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## Introduction

Sudan is endowed by a great variation on the climatic zones. The Rainfall varies, north to south, from 25 to 700mm. With the great variation on the climatic zones of Sudan, great variations are expected in the wood anatomical properties between and within species. This variation need to be fully explored in order to suggest best uses for the species. Modern research on wood has substantiated that the climatic condition where the species grow, specially water availability, has significant effect in wood properties. Understanding the extent of variability of wood is important because the uses for each kind of wood are related to its characteristics.

The present study is an attempt to investigate the effect of rainfall zones in some wood anatomical properties of *Acacia seyal* var. *seyal* growing in Sudan. For this purpose, twenty healthy trees were collected randomly from two rainfall zones (relatively low rainfall zone of 273mm annually and relatively high rainfall zone of 701mm annually). From each sampled tree, a stem disc was cut at 10% from stem height. One radius was obtained in central stem dices. Samples representing juvenile and mature wood were taken from each disc. The investigated anatomical properties were fibers length, fibers and vessels diameter, lumen diameter and wall thickness.

## Materials and Methods

### Materials:

The wood raw materials were collected from two rainfall zones in Sudan. Each zone was represented by 10 trees collected randomly from 5 natural stands located in two different states. The location and characterization of the study areas are summarised in Figure 1, while sampling procedure is presented in Figure 2.

### Methods:

In order to measure fiber length, Shultze maceration method was adopted to macerate the woody materials into individual cells using a strong agent (nitric acid 65%). A number of 40 fibers length were measured microscopically.

In order to measure fibers and vessels diameter and lumen diameter, wood specimens of 0.5 x 0.5 x 1 cm were softened. Transverse sections of about 10-15 μm thick were prepared with the aid of a GSL1 microtome. A number of 40 fibers and 30 vessels diameter and lumen diameter were measured using ImageJ-software. Both fibers and vessels wall thickness were calculated using the following equation:

$$WT = \frac{D - LD}{2}$$

Where: WT = wall thickness; D = diameter and LD = lumen diameter

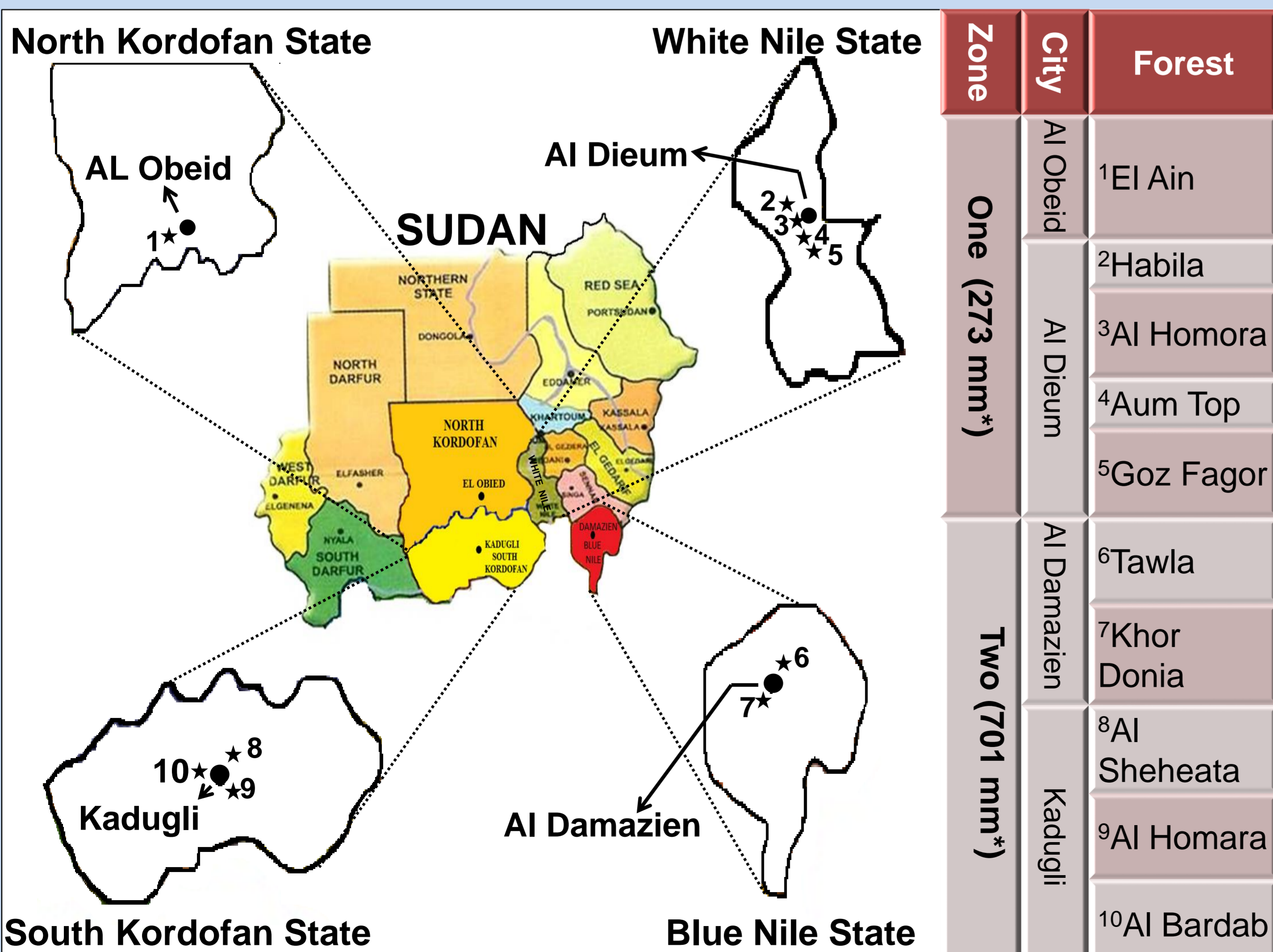


Figure 1: Location and characterization of the study areas (\*= Zone's mean annual rainfall of 10 years from 2000 to 2009)

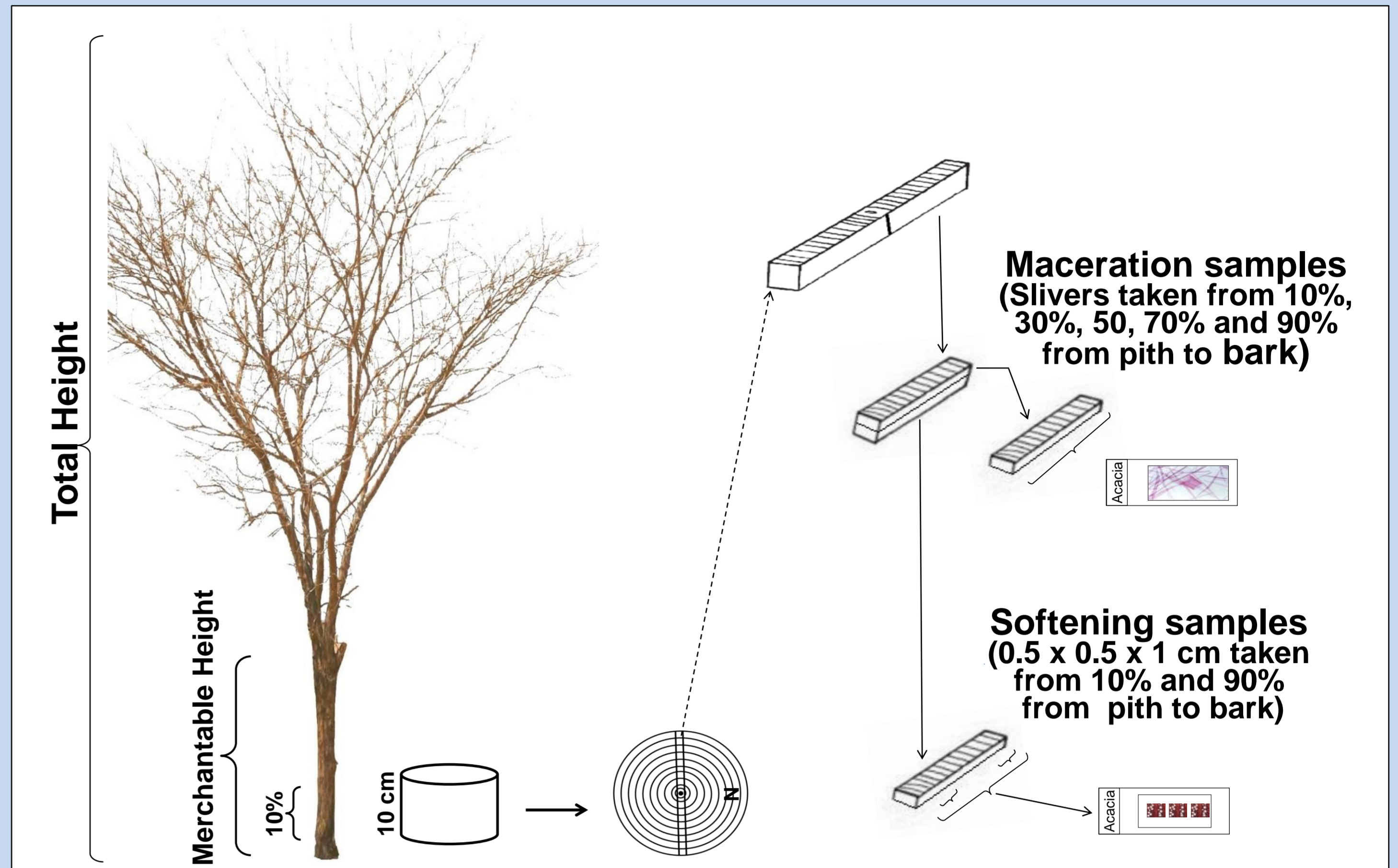


Figure 2: Sampling Procedure

## Results

The study result reveals significant differences between zones in mature wood vessels diameter and wall thickness as well as juvenile wood vessels wall thickness. The higher values were detected in the drier zone. Significant differences were also observed in juvenile wood fibers diameter and wall thickness as well as in mature wood fibers length. Contrary to vessels diameter and wall thickness, the fibers length, diameter as well as wall thickness were decreased in the drier zone. Table 1 and 2 represent the study species fibers and vessels dimensions per zone, while figure 3 summarizes the effect of rainfall zones on the study species anatomical properties.

Table 1: Fibers and vessels dimensions mean values (Means with \* in the same row are significantly different from each other at 0.05 probability level)

Sample	Dimensions	Fibers Dimensions		Vessels Dimensions	
		Mean Values (μm)		Mean Values (μm)	
		Zone1	Zone2	Zone1	Zone2
Juvenile (J)	Diameter	10.08*	10.64*	113.82	113.45
	Lumen diameter	3.72	3.88	96.06	95.69
	Wall thickness	3.11*	3.35*	8.75*	8.40*
Mature (M)	Diameter	10.94	11.16	133.58	127.93
	Lumen diameter	3.56	3.67	112.18	109.75
Mean of J and M	Wall thickness	3.65	3.73	9.98*	9.40*
	Diameter	10.51*	10.90*	123.67	120.69
	Lumen diameter	3.64	3.77	104.13	102.72
	Wall thickness	3.38*	3.54*	9.37*	8.90*

Table 2: Fiber length mean values

Radial Position (%)	Mean Values (mm)	
	Zone1	Zone2
10	1.07	1.08
30	1.25	1.26
50	1.27*	1.32*
70	1.32*	1.35*
90	1.35	1.36
Mean	1.25*	1.27*

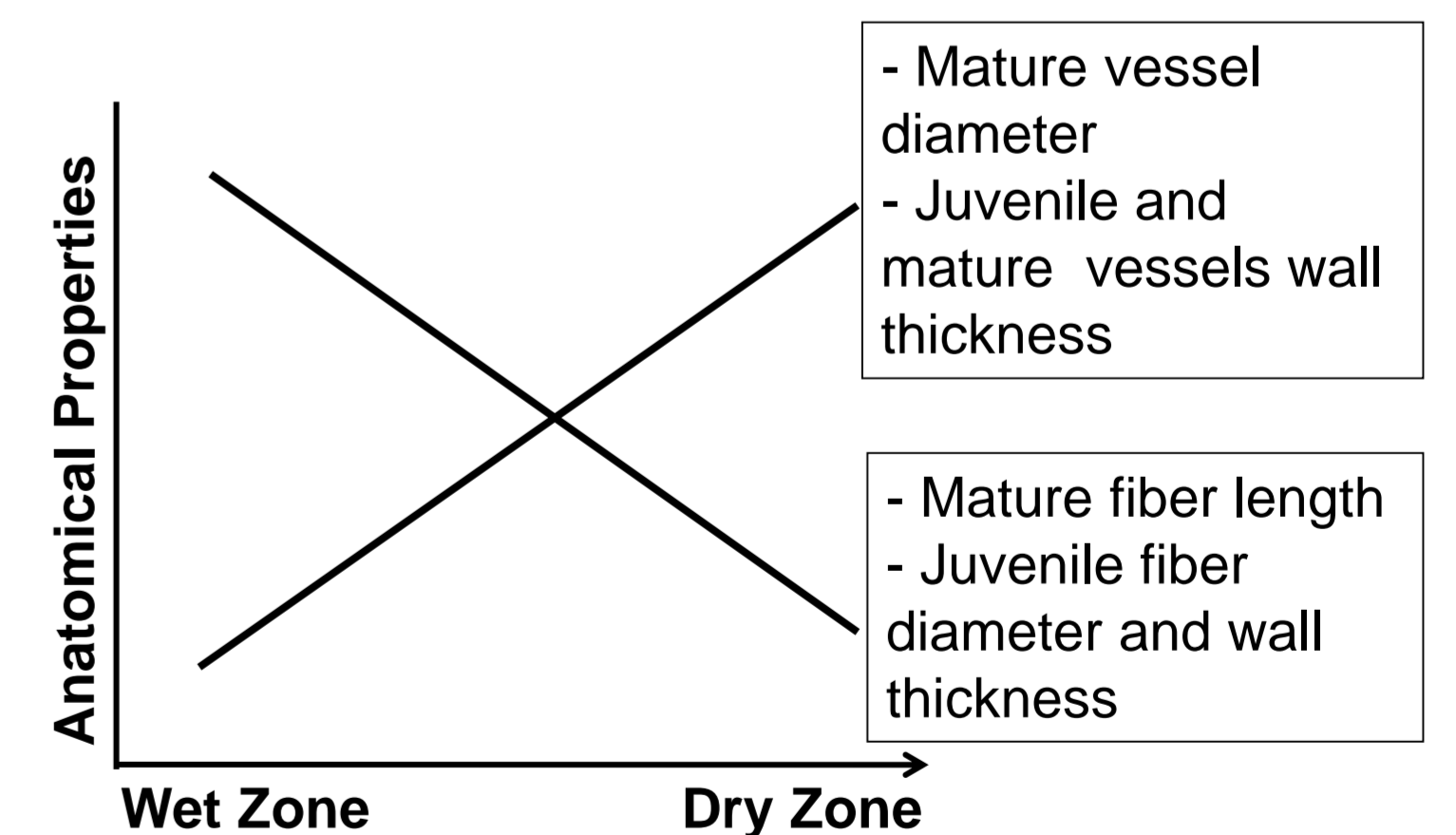


Figure 3: The effect of rainfall zones on the study species anatomical properties

## Conclusion

The result confirms several trends reported in the literature, especially in the decreasing fiber dimensions in the drier zone. The increasing vessels dimensions values in the drier zone versus decreasing fiber dimensions values in the same zone, ensures that each cell has its own mechanism to adapt with the same differences in climatic condition. From these results *Acacia seyal* var. *seyal* seems to be well adapted with the change in rainfall and may survive in any rainfall zone.