

Microscopy detection of cytoplasmic lipid droplets (LDs) in leaves of different *Coffea* species



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MATERIAL & METHODS



Fig. 1: An example of observed leaves at the same maturation stage

Mature fresh leaves of six different *Coffea* species (fig.1) coming from plants kept under the same greenhouse conditions were sampled in January 2019. Leaf sections were observed by an optical microscope in their native aspect and after staining with a saturated solution of the Sudan IV dye, a test used to detect oils (Jensen et al., 1962). LD diameters and leaf tissue thickness were measured by the Leica LAS X software.

CONCLUSION

This investigation confirms the presence of LDs in *Coffea* leaves, independently of the observed different foliar anatomy. Coffee leaf physiology could certainly be influenced by this type of oil-reserve system revealed for the first time in several coffee species. Further studies are necessary to clarify the role played by LDs in coffee physiology, including the possible role in plant defense mechanisms against pathogens.

Cytoplasmic lipid droplets (LDs), also known as oil bodies, are the common lipids storage form mainly occurring in seeds of some Angiosperms, including several coffee species (Huang et al., 1996, 2018; Crisafulli et al., 2013). LDs were also detected in leaf tissue of some Angiosperms either as a single body per cell or as a cluster. Their possible functions range from adaptation to cold temperatures and intermediate storage products of photosynthesis (Lersten et al., 2006) to plant defense against fungal infection (Shimada et al., 2015). This preliminary study is aimed at ascertaining the presence of LDs in coffee leaves, in order to deepen the knowledge about coffee leaf anatomy and cell behavior.

INTRODUCTION

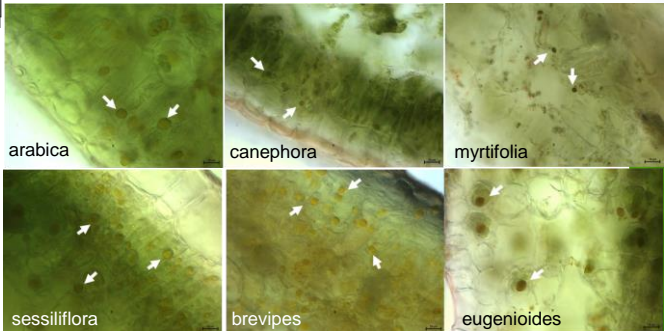


Fig. 2: LDs (white arrows) detected in all investigated coffee species (bars: 10µ)

Fig. 3: presence of LDs in leaf, LDs diameter size and leaf thickness size of 6 species. PP: palisade parenchyma; SP: spongy parenchyma

species	PP	SP	single LD per cell	LDs (2 or +)	LDs size	leaf thickness
<i>arabica</i>	x	x	x		8-10 µ	245 µ
<i>canephora</i>	x	x	x		4-5 µ	250 µ
<i>myrtifolia</i>		x	x	x	1-4 µ	288 µ
<i>sessiliflora</i>	x	x		x	2-7 µ	376 µ
<i>brevipes</i>	x	x		x	2-7 µ	183 µ
<i>eugenioides</i>	x	x	x		2-7 µ	167 µ

RESULTS

LDs were present in all of the six *Coffea* sp. investigated. However different quantity, size and presence in the mesophyll and/or epidermal tissue were observed among species.

LDs were mainly present as single body (1-10 µm, white arrow) in both palisade and spongy parenchyma cells. A maximum size of 10 µm was detected in *C. arabica* leaves. *C. myrtifolia* leaf is characterized by a different organization, having both single ones and clusters of small LDs (1-4 µm), the latter observed only in the spongy parenchyma.