

Reading 5.3 - Balsa Wood: An amazing building material

Balsa wood has been the standard material for model airplane construction since it first became readily available in the U.S. in the late 1920s. Its outstanding strength-to-weight ratio enables hobbyists to construct durable models that fly in a totally realistic manner. Balsa also absorbs shock and vibration well.

- WHERE DOES Balsa WOOD COME FROM?
 - Balsa trees grow naturally in the humid rain forests of Central and South America. Its natural range extends south from Guatemala, through Central America, to the north and west coast of South America as far as Bolivia. However, the small country of Ecuador on the western coast of South America, is the primary source of model aircraft grade balsa in the world. Balsa needs a warm climate with plenty of rainfall and good drainage. For that reason, the best stands of balsa usually appear on the high ground between tropical rivers. Ecuador has the ideal geography and climate for growing balsa trees. The scientific name for balsa wood is *ochroma lagopus*. The word balsa itself is Spanish meaning raft, in reference to its excellent floatation qualities. In Ecuador it is known as Boya, meaning buoy.
- HOW DOES Balsa WOOD GROW?
 - There is no such thing as entire forests of balsa trees. They grow singly or in very small, widely scattered groups in the jungle. For hundreds of years, balsa was actually considered a weed tree. They reproduce by growing hundreds of long seed pods, which eventually open up and, with the help of the wind, scatter thousands of new seeds over a large area of the jungle. Each seed is airborne on its own small wisp of down, similar to the way dandelion seeds spread. The seeds eventually fall to the ground and are covered by the litter of the jungle. There they lay and accumulate until one day there is an opening in the jungle canopy large enough for the sun's rays to strike the jungle floor and start the seeds growing. Wherever there is an opening, made either by a farmer or by another tree dying, balsa will spring up as thick as grass. A farmer is often hard put to keep his food plot clear of balsa. As the new balsa trees grow, the strongest will become predominate and the weaker trees will die. By the time they are mature, there may be only one or two balsa trees to an acre of jungle.
- THE PERFECT NURSE!
 - Nature evidently designed the balsa tree to be a "nurse tree" which would protect the slower-growing species of trees from the scorching jungle sun during their critical early years. For instance, in an area of the jungle that has been ravaged by a tropical storm or other natural disaster, the balsa trees will quickly sprout and begin to shoot up to impressive heights in a very short time.
 - Their fast growth, and the extra large leaves they have in their early years, provide shade to the young seedlings of the slower-growing forest giants. By the time the seedlings are established enough to take care of themselves, the balsa tree is beginning to die. Undoubtedly, the balsa tree's rapid growth, fast spreading crown of first very large and gradually smaller leaves, and it's relatively short life span were intended to make it the "perfect nurse" in the jungle ecosystem.
- HOW ARE Balsa TREES HARVESTED?
 - While nature intended the balsa tree to be a short lived nursemaid, mankind eventually discovered that it was an extremely useful resource. The real start of the balsa business was during World War I, when the allies were in need of a plentiful substitute for cork. The only drawback to using balsa was, and still is, the back breaking work that is necessary to get it out of the jungle. Because of the way the individual balsa trees are scattered throughout the jungles, it has never been possible to use mass production logging procedures and equipment.
 - The best way to log balsa trees is to go back to the methods of Paul Bunyan -- chop them down with an axe, haul them to the nearest river by ox team, tie them together into rafts, and then float the rafts of balsa logs down the river to the saw mill. The logging team usually consists of two native Ecuadorians, each armed with a broad Spanish axe, a machete, and a long pole sharpened like a chisel on one end for removing the bark from the downed trees. Because of the hilly terrain, an ox team may only be able to drag two logs to the river per day. At the saw mill the raw balsa is first rough cut into large boards, the carefully kiln dried, and finally packed into bales for shipment to the U.S. via ocean freighter.

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- **WHY IS Balsa WOOD SO LIGHT?**
 - The secret to balsa wood's lightness can only be seen with a microscope. The cells are big and very thin walled, so that the ratio of solid matter to open space is as small as possible. Most woods have gobs of heavy, plastic-like cement, called lignin, holding the cells together. In balsa, lignin is at a minimum. Only about 40% of the volume of a piece of balsa is solid substance. To give a balsa tree the strength it needs to stand in the jungle, nature pumps each balsa cell full of water until they become rigid - like a car tire full of air.
 - Green balsa wood typically contains five times as much water by weight as it has actual wood substance and is extremely heavy, compared to most hardwoods which contain very little water in relation to wood substance. Green balsa wood must therefore be carefully kiln dried to remove most of the water before it can be sold. Kiln drying is a tedious two week process that carefully removes the excess water. Balsa wood that is dried in the sun does not produce high quality wood.
- **IS Balsa THE LIGHTEST WOOD IN THE WORLD?**
 - No! Most people are surprised to hear that botanically, balsa wood is only about the third or fourth lightest wood in the world. However, all the woods which are lighter than balsa are terribly weak and unsuitable for any practical use. The very lightest varieties don't really resemble wood at all, as we commonly think of it, but are more like a tree-like vegetable that grows in rings, similar in texture to an onion. It is not until balsa is reached that there is any sign of real strength combined with lightness.
 - In fact, balsa wood is often considered the strongest wood for its weight in the world. Pound for pound it is stronger in some respects than pine, hickory, or even oak. Balsa, which is really a hardwood, has one of the strongest weight to strength ratios of any wood including the heaviest, ebony. Dried balsa is composed of very thin, barrel shaped, air filled cells. The strength of the wood is derived from the cells as there is almost no liquid in the tissues, but the wood is pure cellulose. About 90% of the cell is space and the remainder is substance.
- from the catalog of Sig Manufacturing Co which manufactures radio controls for the model airplane industry.