

FLORA

AFTER thirteen years of work, a team of Western Australian scientists has finally identified the molecule in smoke, which promotes seed germination. Out of the 4000 or so molecules formed when plant material burns, the team whittled the possibilities down to three and then, at last, to one! The findings of this world-first discovery were published in the prestigious international journal *Science* on the July 8th 2004. The team consists of botanists from Kings Park in collaboration with chemists from The University of Western Australia and Murdoch University.

For hundreds of years, African tribes have used smoke to improve germination of red rice and maize. 15 years ago South African botanists used bush smoke, derived from burning plant material, to promote the germination of wildflower seeds. On hearing about this, Kings Park started to study the effect of smoke in the WA environment. Although some of the top laboratories in the world have also researched the action of smoke in germination, the identity of the active agent(s) has, until now, remained elusive.

The team discovered a chemical, a unique butenolide, which induces germination in a broad range of wildflower, bushland and agricultural species from Australia and around the world, including celery, parsley and echinacea. Important agricultural weeds such as rye grass and wild oats also respond

Australian Scientists Make World First Discovery in Seed Germination

Kingsley Dixon

to the chemical, possibly heralding a new and effective method to control weeds in agriculture by stimulating germination of dormant seed banks prior to other treatments. The chemical induces earlier and more synchronized germination with likely benefits for agricultural industries particularly in marginal cropping regions.

We also found that the compound is active at extraordinarily low levels, parts per trillion concentrations. These concentrations are some of the lowest recorded in biology and agriculture and indicate that the chemical is likely to have wide acceptance as a naturally occurring substance that is safe to use.

For weed control and in land restoration industries in Australia and overseas, the potency of the chemical is so great that it equates to about 1 gram (quarter of a teaspoon!) per hectare. For restoration activities, particularly bushland, the discovery has potential

to be of great value in improving germination from dormant seed banks without resort to burning.

This discovery represents one of the most significant advances in seed science with benefits in the natural, agricultural, conservation and restoration sciences while providing a new and exciting method for scientists to understand the role of wildfires in the world's ecosystems and biodiversity.

Research is now focused on safety testing, as well as investigating the mode of action of the molecule in native and agricultural species worldwide. Key research linkages and partnerships are presently being formed and hopefully urgently needed funding will retain much of the scientific work here in Western Australia.

The discovery team comprised Dr Kingsley Dixon, Associate Professor Emilio Ghisalberti and PhD student Gavin Flematti of the University of Western Australia and Associate Professor Robert Trengove of Murdoch University. But in addition numerous other people have worked on the topic of smoke-induced germination, including at least eight local students who undertook Honours, Masters or PhD theses. Truly a cooperative effort.

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