

2020/2021 Summer Crop Case Study

Mackay soybean variety by sowing rate trial

Trial Overview

The purpose of the trial was to determine optimal sowing rates for newly introduced varieties of soybean, specifically for the Central region.

2	1	11	16	3	14	8	10
7	10	4	13	6	1	11	15
9	8	14	3	16	12	2	5
12	15	5	6	9	7	13	4
5	11	8	1	2	15	7	3
14	4	2	7	11	5	9	6
3	13	15	12	8	10	16	12
16	6	9	10	13	4	14	1

Figure 1- Mackay soybean variety by sowing rate trial plan.

Trial location/Paddock history

The trial was located west of Mackay at the *Farmacist Professional Grower* Network trial site. The site is fully irrigated via an overhead sprinkler system with the soil type classified as a "Silty Sandiford": silty loam A horizon and a clay B horizon. Prior to trial establishment, winter grain crop demonstration trials had been taken to harvest on the site.

Trial design & methodology

Aim

Specific to the Central region, to determine if yield (t/ha) and biomass (t/ha) of recently released soybean varieties were affected by sowing rate (seeds/ha).

Treatments

Four (4) varieties of soybean (Leichardt, Kuranda, New Bunya & Mossman) were subjected to 4 rates of sowing (200k, 250k, 300k & 350k seeds/ha) in a randomised plot design (Figure 1.). As an established variety in the Central region, Leichardt was included to provide a point of reference for trial outcomes

Planting

Prior to planting, soil analysis was conducted to address site nutritional requirements and constraints. Lime was applied at 2.5t/ha to address soil pH, and nutrients were subsurface applied via liquid fertiliser at the following rates: nitrogen (N) at 20kg/ha, potassium (K) at 40kg/ha, Sulphur (S) at 20kg/ha and molybdenum (Mo) at 100g/ha.

Raised beds were then formed in preparation for planting as per standard regional practice. Planting occurred on the 17th of December 2020, into an established soil moisture profile, using the cooperating grower's "Covington" seeder box, with group H soybean inoculant applied to the seed prior.

Individual treatments were 20 x 3 metre beds at 1.6m spacings, with 2 rows per bed at 40cm row spacing, orientated north-south.

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Figure 2- Mackay soybean variety by sowing rate, site sowing.

Establishment

Emergence of all varieties was noted 9 days post sowing, with Kuranda observed to be maturing at a faster rate - 2nd true leaf stage. Plant counts 2 weeks post sowing identified successful emergence for the individual varieties and correct establishment of the different seed/ha treatments. R1 (commence flowering) and R5 (commence pod fill) biomass samples were taken at the individual variety stage of maturity. Individual biomass samples were weighed, mulched, sub-sampled, weighed, and then dried until sample weight was consistent. Samples were weighed again, and from the resulting t/ha measure, dry biomass was determined for each variety/treatment.

Over the course of the trial significant weed pressure was observed in the interrow spaces with control achieved via zonal application of Glyphosate. In-crop monitoring noted significant pest pressure at key growth stages with appropriate control measures executed. At full flowering Cluster Caterpillar (*Spodoptera litura*) (Figure 3.) were noted above threshold limits and controlled.

Over the duration of pod fill both Red Banded Shield Bugs (*Piezodorus hybneri*) and Green Vege Bugs (*Nezara viridula*) were observed. When populations were noted to be above threshold limits, control measures were individually applied at four events.



Figure 3- Mackay soybean variety by sowing rate. Cluster caterpillar.

Maturity

During the growing season, 16 rainfall events were recorded resulting in a total of 747mm. As soybeans have a high-water demand, soil moisture levels were monitored via a MEA Gdot, to ensure that water stress did not impact upon trial outcomes. As required, irrigation was applied totalling 100mm. As the season progressed, and the individual varieties reached maturity, desiccation was achieved via hand application, with harvest conducted as the individual varieties were observed to have reached dry down and suitable grain moisture.

Harvested grain was subsampled and dispatched to PB Agrifoods for quality assessment and Oil and Protein (%) analysis which formed a component of trial outcomes.

Outcomes

Trial outcomes for the 2020/2021 soybean season show an impact of sowing rate upon each of the individual varieties (Figures 4 & 5.). The Kuranda 200k seeds/ha treatment achieved higher biomass at R1 and R5, and comparable yield outcomes with 350k seeds/ha. The Leichhardt and New Bunya 250k seeds/ha treatments resulted in greatest dry biomass at R5 and yield. The Mossman 300k seeds/ha recorded highest biomass at both R1 and R5, however, greater yield was achieved in the 200k seeds/ha.

Averaged outcomes from Oil and Protein (%) analysis (Figure 6.) show that variety had a greater effect than sowing rate with New Bunya recording highest protein and lowest Oil (%), and Kuranda recording lowest Protein and highest Oil (%). Grain quality analysis identified purple staining of grain in the following order of varietal impact: New Bunya> Kuranda>Mossman / Leichhardt. Investigation identified that *Cercospora* fungus (Image 1.) was the issues, caused by in crop seasonal conditions.



Image 1- Purple stained soybean seed: *Cercospora* fungal infection.

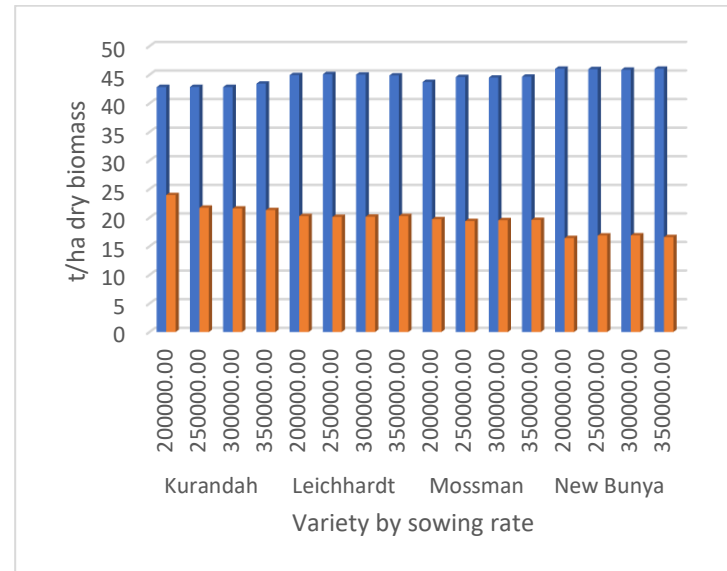


Figure 4- Variety by seeding density. R1 and R5 averaged dry biomass (t/ha).

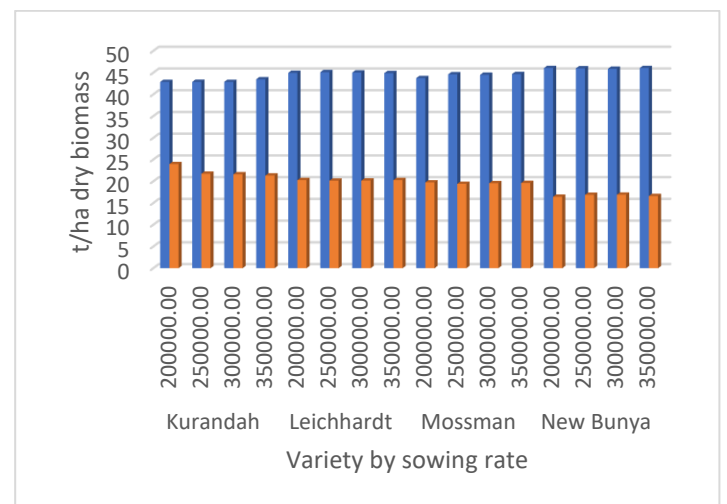


Figure 5- Variety by seeding density. Averaged harvest grain yield (t/ha).

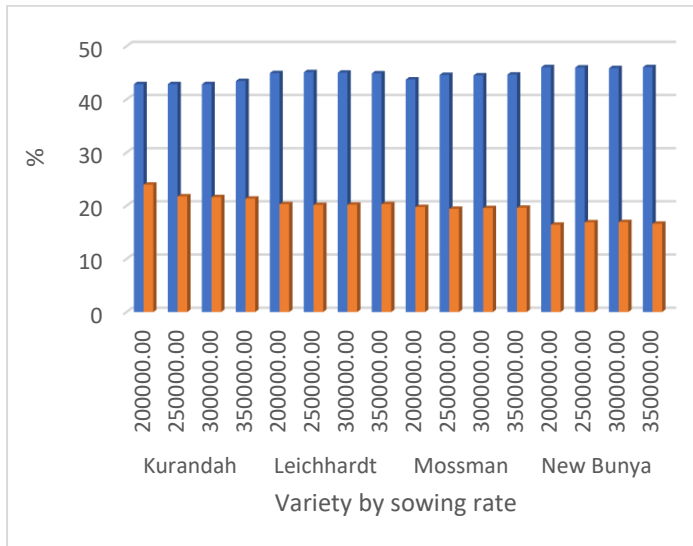


Figure 6- Variety by seeding density. Averaged oil and protein (%).

Recommendations

Results show that across varieties included in the trial, seeding at the lower rate(s) did not negatively impact yield outcomes, and varietal selection played a role in grain quality. Where oil or protein (%) is an important factor in varietal selection, New Bunya provided increased protein, (%) and Kuranda increased oil (%). Where forecast seasonal conditions are expected to result in *Cercospora* fungal infection, the longer season varieties Mossman and Leichhardt resulted in increased grain quality. Further research into understanding the various factors effecting *Cercospora* infection such as varietal resistance, climatic influences, trash management and options for fungicide usage would benefit production outcomes and growers across regions.

Farmacist would like to acknowledge the assistance of PB Agrifood over the course of the trial.



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