Nile grass (*Acroceras macrum*) for Argentinean waterlogged soils

Background

Acroceras macrum (Nile grass) is a forage grass native to sub-Saharan Africa, and recommended for its good adaptation to wet soils with poor drainage and waterlogging tendency of NE Argentina (NEA). Its greatest limitation for commercial use is the strenuousness to obtain fertile seed for large-scale sowing. Due to the lack of commercial seed, producers propagate it by manually planting rhizomes. This leads to genetically highly uniform stands.

During the 1970's, the Agricultural Research Council (ARC) in South Africa began an improvement program. Plants were collected from different African populations; agronomic evaluations were carried out; and fertile crosses were achieved, although with low reproductive efficiency. As a result, to date the only registered cultivar of the species is cv. Cedara Select, which is of clonal propagation [1].

Nile grass in Argentina

During the 1980's-1990's, Argentinean producers introduced cv. Cedara Select to NEA from South Africa. Waterlogging during the rainy season is an extended, serious problem for a wide area in NEA, where the scarcity of pastures produces drastic declines of livestock, which is the basic regional economic resource. Producers found that Nile grass allowed more efficient production. This created interest of INTA to evaluate and, subsequently, improve the species.

Depending on environmental conditions and management, cv. Cedara Select can achieve 5 t DM/ha. Regarding nutritional quality, on average, this cultivar presents crude protein (CP) contents of 17% in leaves, 7% in stems, and 10.5% for the overall aerial portion; with digestible energy of 2.85 Mcal/ kg [2].

Nutritional quality of grasses that prevail on waterlogged soils in subtropical regions is usually poor. A few wild grasses have favorable nutritional composition and high digestibly, but they only represent a low percentage in the botanical composition, are low-yielding and short-season annuals. Nile grass is one of the few subtropical C_3 perennial grasses. It has nutritional quality similar to that of temperate species. INTA's evaluations of cv. Cedara Select showed very high CP content, digestibility and yield compared to the natural pastures in NEA's wetlands.

In fact, with adequate fertilization and good cattle handling strategies, DM yields are roughly similar to the C_4 cultivated pastures mostly used in the subtropics, but it has higher quality and palatability. Also, a wide production period, outstanding persistence (e.g. > 20 years at the INTA Experimental Station Corrientes), and resilience were noted. Therefore, Nile grass has become an interesting alternative to increase the productivity of livestock systems in NEA.

A plot with cv. Cedara Select of *A. macrum* at INTA-Corrientes. *PHOTOS: all from S Ferrari*

In 1995, INTA professionals introduced 57 experimental lines from ARC to Corrientes. In 2011, the Botanical Institute of the Northeast (IBONE) and INTA-Corrientes together began the basic studies necessary to start an *Acroceras macrum* breeding program. This included investigation of ploidy levels, genetic diversity of material, and reproductive studies (i.e. fertility, mode of reproduction, pollination system). As a result, 27 genetically different lines were identified,

Evaluation-crossing plot containing the *A. macrum* germplasm collection at INTA-Corrientes, containing 27 different genotypes originating from ARC, South Africa.

including 22 tetraploid (2n = 4x = 36) and5 hexaploid (2n = 6x = 54), as well as wide genetic diversity [3] and higher fertility between 4x homoploid crosses [4].

Nile grass improvement

Cross-pollination resulted the predominant system in our preliminary studies. Intra-specific crosses were designed and 16 families of complete siblings were obtained. Efficiency was variable depending on the cross, resulting between 2 and 32 hybrids per family. The entire population had 174 hybrids evaluated since 2015. These had important variability not only in yielding but also in growth habit (height : base ratio), nutritional value, leaf : stem ratio, leaf and stem widths and lengths, tiller density, internode length, and resilience to different kinds of stresses, e.g. drought, freezing, grazing, and permanent waterlogging. Interestingly, during the spring-to-late summer period, some of the new hybrids obtained from crosses (with average yields as much as 8 t DM/ha per cut under a cutting regime of 45 days) were higher than cv. Cedara Select in NEA, not only in yield but also resilience, quality and leaf : stem ratio. This indicates that, within our hybrid materials, there are superior types than the material disseminated in our region and used in other parts of the world.

Hybrid cultivar development is going on in a number of projects coordinated by INTA-Corrientes, aiming at

- Selection of 1-2 hybrid materials for use in NEA production systems available in the medium term; and
- Hybrid materials with the capacity to produce quality seed in adequate quantity in the long term.

CONTACT: Silvana Ferrari Usandizaga, INTA EEA Corrientes, Argentina (Email: ferrariusandizaga.s@inta.gob.ar)

References

[1] Rhind JM, Goodenough DC 1979 *Acroceras macrum* Stapf (Nile grass) – A review. Proc. Ann. Congr. Grassl. Soc. Southern Africa 14(1):27-33.
[2] Gándara L, Ferrari-Usandizaga S, et al. 2016 Efectos de la densidad de plantas y la fertilización en la implantación del Pasto Nilo (*Acroceras macrum*). Rev. Arg. Prod. Anim. 36: Supl. 1: 364.
[3] Ferrari-Usandizaga SC 2015 Estudios sobre sistemas genéticos y diversidad en *Acroceras macrum* Stapf. PhD thesis. Univ. Nac. Rosario. Arg.
[4] Ferrari-Usandizaga SC, et al. 2015 Reproductive behavior of *Acroceras macrum*. V Internat. Symp. Forage Breeding, Buenos Aires, Argentina.