Standardization and optimization of core sampling procedure for carbon isotope analysis in eucalyptus and variation in carbon isotope ratios across species and growth conditions

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Introduction

$\Delta^{13}C$ is a well established surrogate for water use efficiency (WUE). However, variation due to aspect, length of branch and position In canopy can cause potential errors. Hence, experiments were conducted to standardize the sampling procedures for carbon isotope analysis in Eucalyptus.

Methods

Expt 1:
* Cores were taken from periphery to pith in 5 year old trees of Eucalyptus
* Five half sib families of *Eucalyptus grandis* & *E. urophylla* were used
• Cores were further subdivided into 5 fragments representing approximately each year of growth (Fig 1)

Expt 2:
• Core samples made from 3 clones of *E. camaldulensis* and 1 clone of *E. urograndis* grown under well irrigated and rain-fed conditions were used for analysis
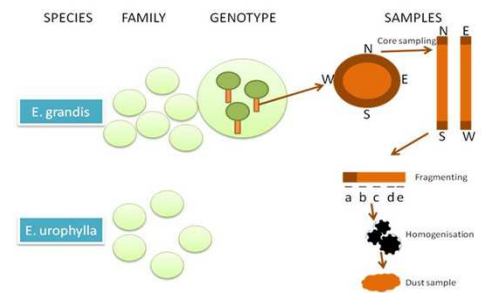• Carbon isotopic ratios were measured using IRMS at UAS, Bangalore

Fig 1: Sampling procedure for $\Delta^{13}C$

Results & Discussion

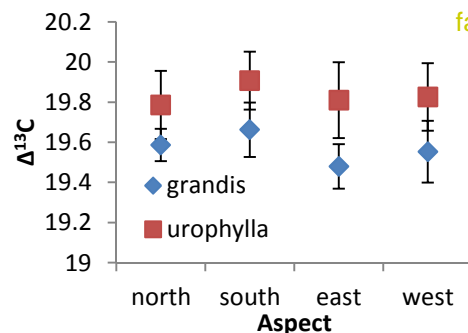* Aspect of cores did not cause variation in $\Delta^{13}C$ (Fig 2)

* Cores taken from north aspect to assess variability in $\Delta^{13}C$ across species, families and genotypes showed significant variability (Table 1 & Fig 3)

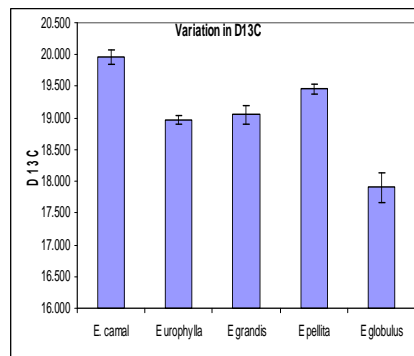**Fig 2: $\Delta^{13}C$ in different aspects**

Fig 3: $\Delta^{13}C$ in different species

Fig 4: $\Delta^{13}C$ in different clones and growth conditions

Table 1: Summary of effects of variables on $\Delta^{13}C$

Variable	N	Level of significance
Species	2	P<0.05
Family within Species	5	p<0.0001
Genotype within Family	3	p<0.0001
Aspect	4	NS
Fragment within Tree	5	p<0.01

• Rain-fed clones had lower $\Delta^{13}C$ than irrigated clones
• Clonal variation observed for $\Delta^{13}C$
• Aspects did not show variation in experiment 2 also

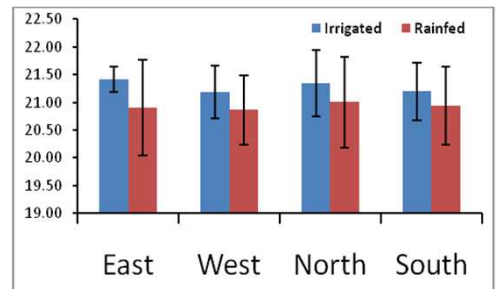**Fig 5: Influence of aspect on $\Delta^{13}C$**

Conclusions

*Standardized appropriate sampling procedures for $\Delta^{13}C$ analysis in Eucalyptus
*Aspect does not influence on $\Delta^{13}C$ values n Eucalyptus
* Species, family, genotype and clonal variation observed for $\Delta^{13}C$ in Eucalyptus

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