

Releasing Seed Dormancy with Oxygen Concentrated by Medical Equipment

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Introduction

Medical-style oxygen concentrators are useful for releasing seed dormancy, including dormancy of some crop wild relatives. The effectiveness of concentrated oxygen for releasing dormancy was documented by 1914 (Shull), but was cumbersome to implement before equipment was available to deliver concentrated oxygen easily (Brenner et al., 2015).

Concentrated oxygen is effective for releasing seed dormancy of some plants. The phenomena is reviewed by Bewley and Black (1994) and Corbineau and Côme (1995). Dekker and Hargrove (2002) found it effective with giant foxtail *Setaria faberi*, and proposed that in nature, oxygen-rich water carries dissolved oxygen through the giant foxtail placental pore to the embryo, initiating germination. The dormancy releasing effect of concentrated oxygen is widespread but not universal, for example it was not observed with seeds of switchgrass (*Panicum virgatum* L.) (Duclos et al., 2013). A survey of many plant specie's germination response to oxygen would be helpful. Medical oxygen concentrating equipment for home use has been in use since 1973, and many models are now available (McCoy, 2013). These machines will safely, and easily provide concentrated oxygen for seed germination.

Demonstration of concentrated oxygen for releasing seed dormancy

Following development of methods, we demonstrated the effectiveness of concentrated oxygen with three *Setaria* seed lots. Germination chambers were 45 by 57 cm polyethylene and nylon airtight sealable bags sold in local stores for home use, and traditional plastic 14 by 14 by 3 cm germination boxes. The oxygen was provided by a medical oxygen concentrator that was purchased for \$500 in used condition. Concentrator functioning was verified by a local medical supplies vendor, the output equilibrated at 96.3% oxygen gas. For the control treatment, an aquarium air pump was used to fill the chambers. The chambers were inflated through standard 4.76-mm interior diameter medical tubing from the concentrator and into the bag's mouth. After the chambers were inflated, the tubes were withdrawn quickly and the chambers were sealed for the 8 day duration of the experiment within a 20/30 °C germinator.



Filling a plastic bag with concentrated oxygen

Treatments	Rep.	<i>Setaria</i> seed lots		
		PI 509035	PI 669940	DB 2013006
		Germination/100 seeds		
Germination boxes traditional	1	26	13	23
	2	9	9	23
Ambient air in sealed chambers	1	15	13	23
	2	15	14	33
Oxygen in sealed chambers	1	41	29	49
	2	54	40	47

Significantly increased germinations occurred with concentrated oxygen. A statistical analysis of these data is presented in Brenner et al (2015).



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