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Quality of hermetically packaged nonfat dry milk in long-term storage
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RESULTS

Headspace Oxygen, Seams, Water Activity, and Color

Headspace oxygen (Figure 1) ranged from 0.65-29.0%. Also shown is the oxygen removal treatments (nitrogen, carbon dioxide, or oxygen absorbers). Only 6 of the 20 samples had <2% headspace oxygen.

Sensory Quality

Figure 4 shows sensory results for aroma, flavor and overall acceptability. Aroma scores ranged from 4.3 to 5.6. Flavor scores ranged from 2.8 to 4.1. Overall acceptability score were closely aligned with flavor scores, with a range of 2.9 to 3.2. Those samples which scored lower in aroma also scored lower in flavor and overall acceptability.

Comparison of regular and instant NFDM showed no significant differences in overall acceptability, indicating both types are suitable for storage. This agrees with the research of Dussell and others (1986).

Sensory Storage-Life

The data showing percentage of panelists who would drink each sample in an emergency is shown compared to sample age (Figure 5). The extinction of panelists to drink NFDM in an emergency situation decreased with sample age. Sensory scores for overall acceptability were highly correlated with % of panelists who would drink (R=0.95) and use (R=0.96) each sample in an emergency situation (data not shown). Panelists were more willing to use each sample in an application other than drinking, with 75% of the panelists indicating they would use the sample that received lowest overall acceptability score, compared to 63% who would drink that sample. If the value of <50% was used to determine the end of shelf life (Duyvesteyn and others 2001), all of the samples in this study would be considered acceptable for use in an emergency situation.

Nutritional Quality

Thiamin (Figure 6) ranged from 2.7 to 4.9 μg/g, riboflavin (Figure 7) ranged from 12.9 to 20.2 μg. Unlike Mercurio and Tadjalli (1979) who found significant losses of vitamins B1 and B2 in NFDM stored for 20 years in a sealed metal canister in a basement, our data shows that the vitamins were fairly stable and did not demonstrate a correlation with sample age (Figure 8) varied from 1.4-2.6 mg/kg. B1 and did not have a strong correlation with % of panelists who would drink.

There was a general decline in sensory quality of NFDM during long-term storage, with residual oxygen levels held in long-term storage, while nutritional quality remains fairly stable. This research may help to explain the sensory and nutritional attributes, the quality of NFDM currently stored in No. 10 cans, and the conditions in residential storage would likely be acceptable to the users in an emergency situation.

CONCLUSIONS

Ten samples of regular and instant NFDM (representing 9 brands) stored up to 29 years at non-abusive temperatures, and storage time. This agrees with the research of Henry and others (1947) and Mercurio and Tadjalli (1979). Sensory scores for overall acceptability were highly correlated with % of panelists who would drink (R=0.95) and use (R=0.96) each sample in an emergency situation (data not shown). Panelists were more willing to use each sample in an application other than drinking, with 75% of the panelists indicating they would use the sample that received lowest overall acceptability score, compared to 63% who would drink that sample. If the value of <50% was used to determine the end of shelf life (Duyvesteyn and others 2001), all of the samples in this study would be considered acceptable for use in an emergency situation.

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REFERENCES


Mercurio, K.C. 1985. Stored in hermetically sealed cans with reduced oxygen levels held in long-term storage and to term storage and to


Mercurio and Tadjalli (1979) compared a sample of instant NFDM that had been stored in aseptically filled cans in a refrigerator. To storage for 20 years to near pH 7.0 and found that the storage level had been an important factor in flavor and overall acceptability. The objectives of this research was to evaluate the sensory nutritional quality of NFDM of a hermetically sealed cans with residual oxygen levels held in long-term storage. This agreement with the research of Henry and others (1947) and Mercurio and Tadjalli (1979). Sensory scores for overall acceptability were highly correlated with % of panelists who would drink (R=0.95) and use (R=0.96) each sample in an emergency situation (data not shown). Panelists were more willing to use each sample in an application other than drinking, with 75% of the panelists indicating they would use the sample that received lowest overall acceptability score, compared to 63% who would drink that sample. If the value of <50% was used to determine the end of shelf life (Duyvesteyn and others 2001), all of the samples in this study would be considered acceptable for use in an emergency situation.

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