Aerobic methane emission from plant: comparative study of different communities and plant species of alpine meadow

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INTRODUCTION

Methane is the second most prevalent anthropogenic trace greenhouse gas in the atmosphere, with carbon dioxide being the most prevalent. The mixing ratio of methane is more than twice the pre-industrial level. The atmospheric concentration has reached approximately 1800 ppb in recent years (Forster et al. 2007), and increasing at a yearly rate of 1.1% since the pre-industrial era (Zhou et al. 2004). Atmospheric methane comes from diverse sources, including biomass burning (Crutzen and Andreae 1990, Andreae and Merlet 2001), emissions from the earth's crust (Etiopé and Klusman 2002), ruminants (Ghyczy et al. 2003, 2008), rice paddies (Inubushi et al. 1989), and coal mines (Krüger et al. 2008). Keppler et al. (2006) reported aerobic methane emission from plants, although this finding has been questioned as the evidence was conflicting and the mechanism was uncertain. Clearly, the contribution of this putative source of atmospheric methane to the global methane budget cannot be quantitatively assessed at present.

A review of the literature reveals conflicting reports as to whether or not plants emit methane. Dueck et al. (2007) attempted unsuccessfully to reproduce the original result of Keppler et al. (2006). No substantial emission under aerobic conditions was detected by Beerling et al. (2008), although it was detected by several other workers using a variety of methods. Emission of methane under aerobic conditions in the laboratory (Wang et al. 2007) and in the field (Carmo et al. 2006, Crutzen et al. 2006, Sanhueza and Donoso 2006, Sinha et al. 2007; Cao et al. 2008) was observed. Emission was also detected with isotope signature analysis