Seventh framework programme
Food, Agriculture and Fisheries, and Biotechnology

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

SEVENTH FRAMEWORK PROGRAMME

Sweet Fuel

Sweet Sorghum
an alternative energy Crop

Grant Agreement n° 227422

WP3
Deliverable 3.4:

Fifteen varieties evaluated for their response to Al toxicity stress

Composition of the consortium
CIRAD
ICRISAT
EMBRAPA
KWS
IFEU
UniBO
UCSC
ARC-GCI
UANL
WIP

The 25 sweet sorghum cultivars and the panel of 50 sweet sorghum lines in Task 3.1 were evaluated in nutrient solution for tolerance to Al toxicity. In the 75 sweet sorghum cultivars, we identified several cultivars with varying levels of tolerance to Al toxicity; four new cultivars (CMSXS 647, CMSXS646, CMSXS639 and CMSXS626) and previous introductions BR501 (Brandes), MN 4509, CMSXS604, Taguaiba 1, and BR503 (Thesis).

These nine cultivars are all tolerant to Al toxicity in nutrient solution, but with different expression. Attention must be given to net root growth as well as relative root growth. Our protocol for determining tolerance to Al toxicity brings together net root growth in seven days, root growth relative to initial seminal root length to correct for rate of root growth, and both net root growth and relative root growth relative to zero Al in nutrient solution. Consequently the data in both Tables 1 and 2 must be considered for determining Al tolerance. Field evaluation and validation of CMSXS626, CMSXS639, CMSXS646, CMSXS649, Brandes and Theis will be completed in 2012. Results with grain sorghum indicate a very high correlation between root growth in nutrient solution (27µM Al) and grain yield at 20 and 40% Al saturation in the soil in the field.

We conducted a field experiment in the 2010/2011 rainy season at the Al Phenotyping Site for performance at 40% Al saturation with 10 sweet sorghum cultivars contrasting for Al tolerance. However, there was heavy rainfall at the end of the cycle, which caused great environmental effect and prevented the collection of data. This experiment is being conducted again this rainy season 2011/2012 at two levels of Al saturation (0 and 40%). Additional Al tolerant cultivars will be identified in the best of the 275 RILS derived from Al tolerant BR501R (Brandes).

Table 1. Seedling root growth at 27 µM Al

Pedigree	Mean daily growth* 1-3 days	Mean daily growth* 3-5 days	Mean daily growth* 5-7 days	Mean total growth 1-5 days	Mean total growth 1-7 days	Mean relative** growth 1-5d	Mean relative** growth 1-7d
CMSXS647	12,3	14,2	11,2	65,4	87,8	249,4	332,8
CMSXS 604	5,6	3,9	10,0	24,7	44,7	48,9	91,8
TAGUAIBA 1	6,6	8,1	8,4	35,9	52,7	68,6	100,9
BRANDES	8,9	10,3	8,3	47,3	63,9	85,8	115,5
Tolerant Control	**5,2**	**5,8**	**5,1**	**27,3**	**37,4**	**65,2**	**88,9**
MN 4509	6,9	7,2	3,9	35,0	42,7	61,1	75,1
CMSXS639	3,8	3,1	1,4	17,6	20,4	101,7	112,0
CMSXS646	4,1	4,9	1,3	22,0	24,5	83,2	92,2
CMSXS626	2,0	2,5	1,2	11,0	13,4	23,5	28,3
Susceptible Control	**1,5**	**0,4**	**0,5**	**5,4**	**6,3**	**18,3**	**21,5**

* growth mm ** Growth relative to initial root length day zero

Table 2. Seedling root growth at 27 µM Al relative to zero Al

Pedigree	Mean daily growth* 1-3 days	Mean daily growth* 3-5 days	Mean daily growth* 5-7 days	Mean total growth 1-5 days	Mean total growth 1-7 days	Mean relative** growth 1-5d	Mean relative** growth 1-7d
CMSXS647	54,3	84,0	79,4	64,1	67,4	56,1	58,7
CMSXS 604	51,5	47,8	113,8	50,3	67,0	52,4	72,6
TAGUAIBA 1	74,2	84,3	50,4	78,4	66,6	82,1	68,2
BRANDES	82,4	173,5	130,3	106,8	112,0	102,4	106,7
Tolerant Control	**66,8**	**102,6**	**71,9**	**78,3**	**76,2**	**73,9**	**71,3**
MN 4509	51,8	68,7	42,5	57,6	54,2	60,1	56,8
CMSXS639	54,3	64,6	45,2	57,5	55,4	91,1	82,6
CMSXS646	161,2	487,5	83,3	229,2	194,4	298,4	248,4
CMSXS626	35,9	70,0	32,7	46,1	42,9	48,9	45,2
Susceptible Control	**37,2**	**11,3**	**17,5**	**27,8**	**25,4**	**32,3**	**29,6**

* growth mm ** Growth relative to initial root length day zero