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Feasibility of re-using PETE soda bottles to exclude oxygen during storage of low moisture foods

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PETE bottles for anaerobic long term storage...

Food Microbiology and Safety **Sensory and Food Quality**

Abstract: Many consumers are beginning to store grain on their own creating a need for easy disinfestation methods that can be accomplished in the home. Oxygen deprivation has proven to be an effective method for grain disinfestation when kept below 1% for 12 days. Re-using PETE soda bottles is an easy way many consumers can store their grains. The purpose of this study was to determine if using oxygen absorber packets in used PETE soda bottles will keep the oxygen percent low enough to disinfest the grain stored in them. Experiments were carried out to determine how long oxygen absorber packets could keep the oxygen level below 1% to disinfest grain. It was determined that low moisture foods can be stored in re-used sealed PETE bottles containing oxygen absorber packets for at least a year without any appreciable increase in oxygen at a level low enough to accomplish disinfestations.

Keywords: Long term storage, PETE soda bottles, Oxygen deprivation, Disinfestation

Practical Application:

Oxygen absorber packets are a practical method for the disinfestation of grain stored in PETE bottles for long term storage.

Introduction

Various recommendations exist regarding the feasibility of reusing food grade plastic containers for long-term storage of low moisture foods including wheat, rice and beans. Oxygen levels below 1% for 12 days will disinfest grains (Tarr and Clingeffer 2005; Gilberg and Roach 1993). The shelf life of many dried foods can be prolonged by the absence of oxygen. The objective of this study was to determine if used polyethylene terephthalate (PETE) soda bottles containing an oxygen absorber packet would maintain low headspace oxygen during one year of storage at room temperature.

Materials and Methods

Clear plastic 2 liter bottles of soda were purchased at a local grocery store and the soda removed. The bottles and lids were washed with soap and air-dried. Bottles were randomly assigned to one of three treatments, as shown in Table 1. Treatment 1 consisted of bottles containing an Ageless[®] ZPT300 oxygen absorber packet (Mitsubishi

Gas Chemical America, Inc., New York, New York, USA) and filled with 1500 g of wheat. These oxygen absorber packets are activated by the moisture in the air. Treatment 2 was bottles containing only an oxygen absorber packet, i.e., no wheat was added. Treatment 3 (control) was bottles filled with 1500 g of wheat, but no oxygen absorber packet. All three treatments were stored at room temperature for various lengths of time up to one year.

The oxygen content of the bottle headspace was measured using an Illinois Instruments 3500 oxygen analyzer with syringe and needle at the times shown in Table 1.

Table 1. Experimental design.

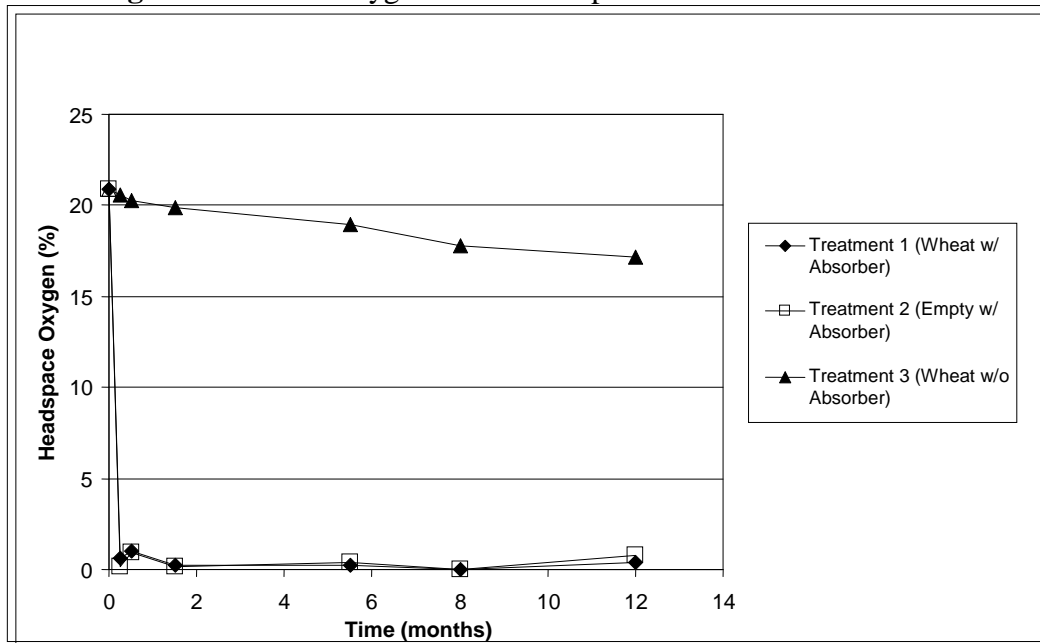
Time (months)	Number of soda bottles		
	Treatment 1	Treatment 2	Treatment 3
	Wheat with oxygen absorber	Empty, with oxygen absorber	Wheat with no oxygen absorber
0	3	3	3
0.25	3	3	3
0.5	3	3	3
1.5	3	3	3
5.5	3	3	3
8	3	3	3
12	3	3	3
Total	21	21	21

Results and Discussion

As can be seen in Figure 1, the amount of oxygen in the bottles containing oxygen absorbers (Treatments 1 and 2) did not increase over time. In bottles containing wheat with no oxygen absorber (Treatment 3), the oxygen decreased slowly over time. Possible explanations for this decrease are the cellular respiration of the wheat or oxidation of oil in the kernels.

Weevils, moths, and confused flour beetles have been shown to be eliminated in 8, 5, and 4 days respectively when oxygen levels are maintained below 1% (Storey 1973, 1975, and 1978). Saw-tooth grain beetles have been shown to be eliminated when oxygen levels are maintained below 1% for 12 days (Tarr and Clingeleffer 2005; Gilberg and Roach 1993). Though this study was done with wheat, it would be applicable to other low moisture food storage items.

Figure 1: Percent oxygen in the headspace of re-used PETE bottles.



Conclusion

Low moisture foods, such as wheat, can be stored in re-used sealed PETE bottles containing oxygen absorber packets for at least a year without any appreciable increase in oxygen. Oxygen levels in those containers will be low enough for a sufficient length of time to accomplish disinfestations.

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