



# Optimisation of Seedball Technology for Pearl Millet Production in the Sahel



Nwankwo, C.I\*.<sup>1</sup>, Herrmann, L.<sup>1</sup>, Rennert, T.<sup>1</sup>, Neumann, G.<sup>2</sup>

<sup>1</sup> University of Hohenheim, Institute of Soil Science, Emil-Wolff Str. 27, 70599 Stuttgart, Germany

Contact: c.nwankwo@uni-hohenheim.de

<sup>2</sup> University of Hohenheim, Institute of Crop Science, Fruwirthstr. 20, 70599 Stuttgart, Germany

## Introduction

Erratic rainfall, low soil fertility, and resource scarcity severely restrain pearl millet production in the African Sahel. Seedling survival at the on-set of rainy season is an utmost topic. The solutions to these problems such as irrigation systems, the use of mineral fertilizer and seed treatments demand high skills and resources which the Sahelian small-holder farmers can rarely afford. Seedballs represent a cheap and simple seed-pelleting technique that is potentially able to improve seedling survival using locally available resources. For seedball production, clay + sand + seed + water are combined in a gravimetric ratio. Additives such as NPK-mineral fertilizer, wood ash and anti-rodent compounds can be included.



Figure 1: Geographic extension of the Sahel.



Figure 2: 1.5 - 2.0 cm diameter seedball samples ready for sowing

## Materials and methods

- uncoated seeds and seedballs (with 1g NPK and 3g wood ash) were germinated in pot experiments in a climate chamber
- <40 days experiment duration, 30° C temperature, 48.5% air humidity, sandy soil; randomized block-design of six replicates
- seedballs of different sizes and nutrient concentration were fabricated to assess seedlings' emergence
- root and shoot dry matter production were measured
- essential nutrients (N, P, K, Ca and Mg) were analyzed in both root and shoot systems (graphs not shown)
- treatments were uncoated seeds (Ca), a mixture of 80g sand + 50g clay + 25g water (Cb), Cb + different levels of wood ash (A), NPK 15:15:14 (N) and calcium nitrate tetrahydrate (CNT)

## Objectives

- to improve pearl millet seedlings' establishment using small-holder farmers' affordable local materials
- to reduce labour requirements for re-planting after crop failures arising from dry spells
- to reduce seed wastages and predation after sowing by birds, insects and rodents

## Hypotheses

- seedballs do not negatively affect pearl millet seedlings' emergence
- seedballs enhance shoot and biomass production of pearl millet seedlings
- seedballs improve the nutrient content of pearl millet seedlings

## Results

- seedballs of 1.5 – 2.0 cm diameter size at 2.0 – 3.0 cm sowing depth have no suppressive effects on seed germination (Figure 3c)
- NPK-mineral fertilizer and wood ash seedballs showed significant increments in root and shoot dry matter production (Figure 3a + b) and nutrient concentration
- urea and ammonium inhibit germination in seedballs (graphs not shown)

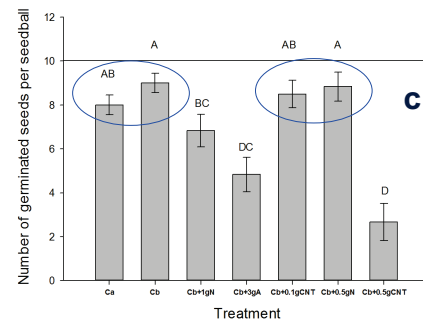
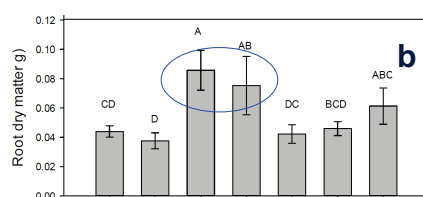
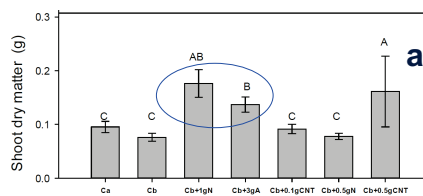


Figure 3: Shoot dry matter (a), root dry matter (b) and number of emerged seedlings (c) in the different seedball treatments compared to the non-pelleted seeds. Bars show arithmetic means and standard deviations, n = 6, comparison performed with one-way ANOVA. Different letters indicate significance (Tukey test, p < 0.05). Ca = non-pelleted seeds, Cb = 80g sand+50g clay+25g water, N = 15:15:15 NPK-mineral fertilizer, A = wood ash, and CNT = calcium nitrate tetrahydrate

## Conclusions

- seedballs have no negative effects on pearl millet seedlings' emergence
- seedballs enhance root and shoot biomass production in pearl millet seedlings
- local materials, through the seedball technology, have the potentials of improving pearl millet seedlings' establishment in the African Sahel



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