Food-flavouring smoke extracts promote seed germination

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Aqueous extracts of plant-derived smoke promote seed germination. Two commercial smoke food flavourants were tested for their ability to stimulate seed germination. Both extracts promoted germination of light-sensitive Grand Rapids lettuce seeds. One commercial food flavourant, Smoke Liquid Concentrate 94725, and an aqueous smoke extract of Themeda triandra were subjected to bioassay-guided fractionation. Purification steps included semi-preparative HPLC, two TLC systems and analytical HPLC. Each purification step was monitored using the lettuce seed bioassay and biologically active fractions were pooled for further fractionation. After each step, biological activity was found in the same fractions for both the commercial smoke extract and the T. triandra extract, indicating that they possibly contain the same active compound(s).

Keywords: Food flavouring, fractionation, seed germination, smoke extract.

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Smoke and aqueous smoke extracts have been shown to stimulate seed germination in both fire-dependent (De Lange & Boucher 1990; Baxter et al. 1994; Brown 1993; Brown et al. 1993) and non-fire-dependent plant species (Drewes et al. 1995; Thomas & van Staden 1995). The use of smoke extracts may therefore find a wide application both commercially and in conservation of difficult-to-germinate species. It is at present not known what the active compound(s) in smoke is, nor is the mechanism known by which smoke acts. It has been suggested that the activity of smoke is due to the presence of ammonia or ethylene (van der Venter & Estherhuizen 1988), or to organic acid (Suttlecliffe & Whitehead 1995), but studies using light-sensitive lettuce seeds have indicated that neither of these compounds can account for the promoting effect of smoke extracts on lettuce seed germination (van Staden et al. 1995c, Jäger et al. 1996a).

It has previously been shown that almost all aqueous smoke extracts generated from a wide range of plant species promoted germination of Themeda triandra seeds (Baxter et al. 1995). In this communication we investigated the effects of commercial smoke extracts used as food flavourants on the germination of light-sensitive lettuce seed.

Two commercial food flavourants, Smoke Liquid Flavor 94275 (SLF 94275) and pyrrolignous acid ex-eucalyptus wood 621053, were obtained from Haarmen and Reimer SA Pty Ltd. A dilution series of each extract was assayed using the Grand Rapids lettuce seed bioassay (Drewes et al. 1995) to test its ability to promote seed germination. The ex-eucalyptus 621053 extract promoted seed germination at dilutions of 1:10000 to 1: 100000 and the SLF 94275 extract at dilutions of 1:100 000 to 1:1 000 000 (Figure 1). Both extracts showed inhibition of germination at high concentrations (1:1 000 dilution). This is in agreement with the work of Drewes et al. (1995) and van Staden et al. (1995b) who found that aqueous smoke extract of Themeda triandra was inhibitory in high concentrations, but promoted seed germination at more dilute concentrations.

The SLF 94275 extract was purified by bioassay-guided frac-
Concentrate 94275.

Figure 1 Germination of Grand Rapids lettuce seeds following application of a series of dilutions of (A) Smoke Liquid Concentrate 94725 and (B) pyrolygenous acid ex-eucalyptus wood 621053 extract. Control germination (as in Figure 1) was 15.2 ± 7.2%.

Figure 2 Germination of Grand Rapids lettuce seeds following application of fractions derived by analytical HPLC of Smoke Liquid Concentrate 94275. One μl (a) and 10 μl (c) of HPLC fractions were tested. Control germination (as in Figure 1) was 15.2 ± 7.2%.

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References


