Horn Structure Related to Sinking Pattern of Water Caltrop Rhizome

Jittiphalangsri , Prynn (School: Bangkok Christian College)
Oranriksupuk, Pachara (School: Bangkok Christian College)

Water Caltrop (Trapa bicornis), also known as devil pod or bat nut, is an aquatic flora with a unique horn-liked shape rhizome. We were interested in its special structure which appears to affect its sinking while dropping on the riverbed. External shape and internal cell structure alteration have been studied to compare horn scale's transformation in each stage. By comparing the length of the rhizomes at different ages, it is found that 4½ and 6-month-old rhizomes showed highest degree of change in horn size. This can be related to their distribution pattern by always turning their right horn to the ground. Best chance of germination can be achieved at all angles of projectile (30, 45 and 60 degrees) of which the rhizomes have been launched to the riverbed. It appears that the key behind the special sinking characteristic is its center of gravity which is closer to the right horn. In addition, the drag force experienced by the right horn which is lower than the left side may also play an important role. Seed ball cultivation is a method for distributing seeds by encasing them in soil materials. The seed balls can be thrown by hand, spatter, catapult, or slingshot into hard to reach areas. In this study, seed balls with round and horn-like shape imitating the water caltrop rhizome were made in order to compare their landing accuracy and germination rates. It was found that the horn-like seed ball has lower bounce distance and is at 100% accuracy compared to the round ones. Also, out of the 6 possible directions of body side, these horn-like seed balls mostly hit the ground with one specific side at approximately 32%.

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