Dusormil Sorghums

Walter A.J. de Milliano, version 14 July 2023

Introduction

Dusormil sorghums are a new development in the long domestication of sorghums. The challenge was to produce a viable grain on a plant for an unknown market, during a long photoperiod in a cool temperate environment at 51° northern latitude. Most of the foreign elite germplasm, however, was not able to produce completely viable grain within the 120 to 150 days before the onset of the cold winter weather (frost, snow, and temperatures < 5 ®C), at the farm "Hoeve Dierkensteen (HD)", in Oostburg, The Netherlands. It follows, that the usual gradual improvement of elite material – was no option for breeding. Breeding and selection method development for these new adaptation requirements began in the Netherlands with the aim of developing prototypes for the local market. Parents for breeding were carefully selected out of the large diversity of sorghum germplasm. The best adaptation was the main, but rather unknown, breeding target. The quality traits of the prototypes for the market segments would have to be determined as the quality of the newly selected parental sorghums and the effect of the selection process on the quality of the plant products, were unknown.

Materials and Methods

In the period 2002 to 2005, at the African Centre for Crop Improvement (ACCI) of the University of Kwazulu-Natal, Pietermaritzburg, South Africa, the author was able to develop a large germplasm collection and become familiar with these sorghums. With the help of this knowledge, my intuition of the adaptation requirements, I carefully made a selection out of this germplasm with the assistance of the then Director of the ACCI Prof Marc Laing.

In 2005, a moderate number but various sorghum types and species were introduced in the Netherlands (51° 20' NL, 3° 30' OL, 1 m a.s.l.). After three years of testing germplasm for adaptation, the results were not encouraging. There were only sorghums that did not develop fully developed grains. Some were producing germinating seedlings but had a weak growth and fitness after emergence. Nevertheless the first crosses were made in 2008. The first lines out of these crosses ensued after six generations of population breeding and head selection. Extra generations were generated during this population breeding in the counter seasons at South Africa, Chile (2) and Sierra Leone.

Results

Thus locally developed sorghum lines produced viable grain of different grain colors, and tannin levels from low to high according to the Bleach test (1).

Dusormil Sorghums

Walter A.J. de Milliano, version 14 July 2023

Figure 1. Dusormil sorghums out of the Bleach test for tannins. "Tannin sorghum grains are those grains that are **black over the entire surface of the grain**, with the exception of the where the germ is which is somewhat lighter in colour. Non-tannin sorghum grains are those which are either completely white, **or** are brown over **part** of the surface of the grain"(1).

The Louis Bolk Institute, The Netherlands, showed competitive performance of sorghum compared to maize for dry matter, raw protein, raw cell material, raw ash, and sugar (3). Grain yields were up to 6 MT ha^{-1} in The Netherlands (3), but up to 8 MT ha^{-1} of grain in France (5). Grains could be harvested by a combine machine on a commercial scale. Dry matter yield of lines were between 8 to 21 MT ha^{-1} and various uses are being tested (4). The importance of sorghum for Climate Smart Agriculture has been recognized in 2015 by the Climate-Knowledge and Innovation Community in The Netherlands.

The food quality, however, remained to be evaluated. An international collaboration between experts from INRAE (Montpellier France), UNIRIO (Rio de Janeiro, Brazil), and the University of Manitoba (Winnipeg, Canada) took up this task.

References

1. J.R.N. Taylor and J. Taylor. 2008**.** Five simple methods for the determination of sorghum grain end-use quality. With adaptations for those without laboratory facilities. University of Pretoria, South Africa, Intsormil, USAID. 18 pp.
2. W.A.J. de Milliano. 2016.Breeding and selection of sorghum for regions above 50 degrees latitude. Poster. First European Sorghum Conference.
3. J. Deru, S. van de Goor, N. van Eekeren, A. De Vliegher, J. Pannecoucque and J, Van Waes. 2018. Sorghum als derde gewas in de melkveehouderij - Proeven met rassen, zaaidichtheid en bemesting in Nederland en Vlaanderen. Louis Bolk Instituut, The Netherlands – Instituut voor Landbouw en Visserij Onderzoek (ILVO), Belgium. Publication # 2018 – 010 LbD. 19 pp. www.louisbolk.nl/publicatie
4. W.A.J. de Milliano. 2020. Le sorgho au pays des moulins et des tulipes. Sorghum ID, 18 February 2020.
5. W.A.J. de Milliano. 2021. 8 T/ha of grain sorghum in Northern France… soon possible? Sorghum ID, 10 March 2021.