

Genetic Mutation in Mangroves

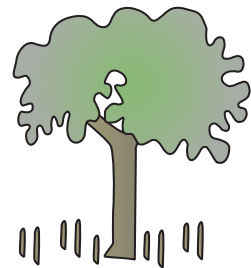
Petroleum hydrocarbons linked to genetic decline

Lloyd Godson BSc (Hons) Completed June 2002



Genetic mutations in mangrove trees have been correlated with petroleum oil concentrations in tidal sediments. This mutation is recognised as 'albino' propagules attached to parent trees, ie. propagules ('fruits') which lack chlorophyll and normal green colouration, leaving them yellow, orange or red (see picture, left). They may become established and grow leaves but they die once seedling reserves are depleted. For this reason, this abnormality is lethal, and its frequency in the community is seen as a measure of genetic deterioration. The planthouse study investigated whether the presence of albinos is due to toxic damage in the genetic makeup of plants, or if contaminated soils favour the mutant carrier trees.

Mangrove Species Tested



Avicennia marina

Mutations have been observed in a number of mangrove species world-wide. In Moreton Bay, *Avicennia marina* is the dominant mangrove species and it commonly bears albino propagules. There is a significant correlation between the frequency of albino-bearing trees and concentrations of polycyclic aromatic hydrocarbons (PAH's) in tidal sediments.

Methods

Avicennia marina seedlings from both normal ('wildtype') and mutant ('heterozygous') carrier trees were used. Seedlings were treated with various petroleum products, including Unleaded fuel, Dubai Crude and Jackson Crude. Plant growth (height, leaf production and mortality rates) and photosynthetic efficiency measurements were taken.



Albino, heterozygous and wildtype seedlings were grown from propagules

Recording data on seedling health

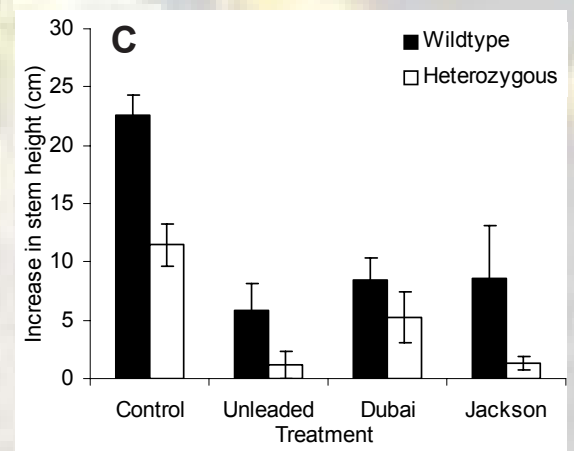
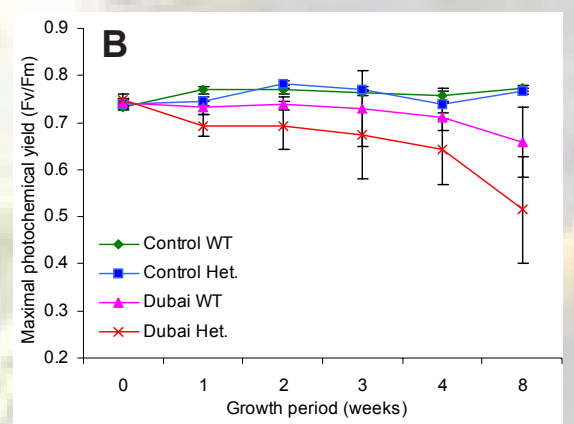
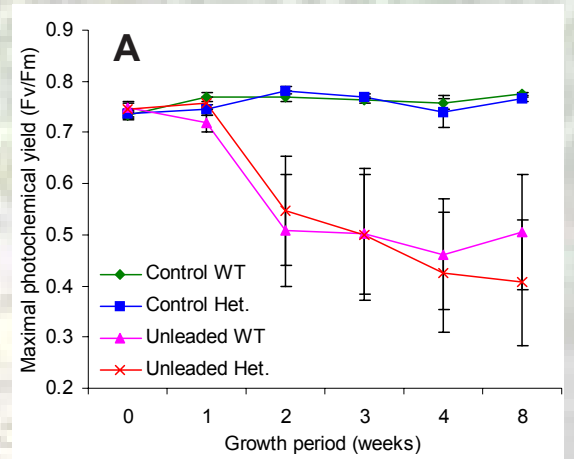


Outcomes



Effects of oil pollution on *Avicennia marina* seedlings

The Unleaded fuel and Jackson Crude had the most rapid and significant effect on seedling stem height, photosynthesis and mortality. Response of mangroves to oil is not only substance and concentration-specific, but also appears to be genotype specific. The 'heterozygous' seedlings have a disadvantage in oiled sediments than the 'wild type' seedlings. The oiled sediments did not favour the survival of heterozygous seedlings, suggesting that the petroleum is causing the genetic mutation. Studies such as this are vital, as the implications of petroleum hydrocarbon pollution are not limited to Moreton Bay, or mangroves alone, and much is still to be discovered and understood.



Photosynthetic efficiency of *Avicennia marina* wildtype (WT) and Heterozygous (Het) seedlings treated with (A) Unleaded and (B) Dubai Crude. (C) Increase in stem height over 8 weeks of treatment.

