

**World
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REGIONAL COCOA SYMPOSIUM 2016

Using grafting for propagation of quality planting materials to rehabilitate old cocoa (*Theobroma cacao* L.) orchards in Côte d'Ivoire

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OUTLINE

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INTRODUCTION

➤ Context

- **Cocoa productivity in Côte d'Ivoire has been plummeting lately due to various reasons among them non-improved ageing trees and pest and diseases outbreak.**
- **Research has developed high-yielding hybrid varieties and clones, but their availability is limited.**



INTRODUCTION

➤ Context

- **Grafting is the easy and fast way (Mng'omba and du Toit, 2006) to permit farmers access to the elite planting materials.**
- **Promoting access of high performing clones to farmers to rehabilitate their old cocoa orchards is of paramount importance. It is key to enhancing cocoa productivity in Côte d'Ivoire.**



INTRODUCTION

❖ Objective

- **To evaluate two grafting techniques and their effects on selected growth parameters in the nursery and field.**

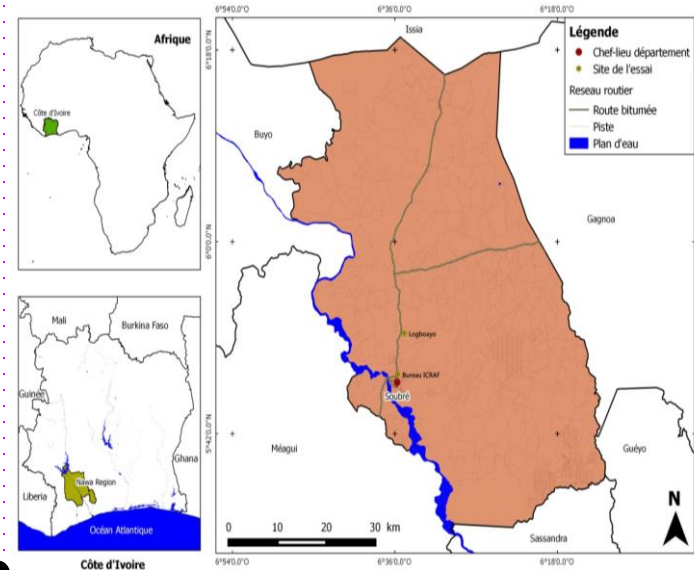
MATERIALS & METHODS

➤ Experiment site

Experiments were conducted at the **World Agroforestry Centre (ICRAF) Soubré Station**, located in the **Nawa Region**, South-West of Côte d'Ivoire.

➤ Plant material

- **Ten elite cocoa clones coded as C1, C8, C9, C14, C15, C16, C17, C18, C20 and C21 were used as scions.**
- **The recommended hybrid variety Mercedes was used as root stock.**
- **Three months after planting, the seedlings were grafted with the elite clones.**
- **The seedlings were grown for 5 months in a screen house before transplanting them to the field.**



MATERIALS & METHODS

➤ **Experimental design and cultural practices**

- **A randomized complete block design with three replications was used and good agricultural practices were applied.**
- **Top grafting and budding were used.**
- **The experimental unit consisted of ten grafted seedlings for each clone giving a total of 600 seedlings for the entire experiments.**

MATERIALS & METHODS

➤ **Data collection**

Data were collected on:

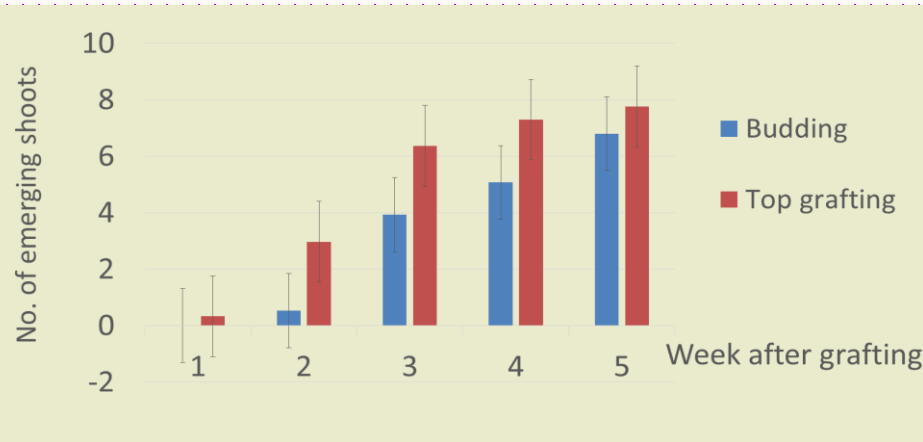
- **shoot emergence 1 to 5 weeks after grafting (WAG)**
- **grafting success at 10 WAG.**
- **growth parameters in the nursery and in the field.**

➤ **Data analysis**

- **The data were subjected to two ways analysis of variance using Statistical Analysis System software (SAS, 2003).**
- **The differences between means were assessed with the Student-Newman-Keuls (SNK) method at 5%.**

RESULTS

➤ 1. Shoot emerging

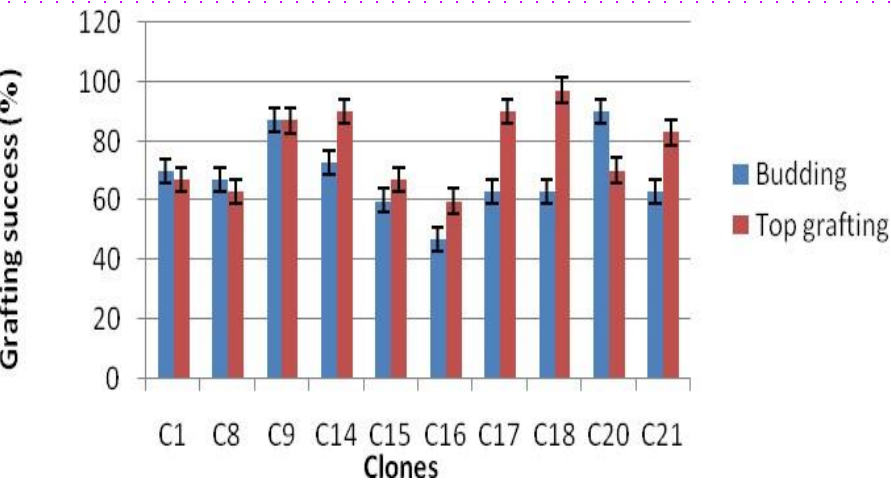


Number of emerging shoots in nursery according to the techniques per WAG

- **Grafting techniques significantly affected the number of shoots during 1 to 4 week after grafting.**
- **Budding showed no shoot compared to top grafting which recorded significant shoots during the first WAG.**
- **No significant effect of grafting techniques was observed 5 weeks after grafting.**

RESULTS

➤ 2. Grafting success



Clones grafting success according to the grafting techniques 10 WAG

- **Top grafting recorded 77% success compared to budding which showed a success of 68%.**
- **When top grafting was used, all clones showed a high grafting success percentage compared to budding except for clones C20, C1 and C8.**
- **The overall grafting success in nursery in this study (73%) was similar to that obtained in Malaysia (74%) as reported by Figueroa *et al.* (1991).**

RESULTS

➤ 3. Growth parameters in nursery

Clones growth parameters in nursery according to the grafting techniques

Clones	Number of leaves		Number of primary branches		Main branch length (cm)	
	Bud	TG	Bud	TG	Bud	TG
C1	6.81 ^{b*}	13.55 ^a	1.00 ^b	2.30 ^a	12.70 ^b	16.14 ^a
C8	4.50 ^b	8.30 ^a	0.75 ^b	2.15 ^a	6.79 ^a	8.31 ^a
C9	4.92 ^b	12.84 ^a	0.88 ^b	2.36 ^a	9.02 ^a	11.26 ^a
C14	5.05 ^b	10.30 ^a	0.82 ^b	2.04 ^a	8.65 ^a	9.77 ^a
C15	5.74 ^b	13.75 ^a	1.00 ^b	2.65 ^a	10.13 ^a	9.34 ^a
C16	2.50 ^b	12.96 ^a	0.50 ^b	2.28 ^a	4.64 ^b	11.98 ^a
C17	3.68 ^b	8.48 ^a	0.74 ^b	1.93 ^a	6.15 ^a	8.67 ^a
C18	4.00 ^b	9.69 ^a	0.89 ^b	2.28 ^a	6.33 ^b	9.61 ^a
C20	3.70 ^b	10.62 ^a	0.81 ^b	2.00 ^a	4.93 ^b	10.56 ^a
C21	5.65 ^b	11.68 ^a	0.88 ^b	2.16 ^a	9.24 ^a	11.10 ^a

- **Grafting techniques significantly affected selected growth parameters in the nursery.**
- **Top grafting showed the highest number of leaves, primary branches and main branch length than budding in all ten clones.**

*Means followed by the same letter in the same line per parameter are not significantly different at the 5% level

RESULTS

➤ 3. Growth parameters in field

Clones growth parameters in field according to the grafting techniques

Clones	Number of leaves		Number of primary branches		Main branch length (cm)	
	Bud	TG	Bud	TG	Bud	TG
C1	34.33 ^{b*}	55.80 ^a	1.20 ^b	2.20 ^a	55.73 ^a	54.93 ^a
C8	27.07 ^a	33.20 ^a	0.93 ^b	2.00 ^a	35.73 ^a	37.60 ^a
C9	35.07 ^a	43.00 ^a	1.27 ^b	2.40 ^a	47.20 ^a	45.63 ^a
C14	47.40 ^a	37.80 ^a	1.00 ^b	2.07 ^a	48.30 ^a	35.47 ^b
C15	40.00 ^a	56.87 ^a	1.13 ^b	2.67 ^a	43.47 ^a	42.27 ^a
C16	17.20 ^b	50.53 ^a	0.67 ^b	1.93 ^a	20.47 ^b	41.60 ^a
C17	24.07 ^b	51.60 ^a	0.73 ^b	2.07 ^a	30.60 ^b	51.13 ^a
C18	28.80 ^a	34.87 ^a	1.20 ^b	2.00 ^a	36.00 ^a	34.80 ^a
C20	25.20 ^b	51.47 ^a	0.93 ^b	1.80 ^a	43.67 ^a	47.40 ^a
C21	36.27 ^a	45.60 ^a	1.00 ^b	1.73 ^a	44.93 ^a	42.40 ^a

- **Top-grafting yielded the best results in most cases. It exhibited high number of leaves compared to budding in clones C1, C16, C17 and C20.**
- **Top grafting produced ~double the number of primary branches and generally longest main branch than budding in the field.**

CONCLUSION & PERSPECTIVES

- **During this study, grafting techniques were found to have some effect on selected growth parameters of cocoa clones both in the nursery and in the field.**
- **Most clones exhibited high grafting success when top grafting was used and it was proposed therefore that this should be adopted for grafting the elite cocoa clones in the study areas.**



**THANK FOR
YOUR
ATTENTION**

