

# Brash Center or "Brittle Heart" - A Common Defect in Philippine Dipterocarps

by

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Brash center or "brittleheart" refers to a defect of a piece of timber which causes it to fail abruptly without splintering. It is synonymous to soft heart, spongy heart or punky heart (7)<sup>2</sup>. This kind of defect lowers the value of timber especially those for export and renders them unfit for many useful purposes. One of the serious adverse effects of brittleheart is the failure of timber in service without warning. Furthermore, in both the plywood and match-making industries brittleheart causes the rejection of large cores (2). Wood considered brashy would also produce paper of inferior quality, considering that broken fibers are comparatively shorter than unbroken ones, hence, paper produced by this kind of fiber is less in strength.

A log with brittleheart is characterized by caroty appearance, torn grain at the end of the log, low density, areas of light-colored heartwood and fuzzy appearance in longitudinal surfaces when planed. Dadswell and Langlands (5) observed in eucalyptus that the boundary between brittleheart and normal wood was not necessarily concentric about the pith, nor was it regular in vertical cross section.

Some theories have been advanced as to the causes of brash center in wood, namely; stresses and heart. Long-term stresses cause failure in longitudinal compression especially with the increase in magnitude as the tree

increases in diameter. Jacobs (6) and Boyd (1) have shown that these stresses are of an order that could cause compression failures of wood in the central portion of the tree. Further test indicated that continued growth and increased stresses cause the expansion of brittleheart into wood of higher density and much greater compressive strength (4, 5). Martley as cited by Burgess (2) added that the greatest internal stresses caused by the weight of the tree in this way could account for only a small proportion of stress required to cause failure. Heart as another cause of brash center, is that center of the tree affected by decay or brittle in the absence of decay. The outstanding characteristic of heart is its brittleness and low impact strength which may be 50 per cent or less than the impact strength of the normal wood (3). Skolmen and Gerhards (9) found also that the toughness values of *Eucalyptus robusta* grown in Hawaii as defined by brash center failure, has but 29 per cent the toughness of normal wood.

Macroscopically, brittleheart could be detected by inspection, knife and splinter tests. Inspection test although not as reliable as the latter tests may be used by careful observation at the end of the log, the difference in color and density. Generally, brittleheart portion is light-colored and low in density including the presence of torn fibers. This method renders it difficult to define the boundary between normal wood and brashy wood because there are instances in which both show no difference in appearance. Knife test is used by lifting up a small sliver. A straight,

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<sup>2</sup> Number in parentheses refers to reference cited at the end of this paper.

clean fracture of the sliver indicates the presence of brittleheart. Breaking of small splinters between fingers reveals also the presence or absence of brash center. Abrupt and clean fracture shows the presence of such defect compared with normal wood which breaks with difficulty thus causing splintering of fibers. Sections prepared from brash wood reveal the presence of compression failures across the fibers (Fig. 1). Broken fibers of macerated wood as observed in a microscope are further evidences of brittleheart (Fig. 2).

In the Philippines, dipterocarp species which constitute about 75 percent of the stand of forest are commonly affected by brittleheart. It prevails at the center, sometimes adjacent to the center of the log particularly at the base or butt-log. In some instances it was found to be most widespread in the upper portions. These observations agree with the finding in some eucalyptus species in Australia (3).

Seventeen dipterocarp species under 6 genera collected from Agusan, Cagayan, Laguna and Quezon provinces were studied as to the occurrence of brash center. Results of the observation including the origin and diameter of these species are shown in table 1. The knife and splinter tests revealed that a great variation in the amount of brittleheart was observed in different species. This difference may be due to the resistance or susceptibility of the species to brittleheart, to geographical location, crown density and exposure of the species to wind. Furthermore, the study of different trees of a single species generally tend to show that the percent of brittleheart is proportional to the diameter. This, however, did not hold true to bagtikan collected from Agusan with 5.96 per cent defect (diameter—65 cm.), and 4.95 per cent (diameter—70 cm.). The average per cent defect of brittleheart in the descending order are as follows: manggasinoro—26.50; mayapis—16.00; tangile—12.77; red lauan—12.76; white lauan—12.10; malapa-

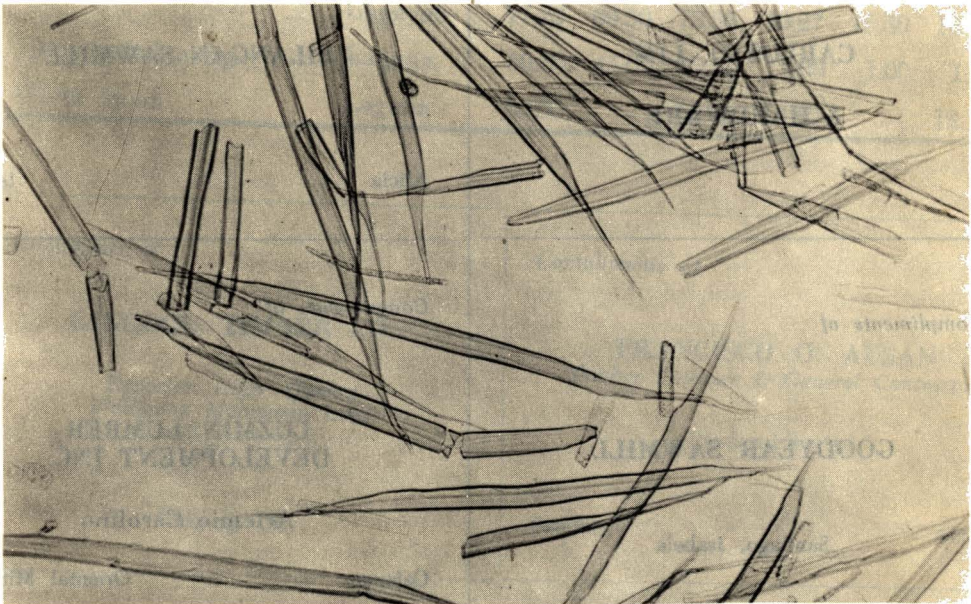
nau—6.59; almon—5.50; bagtikan—5.46; malaanonang—5.16; afu—3.92; manggachapui—3.50; apitong—3.00; broadwinged apitong—1.00; thick-leafed narig—1.00; dagang—0.96; guiyo—0.46; and panau—0.34. Studies of Serevo (8) on northern Mindanao species reveals that the per cent of brittleheart of mayapis, tangile, and white lauan, more or less agree with the present finding of the same species collected from Agusan, Cagayan and Laguna. Previous finding on red lauan, however, by the same author shows that this species from northern Mindanao has higher per cent of defect (15%) than those collected from Cagayan (12.76%) of the same species.

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**FIG. 1.**—*Radial section of tangile (Shorea polysperma (Blanco) Merr.) showing the minute compression failures as evidence of a brash wood or brittleheart.*



**FIG. 2.**—*Macerated brash wood of tangile showing broken fibers.*

TABLE 1.—Data showing the average percentages of brittleheart by splinter and knife test.

| Species                 | Origin  | Diameter (cm.) |       |         | Percent defect |       |         |
|-------------------------|---------|----------------|-------|---------|----------------|-------|---------|
|                         |         | Butt           | Top   | Average | Butt           | Top   | Average |
| 1. Afu                  | Cagayan | 80.20          | 76.80 | 78.50   | 3.14           | 4.70  | 3.92    |
| 2. Almon                | Quezon  | 100.00         | —     | 85.00   | 8.00           | —     | 5.50    |
|                         |         | 70.00          |       |         | 3.00           |       |         |
| 3. Apitong              | Quezon  | 75.00          | —     | 75.00   | 3.00           | —     | 3.00    |
| 4. Bagtikan             | Agusan  | 65.00          | —     | 67.50   | 5.96           | —     | 5.46    |
|                         |         | 70.00          |       |         | 4.95           |       |         |
| 5. Broad-winged apitong | Quezon  | 60.00          | —     | 60.00   | 1.00           | —     | 1.00    |
| 6. Dagang               | Laguna  | 80.00          | —     | 80.00   | 0.96           | —     | 0.96    |
| 7. Guijo                | Laguna  | 55.00          | —     | 55.00   | 0.46           | —     | 0.46    |
| 8. Malaanonang          | Cagayan | 103.30         | 65.60 | 84.45   | 2.45           | 7.87  | 5.16    |
| 9. Malapanau            | Cagayan | 66.75          | 54.55 | 60.65   | 5.47           | 7.71  | 6.59    |
| 10. Manggachapui        | Quezon  | 65.00          | 55.00 | 60.00   | 6.00           | 1.00  | 3.50    |
| 11. Manggasinoro        | Cagayan | 75.20          | 65.90 | 70.55   | 24.21          | 28.90 | 26.50   |
| 12. Mayapis             | Quezon  | 65.00          | —     | 65.00   | 16.00          | —     | 16.00   |
| 13. Panau               | Laguna  | 50.00          | —     | 50.00   | 0.34           | —     | 0.34    |
| 14. Red lauan           | Cagayan | 93.25          | 92.00 | 92.63   | 13.89          | 11.62 | 12.76   |
| 15. Tangile             | Agusan  | 65.00          | —     | 67.50   | 10.88          | —     | 12.25)  |
|                         |         | 70.00          |       | 70.00   | 13.62          |       | 12.77)  |
|                         |         | 77.25          | 69.50 | 73.38   | 10.27          | 16.30 | 13.29)  |
| 16. Thick-leafed narig  | Laguna  | 60.00          | 45.07 | 52.50   | 1.00           | 1.00  | 1.00    |
| 17. White lauan         | Laguna  | 60.00          | —     | 60.00   | 12.10          | —     | 12.10   |

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