

AJGA 2009036/5206

## On-farm evaluation of seed priming technology in Nigeria

S.O. Bakare\* and M.N. Ukwungwu

National Cereals Research Institute, Badeggi, P.M.B. 8, Bida, Niger State, Nigeria

(Received April 18,2009)  
(Accepted July 1,2009)

**ABSTRACT:** A simple pair-plot comparison of primed and unprimed seed plots of NERICA 1 (FARO 55) was established on farmers' field in Nasarawa, Ekiti and Ondo States of Nigeria in 2007 and 2008 with the objective of improving seedling germination for better upland NERICA establishment and performance in an upland ecology. Rice in the primed seed plot showed superiority over the unprimed seed plot in the percentage seedling emergence, percentage weed occurrence, plant height, panicle/hill and grain yield. The mean advantage of primed seed ranged between 13 – 20% across the States in the growth parameters. Seed priming technology is recommended for adoption by upland rice-growing farmers.

**Key Words:** Seed priming; Seed plots; Pair-plot comparison; Rice; Upland ecology.

### Introduction

One of the major constraints of upland rice production leading to low yield is drought (1) caused by either insufficient rains or water holding capacity of upland soils to retain water for a long time for rice utilization. Seed priming practice is one of the beneficial activities to enhance upland rice productivity. Seed priming is known to be effective in reducing the time required for germination and emergence in rain-fed dry seeded rice, sorghum and kentucky blue grass thereby enhancing plant vigor and growth and then consequently leading to higher grain yield (2, 3 and 4).

On-farm seed priming technology carried out in five states of Nigeria indicated that, it is a low cost, low risk intervention for ensuring fast germination of rice, good seedlings establishment and generally higher yields among the participating farmers with state yield advantage ranging from 33 – 84% (5 and 6).

In the past, the seed priming technology had been carried out using intra specific rice variety, FARO 46. One of the fears of the farmers was the workability of the technology on other variety other than FARO 46 as mentioned with the earlier participating farmers (6). With the current widely accepted interspecific variety (NERICA), this trial was then aimed at evaluating NERICA's response to seed priming technology to alleviate the fears that the technology is not variety specific. The objective of the trial is to improve seedling germination for better establishment and performance of NERICA in an upland ecology.

---

\*Corresponding Author

Emails: [oladelebakare@yahoo.co.uk](mailto:oladelebakare@yahoo.co.uk) and [ukwungwu@yahoo.com](mailto:ukwungwu@yahoo.com) respectively

## Materials and Methods

A simple pair-plot comparison of primed and unprimed seed plots of NERICA (FARO 55) on a plot size of 10m x 10m was established on farmers' field in Nasarawa State in 2007 and 2008. Ten farmers' field were used in 2007 but scaled up to 46 farmers' field in 2008 as a result of interest shown by the farmers. Also five farmers participated in Ekiti State in 2008 and 20 farmers in Ondo State in 2008.

Two (2) kg of seeds were given to each farmer. This was divided into two by the farmer. That is, each plot had 1kg respectively. For the unprimed plot, the 1kg seed was planted directly into the prepared plot. The procedure for planting primed plot was as followed: The 1kg seed was soaked in water and then the chaff and bad seeds that float on top of the water removed, leaving the good seeds inside the container. Soaking started from 6 pm in the evening to 6 am the following morning, making 12 hours of soaking. After the 12 hours of soaking, the seed was drained, thinly spread on a slab or tarpaulin or sewn fertilizer bags, whichever was available to the farmer and air dried in a cool area for about 2 hours and then planted directly into the prepared plot. Hand weeding was done at 21 and 42 days after sowing and basal fertilizer applied using NPK 15:15:15 at the rate of 30kgN/ha, 30kgP<sub>2</sub>O<sub>5</sub> and 30kgK<sub>2</sub>O/ha respectively and then top dress with Urea at 30kgN/ha at 6 weeks after sowing for both plots was done. Data/observation recorded were subjected to CropStat Software for the analysis of variance and the means were compared using the Least Significant Difference at P = 0.05.

## Results and Discussion

In all the parameters measured in Nasarawa State which include % seedling emergence at 7 days after sowing (DAS), % weed occurrence at 21 DAS, plant height at 21 and 42 DAS, panicle/hill at maturity, days to 50% flowering and grain yield in both 2007 and 2008, primed seed plot showed superiority over the unprimed seed plot (Tables 1 - 7). It was only in % weed occurrence at 21 DAS that primed seed plot did not significantly different at Ekiti and Ondo States but in all the other parameters, primed seed was better than unprimed (Table 2). There were indications that seed priming technology had advantage over unprimed seeds (Table 8) and the mean State growth parameters' advantage ranged between 13 – 20%. The good results obtained (6) on FARO FARO 46 and currently on NERICA 1 (FARO 55) showed that seed priming technology is also beneficial to upland NERICA.

Table 1: Effect of seed priming technology on percentage seedling emergence in Nasarawa, Ekiti and Ondo States, Nigeria

| Treatment | % seedling emergence 7 DAS |                   |                   |                   |                   |                   |
|-----------|----------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|           | 2007                       | Nasarawa          |                   | Ekiti             | Ondo              |                   |
|           |                            | 2007              | 2008              | 2008              | 2008              | 2008              |
| Primed    | 82.0 <sup>a</sup>          | 93.8 <sup>a</sup> |                   | 60.0 <sup>a</sup> | 84.5 <sup>a</sup> |                   |
| Unprimed  | 50.5 <sup>b</sup>          |                   | 82.8 <sup>b</sup> | 50.0 <sup>b</sup> |                   | 70.8 <sup>b</sup> |
| SE±       | 4.4                        |                   | 1.6               | 0.7               |                   | 1.7               |
| CV%       | 21.1                       |                   | 7.6               | 2.0               |                   | 4.4               |

DAS = Days after sowing

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 2: Effect of seed priming technology on percentage weed occurrence in Nasarawa, Ekiti and Ondo States, Nigeria.

| Treatment | % weed occurrence 21 DAS |                   |                   |                   |      |
|-----------|--------------------------|-------------------|-------------------|-------------------|------|
|           | 2007                     | Nasarawa          |                   | Ekiti             | Ondo |
|           |                          | 2008              | 2008              | 2008              | 2008 |
| Primed    | 49.0 <sup>b</sup>        | 24.0 <sup>a</sup> | 38.0 <sup>a</sup> | 17.5 <sup>a</sup> |      |
| Unprimed  | 57.0 <sup>a</sup>        | 25.0 <sup>a</sup> | 38.0 <sup>a</sup> | 22.5 <sup>a</sup> |      |
| SE±       | 2.1                      | 3.3               | 0.4               | 1.4               |      |
| CV%       | 12.3                     | 13.4              | 1.9               | 14.4              |      |

DAS = Days after sowing

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 3: Effect of seed priming technology on plant height in Nasarawa, Ekiti and Ondo states, Nigeria.

| Treatment | Plant height (cm), 21 DAS |                   |                   |                   |      |
|-----------|---------------------------|-------------------|-------------------|-------------------|------|
|           | 2007                      | Nasarawa          |                   | Ekiti             | Ondo |
|           |                           | 2008              | 2008              | 2008              | 2008 |
| Primed    | 29.6 <sup>a</sup>         | 14.4 <sup>a</sup> | 27.5 <sup>a</sup> | 26.5 <sup>a</sup> |      |
| Unprimed  | 26.1 <sup>b</sup>         | 11.1 <sup>b</sup> | 15.0 <sup>b</sup> | 21.3 <sup>b</sup> |      |
| SE±       | 0.7                       | 0.5               | 3.9               | 1.0               |      |
| CV%       | 8.2                       | 15.8              | 7.5               | 8.5               |      |

DAS = Days after sowing

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 4: Effect of seed priming technology on plant height in Nasarawa, Ekiti and Ondo states, Nigeria.

| Treatment | Plant height (cm), 42 DAS |                   |                   |                   |      |
|-----------|---------------------------|-------------------|-------------------|-------------------|------|
|           | 2007                      | Nasarawa          |                   | Ekiti             | Ondo |
|           |                           | 2008              | 2008              | 2008              | 2008 |
| Primed    | 65.8 <sup>a</sup>         | 36.2 <sup>a</sup> | 66.3 <sup>a</sup> | 54.8 <sup>a</sup> |      |
| Unprimed  | 55.9 <sup>b</sup>         | 28.5 <sup>b</sup> | 60.0 <sup>b</sup> | 47.3 <sup>b</sup> |      |
| SE±       | 1.2                       | 1.3               | 1.8               | 2.1               |      |
| CV%       | 6.4                       | 16.4              | 21.5              | 8.0               |      |

DAS = Days after sowing

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 5: Effect of seed priming technology on days to 50% flowering in Nasarawa, Ekiti and Ondo states, Nigeria.

| Treatment | Days to 50% flowering |                   |                   |                   |      |
|-----------|-----------------------|-------------------|-------------------|-------------------|------|
|           | 2007                  | Nasarawa          |                   | Ekiti             | Ondo |
|           |                       | 2008              | 2008              | 2008              | 2008 |
| Primed    | 66.7 <sup>b</sup>     | 63.7 <sup>b</sup> | 65.0 <sup>b</sup> | 43.8 <sup>a</sup> |      |
| Unprimed  | 71.3 <sup>a</sup>     | 68.0 <sup>a</sup> | 69. <sup>a</sup>  | 46.5 <sup>a</sup> |      |
| SE±       | 0.8                   | 0.8               | 0.5               | 1.1               |      |
| CV%       | 3.9                   | 7.8               | 1.6               | 4.7               |      |

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 6: Effect of seed priming technology on panicle/hill at maturity in Nasarawa, Ekiti and Ondo States, Nigeria.

| Treatment | Panicle/hill      |                  |                  |                  |
|-----------|-------------------|------------------|------------------|------------------|
|           | 2007              | Nasarawa<br>2008 | Ekiti<br>2008    | Ondo<br>2008     |
| Primed    | 10.2 <sup>a</sup> | 9.8 <sup>a</sup> | 7.0 <sup>a</sup> | 6.3 <sup>a</sup> |
| Unprimed  | 7.1 <sup>b</sup>  | 8.8 <sup>b</sup> | 6.0 <sup>b</sup> | 5.4 <sup>b</sup> |
| SE±       | 0.3               | 0.2              | 0.3              | 0.1              |
| CV%       | 12.5              | 8.9              | 8.8              | 3.6              |

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 7: Effect of seed priming technology on grain yield in Nasarawa, Ekiti and Ondo States, Nigeria.

| Treatment | Grain yield (kg/ha) |                     |                     |                     |
|-----------|---------------------|---------------------|---------------------|---------------------|
|           | 2007                | Nasarawa<br>2008    | Ekiti<br>2008       | Ondo<br>2008        |
| Primed    | 3782.5 <sup>a</sup> | 3702.6 <sup>a</sup> | 2156.0 <sup>a</sup> | 1906.0 <sup>a</sup> |
| Unprimed  | 2681.3 <sup>b</sup> | 2969.4 <sup>b</sup> | 1041.0 <sup>b</sup> | 1603.0 <sup>b</sup> |
| SE±       | 111.4               | 145.3               | 108                 | 43.0                |
| CV%       | 10.9                | 18.0                | 10.8                | 4.9                 |

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD

Table 8: Percentage priming advantage on growth and growth parameters in Nasarawa, Ekiti and Ondo States, Nigeria in 2007 and 2008.

| Parameter                          | 2007 | Nasarawa<br>2008 | Ekiti<br>2008 | Ondo<br>2008 |
|------------------------------------|------|------------------|---------------|--------------|
| 1. % Seedling emergence<br>(7 DAS) | 38.4 | 11.7             | 16.7          | 16.2         |
| 2. % Weed occurrence<br>(7 DAS)    | 14.0 | 4.0              | 0.0           | 22.2         |
| 3. Plant height<br>(21 DAS)        | 11.8 | 22.9             | 45.5          | 19.6         |
| 4. Plant height<br>(42 DAS)        | 15.0 | 21.3             | 9.5           | 13.7         |
| 5. Days to 50%<br>flowering        | 6.5  | 6.3              | 5.8           | 3.9          |
| 6. Panicle/hill<br>at maturity     | 30.4 | 10.2             | 14.3          | 13.3         |
| 7. Grain yield (kg/ha)             | 29.1 | 19.8             | 51.7          | 15.9         |
| Mean                               | 20.7 | 13.7             | 20.5          | 15.1         |

ACKNOWLEDGEMENT: The authors are grateful to the Multinational NERICA Dissemination Project, the sponsor of the trial and the Management of National Cereals Research Institute, Badeggi for creating enabling environment to carry out the trial

## **References**

1. Ezedinma CI and JK Atala Impact of trade on the development of domestic rice production in Nigeria. A research report submitted to IVC/NCRI/WARDA 61 PP. 2003
2. Harris D. The effect of manure, genotype, seed priming, depth and rate of sowing on the emergence and early growth of sorghum bicolor (L) Moench in semi-arid Botswana. Soil and tillage research 40(½) 73 – 88. 1996
3. Harris DJM On-farm seed priming to accelerate germination in rain-fed, dru seeded rice. International Rice Research Institute 22 (2) 30. 1997
4. Yamamoto I; Turgeon AJ and Duich JM Seedling emergence and growth of matrix primed kentucky blue grass seed. Crop Science 37 (1) 225 – 229. 1997
5. Fademi OA and Bakare SO On-farm seed priming in Nigeria: Report of activities carried out by National Cereals Research Institute, Badeggi in 2002 for West Africa Seed Priming Network Meeting held at Mensvic Hotel, Accra, Ghana between 28 May – 1 June, 2003
6. Bakare, SO, MN Ukwungwu; Fademi AO; Harris, D and AA Ochigbo Adoption study of seed priming technology in upland rice. Global approaches to extension practice (GAEP) 2005.