

Germination of *Cola nitida* (Vent.) Schott and Endlicher Nut as Influenced by Nut Weight and Colour¹

M. A. O. Oladokun*

ABSTRACT

A factorial trial was conducted on germination of *Cola nitida* (Vent.) Schott and Endlicher nuts using different weights (1-5, 6-10, 11-15, 16-20, 21-25 and 26-30 g) and three nut colours (red, pink and white). Nut weight was significant at certain periods while nut colour was significant throughout the period of germination. The interaction between nut weight and nut colour was also significant at 18 and 22 weeks after sowing.

INTRODUCTION

Kola plantations have been established mainly through planting the nuts at stake in the field or through seedlings raised in the nursery. Moreover, research has suggested the possibility of establishing kola plantations through rooted cuttings or other methods of vegetative propagation. However, such vegetative techniques have by no means been perfected. Thus, until the vegetative means of propagation of kola are perfected, the factors that determine the rate, uniformity and pattern of germination of kolanuts will continue to be of concern to farmers and research workers alike (9).

Nut weight has been reported to influence germination of *C. nitida* nuts. Ashiru (1), Dublin (4) and Ibikunle and Mackenzie (7) reported improved germination with increases in nut weight. On the other hand, Clay (3) and van Eijnatten and Quarcoo (5) found no significant effect of nut weight on germination of *C. nitida* nuts. In *C. acuminata* (P. Beauv) (Schott and Endlicher), increase in nut weight enhanced the germination of the nuts (11). The role of nut weight per se on the earliness of germination of the species becomes questionable with the report of Brown and Afrifa (2), who showed that cutting off of about half the nut of *C. nitida* accelerated germination as compared to whole nuts, although it led to some delay in initial growth after germination.

COMPENDIO

Se estableció una prueba factorial para estudiar la germinación de la nuez *Cola nitida* (Vent.) Schott and Endlicher, comparando diferentes pesos (1-5, 6-10, 11-15, 16-20, 21-25 y 26-30 g) y tres colores de la nuez (rojo, blanco y rosado). El efecto del peso de la nuez fue significativo en ciertos períodos, mientras que el efecto del color de la nuez fue significativo a lo largo del período de germinación. La interacción entre el peso de la nuez y el color de la nuez también fue significativa en las semanas 18 y 22, después de la siembra.

Effect of nut colour on germination of *C. nitida* nuts has been reported by van Eijnatten (6), who stated that white nuts germinated quicker than red nuts. In *C. acuminata*, Oladokun (11) reported that though the colour effect was not significant, pink nuts germinated quicker than either red or white nuts.

At present, information is lacking on the possible interactions between nut weight and nut colour on the germination of *C. nitida*. An effort made to provide such information is reported below.

MATERIALS AND METHODS

Kola pods harvested from AA 231 trees in plot 63-7 at the Cocoa Research Institute of Nigeria Headquarters Ibadan, were processed. The nuts were sorted out into nut weight classes (1-5, 6-10, 11-15, 16-20, 21-25, 26-30 and 31 + g). Each nut weight class was sorted into the three colours (red, pink and white). The percentage distribution is outlined in Table 1. Ten nuts of each nut colour in each nut weight class (1-5, 6-10, 11-15, 16-20, 21-25 and 26-30 g) were sown in a germination tray (122 x 122 x 15cm) filled with wet sawdust. There were four replicates in the factorial trial and these were laid out in a randomised complete block design.

Daily records of seedling emergence were kept. Median time (T_m), defined as the number of days after sowing required to obtain fifty percent germination, was recorded and was used to evaluate the rate

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* Cocoa Research Institute of Nigeria P M B. 5244 Ibadan, Nigeria.

of germination of the nuts. The data collected were subjected to factorial analysis according to Litte and Hills (8).

RESULTS

Figs. 1 and 2 show interaction effects of both the nut weight and nut colour on germination of *C. nitida* nuts. In Fig 1, pink nuts were not a widespread as the red and white nuts, especially the white nuts. Significant interaction was observed at 18 and 22 weeks after sowing (Table 2). Among the white nuts, 16-20 g nuts germinated best, while other sizes were not significantly different from one another. In the case of the pink nuts, 21-25 g nuts led all others, while the rest were not significantly different

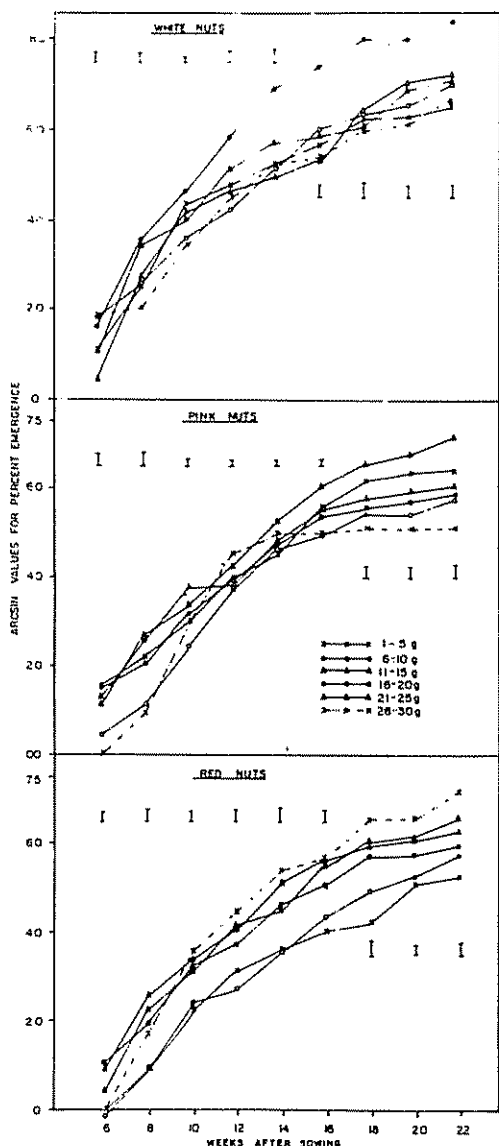


Fig. 1 Effect on nut weight and nut colour on germination *Cola nitida* nuts. Bars represent standard errors

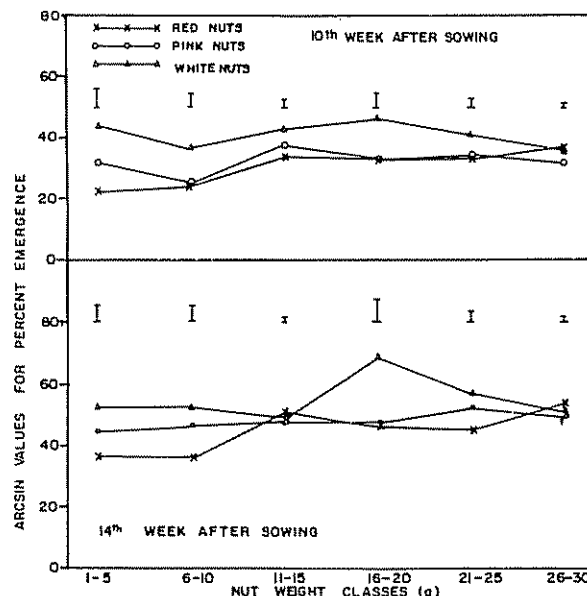


Fig. 2. The interactive effects of nut: weight and nut colour on germination of *Cola nitida* nuts. Bars represent standard errors.

from one another. Though 26-30 g nuts had a poor start among the red nuts, it finally led other weights in germination, especially after the 18th week after sowing. In general, nut weight effect was inconsistent and not significant several weeks after sowing (Fig. 3; Table 2).

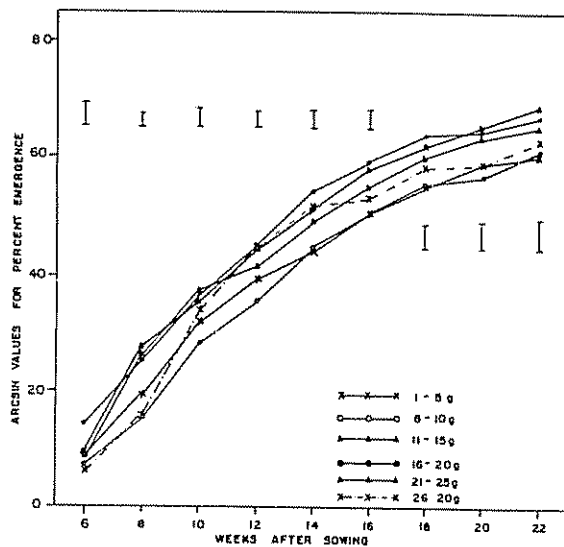
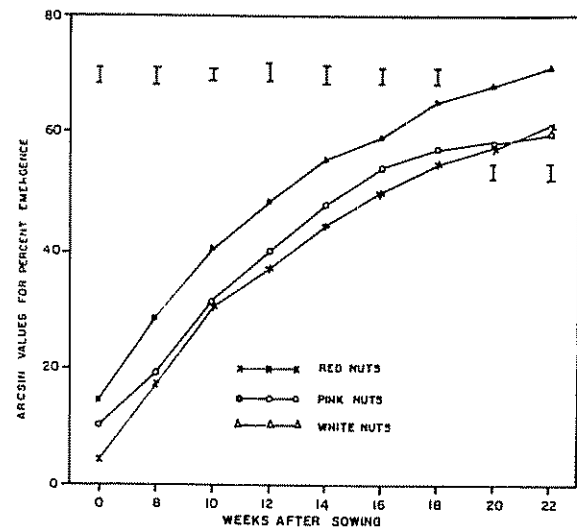
In Fig. 2, the interaction between nut weight and nut colour was further elucidated. However, the influence of nut weight was not consistent in each nut colour. It was, however, observed that colour effect on germination was significant, especially at the 14th week after sowing. This is further shown in Fig. 4.

Figs. 3 and 4 show the pooled nut weight and nut colour effects. The pooled nut weight effect was not significant except at 8, 12 and 14 weeks after sowing (Fig. 3; Table 2). However, in Fig. 4, white nuts germinated significantly better than the other two colours; also, Table 2 shows that nut colour was significant in germination of the nuts ($0.1\% < P < 5\%$).

In Fig 5, the rate of germination was determined using the median time (T_m) values. Except for the nuts weighing 11-15 g, the order of the rate of germination was white < pink < red nuts. Thus, white nuts recorded the shortest median time values. Statistical analysis of the median time values showed that both the nut size and nut colour effects were significant at $P < 1.0\%$ and $P = 0.1\%$ respectively.

Table 1. Contingency table showing the percent frequency of each category of nuts of *Cola nitida*.

| Nut size (g) | NUT COLOUR | | |
|--------------|------------|-------|-------|
| | Red | Pink | White |
| 1 - 5 | 78.67 | 10.67 | 10.67 |
| 6 - 10 | 79.89 | 14.34 | 5.76 |
| 11 - 15 | 82.85 | 13.38 | 3.77 |
| 16 - 20 | 82.94 | 12.62 | 4.44 |
| 21 - 25 | 80.20 | 14.09 | 5.70 |
| 26 - 30 | 81.61 | 12.64 | 5.75 |
| 31 + | 81.69 | 12.68 | 5.63 |

Fig. 3. Pooled nut weight effect on germination of *Cola nitida* in nut weight: nut colour factorial trial. Bars represent standard errors.Fig. 4. Pooled colour effect on germination of *Cola nitida* in nut weight: nut colour factorial trial. Bars represent standard errors.

DISCUSSION

The fact that the nut weight effect on germination of *C. nitida* was not significant throughout the study period agrees on the one hand with part of the findings of Clay (3) and van Eijnatten and Quarcoo (5), and on the other with part of the findings of Ashiru (1), Dublin (4) and Ibikunle and Mackenzie (7). It is suggested that the conflicting results reported by the previous workers were due to the time of recording as well as the source of the nuts.

White nuts germinated fastest. This is in agreement with van Eijnatten (6), but contrary to the findings on colour effect on germination of *C. acuminata* (11). In *C. acuminata*, it was reported that white nuts germinated poorest while pink nuts recorded the shortest median time values.

In spite of the fact that white nuts germinate better than other colours, the proportion of white nuts in a population of *C. nitida* is rather small (4 - 11%) (Table 1). In *C. acuminata*, white nuts are even rarer (3 - 4%) (10) than in *C. nitida*. However, in *C. acuminata* pink nuts which germinated better than other nuts recorded the highest percent frequency (64%) (10). In terms of market value, white nuts are preferred to pink or red nuts. Thus, if plant breeders can selected or breed for white-coloured nuts in *C. nitida*, the frequency may increase to match the germination potential as well as their preferential consumer demand.

CONCLUSION

Nut weight and nut colour influenced germination of *C. nitida* nuts. However, it is the effect of nut

Table 2. Mean square values of germination of *Cola nitida* nuts

| Source of Variation | DF | PERIOD AFTER SOWING (WEEKS) | | | | | | | | | Tm |
|------------------------|----|-----------------------------|-----------|-----------|----------|-----------|----------|-----------|-----------|-----------|------------|
| | | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | |
| Between nut size (S) | 5 | 97.46NS | 365.31*** | 153.29NS | 164.46* | 196.69* | 158.58NS | 157.68NS | 142.40NS | 144.28NS | 1231.98** |
| Between nut colour (C) | 2 | 526.68* | 872.65** | 729.21*** | 834.52** | 729.23*** | 491.23** | 683.01*** | 858.16*** | 948.59*** | 3292.34*** |
| SXC interaction | 10 | 144.59NS | 85.02NS | 64.11NS | 83.40NS | 131.54NS | 168.47NS | 236.01* | 160.36NS | 217.42* | 314.94NS |

TM = Median time values

* = Significant at 5%

** = Significant at 1%

*** = Significant at 0.1%

colour that was most clearly significant. The interaction between the nut weight and nut colour was also significant at certain periods after sowing.

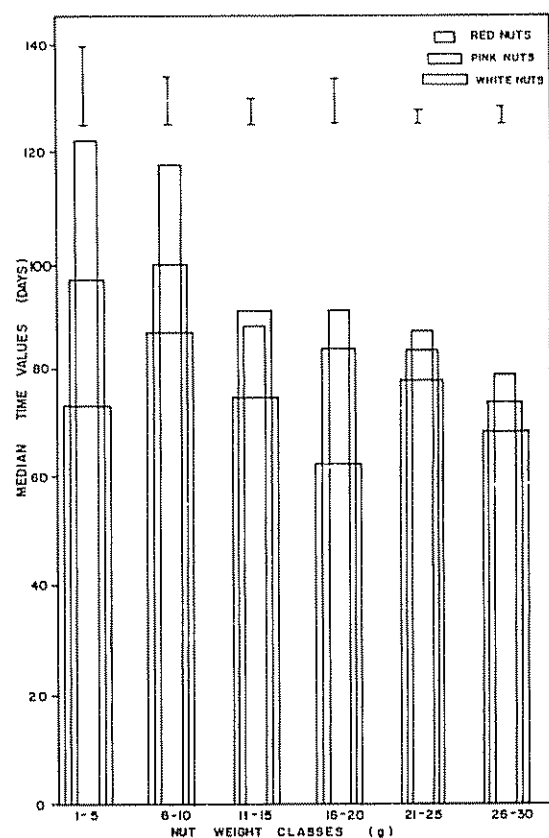


Fig 5. Median time (Tm) values of germination of *Cola nitida* nuts. Bars represent standard errors.

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