Microbial Flora of Pecan Meat

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Microorganisms found associated with commercially shelled pecan meats are numerous and varied. No bacteria and only two fungal microorganisms, *Aspergillus flavus* and *Trichothecium* species, were found on aseptically shelled pecans.

Bacteria of the coliform group, especially *Escherichia coli*, are commonly used as indicators of fecal pollution. Ostrolenk and Hunter (8), Ostrolenk and Welch (9), Kokal (5), and other workers have reported that nut meats in unbroken shells do not contain this bacterium and that its presence in shelled nut meats reflects unsanitary processing practices. Other bacteria, including *Bacillus* and *Streptococcus*, have been identified on several types of nut meats used in ice cream mixes (11). Fungi, especially aflatoxicigenic isolates of *Aspergillus flavus*, have been isolated from pecans by Lillard et al. (7). However, there appears to have been no attempt to isolate and identify all of the microflora present on a particular sample of nut meat. It was the purpose of this investigation to isolate and identify all of the bacteria and fungi present on samples of both shelled and unshelled pecan meats.

Shelled and unshelled pecan meat samples were obtained from two commercial operations and stored at 4 C until microbiological examination could be conducted. Unshelled pecans were surgically face-sterilized by total submersion for 2 min in a solution of 1.0 mm HgCl$_2$ and then rinsed with sterile distilled water. The meats were then aseptically removed and placed in sterile petri dishes. For bacterial isolation, sterilized Trypticase soy agar was then poured over these samples and over samples of commercially shelled pecans in other dishes, and the dishes were gently rotated and allowed to solidify. For fungal isolation, samples were plated in 2% (w/v) agar (Difco) in the same manner. Bacterial samples were incubated at 37 C; fungal samples were incubated at 22 C.

Isolation and identification of all bacteria were conducted in accordance with published procedures (2, 3, 10; *Bergey's Manual*, 7th ed.) Petri dishes containing fungi were incubated until sporulation of the colonies occurred (approximately 2 weeks). Then, isolation and identification of colonies were conducted in accordance with the *Laboratory Manual for Medical Mycology* (1).

Thin sections of both commercially shelled and aseptically shelled pecan meats were examined for the presence of fungal hyphae and were prepared by impregnation of meats with liquefied paraffin wax for 48 hr at 80 C. Samples were then cooled, and thin sections having a thickness of 25 mu were prepared by using a Spencer rotary microtome.

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**Table 1. Identification of microorganisms found in pecan meats**

| Bacteria                          | Per cent$^a$ | Fungi               | Per cent$^b$ |
|----------------------------------|--------------|---------------------|--------------|
| *Pseudomonas effusa*             | 10           | *Penicillium notatum* | 30           |
| *Corynebacterium paurometabolum* | 10           | *Aspergillus clavatus* | 15$^b$       |
| *Escherichia coli*               | 20           | *A. niger*          | 15           |
| *Leuconostoc mesenteroides*      | 20           | *Fusidium species*  | 15           |
| *Proteus vulgaris*               | 10           | *Trichothecium species* | 15$^c$     |
| *Aerobacter aerogenes*           | 30           |                     |              |
| *Clostridium species*            | 10           |                     |              |

$^a$ Percentage of commercially shelled samples tested that were positive for indicated microorganism.

$^b$ Per cent isolated from aseptically shelled pecans was 4.

$^c$ Per cent isolated from aseptically shelled pecans was 5.
shelled samples held under recommended conditions of storage, no evidence of hyphal growth or penetration of tissue could be obtained.

Hyndman (4) stated that other pathogenic microorganisms associated with the presence of E. coli introduce a health factor which is important to regulatory agencies concerned with consumer protection. The present study indicates that unless pecan meats are stored under conditions of low temperature and humidity immediately after harvesting and processing, problems involving the safety of this product for human consumption could be encountered.

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