

DROUGHT SCREENING OF UPLAND NERICA VARIETIES

Contributors: Baboucarr Manneh and MN Ndjiondjop

Eleven NERICA varieties (N1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 12) as well as WAB56-104 and CG 14, the parents of NERICA1–7, were screened for drought tolerance together with 87 other rice genotypes that included *O. sativa* spp. *indica*, *O. sativa* spp. *japonica*, *O. glaberrima* and interspecifics (*O. sativa* × *O. glaberrima*), which were sourced from WARDA, CIAT and IRRI. The trial was conducted at Togoudo research station (Benin) in the dry season (December 2005–March 2006). In this trial, the drought screening protocol used involved imposing 21 days drought stress at 45 days after sowing (DAS), which coincides with the vegetative/reproductive phase of crop development. The trial was laid out as a split-plot design with irrigation regime as the main plot factor and genotype as the sub-plot factor. Two irrigation levels were used – full irrigation up to maturity and imposing 21 days drought stress starting 45 DAS. Recommended agronomic practices such as thinning, fertilizer application, weeding and spraying against pests and diseases were carried out. Soil water status at the trial site was measured in three 20 cm layers of soil from the surface to 60 cm depth.

The soil at the trial site is an Alfisol with a sandy texture (82–89%) from 0–50cm depth and hence has a low water-holding capacity. Soil moisture content in the top 20cm towards the end of drought stress (20th day of stress) was 2.61% in the stressed treatments and 4.5% in the fully irrigated treatment. Thus withholding irrigation for 21 days was sufficient to induce severe drought stress in the trial since the effective rooting depth of most rice varieties is the top 20cm of soil.

The first visual symptom of drought stress was leaf rolling, and severity of leaf rolling as well as leaf drying increased with duration of drought. Drought stress significantly ($P < 0.05$) reduced tiller number, leaf chlorophyll content (SPAD92), numbers and weights of fertile panicles and grain yield but increased leaf temperature and delayed flowering (Table 15). Flowering was delayed by 10 days in the stress treatment compared to the non-stressed treatment. Consequently, grain yield per plant was significantly reduced ($p < 0.05$) from a mean of 12.42 g in the fully irrigated treatment to 5.063 g in the stressed plot. The NERICAs exhibited a wide range of responses to drought stress. However, six (N3, 5, 7, 8, 9 and 12) out of the 11 NERICAs screened gave higher than the average yield under drought and there was no significant difference between yields of NERICA1, NERICA4 and the average yield under drought (Figure 17). NERICA2, NERICA6 and NERICA10 performed poorly under drought stress in this trial. However, further trials are being conducted to validate these preliminary results, and the findings will be incorporated in the next edition of this compendium.

Table 15. Effect of 21 days drought stress on morpho-physiological traits of upland NERICA lines with their parents WAB56-104 and CG14 at Togoudo research station, Benin.

Variety	Temp * 59		Tiller no. 92		SPAD 92		50% Flowering		FTPNO		FTPWT		Burn 67	Roll 80	Burn 80
	Irrig	Dry	Irrig	Dry	Irrig	Dry	Irrig	Dry	Irrig	Dry	Irrig	Dry	Dry	Dry	Dry
NERICA1	31	33	15	9	48	44	73	91	27	9	6.39	4.29	4	2	2
NERICA2	31	32	14	16	48	46	78	93	10	8	15.14	7.5	4	1	2
NERICA3	31	33	15	12	46	48	70	79	4	13	2.67	9.6	7	2	1
NERICA4	32	32	20	12	48	48	69	81	13	5	19.73	4.7	6	3	2
NERICA5	31	34	14	15	47	44	63	64	6	24	5.54	17.88	6	3	2
NERICA6	31	33	13	11	48	45	80	96	9	8	8.78	8.3	7	5	1
NERICA7	31	33	14	7	45	44	63	74	5	7	6.39	8.25	5	3	4
NERICA8	32	33	18	12	44	43	69	81	10	5	11.78	3.89	8	5	2
NERICA9	32	33	26	14	46	43	72	87	6	11	3.96	15.66	8	4	3
NERICA10	31	32	17	10	46	46	76	87	7	6	6.92	6.67	4	2	3
NERICA12	31	34	16	13	48	47	73	80	8	9	7.24	13.43	6	3	2
CG 14	31	33	43	39	39	38	59	64	20	3	7.96	2.19	9	4	4
WAB56-104	30	32	10	12	46	46	71	78	11	9	16.88	9.78	6	1	1
Mean	31	33	22	19	43.25	43.06	74	84	13	8	14.55	6.12	7	3	2
S.E.M.	0.1	0.1	0.36	0.35	0.13	0.13	1	1	1	1	0.35	0.33	1	1	1

a - Numbers following trait names indicate the DAS on which the trait was measured.

Note: Irrig – continuously irrigated; Dry – drought stressed; S.E.M.–standard error of the mean; Temp. – leaf temperature measured with infrared thermometer; SPAD – leaf chlorophyll content; 50% Flowering – no. of days from sowing to 50% flowering; FTPNO – no. of fertile panicles; FTPWT – fertile panicle weight; Roll – leaf rolling score under drought stress; Burn – leaf drying score under drought stress.