Tropentag, September 17 – 19, 2018, Ghent (Belgium)

''Global food security and food safety:
The role of universities''

Oil palm (*Elaeis guineensis* Jacq.) leaf K and Mg contents differ with progenies: implications and research needs

Olivier **Dassou**[1,3*], Léifi **Nodichao**[1], Jean **Ollivier**[2], Reinout **Impens**[3,6], Bernard **Dubos**[2], Xavier **Bonneau**[2], Marcel **De Raïssac**[2], Tristan **Durand-Gasselin**[4], Brice **Sinsin**[5] and Patrick **Van Damme**[3]

*[1]INRAB, Institut National de Recherches Agricoles du Bénin / *Corresponding author: mandas.oliver@gmail.com (Benin), [2]CIRAD, Montpellier (France), [3]Ghent University (Belgium), [4]PalmElit SAS, (France) & [5]FSA / UAC : Faculté des Sciences Agronomiques / Université d'Abomey-Calavi (Benin), [6]PRESCO Plc, Nigeria (Edo State).*

Introduction

Fertilizer application has always been an important aspect for the industrial oil palm plantation managers because of the large part of the budget it represents in the annual production cost. Good management practices in oil palm rely on accurate predictions of fertilizer requirements that respect the environment and are economically optimal. The use of leaf analysis for the control and the management of oil palm nutrition, requires a comprehensive knowledge of the response curves to fertilizer applications and the critical nutrient contents of the leaves. It permits the establishment of fertilization tables, that can be used at field scale in order to reach the optimum nutrient contents.

Context

A previous study performed in Indonesia pointed out that K and Mg leaf contents greatly vary from one oil palm progeny to another for the same production level. Such differences in nutrient contents may lead to an incorrect assessment of nutrient requirements (based on long term analysis of nutrient contents in leaf according to the fertilization), questioning the validity of leaf analysis as a diagnostic tool.

Picture 1: Store of Fertilizer

Picture 2: Kieserite (left) and MOP / KCl (right)

Picture 3: Oil palm tree fertilization in trial

Aim

The principal aim of this poster is to study the behavior of different oil palm progenies and assess their Potassium / Magnesium absorption capacity.

Table 1: Pedigree and characteristics of the progenies

Progenies	Dura	Dura origin	Tenera / Pisifera	Tenera / Pisifera origin	Progeny type
C1	PO 2630D	DA 10D x DA 3 D	PO 2766P	LM 10 T AF	K+Mg-
C2	PO 3174 D	DA 115 D AF	PO 2973 P	LM 5 T x LM 10 T	k-Mg-
C3	PO 3174 D	DA 115 D AF	PO 4747 P	LM 5 T AF	k-Mg++
C4	PO 4953 D	Unknown	PO 4260 P	LM 238 T x LM 511 P	K++Mg+

Materials and method

A split plot trial has been set up in 2011 in Nigeria (Edo State) and fertilizer was applied during seven years. It consisted in doing a factorial design, with 3-levels of K and Mg fertilizer respectively (KxMg) as main factor combined with 4-oil palm progenies in subplots and 6 repetitions. Leaf analysis results were statistically analyzed according to the progenies and the fertilizer treatments based on the K and Mg leaf content.

Results

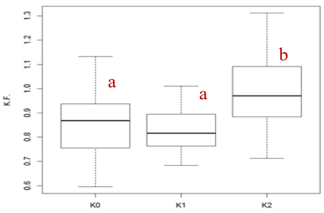

Figure 1: KCl effect on K leaf content

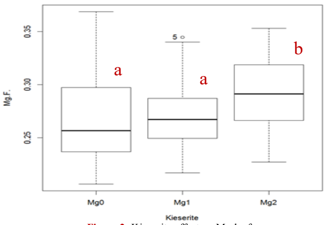

Figure 2: Kieserite effect on Mg leaf

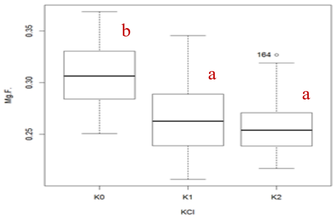

Figure 3: KCl effect on Mg leaf

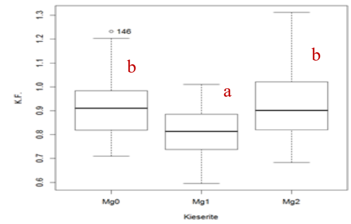

Figure 4: Kieserite effect on K leaf

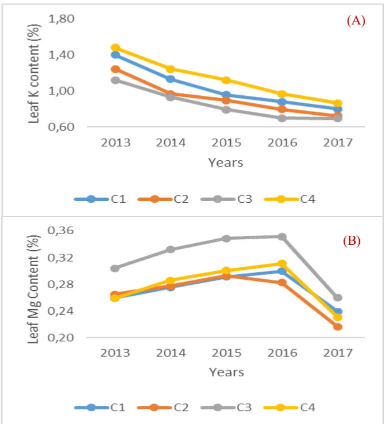

Figure 5: K (A) and Mg (B) leaf content evolution during the time

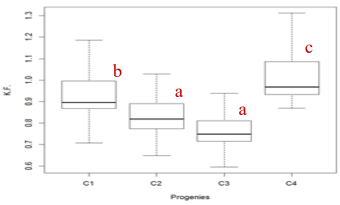

Figure 6: K leaf content variation according to the progenies

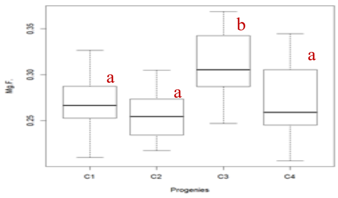

Figure 7: Mg leaf content variation according to the progenies

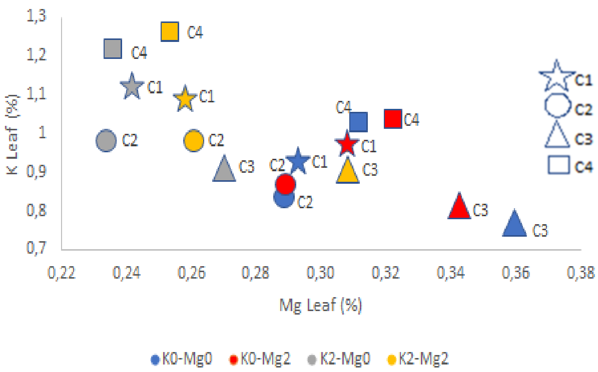

Figure 8: Mg leaf content variation according to the progenies

Future Research questions

1- Do oil palm progenies with different leaf nutrient contents need to be fertilized with specific fertilization tables?
2- Does the difference in leaf nutrient contents between progenies reflect different patterns for nutrient allocation within plant tissues?
3- Do mineral absorption, fertilizers recovery and use efficiency differ with oil palm progenies? and to what extent so far?
4- Is there any progeny which can adapt itself to agronomic practices requiring less fertilizer for highest production?
5- How progenies having highest production with less fertilizer use their nutrients absorbed and which are the plastic factors, breeders can rely on for their selection ?
6- What are the metabolite synthesis reactions involve in that K and Mg variation, what are the consequences on the oil production and how to better adapt the fertilizations?

Conclusion

These results confirm the differences in foliar contents between the various oil palm genetic origins and thus of their contrasted foliar K and Mg mineral absorption spectrum.

To know more

PhD Research ongoing: *Interaction between genotypes and mineral nutrition: potassium and magnesium absorption and use efficiency in oil palm progenies*