



**Seventh framework programme
Food, Agriculture and Fisheries, and Biotechnology**

Specific International Co-operation Actions
Small or medium scale focused research project



Sweet Sorghum an alternative energy Crop

Grant Agreement n° 227422

Deliverable 3.6:

*Ten to twenty varieties and hybrids
evaluated for responses to Al toxicity
stress*



Composition of the consortium

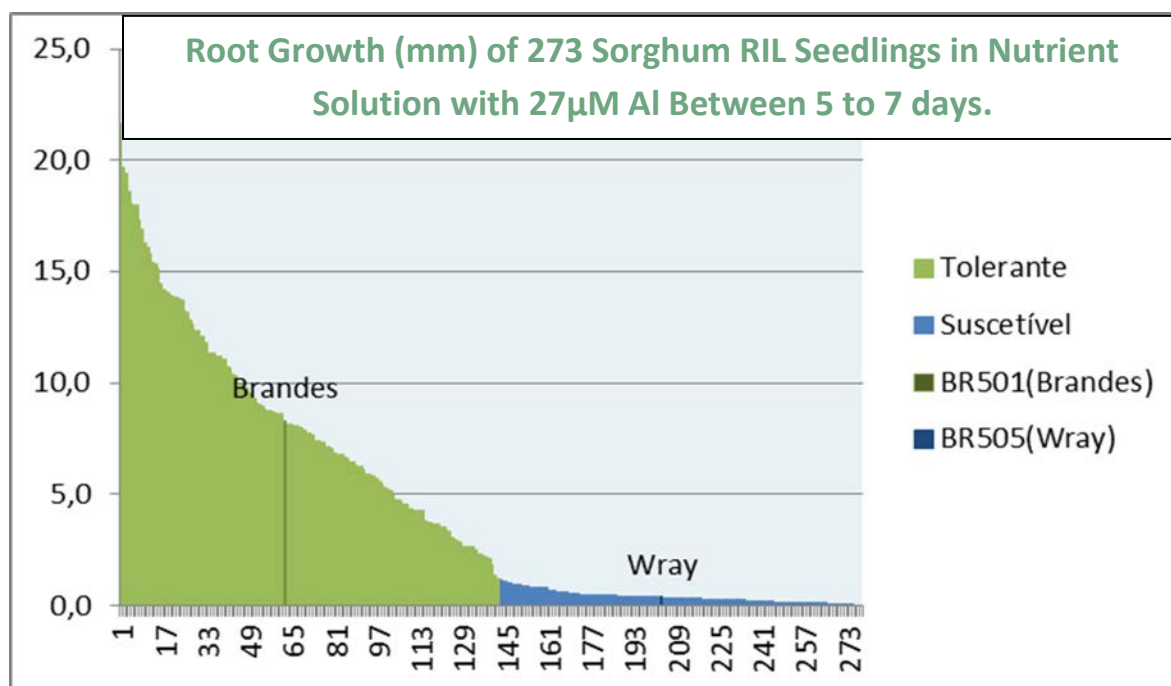
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Two fertility restorer lines, BR501R (Brandes) and BR505R (Wray), both released sweet sorghum cultivars were crossed with the objective to develop a Recombinant Inbred Line (RIL) population by single seed descent (SSD) for the purpose of identifying QTLs associated with plant tillering, total sugars in the juice and sucrose in the juice. Brandes is a high tillering sweet sorghum cultivar with low purity (low sucrose) and tolerant to aluminum toxicity, and Wray is a non-tillering cultivar with high purity and susceptible to aluminum toxicity. The F1 was self pollinated to produce a large F2 population. Two hundred seventy-five F_{2:2} RILs were advanced to the S₈ (F_{2:9}) generation by single seed decent. This RIL population has been phenotyped for both agronomic and industrial characteristics (2010/2011 and 2011/2012) in a Dark Red Latosol that is generally defined with low pH in the subsoil (20 – 80 cm) with low levels of phosphorus and aluminum toxicity. DNA has been extracted from the parents and each RIL for genotyping by sequencing (GBS) which was completed in 2013. The parents and each RIL were phenotyped in nutrient solution with 27μM Al for 7 days. Contrasting seedling root growth (mm) of the parents, RILs, and a susceptible (ATF13B) and tolerant ATF14B) check can be visualized in the following photo.



Two hundred twenty-five (225) were phenotyped for production and quality for two years in a Dark Red Latosol for two years (2011/12 and 2012/13). We have found that the root growth between the 5th and 7th day is an excellent parameter for determining tolerance to Al toxicity. Entries with root growth less than 2 mm are susceptible to Al toxicity and entries with root growth more than 3mm are tolerant.

The graph below shows the distribution of tolerance to Al toxicity of the 273 RILs and tolerant (Brandies) and susceptible parents.



Five of top 7 and 15 of the top 20 of the 223 RILs evaluated in the “Cerrado” w/ Al in subsoil for two years were tolerant to Al toxicity clearly supporting that tolerance to Al toxicity is essential where Al toxicity in the subsoil is a limiting production factor.

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Pedigree RIL	Ethanol Production (l ha ⁻¹)	Seedling Root Growth 27µM Al 5-7 days (mm)	Seedling Root Growth 27µM Al 1-7 days (mm)	Relative Root Growth CRRS 1-7 days	Tol/ Suc Al Toxico T/S
(BR505 * BR501)-90	3275,00	5,9	50,0	79,9	T
(BR505 * BR501)-83	2831,18	0,5	13,6	15,7	S
(BR505 * BR501)-24	2651,50	0,5	23,8	29,9	S
(BR505 * BR501)-132	2604,47	11,4	77,6	73,9	T
(BR505 * BR501)-74	2583,43	4,6	61,6	74,6	T
(BR505 * BR501)-276	2520,22	6,4	52,9	66,1	T
(BR505 * BR501)-253	2513,48	9,3	65,0	82,5	T