Feed and forage development program
Drought stress in tropical forages

Key messages

- Forage genebank at the International Livestock Research Institute (ILRI) maintains large collections of Buffel and Napier grasses.
- Assessment of forage performance and feed quality on the collections revealed that there are significant opportunities to improve these species through plant breeding.
- Molecular marker technologies were developed by ILRI scientists to enable plant breeders to accelerate the selection of varieties improved for economically important traits, including water use efficiency.

Supported by the Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), Mexico and the Rural Development Administration (RDA) of the Republic of Korea, the feed and forage development program at ILRI and its partners have been focusing on molecular dissection of drought-tolerance traits in some of the most important tropical forage grasses.

Cenchrus is a genus of plants in the grass (Poaceae) family which includes species that are native to many countries in Africa, Asia and the Americas. Napier grass or elephant grass, scientifically known as *Cenchrus purpureus*, is a tall perennial tropical grass that becomes coarse as it matures. This grass is fast growing, producing up to 70 tons dry matter (DM)/ha/yr across a wide range of conditions and systems (Negawo et al. 2017). Its production is optimal where annual rainfall exceeds 1,000 mm, for smallholder or large-scale agricultural systems. Napier grass is popular across the global tropics, notably in cut-and-carry systems. In addition to Napier grass, ILRI scientists also work on an equally important warm-seasoned perennial, particularly for the semi-arid areas, known as buffe lgrass (*Cenchrus ciliaris*). This species is known for its climate resilience and is one of the most drought and high temperature stress tolerant grasses, producing nearly 24 tons DM/ha/year of good quality forage.

ILRI scientists have been developing genomic tools to address drought stress in forages and a number of key milestones have been achieved. These include developing molecular capabilities to explore the diversity of Napier grass (Muktar et al. 2019) and the 'never thirsty' buffel grass (Negawo et al. 2020), generating more than 135,000 and 234,000 molecular markers respectively which, together with the core collections and subsets identified, will enable plant breeders to accelerate the selection of improved water use efficiency traits that will support the development of more drought tolerant forage varieties. In addition, the forage performance of the

buffel grass collection has been assessed (Sánchez Gutiérrez et al. 2017 and 2020) and exhibited high variability in all the different characteristics measured, which presents an opportunity to improve this species through a breeding program. A similar study is underway for Napier grass (Habte et al. 2020; Muktar et al. 2021).

Information generated through molecular analysis could be used to select diverse genotypes for further evaluation in multi-location trials and conduct further genomic studies linked to drought tolerance. Therefore, donor investment in genomic selection and genome-wide association studies promises to increase genetic gains and benefit for a food secure future through improved livestock productivity (Simeão et al. 2021).

References

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ILRI thanks all donors and organizations which globally support its work through their contributions to the CGIAR Trust Fund.

April 2021