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RESEARCH ARTICLE

Speed of Emergence of Soybean (*Glycine max* (L.) Merr) Seeds Stored in Different Materials and Environmental Conditions in Yola Nigeria

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Abstract

A study was carried out at the Department of Crop Production and Horticulture, Modibbo Adama University of Technology, Yola to determine the speed of emergence of soybean seed. The experiment was replicated three times in a factorial Design (5x3x2) and the treatments were five storage materials (bottle, poly-bag, poly-sack, clay pot, and tin), three varieties of soybean (Samsoy II, TGX1019-2E and TGX1448-2E) and two environmental conditions (room and open air temperatures). Data collected were analyzed statistically using Generalized Linear Model (GLM) procedure of SAS and means that were significantly different were separated using Least Significant Difference (LSD). The result revealed that there were highly significant differences ($P \leq 0.01$) among the storage materials on speed of emergence of soybean seed stored. At 360 days in storage, poly bag had the highest speed of emergence with 73.4 %/day. There were highly significant differences ($P \leq 0.01$) among the varieties throughout the sampled periods. At 360 days in storage, Samsoy II recorded the highest speed of emergence with 70.5 %/day compared to TGX1019-2E and TGX1448-2E which had 60.2 and 52.6 %/day, respectively. Similarly, at 360 days in storage, room temperature storage had highest speed of emergence with 68.7 %/day compared to open air temperature storage which had 62.7 %/day. It can be concluded that variation in performance among the treatments might be due to differences in storability as a function of temperature and relative humidity.

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Introduction

The speed of emergence of Soybean seed is invariably depending on its viability and vigour. These are the major constraints in soybean production because considerable amount of seed deteriorate due to improper storage as longevity of such is increased by controlling seed moisture content and storage temperature (Pessu *et al.*, 2006; Shelar *et al.*, 2008). Seed quality is affected during pre and post-harvest period (Walters *et al.*, 2005). The germination potential (viability) is very short lived in soybean as compared to other oilseed crops and is often reduced prior to planting time which affect the speed of emergence (Agha *et al.*, 2004). This loss of germination is much more acute under

tropical conditions (Tang *et al.*, 1999; Tatipata, 2009). These environmental conditions make maintenance of soybean seed viability during storage very difficult.

Materials and Methods

The plant was grown and harvested under rain fed in 2006 growing season on the Teaching and Research Farm of the Department of Crop Production and Horticulture, Modibbo Adama University of Technology, Yola. The postharvest experiment was carried out in the Laboratory of the Department of Crop Production and Horticulture, Modibbo Adama University of Technology, Yola Adamawa State. Yola is located in Northern Guinea Savanna region of

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Nigeria within Latitude $9^{\circ} 19^1$ N and Longitude $12^{\circ} 30^1$ E, at an Altitude of 158.5 m above sea level (Adebayo and Tukur, 1999). It has an annual mean minimum temperature of 15.2°C and mean maximum temperature of 39°C .

Speed of emergence was calculated using the formula proposed by Edmond and Drapala (1958) as reported by Copeland (1976), using the results from the daily assessment of the emergence test.

$$\text{Speed of Emergence} = \frac{(E_1 + E_2 + \dots + E_x)(100)}{E_1 T_1 + E_2 T_2 + \dots + E_x T_x}$$

Where: E = Number of seedlings that emerged

T = Time corresponding to E

X = Number of days to final count

Results and Discussion

There were highly significant differences ($P \leq 0.01$) among the storage materials regarding speed of emergence all through the sampled period except at 180 days in storage that significant differences at $P \leq 0.05$ were observed and no significant difference ($P \leq 0.05$) at 240 days in storage. Also, there were highly significant differences ($P \leq 0.01$) among the varieties on speed of emergence all through the sampled period. Whereas, there was no significant difference ($P \leq 0.05$) among the environmental conditions all through the sampled period except at 360, 420 and 540 days in storage that highly significant differences ($P \leq 0.01$) were observed.

The effects of the storage materials, varieties and environmental conditions on speed of emergence of soybean stored under ambient conditions are presented in Figure 1. At 60 days in storage, tin recorded the highest speed of emergence with 67.0 %/day followed by poly bag with 64.8 %/day. These storage materials differed significantly ($P \leq 0.01$) from the rest of the storage materials which had 58.2, 55.1 and 42.7 %/day for clay pot, bottle and sack, respectively. The same trend was observed 120, 180 and 240 days in storage. At 300 days in storage, poly bag had the highest speed of emergence with 57.4 %/day. This material differed significantly ($P \leq 0.01$) from the rest of the storage materials. The same trend was observed in the rest of the sampled period (Figure 1a).

The differences occurred in speed of emergence among the storage materials in which poly sack recorded higher values in the early month but was superseded by poly bag after being stored for longer period. Furthermore, after 360 days in storage,

poly-bag maintained higher speed of emergence. This implies that poly-sack had the ability to preserve seed viability for faster emergence in a short period compared to poly-bag, bottle and tin which could preserve seed longer. This might be due to airtight storage in bottle which agrees with the report of Kundu and Kachari (2000). They also concluded that emergence was faster when soybean seeds are stored in metal Cans than in Jute bags.

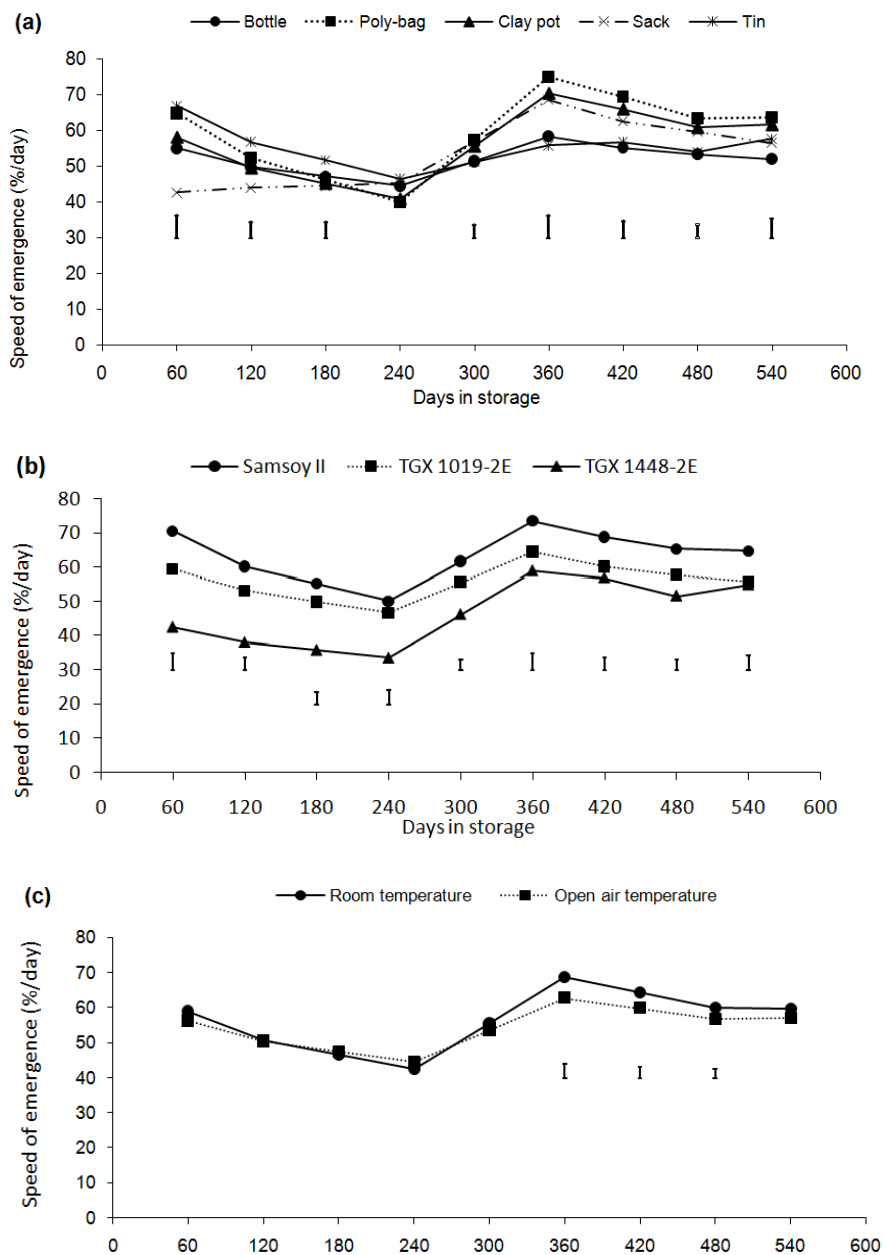
At 60 days in storage, Samsoy II recorded the highest speed of emergence with 70.5 %/day compared to TGX1019-2E and TGX1448-2E which had 59.5 and 42.6 %/day, respectively. The same trend was observed all through the sampled period although after reaching maximum speed of emergence at 360 days in storage, then started decreasing as storage time progressed (Figure 1b).

Samsoy II performed better on speed of emergence compared to TGX1019-2E and TGX1448-2E implies that variation among varieties on speed of emergence might be due to differences in initial seed quality among the varieties. Also, differences in performance during storage depend on the characteristics inherent to the species and seed development stage. This is similar with the findings of Ndimande *et al.* (2006) who reported that soybean genotype differ in their capacity to maintain viability and speed of emergence during storage. Thus, the higher that speed of emergence the faster and better the performance on the field.

At 360 days in storage, room temperature had highest speed of emergence with 68.7 %/day compared to open air temperature which had 62.7 %/day. The same trend was observed from 420 to 540 days in storage, although after 300 days in storage, the speed of emergence decreased as storage time progressed (Figure 1c).

The differences occurred among the environmental conditions on speed of emergence implies that open air storage might not performed better for longer storage period compared to room temperature storage. However, open air storage tends to enhance seed death. This might be due to high temperature and relative humidity in open air storage. This is similar with the finding of Yaja *et al.* (2005) that seed production environment affects soybean plants when placed in high temperature stress to observe changes in germination, emergence and seedling weight. The authors stated that increasing temperature stress dropped speed of emergence levels from 80 % + to approximately 50 %.

Fig. 1: The effects of (a) storage materials (b) varieties and (c) environmental conditions on speed of emergence of soybean seeds under ambient conditions. I= LSD



Conclusion

It can be concluded that variation in performance among the treatments might be due to differences in storability as a function of temperature and relative humidity. Higher speed of emergence could have been affected by favourable temperature and relative humidity.

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