Advances in Biological Sciences Research, volume 11
Proceedings of the Joint Symposium on Tropical Studies (JSTS-19)

The Existence of Reaction Wood on Branch of Teak Wood (*Tectona grandis* Linn. F) (*Macroscopical Characteristics*)

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ABSTRACT
This study aims to determine the existence of reaction wood in teak wood branches (*Tectona Grandis Linn. F*) by the colouring method of Chlor Zinc Iodine in the transversal section. The main branch with 4 cm in diameter was cut to the ten parts in sequence, then dropped by the Chlor Zinc Iodine solution in the transverse section and observed under the microscope NIKON SMZ645. The natural wood surface is a light brown that was evenly distributed. But after dropping with chlor zinc iodine, there are changes of colour on the wood surface shown by the presence of spots with blue and dark blue, which indicates the reaction wood in some pieces a branch with a pattern of spots and changes in position. It can be concluded that there is significant existence of reaction wood in branches of teak wood.

Keywords: *Macroscopical characteristic, Reaction Wood, Branches, Chlor zinc iodine, Teak wood.*

1. INTRODUCTION

Wood is a forest product from natural resources and is a raw material that is quickly processed to be used as goods by technological progress. Wood has several properties that can not be replicated by other materials simultaneously [1].

Not all woody trees usually grow. Some experience differences are called abnormalities in wood growth or wood defects. Wood defects that are often found are reaction wood (Reaction Wood). Reaction wood physically has anatomical characteristics that grow specifically from sloping stems or branches, which function to restore the position of its abnormalities to the starting position. This process is formed at any time during tree growth, especially in young trees, because the trunk is still small and flexible and is easily bent or arched by strong winds, snow, shifting land, etc. Disrupting its natural balance will make trees forming a unique network [3]. A wood reaction occurs mostly in the branch compared to the stem. It is because the position of the branch growth is naturally sloping.

This study aimed to determine the presence of reaction wood on the part of the teak (*Tectona grandis* Linn. F) branch through a macroscopic test of drops of Zinc chloride iodine solution in the transverse plane.

2. MATERIAL AND METHOD

2.1. Tools and materials

The tools and materials used in this study are: Zinc Chloride iodine liquid, Stereoscopic microscope Nikon SMZ645, Camera, teak branches

2.2. Research procedure

The stages of activities in this study are:

2.2.1. Preparation of research material

Wood samples used were one branch of the tree branch with a 50 cm length of the stem. Then cut the wood in the radial direction, divided into ten pieces with a thickness of 5cm on each piece, from the branch's base to the end of the unit, indicating the presence of reaction wood.

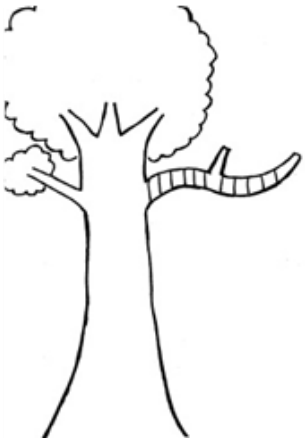

Figure 1 Branch sampling process: Branch section is taken from the base near the stem 50 cm long

The top and bottom of the wood that has been cut were marked (A) for the top and (B) for the base. They were numbered according to the number of samples used.

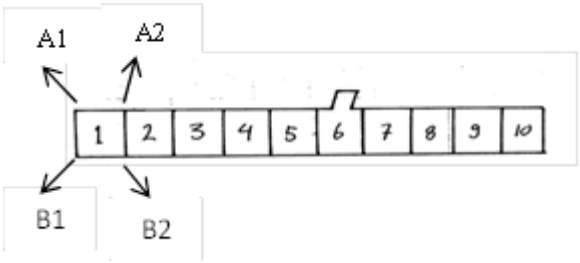

Figure 2 Sample marking process: the part of the wood that has been cut is marked using the code (A1) position of the top first, code (A2) position of the top end, and code (B1) the initial bottom position, code (B2) bottom end position

Smooth the wood surface in the transversal plane to facilitate the observation process. Take photos/pictures of wood surfaces before chemical drops.

2.2.2. Determination of reaction wood samples

Drops Zinc Chloride-iodine in ten smoothed samples in the transversal plane (plane X). Samples with suspected reaction wood will change their color to darker. After dripping with Zinc Chloride-iodine, in the ten sections of the wood (field X) will show a color change reaction. Observe the presence of wood reaction seen by using the *Stereoscopic Microscope Nikon SMZ645.* Take photos/pictures showing the presence of reaction wood. Record changes in the color and position of the reaction wood in each sample.

Figure 3 The process of observing the reaction wood using the *Stereoscopic Microscope Nikon SMZ645*, after dripping with *Zinc Chloride-iodine* liquid

3. RESULT AND DISCUSSION

3.1. Tension Wood

Tension wood is a reaction wood on wide-leaf wood (Hard Wood), which can occur due to the tree's reaction to external stimuli because the usual reason for the formation of wood is due to the tree's slope. Tension wood appears on the upper side of the sloping stem and is considered a physiological response to gravitational forces. The tension wood is actually in a stretch position (pull), which attempts to re-establish the tilted tree. Tension wood can be formed at any time during tree growth, especially in young trees because the trunk is still small and flexible and easy to bend/bend, for example, by wind, snow, ice, changes in light, and others. During the years of tree growth, tension wood can form in juvenile timber and can be spread throughout the stem and not only on one side [2]**.**

3.2. Zinc Chloride iodine drop test

Before dropping the solution

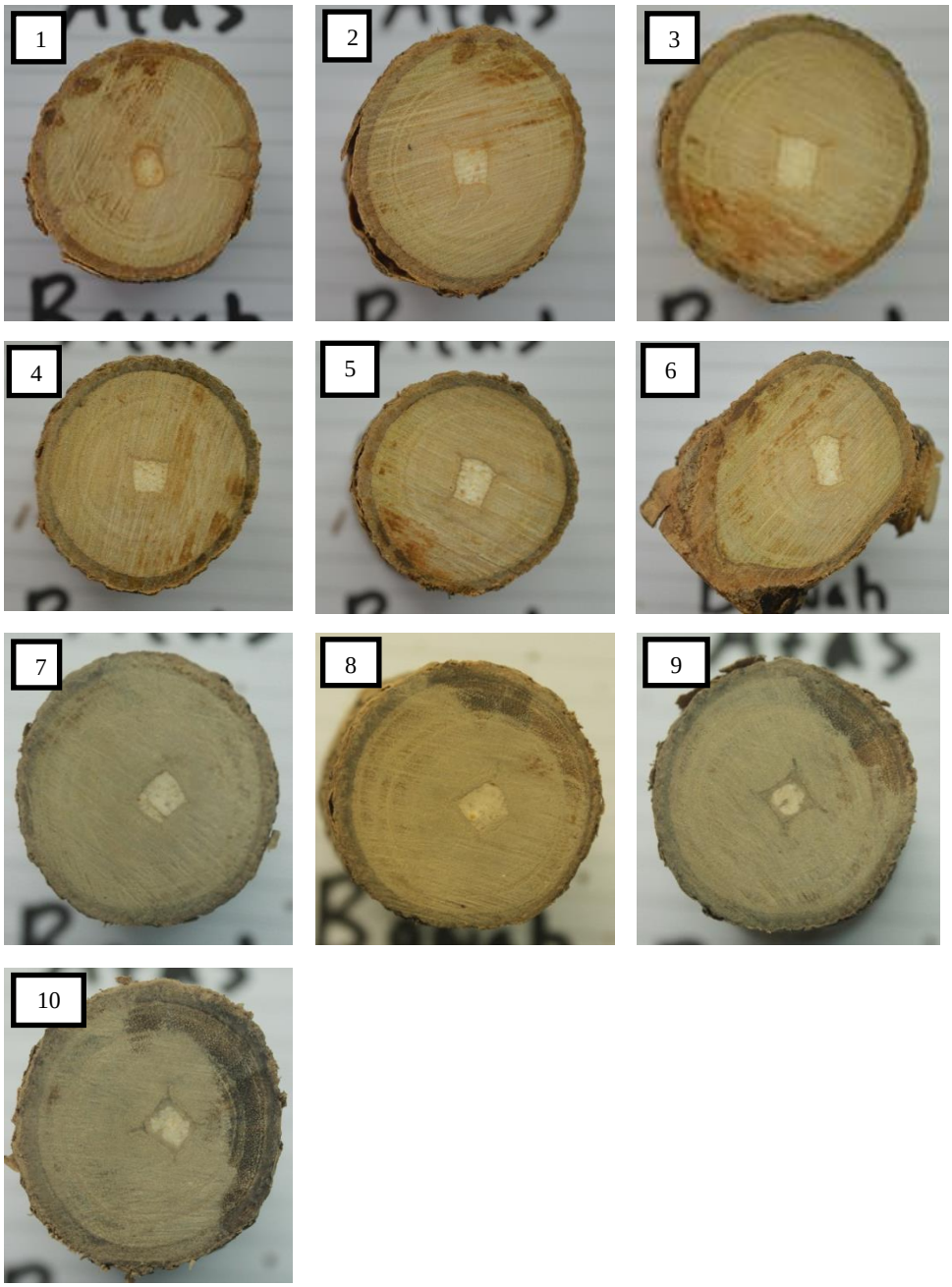

Figure 4 The wood surface in the transverse plane of the ten samples before being given a chemical that shows the same color, which is light brown color evenly

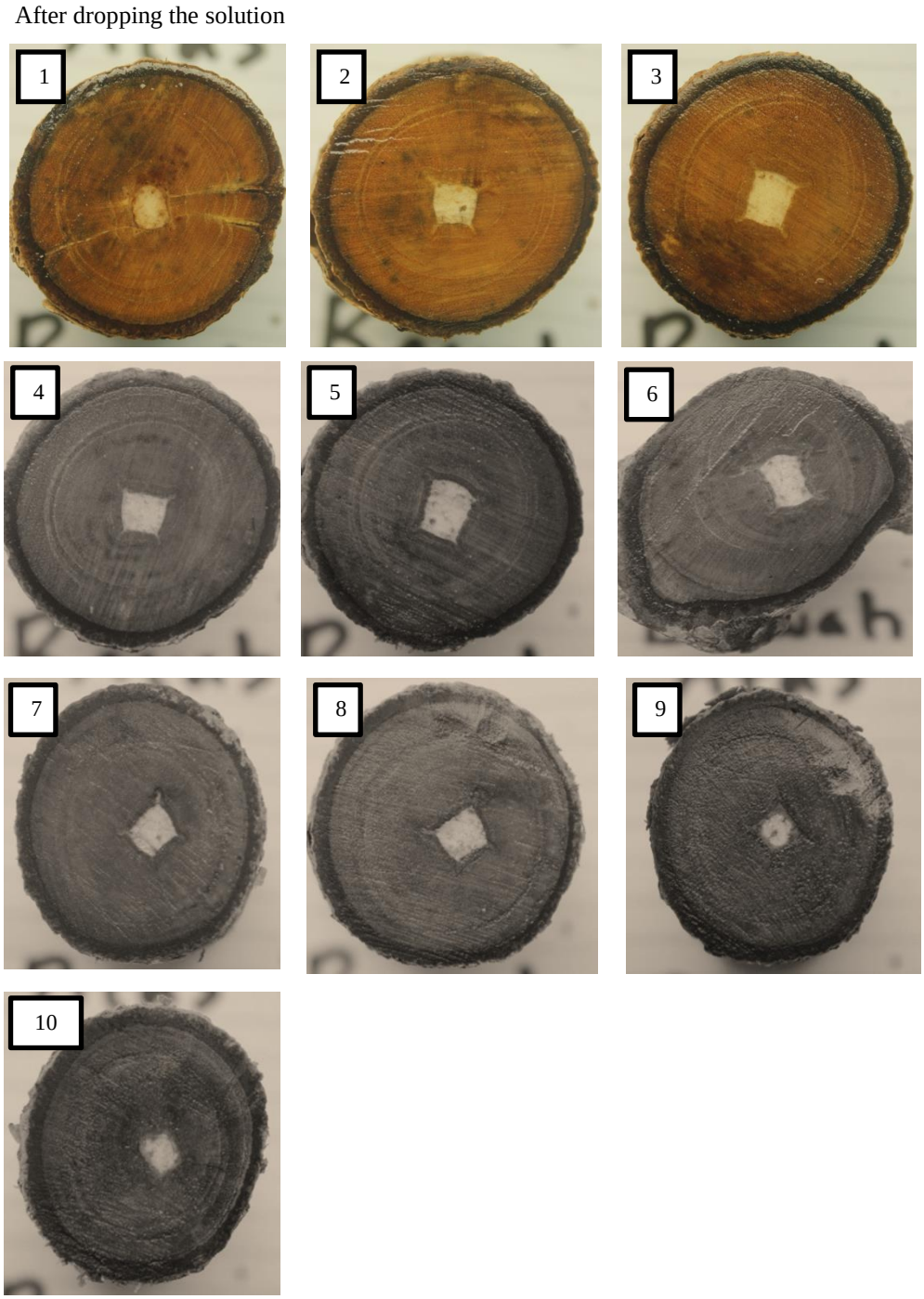

Figure 5 The condition of the wood surface on the transverse plane after the chloride iodine liquid has discolored into dark blue and clearly the color changes become darker, indicating the reaction wood in each piece in the branch that has the shape of a spot-spot pattern and changes in position

Samples No. 1, 2, 3, 6, and 7 are mostly similar due to the presence/position of the reaction wood cells can be seen from top to bottom on the left side. In samples 4 and 5, the position of the reaction wood cells are at the top and the bottom of the wood, with a smaller distribution and formed curved lines on the wood surface's top and bottom. Samples 8 and 9, the position of wood the reaction wood, is on the top at the right side and forming thick curved lines. Sample No 10, the position of reaction wood spread more and irregular on each side. Tension wood modified wood found to the upper side of leaning branches and trunks in most hardwoods [4, 5]. Abnormal growth of the stem usually accompanies it. Like softwood compression wood, hardwood tension wood develops as a reaction response to gravity or possibly stress [6].

CONCLUSION

The presence of reaction wood and its position on each sample showed inconsistently. The first disk (bottom part) is mostly dominated by reaction wood on the top to the left side, but in the next disk, reaction wood appears in the form of spots and diffuse (in various positions). The wind factors could cause the changes in the position of reaction wood in the branches.

ACKNOWLEDGMENTS

We want to thank you to Mrs. Ir. Kusno Yuli Widiati, M.P. for suggestions and valuable discussions regarding research methodology.

REFERENCES

[1] J.F. Dumanauw, Mengenal Kayu, Penerbit KANISIUS: 1, Yogyakarta, 1990.

[2] B. Haygreen, Hasil Hutan dan Ilmu Kayu Suatu Pengantar, Gadjah Mada University Press, Yogyakarta., 1989.

[3] I.K.N. Pandit, S.R. Istie, Ultra-Struktur Kayu Tekan Damar (*Agathis loranthifolia* Salisb.) dalam Hubungannya dengan Sifat Fisis Kayu, J. Tropical Wood Science and Technology 15(1), 2007

[4] A.W. Robards, The effect of gravity on the formation of wood, Science Progress, 57, 1969, pp. 513-32

[5] D.J.B. White, The anatomy of reaction tissues in plants, In: Viewpoints in Biology IV. Ed. J.D. Carthy, C.L. Duggington, Butterworth, London, 1965, pp. 54-82.

[6] J.D. Boyd, Basic cause of differentiation of tension wood and compression wood, Australian Forest Research, 7, 1977, pp. 121-43.