Project Update

P1c Exploring Genetic Variability of Kikuyu

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Kikuyu cultivars

Kikuyu grass is a C4 grass adapted to both the tropics and temperate climates. It is fast growing and produces more dry matter of higher quality than most C4 grasses.

However, since the development of Whittet more than 50 years ago, only 2 new cultivars for grazing have been released (Acacia and Fulkerson).

Kikuyu genetic research

The University of Sydney in collaboration with Hatton's Turf Research has been breeding improved kikuyu grasses for more than 15-years. These new materials have greater biomass production, tolerance to salinity and drought and represent significant new diversity for nutritional factors.

Industry needs

Current kikuyu pasture cultivars are limited in adaptation, nutritional quality and scope.

However, the extent of adaptation in the new materials developed by the University of Sydney and Hatton's remains largely untested in most dairy producing areas. The nutritional status of these materials when grown in a broader range of environments is also untested. Such information could lead to the release of improved pastures and will provide a basis for continued breeding and selection.

Unlocking the potential of Kikuyu

Dairy UP's P1 project aims to unlock the potential of Kikuyu pastures used by NSW dairy farmers. P1 is a suite of five projects that collectively explore new management options to grow and utilise more Kikuyu over summer and increase the productivity of Kikuyu-based pastures.

P1a: Remote pasture management using advanced sensing technologies

P1b: Antinutritional Factors (toxicity)

P1c: Genetic diversity of Kikuyu

P1c Genetic Diversity

P1d: Carbon on NSW dairy farms P1e: Real time prediction and manipulation of Kikuyu's nutritive value for animals.

P1e Nutritional value of Kikuyu

This document provides an update on P1c: Genetic diversity of Kikuyu.

Project aims

This project is exploring and evaluating promising lines of kikuyu that have been selected for increased biomass production and tolerance to salinity and drought.

Benefits

Given that Australia's pasture lands are increasingly subject to moisture stress and warmer temperatures, this climate-ready pasture could provide greater flexibility to the animal industries including dairy.

Findings to date

The Dairy UP team has identified three candidate lines of kikuyu with potential commercial valuable for dairy pastures.

Compared to the varieties currently used on NSW dairy farms (Whittet and Fulkerson), findings to date indicate that all three candidate lines show promise in terms of dry matter production, genetic diversity, disease resistance and nutritional value.

Research approach

Thirteen distinct kikuyu genotypes owned by Hatton's Turf Research Pty Ltd, were selected to be evaluated in small, replicated plots at the Plant Breeding Institute at Cobbitty during 2021/22. Two commercially available varieties (Whittet and Fulkerson) were included as controls.
The plots were exposed to natural conditions. Soil nutrient/moisture and daily weather were assessed throughout the experimental period. Plots were cut for biomass assessment at key periods of the year and rate and extent of re-growth assessed. Materials were screened for nutritive value and local adaptation. Concurrent pot studies were conducted in a hydroponic system for more detailed assessment of nutritive traits.

The same traits were assessed in the field at both locations for comparison and determination of stability.

Lines with potential

Based on the results, three new kikuyu lines were identified as candidates with potential commercial value. These were screened with larger plot trials in 2022/23.

Results from the initial plot trials indicated the three candidate lines were resistant to disease and grow quickly with high yields over 12 months (more than 14 tonnes/ha/yr). Their nutritional values were high in terms of crude protein, water soluble carbohydrates and fibre.

The 2022/23 plots were used to produce enough runners to establish field trials.

Field trials

The three candidate lines (and Whittet as a control) were further assessed in 2024/25 through replicated strip trials on three dairy farms in southern NSW (Bega, Berry, Corstorphine).

The trials ran from November to May with the strips managed as closely as possible to the farm's practices. Biomass was monitored using remote sensing technology and a rising plate meter. Grazing was allowed on one half of the trial and samples were collected for analysis from the mowed treatment. Biomass yield from mowing was used as a proxy for grazing and to compare with the grazing treatment.

Given the wet conditions during the 2024/25 trials, further field trials will be conducted over the 2025/26 summer to better understand the performance of the candidate lines under different seasonal conditions.

Disease resistance

Lines were assessed for disease resistance in glasshouse trials where plants were inoculated with either blackspot or kikuyu yellows.

All three of the candidate lines appear to be more resistant than Whittet to blackspot. One of the candidate lines appears to be more resistant to kikuyu yellows.

The 2025/26 field trials will be used for a field inoculation trial of black spot and kikuyu yellows.

DNA testing

Throughout all trials, samples have been collected for DNA testing. In addition, samples have been collected from regional dairy farms for testing.

DairyUP
Unlocking potential

Results

The DNA analysis revealed more genetic diversity than expected with just 35% of sampled sites aligning with the Whittet and Fulkerson lines.

The three candidate lines are genetically distinct from the ones currently available commercially (largely Whittet, Fulkerson and Acacia).

Dry matter produced at on-farm trials varied between 8t/ha in the South Coast and 14t/ha at Camden, but the differences among the lines at each site were not statically significant. The unusually wet season meant there wasn't an opportunity to observe differences in ability to tolerate dry conditions and subsequent impact on yield.

The three candidate lines differ in disease resistance and chemical profile as follows.

- Line 2: the most disease resistant line with an intermediate chemical (nutritional) profile, similar to Whittet.
- Lines 8 &10: resistant to black spot but equivalent susceptibility to kikuyu yellows as Whittet and Fulkerson; well-balanced chemical (nutritional) profile.

There appears to be a relationship between kikuyu toxicity and kikuyu genotype, with more instances occurring at the sites where the Whittet and Fulkerson related materials were grown. Further investigation is needed to make a definitive conclusion.

Next steps

Further field trials will be conducted over the 2025/26 summer to better understand the performance of the candidate lines under different seasonal conditions. In field inoculation of black spot and kikuyu yellows will be conducted to further investigate disease resistance.

Path to market

Collaboration with a commercial partner provides a clear path to market.

Once superior lines have been identified Hatton's Turf will undertake multiplication, dissemination and marketing.

PhD student

Several lines are concurrently being testing in P1b for differential toxicity response and a PhD student, Vivien Tan, is working across both P1b and P1c to document outcomes.

Collaborators

The P1c project is a collaboration between researchers from Dairy UP, University of Sydney and Hatton's Turf.

More info

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Delivery organisations

The University of Sydney Dairy Research Foundation | NSW Department of Primary Industries | Seibus | Dairy Australia

Partner organisations

NSW Farmers Growing the best | eastAUSmilk | Dairy NSW | Dairy Australia | AFMH | Leppington Pastoral Company Pty Ltd | NSW Local Land Services | Norco

Additional program supporters, collaborations or partnerships

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