



Using Rainforest Research

Dust from walking tracks: Impacts on rainforest leaves and epiphylls

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Dust on rainforest leaves?

It is well known that the vegetation along unsealed roads through the rainforest may become completely coated in dust, or soil particles. However even along walking tracks in frequently visited National Parks, leaves suffer from the accumulation of dust, particularly during the dry season.

In her PhD studies, Rainforest CRC student Pia Anthony looked at the dust on leaves along the walking trail in Mossman Gorge National Park. This is one of the most popular rainforest walks in north Queensland, with visitor numbers estimated at up to 1000 people per day during the peak tourist season. Since most of the track is unsealed bare soil dust is constantly raised by the heavy walking traffic. The subsequent film of dust on the leaves is usually obvious to the naked eye.



Tourists on the walking track through Mossman Gorge National Park (photo: Pia Anthony)

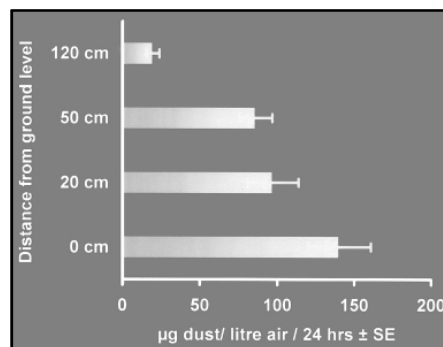
Dust concentrations in the air and on the leaves themselves were measured by two different methods:

- by using air pumps to estimate the amount of dust raised from the track, and
- by measuring the dust deposited on the leaves after washing off the dust.

Dust levels on leaves were compared for sections of the walking track, tree-fall gaps and undisturbed understorey sites during two wet and two dry seasons.

Where, when and how much dust?

Both methods showed that dust concentrations were ten times higher along the walking track than in the under-storey and tree-fall gaps. As expected, levels of dust were much lower during the wet season because the track itself generally remains moist, therefore creating little dust.

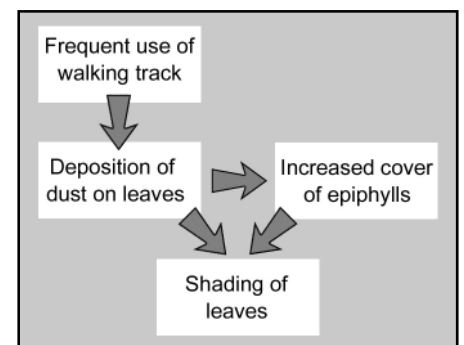


Dust levels along the walking track in Mossman Gorge National Park measured using air pumps during the dry season. Values are means of three pumps per height at three sections along the walking trail.

Most of the accumulated dust is washed off during heavy rainfalls, although smaller dust particles often stick to the cuticle - the waxy coating on the leaf surface. The highest concentrations of dust occurred at ground level, and then gradually diminished with height. The same was found with the size of dust particles, with larger particles occurring on leaves closer to ground level. The plants on the forest floor are obviously the ones most susceptible to the accumulation of dust on their leaves.

What does this mean for plants?

This layer of dust is likely to directly stress the plants by shading the leaves. Previous studies have shown that shading by dust can cause about a 20% reduction in leaf photosynthesis. Fine dust particles have also been reported to clog up stomata. These are the openings in the leaf that allow gas exchange during photosynthesis and their blockage is also likely to lead to a reduction in plant performance.



Outline of effects of dust on epiphylls and leaves from frequent use of walking tracks

Providing science for the conservation and management of Australia's World Heritage tropical rainforests.



COOPERATIVE RESEARCH CENTRE
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The Rainforest CRC is a research partnership involving the Commonwealth and Queensland State governments, the Wet Tropics Management Authority, the tourism industry, Aboriginal groups, CSIRO, James Cook University, Griffith University and The University of Queensland

Dust may indirectly have adverse effects on leaves by encouraging the growth of epiphylls. These are minute plants, such as lichens, liverworts and mosses that grow on leaf surfaces.

Because epiphylls receive nutrients from the air and rain, their growth can be stimulated by nutrients in the dust. Nutrient analyses of the dust showed nitrogen levels of $25 \pm 1 \mu\text{g}/\text{mg}$ dust and phosphorous concentrations of $7 \pm 1 \mu\text{g}/\text{mg}$ dust.

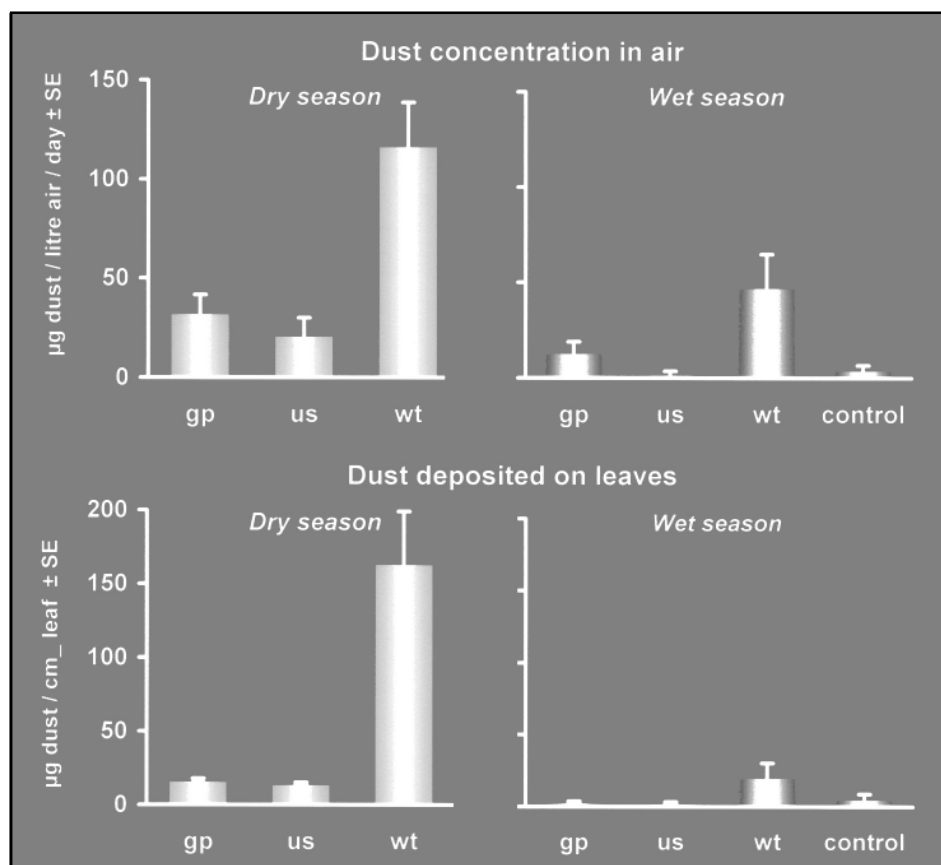


Epiphylls on a rainforest leaf surface (photo: Pia Anthony)

Pia found that the cover of epiphylls is twice as high on leaves in the walking track than in undisturbed understorey and tree-fall gaps. This correlates with the higher levels of dust. Epiphylls generally absorb 50% of light available for photosynthesis, thus significantly shading their host leaves.

Reducing the dust load

The construction of boardwalks protects rainforest plants from dust-induced stress. These especially reduce disturbance in 'high traffic areas' such as pathways to swimming holes and car parking areas. Around the world, boardwalks are widely used to avoid trampling and stressing of vegetation in National Parks and other sensitive areas. Within the Wet Tropics World Heritage Area, their construction also helps in reducing the effects of dust pollution on rainforest plants. Other path hardening methods, such as gravel and bitumen can also reduce the dust load where construction costs must be kept to a minimum.



Dust concentration in air and deposition of dust on leaves in tree-fall gaps (gp), understorey (us) and walking track sections (wt) in Mossman Gorge National Park during the dry and wet seasons. Newly unfolded leaves were used as controls.

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You can read more about epiphylls in 'Miniature gardens on rainforest leaves – a guide to common epiphylls in the Wet Tropics', a brochure compiled by PiaAnthony, Andi Cairns and Betsy Jackes, available on request from the Rainforest CRC.

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