A Research Note

Comparison of Acidified and Antibiotic-supplemented Potato Dextrose Agar from Three Manufacturers for its Capacity to Recover Fungi from Foods

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ABSTRACT

Six lots of potato dextrose agar (PDA) obtained from three manufacturers were compared for their capacity to recover yeasts and molds from 10 foods. Each lot was tested in two forms, viz., at pH 3.5 and at pH 5.6. The media at pH 5.6 contained 100 ppm each of chloramphenicol and chlortetracycline-HCl. Overall, no single source or lot of PDA was superior to others for enumerating fungi. However, results confirm earlier reports from another laboratory that antibiotic-supplemented PDA performs better than does acidified PDA for determining fungal populations in foodstuffs.

Acidified media traditionally have been used to enumerate yeasts and molds in foods. White and Hood (12) were among the first to report that malt agar adjusted to pH 3.4 to 5.8 with lactic acid effectively inhibited growth of bacterial colonies, but did not significantly affect yeast and mold counts of butter. Later studies indicated that at higher pH values, media supplemented with antibiotics were more suitable for recovering fungi from a variety of foods and beverages (2,7,9,10). Growth of some yeasts and molds may be retarded at pH below 4, especially if cells have been subjected to environmental stress such as heat (11), chilling, or desiccation. Other shortcomings are inherent in acidified media (8). Mold colonies have a tendency to spread, there is occasional growth of bacteria, and food particles may precipitate.

In a recent study (1), it was observed that potato dextrose agar (PDA) and plate count agar adjusted to pH 3.5 and 5.5 supported colony formation by conidia of Aspergillus flavus equally well. Koburger (4) attributes the lack of difference in recovery between acidified and unacidified media to the more vigorous condition of laboratory cultures. The possibility also exists that slight differences in formulation of a given recovery medium obtained from various suppliers or produced in different lots by the same supplier may contribute to variations in counts observed at various pH values. To test this hypothesis, a study was conducted in which six lots of PDA manufactured by three companies were compared for their capacity to support colony formation by yeasts and molds.

Ten foods were analyzed using PDA containing no antibiotics at pH 3.5 and containing 100 ppm each of chloramphenicol and chlortetracycline-HCl at pH 5.6 ± 0.2.

MATERIALS AND METHODS

Foods were obtained from local retail stores in the Griffin, Georgia area. Ground beef (fresh), ham hocks, Cheddar cheese, potatoes (hash, frozen), tomatoes (raw), blueberries (frozen), figs (fresh, raw), corn meal, wheat flour, and thyme (dried) were analyzed.

Four 20-g subsamples of each food were each blended (Colworth Stomacher) with 180 ml of sterile deionized water for 2 min. Homogenized foods were further diluted in sterile water and plated in duplicate in six different lots of PDA purchased from three manufacturers: Difco (Detroit, MI), Baltimore Biological Laboratories (Cockeysville, MD), and Oxoid Ltd. (Basingstoke, U.K.). Two lots of PDA had been stored at room temperature for at least 5 yr. Each lot of PDA was acidified to pH 3.5 ± 0.1 with sterile 10% tartaric acid; a second test system consisted of PDA (pH 5.6 ± 0.2) to which 100 ppm each of chloramphenicol and chlortetracycline-HCl were added after sterilization. Plates were incubated at 21 C and colonies were counted after 5 or 6 days.

Means of counts for each food sample were analyzed for significant differences (P < 0.05) using Duncan's multiple range test.

RESULTS

The foods examined and yeast and mold counts obtained using six lots of modified PDA are listed in Table 1. There is no trend to indicate that a particular source or lot of PDA was superior for supporting colony development. Although significantly higher counts (P < 0.05) were noted when using a given test lot of PDA for some foods, the same lot was inferior to others for other test foods. Predominant fungal genera varied with the food sample. It is possible that certain types of fungi grew more readily on some lots of PDA than on others. This would have little or no practical significance since it is extremely difficult to predict predominant mycoflora on or in most foods. The choice of manufacturer of PDA, then, is arbitrary at best with regard to superiority for enumerating total yeasts and molds in a variety of foods.

Antibiotic-supplemented PDA was clearly superior to acidified PDA for enumerating yeasts and molds. Considering the six lots of media and 10 food samples,
compared to antibiotic-supplemented and antibiotic media in 26 of chloramphenicol and chlortetracycline were significantly present in the foods examined did not spread on various counts obtained on PDA. In only one test (blueberries, lot PDA) was acidified to pH 3.5 or supplemented with 100 ppm each of chloramphenicol and chlortetracycline-HCl (pH 5.6 ± 0.2).

**DISCUSSION**

The types of colonies formed on various lots of PDA were similar with regard to genus when considering a specific food; however, colony size was slightly restricted on media from one manufacturer and, for certain foods, pigmentation of colonies differed somewhat on media after 5 days at 21 C to an extent that accurate counting of colonies was difficult.

**REFERENCES**


**TABLE 1. Mean Log_{10} counts of yeasts and molds per gram of food as determined using six lots of PDA.**

<table>
<thead>
<tr>
<th>Lot code for PDA</th>
<th>Modification to PDA</th>
<th>Ground beef</th>
<th>Ham hock</th>
<th>Cheese</th>
<th>Potato</th>
<th>Tomato</th>
<th>Blueberries</th>
<th>Fig</th>
<th>Corn meal</th>
<th>Wheat flour</th>
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<td>1.87def</td>
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</table>

*Means in the same column followed by the same letter are not significantly different (P < 0.05).*