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Selection of Packaging Materials for Soybean Seed Storage.

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Abstract

*Soybean seeds var. CM. 60 has been processed and dried to 9.06 percent moisture content. Seeds were stored in 4 different kinds of plastic bag i.e. Metallized film, Aluminum foil, Polypropylene, and Woven Polypropylene for a period of 4 months under controlled temperature (16°C) and relative humidity (65%). The experimental design was arranged in Factorial in RCB consisting of 2 factors; storage period and packaging material. Changes in fungal flora, water activity value, Carbon dioxide and Oxygen level, standard germination and vigor by accelerated aging technique, electrical conductivity test and acidity value were monthly determined, it was found that seed moisture content was increased in time and showed positive correlation with water activity value and negative correlation with seed germination and seed vigor showed in terms of low percentage standard germination, the electrical conductivity from seed exudates. Oxygen level showed positive correlation with free fatty acid value and showed positive correlation with storage fungi: *Aspergillus sp.*, *A. flavus*, *A. glaucus*, *A. niger*, *A. terreus* and *Penicillium sp.* While field fungi: *Cercospora kikuchii*, *Curvularia lunata*, *Fusarium spp.* and *Macrophomina phaseolina* were decreased. From this experiment, soybean seeds were stored in Metallized film bags and Aluminum foil bags observed highly standard germination and seed vigor, and keep water activity and seed moisture content in low level could delay seed quality deterioration followed by Polypropylene bags and woven bag.*

Background and Aim of the Study

Soybean seeds (*Glycine max*) have highly protein and lipid component (David, 1984) and could maintain their germinability only 3-4 months under room temperature. Moisture content and oxygen were the main causes for lipids autoxidation in soybean to lead to rapidly seed deterioration and the quality will be decline (Ching, 1973; Hartman *et al.*, 1994). Temperature is another important factor for stored soybeans because chemical changes and growth of fungi such as increased with temperature in soybeans. However, another way for prolong storage life in soybean seed without chemical using is different kind of packaging materials and packaging material could be prevent the main cause seed deterioration such as moisture content and O₂ concentration.

Methods

Soybean seeds var. CM.60 had processed and dried to 9.06 percent moisture content. The experiment design was arranged in Factorial in RCB consisting of 2 factors; storage period and packaging materials. Seed were stored in 4 different types of plastic bag i.e. Metallized Polyethylene Terephthalate (MPET), Aluminum foil (AF), Polypropylene (PP), and Woven

Polypropylene (WP) for a period of 4 months under controlled temperature (16C) and relative humidity (65%) during June – October 2004. Seed moisture content, standard seed germination, seed vigour, O₂ concentration, water activity level, field fungi, storage fungi and fat acidity value were monthly determined.

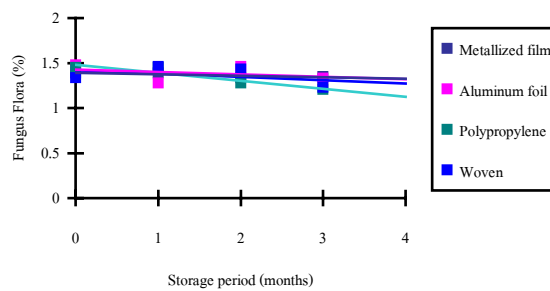
Result and Discussion

From the results, it was found that seed stored in WP bags increased in moisture content and free fatty acid (10.5 % and 1.53 %) during storage time because these bags were not moisture proved and oxygen proved properties compared with MPET, AF and PP bags. Comparing with MPET, AF and PP bags found that MPET and AF bags have better water proved and oxygen proved properties (Michael *et al.*, 2000) (0.0895 cc/m²/hr and 0.0914 cc/m²/hr ; 65 g/m²/hr and 63 g/m²/hr) followed by PP bags (0.2472 cc/m²/hr and 1378g/m²/hr), respectively. Soybean seeds vigour investigated by accelerated aging technique found that slightly decreased and the indirect electrical conductivity test was increased with time. From their properties, seeds stored in MPET bags have least moisture content and free fatty acid (9.42 % and 1.53%) result showed in term of highly standard germination and vigour as compared to the others. MPET and AF bags have better water proved more than enough until water vapor due to seeds respiration could not permeable from the outside, result showed moisture content and free fatty acid of seeds stored in MPET and AF bags were not significantly difference (9.42 % and 9.44 %; 1.53 % and 1.53 %). Free fatty acid value showed positive correlation with storage fungi: *Aspergillus* sp., *A. flavus*, *A. glaucus*, *A. niger*, *A. terreus* and *Penicillium* sp., while field fungi: *Cercospora kikuchii*, *Curvularia lunata*, *Fusarium* spp. and *Macrophomina phaseolina* were decreased. However, seeds stored in MPET and AF bags could maintain their germinability over 70 percent after 4 months better than PP and WP bags but seed stored in WP bags could maintain their germinability only in 3 months.

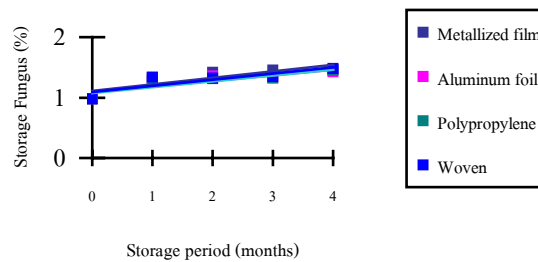
Table1. Means seed moisture content, water activity, germination, storability (investigated by accelerated aging technique), vigour test (investigated by electrical conductivity) and free fatty acid of soybean seeds stored in 4 different containers after 4 months storage

Container type	Moisture content (%)	Water activity	Germination (%)	Storability germination (%)	Vigour test	Free Fatty Acid (%)
MPET	9.42 ^{C*}	0.54 ^C	91.0 ^a	77 ^a	81.52 ^d	0.94 ^b
AF	9.44 ^{C*}	0.54 ^C	90.0 ^a	77 ^a	82.72 ^c	0.94 ^b
PP	9.96 ^b	0.57 ^b	85.0 ^b	70 ^b	85.55 ^b	1.39 ^a
WP	10.50 ^a	0.61 ^a	81.0 ^c	66 ^b	90.25 ^a	1.39 ^a

* Means within column followed by different letter are significantly different at < P 0.05



(1)



(2)

Figure (1) Mean field fungi percentage of soybean seeds stored in 4 different containers
 (2) Mean storage fungi percentage of soybean seeds stored in 4 different containers

Conclusion

Moisture content and oxygen were the main cause of the lipids autoxidation in soybean, lead to loss of enzymatic activity, failure of protein synthesis and loss of membrane integrity, which have direct relationship with low standard germination and vigour (Wilson and McDonald, 1992; McDonald, 1999). From this experiment, seed deterioration can be reduced to an acceptable level by keeping soybean seeds in MPET bags and AF bags because it was observed highly standard germination and seed vigor, and keep water activity and seed moisture content in low level could delay seed quality deterioration followed by PP bags and WP bag, because MPET bags AF bags can be high prevent water vapor barrier and oxygen barrier properties more than other bags.

Acknowledgement

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