

The effect of timing of earthing up on the performance of four Bambara groundnut landrace cultivars in the Mutasa District of Manicaland Province in Zimbabwe

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Abstract

An experiment was carried out at two sites to investigate the effect of timing of earthing up on the yield of four landrace cultivars of Bambara groundnut (*Vigna subterranean* [L.] Verdc.) cultivars in Zimbabwe during the 2006/2007 season. The two sites were Africa University in Mutare and the Farmers' Development Trust Farm. Earthing up at 30 and 60 days after planting significantly increased yield ($P<0.001$) over the control where no earthing up was done. A delay in earthing up from 60 to 90 days after planting resulted in a decrease in yield. It is recommended that Bambara groundnut be earthed up between 30 and 60 days after planting in order to achieve maximum seed yield.

Key words: Earthing up, *Vigna subterranean*, yield, Zimbabwe

Résumé

Une expérience a été menée sur deux sites pour étudier l'effet de calendrier de mise à la terre sur le rendement de quatre cultivars Landrace sur les cultivars d'arachides de Bambara (*Vigna subterranean* [L.] Verdc.) au Zimbabwe au cours de la saison 2006/2007. Les deux sites ont été l'Université Africa de Mutare et ½Farmers' Development Trust Farm ½. Le buttage à 30 et 60 jours après la plantation a augmenté de manière significative ($P<0,001$) le rendement sous le contrôle, là où l'absence de mise à la terre a été faite. Un retard dans la mise à la terre de 60 à 90 jours après la plantation a entraîné une diminution du rendement. Il est recommandé que les arachides de Bambara soient mises à la terre entre 30 et 60 jours après la plantation afin d'obtenir un rendement maximum de graines.

Mots clés: Buttage, *Vigna subterranean*, rendement, Zimbabwe

Background

Bambara groundnut (*Vigna subterranea* [L.] Verdc.) is an important food legume crop. World production is about 330 000

tones, most of which is produced by smallholder farmers in Africa (Coudert, 1984). It is one of the major sources of protein grown and consumed in the SADC countries (Linnemann, 1987, Azam-Ali, 1993). The haulms are also used as fodder (Mabika and Mafongoya, 1997). Mean yields achieved are low, in the range of 530kg/ha (Madamba, 1997). Major constraints leading to low yield are low soil fertility and use of improper agronomic practices as a result of lack of knowledge of the appropriate timing of earthing up (Madamba, 1997). The fruit develops on pegs underground but most of the pegs do not penetrate the soil and require to be covered through the process of earthing up. Earthing up is the raising of the soil around the plant in order to cover the pegs. The days from emergence to flowering depends on the cultivar and environmental conditions. The objective of the study was to determine determining the appropriate duration after planting at which earthing up achieves maximum yield.

Literature Summary

Bambara groundnut is self pollinated and produces flowers above ground and flowers open after self pollination has occurred. After fertilization, cells just below the receptacle divide rapidly to form a short weak peg that elongates obliquely upwards for about half a centimeter before abruptly turning downwards. The peg elongates with the developing ovary at the tip protected by a cap. The pegs penetrate the soil provided it is loose (Underwood *et al.*, 1971). Penetration depends on the soil bulk density but most of the pegs are not long enough to penetrate the soil. Earthing up was found to have a positive effect on yield (Swanevelder, 1998). Fleissner (2001) considered earthing up as an indispensable practice in the production Bambara groundnut.

Study Description

A field trial was conducted to determine the effect of variation in the number of days from planting to earthing up. The trial was conducted during the 2006/2007 season at two sites that varied in soil type. These were Africa University in Mutare with a red clay soil type and Farmers' Development Trust with a sandy loam soil type. The land was plough using a disc plough and basal dressing of compound fertilizer (N:P:K 8:14:7) at a rate of 400kg/ha was applied at planting. A top dressing of gypsum $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ was applied at flowering at a rate of 200kg/ha. Seed was planted in plots of six rows, 3 m long and spaced at 0.5m within the row and 15cm within the row. The treatments were arranged in a 4 x 4 factorial and the two factors were cultivar and earthing up date. The four land race cultivars were Chitofu, Tumbe Matvuku, Tumbe Muchena and Musodzi

Mutema, The earthing up treatments were a control with no earthing up and earthing up at 30, 60, and 90 days after planting (DAP). The design was a Randomized complete block design (RCBD) with three replicates. At harvest 0.3m was discarded at the end of each row and the middle four rows were harvested. Analysis of variance was carried out on mean seed yield and mean separation was conducted using the Least Significant Difference ($LSD_{0.05}$) test.

Research Application

There was a significant ($P<0.001$) cultivar x planting date interaction at each site as well as a site x cultivar x planting date interaction. At each site there were significant differences in mean yield among planting dates ($P<0.001$) (Table 1). At both sites the highest mean seed yield was achieved when earthing up was done at 60 days after planting. Also, a delay in

Table 1. Mean seed yield of four Bambara nut landrace cultivars grown and earthed up at four two sites in Zimbabwe during the 2006/2007 season.

| Cultivar | Earthing up treatments | | | Percent yield increase | | | |
|----------------------------------|-----------------------------|-----|-----|--------------------------|-------|------|-------|
| | — — Days after planting — — | | | — — over the control — — | | | |
| | Control | 30 | 60 | 90 | 0-30 | 0-60 | 60-90 |
| Farmers Development Trust | | | | | | | |
| Chitofu | 2.1 | 3.0 | 3.4 | 2.4*** | 42.9 | 61.9 | -29.4 |
| Tumbe Matsvuku | 1.9 | 1.8 | 2.8 | 2.3*** | -5.3 | 47.4 | -17.9 |
| Musodzi Mutema | 1.9 | 2.3 | 2.1 | 1.7*** | 21.1 | 5.3 | -15.0 |
| Tumbe Muchena | 2.1 | 1.8 | 2.2 | 1.9*** | -14.3 | 4.8 | -13.6 |
| Mean | 2.0 | 2.2 | 2.6 | 2.1 | | | |
| Significance of F. | NS | *** | *** | *** | | | |
| $LSD_{0.05}$ | | | 0.3 | | | | |
| CV% | | | 7.3 | | | | |
| Africa University | | | | | | | |
| | Control | 30 | 60 | 90 | 0-30 | 0-60 | 60-90 |
| Chitofu | 3.1 | 4.2 | 4.1 | 2.6*** | 35.5 | 32.3 | -36.6 |
| Tumbe Matsvuku | 2.3 | 2.5 | 2.8 | 2.2*** | 8.7 | 21.7 | -21.4 |
| Musodzi Mutema | 1.8 | 1.9 | 2.1 | 1.7*** | 5.5 | 16.7 | -19.0 |
| Tumbe Muchena | 1.5 | 2.4 | 1.8 | 2.0*** | 60.0 | 20.0 | -11.1 |
| Mean | 2.2 | 2.8 | 2.7 | 2.1 | | | |
| Significance of F. | *** | *** | *** | *** | | | |
| $LSD_{0.05}$ | | | 0.4 | | | | |
| CV% | | | 5.4 | | | | |

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earthing up from 60 to 90 DAP resulted in a significant reduction in seed yield ($P<0.005$). At Africa University earthing up at 60DAP resulted in a 61.9% increase in yield over the control while at FDT the increase was 32.3%. There were no significant differences in mean seed yields for earthing up dates between 30 and 60 DAP. But there was a significant difference in seed yield among cultivars ($P<0.001$) at all planting dates except for the control treatment.

It is recommended that Bambara nut should be earthed up to achieve high yields. The highest yields were achieved at 60 DAP and it is recommended that Bambara nut should be earthed up between 30 and 60 DAP for these cultivars in these environments.

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