compact, branched plant type with narrow leaf shape, allowing aeration of the canopy and greater penetration of sunlight and sprays. It is highly tolerant to shattering and lodging (Table 1).

Gywdir[Φ] is resistant to soybean leaf rust (***Phakopsora pachyrhizi***) and is the first variety adapted to NSW to provide this level of resistance. It is also resistant to powdery mildew (***Erisyphe diffusa***).

Figure 4 shows the value of resistance to soybean leaf rust in Gywdir[Φ].

Gywdir[Φ] has greater weathering tolerance than early-sown varieties Moonbi[Φ] and Soya 791 and will assist growers to maintain edible market quality and price in environments that experience heavy rainfall at harvest time.

Yield and grain quality

Gywdir[Φ] has been included in advanced replicated variety evaluations at the NSW DPI Grafton Primary Industries Institute since 2014-15 (not including 2019-20) where it has produced higher yield than Richmond[Φ], Soya 791 and Moonbi[Φ] over five seasons (Table 1) and high quality grain.

Gywdir[Φ] has also been evaluated in replicated on-farm trials at leading NSW soybean grower's properties on the Northern Slopes (B. & K. Schwark, Figure 3) and North Coast (K. & K. Dowley, Figure 6).

Gywdir[Φ] has a clear hilum with high protein content suitable for higher value human consumption markets as well as crushing markets. Seed size on average is slightly smaller than Moonbi[Φ] and Richmond[Φ] and slightly larger than Soya 791 (Table 1).

Gywdir[Φ] was included in a blind set of six varieties sent to Vitasoy in Sept 2019 under a Material Transfer Agreement. The report from Vitasoy indicated favorable taste profile rating and'no significant difference to control'. No negative attributes were found. Gywdir[Φ] has the same suitability as Soya 791 and Richmond[Φ] for soy milk, flour and other human consumption uses as well as other animal feed and industrial uses. It does not contain the 11sA4 protein null gene that occurs in variety Hayman[Φ], which is preferred by some tofu manufacturers due to its firmer gelling properties.

Value to soybean growers of resistance to soybean leaf rust

Soybean leaf rust is a major concern for soybean growers throughout the USA. In the cool wet summer of 2006-07, losses to this disease in NSW soybean crops were severe because the disease infected crops in early January, when most crops were entering the critical pod-filling stage.

The disease can rapidly move up the canopy destroying green leaf and preventing grain from filling, leading to reduced yield. Quality is also reduced as seed size is substantially smaller. Prolonged wet conditions that promote the development of soybean leaf rust also make spraying with fungicides difficult or impossible. This disease typically occurs in high yield potential (i.e. wet) seasons, where crops have a dense canopy that favours the development of leaf rust.

Gywdir[Φ] is the only variety released for NSW growers that has resistance to soybean leaf rust.

At the Australian Summer Grains Conference in 2019, Mr Sam Blanch, NSW DPI Grafton, presented an analysis of the value of resistance to leaf rust for soybean growers and the income lost when susceptible varieties are not able to be sprayed with fungicides or spraying occurs too late in the development of the disease (Figure 4). Estimates are based on an edible grain price of $700/t and yield data from replicated variety evaluations at NSW DPI Grafton.

For example, using the long term data, @ $700/t with a 50% yield loss for rust:

	ANNUAL GROSS INCOME		4 YEAR GROSS INCOME
VARIETY	no rust	with rust	rust 1-in-4 yrs
Gywdir[Φ]	**$2976/ha**	**$2976/ha**	**$11,904/ha**
Moonbi[Φ]	$2679/ha	$1339/ha	$9376/ha
		Benefit of rust resistance	**$2528/ha**

With a rust event occurring 1-in-4 years, rust resistance could result in a difference of +$2528/ha averaged across four years. A grower who sows 50 ha each year for 4 years would be $126,400 ahead simply by switching from Moonbi[Φ] to Gywdir[Φ].

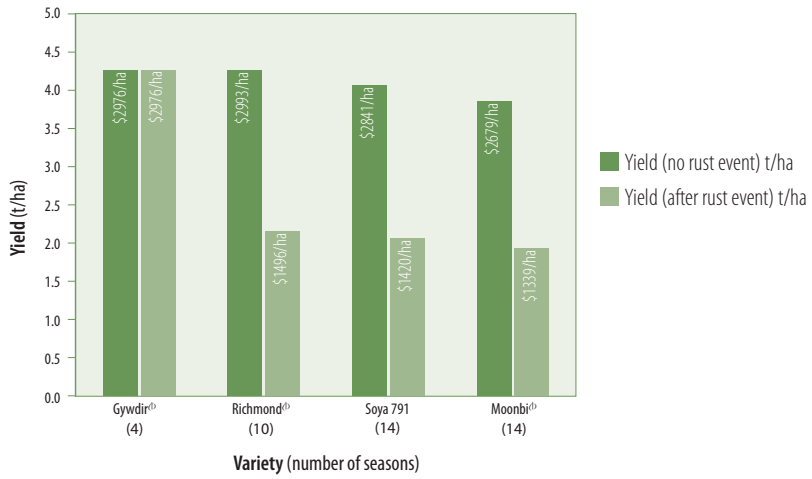

Figure 4. The estimated income lost from severe leaf rust event (edible grain price $700/t). Excerpt from the presentation 'Valuing new traits in Australian soybean varieties' by Sam Blanch, Australian Summer Grains Conference, July 2019, Gold Coast, Queensland.

AGRONOMIC GUIDELINES

Sowing

Seed should be sown into moist soil to a depth of no more than 5 cm. Dryland soybean should be planted into a full profile of soil moisture. For example, 100–120 cm wet soil in the Northern Slopes of NSW and 60–80 cm of wet soil in the NSW Tablelands.

Irrigated soybean fields should be irrigated before sowing and allow a budget of 6–8 ML/ha. Planting at the optimum time for the variety maximises yield potential and grain quality by taking full advantage of daylight/heat units and avoids damage from early frosts.

Establishing the correct plant population for local conditions is critical to achieving yield potential. Optimum seeding rates vary widely across regions and should be calculated based on seed size, the target plant population appropriate for the region, row spacing and sowing time. Consult your local agronomist to determine the correct plant population for your area and farming system. Consult your state agriculture department for more information about soybean production (in NSW refer to the NSW DPI Summer Crop Production Guide).

Use the following formula to calculate sowing rates. An establishment rate of 85% suits most situations.

1000 seed wt (g)	×	Target plant pop'ln	÷	100	÷	Establishment % × Germination %
……	×	……	÷	100	÷	…… × ……
= Your Seeding Rate …… kg/ha						

Nutrition

Always inoculate seed correctly using the soybean specific strain of Group H inoculant (strain CB 1809). In most situations soybean requires little to no 'starter' nitrogen. Too much nitrogen at planting (>25 kg N/ha) will interfere with nodulation and may result in low residual N benefits from the soybean crop for the following crop or pasture.

It is important to provide adequate nutrition to the crop. Critical nutrients for soybean production include phosphorous (P), potassium (K), sulfur (S), and trace elements including zinc (Zn) on heavy grey clay soils and molybdenum (Mo) on acid soils of the NSW tablelands and coast.

Nutrient budgets should be calculated on the basis of a recent soil test.

Weed and insect management

Controlling weeds in the early stages of crop growth before canopy closure will remove competition and improve yield. A wide range of pre and post-emergent herbicides are available.

Soybean crops generally host a wide range of beneficial insects making them ideal for Integrated Pest Management (IPM) practices. Inspect crops for insect pests and beneficial insects at least once a week before flowering and then twice a week from flowering to maturity.

Harvest and grain handling

Harvest soybean crops as soon as mature to reduce the risk of weather damage or harvest losses from over-dry grain. Soybean has a delicate seed coat and should be treated with care to avoid dropping seed.

Figure 5. A 'focus paddock' of Gwydir$^{\Phi}$ at Mark and Beverley North's property at Nunderi in northern NSW. The crop was planted on 6 Sept 2021. Photo taken 28 Oct 2021. Photo: N. Moore NSW DPI.

Figure 6: This replicated on-farm evaluation was sown by Kendall and Kate Dowley (Growvale Trust) at Tabulam on the NSW North Coast on 29 December 2018, following a wheat crop. This farming system uses a wide (0.8 m) spacing. Despite a hotter than average season and very dry January and February, Gwydir$^{\Phi}$ yielded 2.74 t/ha compared with Richmond$^{\Phi}$ at 2.28 t/ha. Photo: N. Ensbey, NSW DPI.

Regional adaptation

Gwydir$^{\Phi}$ is expected to have similar adaption as its parent variety Moonbi$^{\Phi}$. It is well-adapted to northern NSW production regions. It is likely suited to central western regions.

Market suitability

Gwydir$^{\Phi}$ should be suitable for crushing, full fat, and a wide range of human consumption markets.

Breeding

Gywdir$^{\Phi}$ was bred by Dr Andrew James, CSIRO and evaluated by Dr Natalie Moore, NSW DPI for the Australian Soybean Breeding Program. Gwydir$^{\Phi}$ is derived from a cross between Moonbi$^{\Phi}$ (98053-3) and T036AF1 (K086B-1dt/(K033-7/K086B-1dt), a line selected for rust resistance.

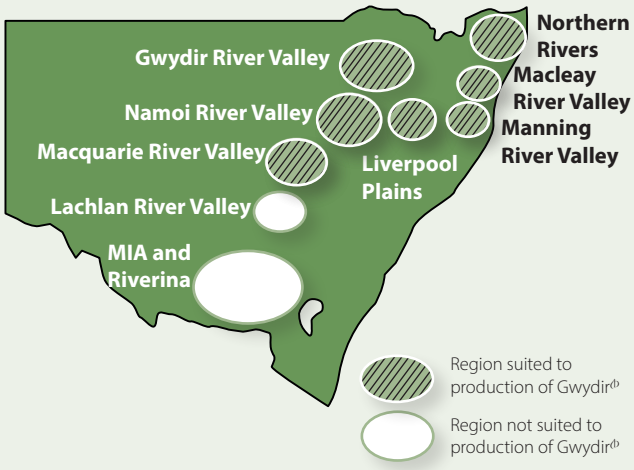

Table 1. Plant and grain characteristics of Gywdir$^{\Phi}$ compared to other early-sown soybean varieties in replicated evaluations at NSW DPI Grafton Primary Industries Institute over five seasons from 2014-15 to 2020-21 (not including the severe drought season of 2019-20). Analysed data are from four field replicates. Data provided by NSW DPI.

Yield	t/ha at 12% moisture
Gwydir$^{\Phi}$	4.15
Richmond$^{\Phi}$	3.93
Soya 791	3.89
Moonbi$^{\Phi}$	3.48
Seed size	**seeds/kg at 12% moisture**
Gwydir$^{\Phi}$	5150
Richmond$^{\Phi}$	4900
Soya 791	5600
Moonbi$^{\Phi}$	4900
Protein	**% dry matter**
Gwydir$^{\Phi}$	41.5
Richmond$^{\Phi}$	42.4
Soya 791	41.3
Moonbi$^{\Phi}$	42.7
Maturity	**days to reach P95, physiological maturity**
Gwydir$^{\Phi}$	132
Richmond$^{\Phi}$	133
Soya 791	140
Moonbi$^{\Phi}$	125
Lodging	**1 to 5; 1=no lodging, 5=severe**
Gwydir$^{\Phi}$	1.3
Richmond$^{\Phi}$	1.4
Soya 791	2.9
Moonbi$^{\Phi}$	1.3

Plant height	cm
Gwydir$^{\Phi}$	84
Richmond$^{\Phi}$	80
Soya 791	100
Moonbi$^{\Phi}$	86
Resistance to soybean leaf rust	
Gwydir$^{\Phi}$	R
Richmond$^{\Phi}$	S
Soya 791	S
Moonbi$^{\Phi}$	S
Weathering tolerance	**% unweathered seed**
Gwydir$^{\Phi}$	71.6
Richmond$^{\Phi}$	72.0
Soya 791	51.5
Moonbi$^{\Phi}$	62.3
Oil	**% dry matter**
Gwydir$^{\Phi}$	21.1
Richmond$^{\Phi}$	21.0
Soya 791	21.7
Moonbi$^{\Phi}$	21.1
Hilum colour	
Gwydir$^{\Phi}$	Clear
Richmond$^{\Phi}$	Clear
Soya 791	Tan
Moonbi$^{\Phi}$	Clear

Soy Australia is licenced to commercialise Gwydir$^{\Phi}$.

Seed available from Soy Australia licenced seed partners.

Version: Feb 2022