Effect of Phosphorus and Potassium On Canopy Cover and Yield of Peanut

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INTRODUCTION

➢With the expansion of sugar cane on marginal soils in the Brazilian Cerrado, peanut is being introduced to reform the sugar cane fields and pastures. Besides benefiting from the residual fertilizer from the previous crop, peanut leaves nitrogen in the soil for next cultivation.

➢The Biofuel Brazilian Program encourages family farmers to cultivate oilseeds, ensuring that at least 25% of raw material comes from family farming.

➢This is a preliminary study to evaluate the commercial cultivation of peanut in the Southwest of Goias State, Brazil.

OBJECTIVE

➢To evaluate the effect of phosphorus and potassium on peanut for two types of Oxisols and two growing seasons, based on peak canopy cover (CCmax) and yield.

MATERIAL AND METHODS

➢Experimental field: at the municipal district of Jatai, in southwestern Goias, Brazil (Fig 1). Climate Aw (tropical savanna), dry season from May to Sept, mean annual temperature 22.2 C, and rainfall 1600 mm/year.

Fig 1. Location of the experimental fields

➢Both experimental fields were degraded pasture areas subjected to conventional tillage. Before the trials, we applied limestone at a rate of 4.2 t/ha on the clayey Oxisol and at a rate of 3.1 t/ha on the sandy Oxisol.

➢Planting dates: Feb/2009 (off-season), Oct/2009 (on-season), with control of weeds, insects and diseases. Cultivar BRS-Havana, sown at 10 seeds/m.

➢Design: 4 randomized blocks in a factorial combination of 0, 40, 80 and 120 kg P/ha by 0, 40 and 80 kg K/ha.

➢Plot: 4 double rows (0.2 m inside + 0.7 m between rows) of 6.0 m length.

➢Sampling: weekly, taking 9 m² (2 double rows central, less 0.5 m at each end) to observe emergence, flowering, first mature pod, and canopy cover.

➢Final parameters: biomass (g/m²), pod weight (g/m²), yield (g/m²), grains / pod and 100 seed weight (g/unit).

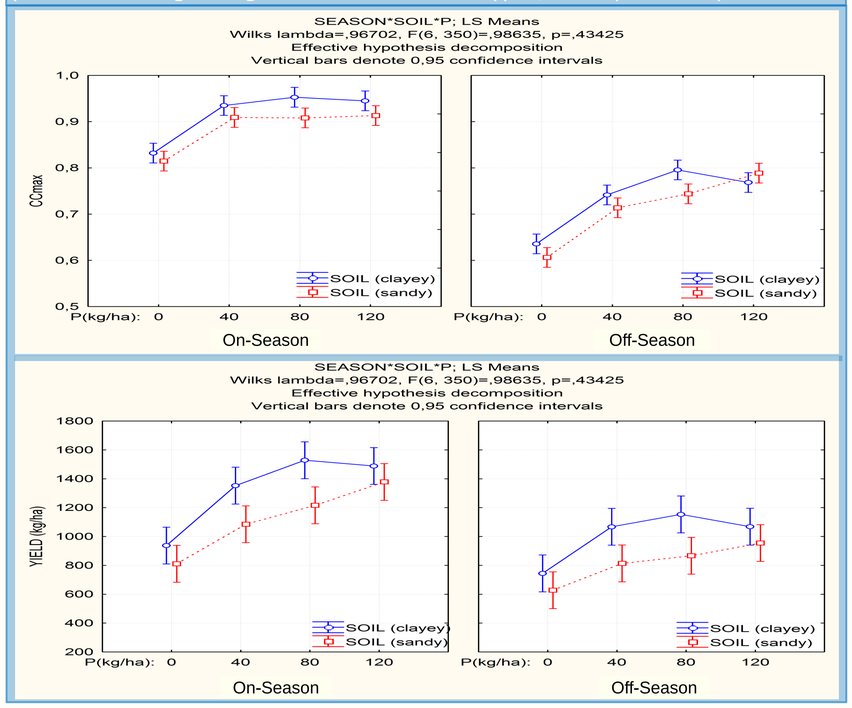
➢Analysis of peak canopy cover, and yield: Three-way ANOVA (for soil types and planting seasons, using blocks, phosphorus, and potassium as factors), Tukey test, and regression to adjust equations that maximize the response variables as a function of phosphorus, and potassium.

RESULTS

➢No significant effect of potassium levels on peak canopy cover (CCmax) and yield, nor interaction between potassium and other factors.

➢On the clayey soil the observed effect was just between “zero” phosphorus and “non-zero” of phosphorus (Fig 2). This suggests an ideal phosphorus level around 80 kg/ha.

Fig 2. Effect of phosphorus levels on peak canopy cover (CCmax) and yield of peanut for two growing seasons and two soil types, at 5% probability.



➢Fig 2 shows a gradual effect of phosphorus levels on CCmax and yield of peanut, for a sandy soil, suggesting an optimal level beyond 120 kg P / ha.

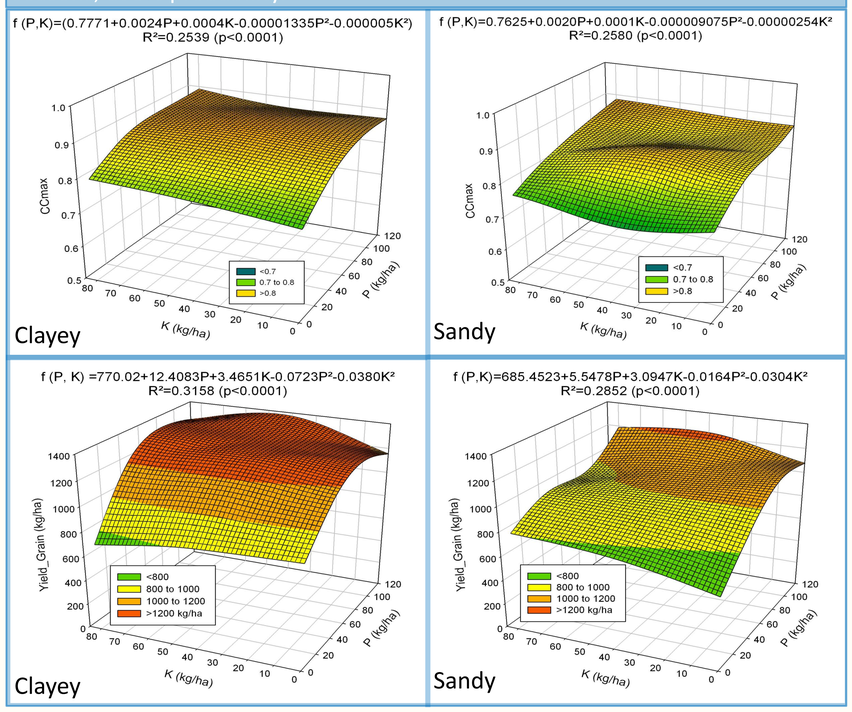
➢Between growing seasons, peanut had a better performance on-season, with 951 mm of rainfall against 418 mm of rainfall off-season.

➢Although clayey soils are not very suitable for peanut, this research shows a better performance on this kind of soil, which has an available water capacity of 167 mm/m against 114 mm/m on the sandy soil. Also the cation exchange capacity of the clayey soil was greater than that of the sandy soil.

➢From Fig 3, response surfaces of peanut parameters on clayey Oxisol maximized for ideal levels of phosphorus and potassium were max{CCmax(P, K)}=0.8930 at (P, K)=(90, 40) and max{Yield(P, K)}=1381 kg/ha at (P, K)=(86, 46).

➢Similarly, maximization on sandy Oxisol were max{CCmax(P, K)}=0.8737 at (P, K)=(110, 20) and max{Yield(P, K)}=1233 kg/ha at (P, K)=(170, 50).

Fig 3. Response surfaces of peak canopy cover (CCmax) and yield of peanut as a function of phosphorus and potassium on two soil types for two growing seasons, at 5% probability.



➢Although potassium levels had no significant effect on peanut, and phosphorus level exceeded 120 kg/ha for a sandy soil, but safely, an ideal fertilization would be 88 ± 2 kg P/ha and 43 ± 3 kg K/ha on a clayey Oxisol, and 140 ± 30 kg P/ha and 35 ± 15 kg K/ha on a sandy Oxisol.

CONCLUSIONS

➢Peanut has a better performance when cultivated on a clayey Oxisol and also on-season.

➢P and K fertilizer levels that maximize canopy cover and yield of peanut are: phosphorus = 88 ± 2 kg/ha, and potassium = 43 ± 3 kg/ha for a clayey soil and phosphorus = 140 ± 30 kg/ha and potassium = 35 ± 15 kg/ha for a sandy soil.

SELECTED REFERENCE

NAKAGAWA, J., ROSOLEM, C. A. **O amendoim: tecnologia de produção.** Botucatu, SP, Brasil: FEPAF, 2011. 325 p. il.