



Early changes in arbuscular mycorrhiza development in sugarcane under two harvest management systems

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INTRODUCTION

- Sugarcane (*Saccharum* spp.) occupies over 8 million ha in Brazil to produce ethanol and sugar.
- Some sugarcane fields are burned to facilitate harvesting.
- However, policies to promote no-burning harvesting practices and reduce environmental impacts (air pollution and greenhouse gas emissions) have been established.
- The sugarcane pre-harvesting burning effects on the soil microbial community, including arbuscular mycorrhizal fungi (AMF), is not known.
- We hypothesized that sugarcane pre-harvesting burning affects the community of arbuscular mycorrhizal fungi (AMF) and symbioses development.
- Thus, we investigated the early impacts of harvest management on AMF spore communities and root colonization in three sugarcane varieties, under two harvesting management systems (no-burning and pre-harvest burning).

MATERIAL AND METHODS

- Soil and root samples were collected in the field after the first harvest.
- Soil and roots under three sugarcane varieties were assessed: SP813250, SP801842, and RB72454.
- AMF species (Figure 1) were identified based on spore morphology.
- Diversity indices were determined based on spore populations.
- Root colonization (Figure 2) was determined as an indicator of symbioses development.

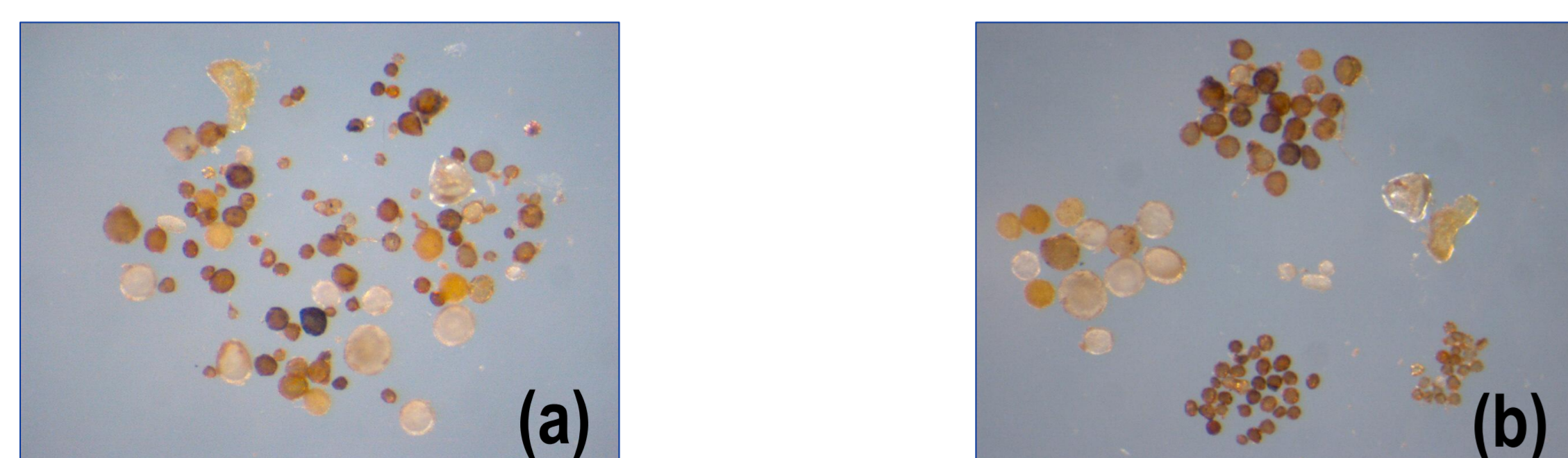


Figure 1a and 1b. Spores of arbuscular mycorrhizal fungi recovered from soil sample under sugarcane.

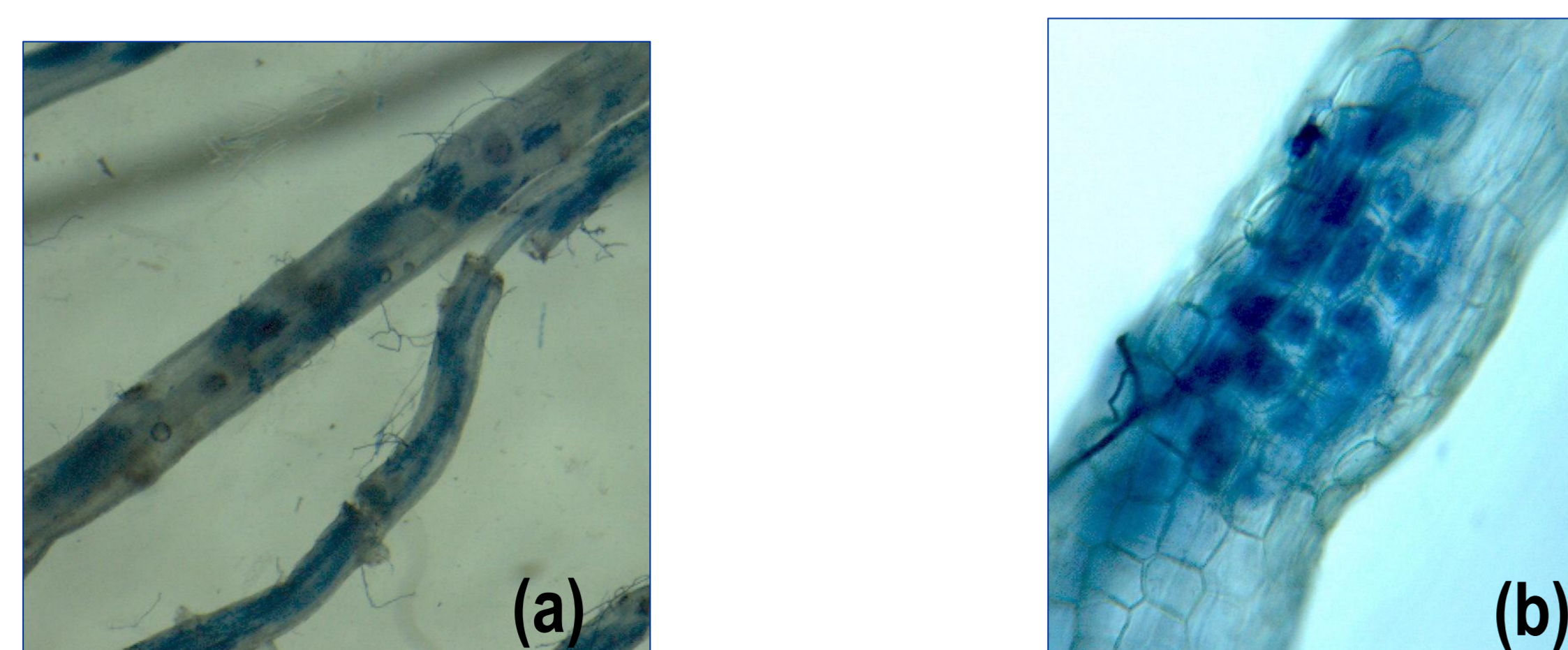


Figure 2a and 2b. Sugarcane root colonization by arbuscular mycorrhizal fungi.

RESULTS

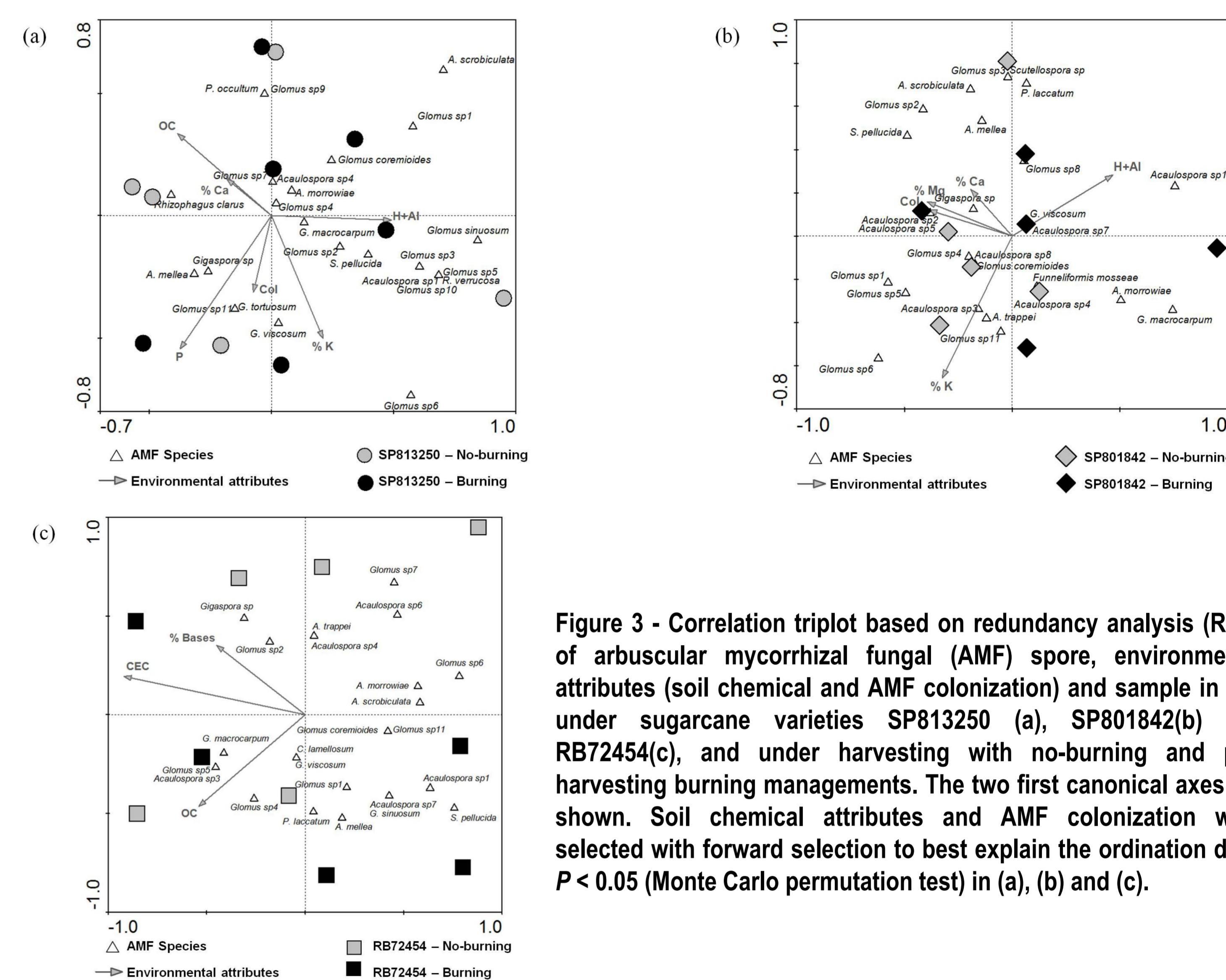


Figure 3 - Correlation triplot based on redundancy analysis (RDA) of arbuscular mycorrhizal fungal (AMF) spore, environmental attributes (soil chemical and AMF colonization) and sample in soil under sugarcane varieties SP813250 (a), SP801842(b) and RB72454(c), and under harvesting with no-burning and pre-harvesting burning managements. The two first canonical axes are shown. Soil chemical attributes and AMF colonization were selected with forward selection to best explain the ordination data. $P < 0.05$ (Monte Carlo permutation test) in (a), (b) and (c).

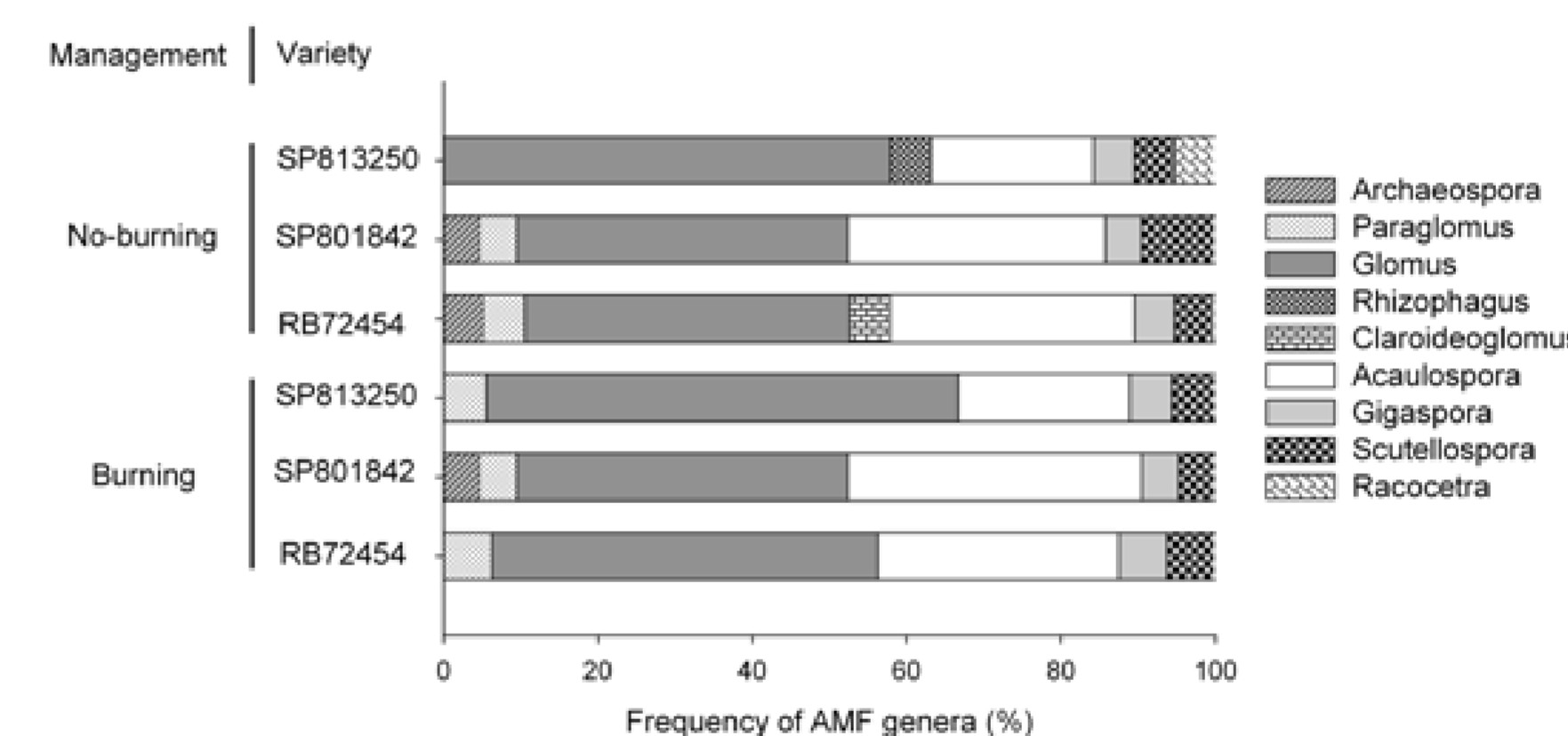


Figure 4 - Relative frequency of arbuscular mycorrhizal fungi genera, based on number of species detected in soil under three sugarcane varieties (SP813250, SP801842 and RB72454) and under harvesting with no-burning and pre-harvesting burning managements.

Table 1 - AM fungal colonization (%) of roots of three sugarcane varieties under harvesting with no-burning or pre-harvesting burning managements.

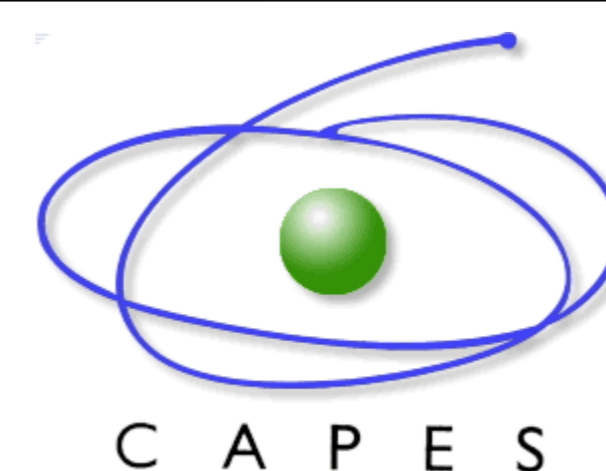
Variety	Management	
	No-burning	Burning
SP813250	51.87 ± 3.04 aA	36.23 ± 2.87 aB
SP801842	45.20 ± 9.46 aA	30.10 ± 2.29 aB
RB72454	49.33 ± 4.29 aA	31.24 ± 9.58 aB

Values are average ± standard deviation (n=3). Means followed by the same lower case letter in a column and upper case letter in a row do not differ statistically (Tukey-Kramer test, $p < 0.05$).

CONCLUSIONS

1. Changing from a long-standing practice of pre-harvesting sugarcane burning to a no-burning harvesting management does not affect AMF community after the first harvest.
2. Root colonization by AMF may benefit from no burning practices since the very first sugarcane cultivation cycle.
3. Root colonization is a sensitive indicator of environmental changes in sugarcane fields, since it represents the active growing phase of intraradical fungi.

Financial support:



Coordenação de Aperfeiçoamento de Pessoal de Nível Superior



Fundação de Amparo à Pesquisa do Estado de São Paulo

Pró-Reitoria de Pesquisa e Pós-Graduação
Universidade Federal de Uberlândia