Storing Shelled Peanuts in PICS Bags

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Low oxygen or hermetic storage has been successfully used to store several commodities such as small grains, cocoa, and coffee. A Feed the Future project team at Purdue University developed a hermetic storage system initially called the Purdue Improved Cowpea Storage or PICS. The system consists of two polyethylene bags, one placed inside the other, and an outer woven polypropylene bag. Producers fill the inner polyethylene bag with the commodity to be stored, then manually squeeze the air out of the bag and securely close the top. The air is the squeezed out of the outer polyethylene bag and securely closed. The outer woven polypropylene bag is then securely closed. The polyethylene bags provide a semi-permeable membrane that minimizes the movement of air and moisture into and out of the commodity stored in the bag. The outer polypropylene bag provides some protection against punctures and abrasions to the inner polyethylene bags. Oxygen inside the bag is consumed during the respiration process of the commodity and any insects in the commodity, and the carbon dioxide (CO_2) concentration increases. The low oxygen/high CO_2 minimizes oxidative deterioration of the commodity and damage due to insects.

Previous research using hermetic storage for peanut or groundnut has had mixed results. Some international research has reported successful hermetic storage in PICS bags. This research was conducted to determine the feasibility of storing shelled peanuts in PICS bags for up to 12 months. Treatments for the study included: 1) normal and high oleic peanuts, 2) two initial moisture contents, and 3) four storage treatments. The four storage treatments were 1) burlap/jute bags as the control, 2) PICS bags, 3) PICS bags with air extracted by vacuum, and 4) PICS bags with sachets of chlorine dioxide (ClO_2) dry fumigant added. There were three replications of each treatment combination. The PICS and jute bags were filled with 23 kg and 27 kg of shelled peanuts, respectively. Peanuts were stored in a room where the temperature followed ambient conditions while a heater maintained the temperature above 21C. Peanuts were placed in storage on 13 Oct 2017 and removed after 301 d of storage on 10 Aug 2018. The initial seed germination of the normal oleic and high oleic peanuts was 77 and 80%, respectively. The initial aflatoxin concentration in all peanuts was less than the detectable limit of 2 ppb. The bags were opened, sampled, and resealed according to the storage protocol after 60, 159, 249, and 301 d storage. In spite of best efforts to keep rodents out of the storage structure, approximately half of the 12 burlap bags suffered significant rodent damage and all had significant infestation by Indianmeal moth (*Plodia interpunctella*). Of the 36 PICS bags used in the study, only 4 had any rodent damage with most of the damage limited to the outer polypropylene bag. There were no live insects in the PICS bags. When the storage facility was unloaded, rodent nesting using both the jute and polypropylene fabric was found. At the end of the study, seed germination had decreased for all samples to an average of 6.3%. The peanuts stored in the jute bags had an average germination of 19.2% compared to 2.1% for the peanuts stored in PICS bags. Only two samples had more than 2 ppb aflatoxin. The aflatoxin concentration in one of the jute bags with normal oleic peanuts was 75 ppb, and one of the PICS bags with high oleic peanuts had an aflatoxin concentration of 12 ppb. All the other samples had aflatoxin below the detectable limit of 2 ppb. Most of the peanuts in the PICS bags had a white, powdery mold on the surface of the peanut, the identification and morphology are pending publication. There was no mold observed on the peanuts in the jute bags.