

Genetic variability of drought tolerance in *Hevea brasiliensis*: The role of vulnerability to xylem cavitation.

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Introduction

Rubber tree is an important agronomic tree in Thailand mainly in the South where rainfall is abundant. However, the plantation is gradually shifting to marginal rainfall areas in the Northeast and the North due to economical reasons. This shift puts natural rubber production under risk from drought stress. Therefore, growers need drought resistant clone to minimizing the risk from drought.

Tree develops cavitation resistance to tolerate drought stress. The pressure inducing 50% loss of xylem conductivity (P_{50}) is used to quantify level of cavitation resistance.

Aim of this study is to analyze the genetic variability in cavitation resistance of rubber clones.

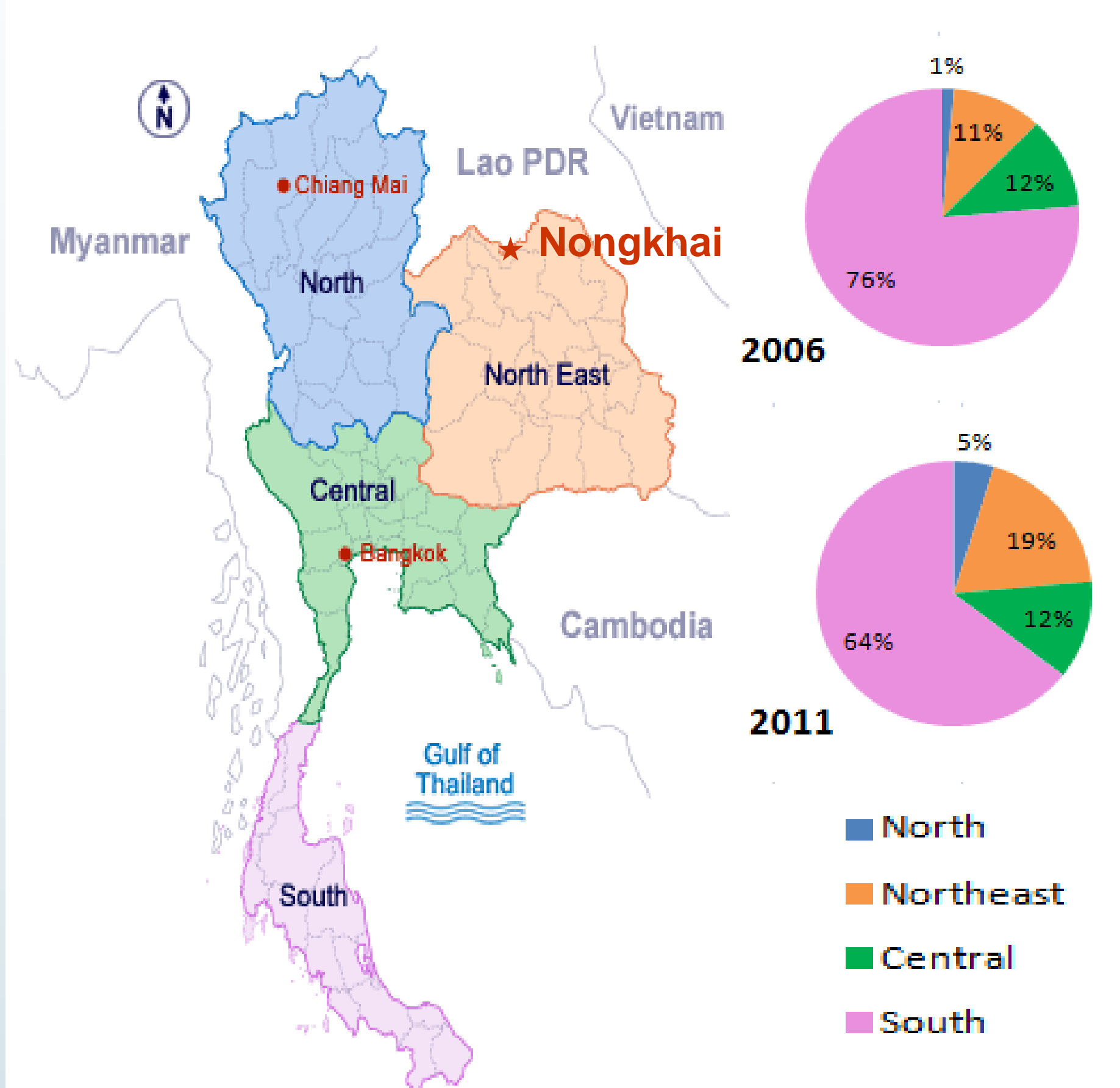


Figure 1: Map of Thailand, different colors represent different departments. The star marked experimental site at NRRC in Nongkhai Province. The pies graphs show percentage of rubber cultivated area when compare 4 departments. The cultivated area found to be increased in the North and the Northeast while decreased in the South.

Materials

Ten rubber clones (BPM 24, PB 217, PB 235, PB 260, PB 5/51, RRII 105, RRII 118, RRIM 600, RRIT 251 and RRIT 408) planted at Nongkhai Rubber Research Center, Thailand were used in the study.



Figure 2: Experimental site. Rubber trees are planted in 0.93 m³ pots, in this figure trees were 14 months old.

Results

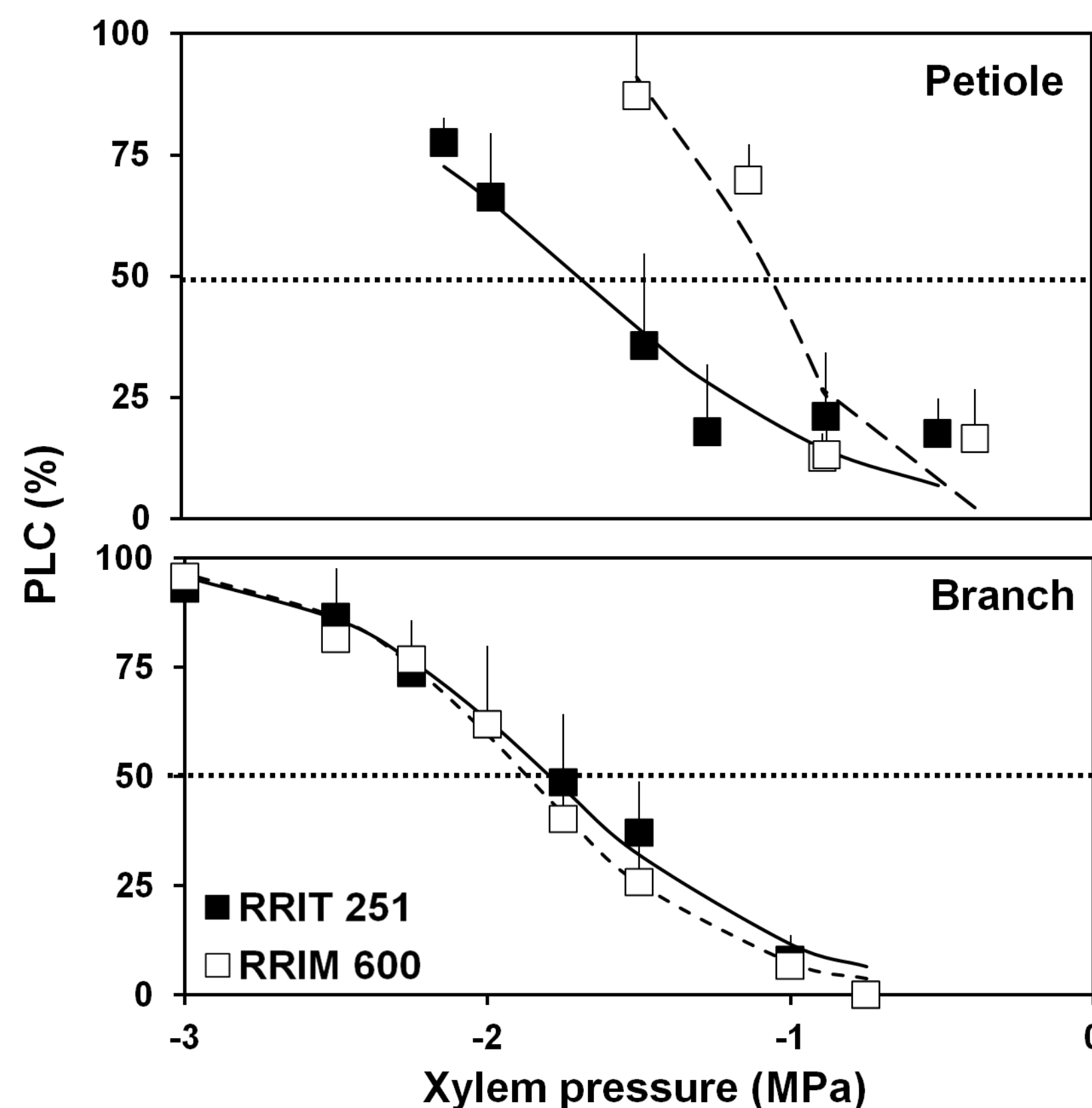


Figure 3: Vulnerability curve (VC) of 2 clones with contrasted P_{50} . Upper panel shows data measured on petiole while lower panel shows data from branch. P_{50} obtained from sigmoidal fitted curve between PLC vs xylem pressure.

Table 1: Rubber clones grouped according to petiole resistance to cavitation. P_{50} values are means of 3 trees with sd in the brackets.

Cavitation resistance	Clone	Petiole P_{50}	Branch P_{50}
+	RRIM 600	-1.15 ^a (0.11)	-1.86 (0.12)
	PB 5/51	-1.16 ^a (0.11)	-1.87 (0.10)
++	PB 235	-1.28 ^{ab} (0.19)	-1.88 (0.13)
	BPM 24	-1.37 ^{ab} (0.10)	-1.85 (0.06)
	PB 260	-1.46 ^{ab} (0.05)	-1.96 (0.16)
	RRII 105	-1.49 ^{ab} (0.05)	-2.02 (0.22)
	RRIT 408	-1.52 ^{ab} (0.25)	-1.73 (0.29)
	PB 217	-1.53 ^{ab} (0.21)	-1.91 (0.08)
	RRII 118	-1.55 ^{ab} (0.15)	-1.89 (0.30)
+++	RRIT 251	-1.65 ^b (0.22)	-1.80 (0.23)

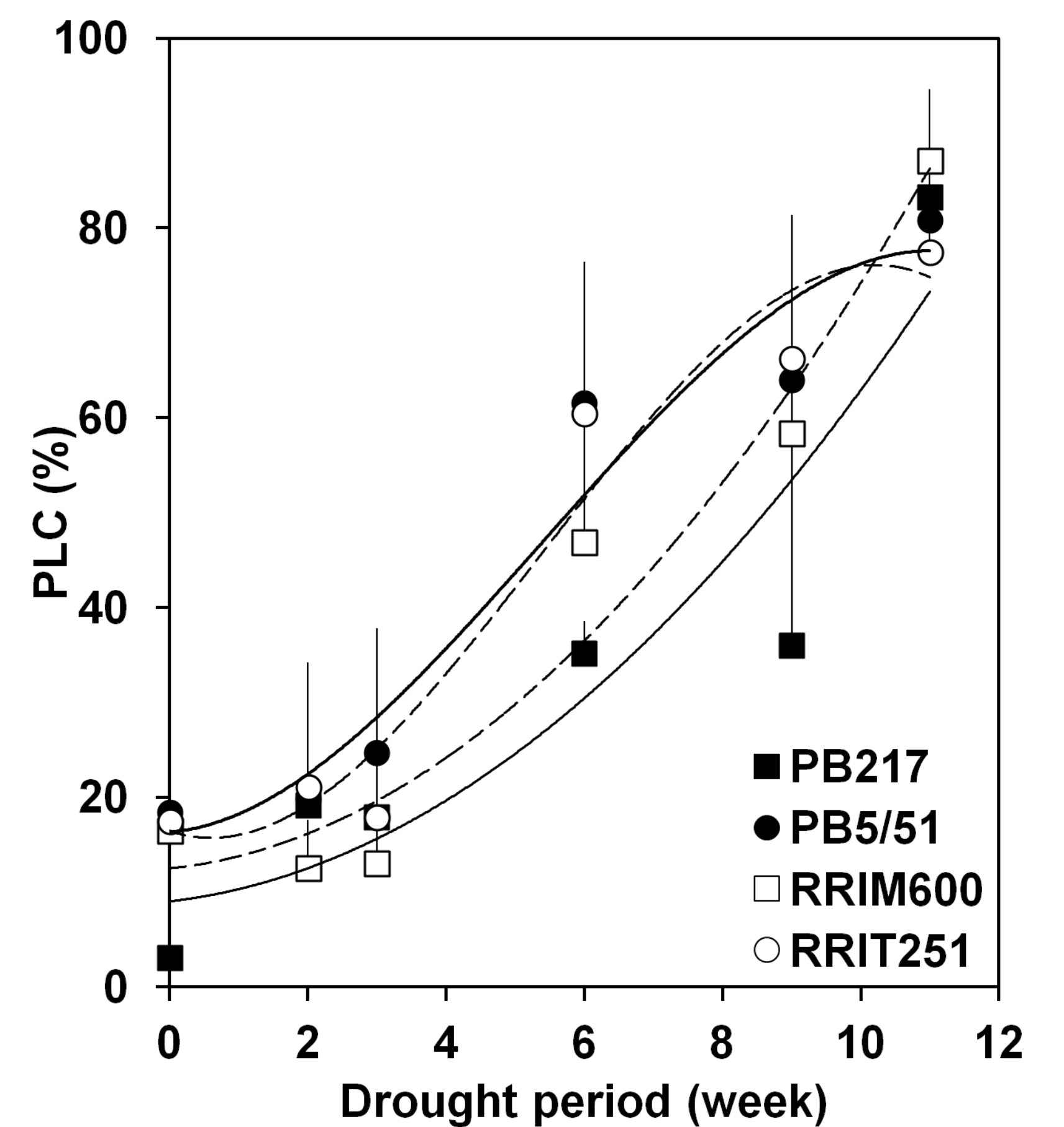


Figure 4: Evolution of embolism level in petiole xylems. Four clones were shown to illustrate difference in progression. Dots are mean values of 3 trees and error bars are sd.

Conclusions

- Petiole was more vulnerable to cavitation than branch, this indicates the segmentation in vulnerability to cavitation.
- Genetic variability in cavitation resistance was observed on petiole of 10 rubber clones but not on branch.
- Differences in embolism rate over time suggests differences in drought resistance.
- Cavitation sensitive clones were not always accumulated xylem embolism faster than the cavitation tolerant clones. Therefore, resistance to cavitation is not only strategy that tree use for coping with drought stress.

References

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