

volumes of 99% isopropanol per volume of beer without cooling. Average yields of 1.5% gum are obtained with 3% glucose in the 20L and 70L fermentors.

E. Drying

The product is recovered and dried at 50°-55° C. for up to one hour in a forced-air tray dryer.

F. Product Quality

One-percent viscosities of the K+ salt are usually in the range of 3000 cP and for the low-calcium sodium salt, approximately 7000 cP.

EXAMPLE 2

Deacetylation and Clarification of the Heteropolysaccharide S-60

Clarification of the gum, while not necessarily for all uses, is of value when the gum is used as an agar substitute. Clarification can be accomplished before deacetylation (in the native state) or after deacetylation. Since deacetylation uses hot caustic, and clarification is done hot, the two procedures are easily and conveniently combined. Both deacetylation and clarification can be done with the beer or the dry polymer. For deacetylation, if the beer is used, the pH is adjusted to 10 with KOH, the solution heated to 90° C. for 15 minutes, the pH adjusted to 7 with dilute H₂SO₄, then clarified.

The general procedure for both deacetylation and clarification follows:

- A. A 2% solution of beer or gum is heated to 90° C.
- B. The pH is adjusted to 10 with KOH.
- C. The temperature of the beer or solution was maintained at 90°-95° C. for 15 minutes.
- D. The pH is adjusted to 6-8 with dilute HCl or H₂SO₄.
- E. Ten gms/liter of Super Aid were added to the material to be filtered.
- F. The material was filtered through a pressure filter unit (pre-heated) with approximately a 6 mm bed of Super Aid and approximately 20-30 psi, using a filter unit with an area of 136 cm.
- G. The filtrate is precipitated with isopropanol immediately to prevent gelation and the fibers dried at 50° C. for one hour or less.

When no deacetylation is necessary, the above procedure is followed, except that the pH is not raised; rather than holding at 90° C., the solution is immediately filtered, and then recovered.

Clarification is typically done on the potassium form; KCl can be added to a solution of previously made product as necessary.

Heteropolysaccharide S-60 Gelling Characteristics

A compilation of data comparing the native gum and the deacetylated gum, both in the K+ form and in the Ca++ form, with carrageenan and agar follows:

Type	Gel Nature	Melts	Sets	Hysteresis
Native S-60	Very Elastic	65-70° C.	65-70° C.	None
Deacetylated S-60				
K+ Gel	Brittle	90° C.	31-48° C.	45-60° C.
Ca ²⁺ Gel	Brittle	90° C.	45-50° C.	45-50° C.
Kappa Carrageenan	Brittle	40-95° C.	25-75° C.	15-20° C.

-continued

Type	Gel Nature	Melts	Sets	Hysteresis
Agar*	Brittle	60-97° C.	32-39° C.	60° C.

*Bacteriological grade specs: gelling temperature range 33°-39° C., melting temperature 70° C. minimum. (Whistler's "Industrial Gums")
 Minimum Gelling Concentration
 Kappa Carrageenan - 0.3%
 Agar - 0.04%
 Deacetylated S-60 - 0.05% (calcium gel)

Note above that there is a wide range of temperatures given for setting and melting of all the various types of gels. For agar, the variations are primarily due to type of seaweed while for kappa carrageenan the potassium ion concentration determines the gel characteristics. The gels of deacetylated S-60 are primarily characterized by the degree of deacetylation. With only slight deacetylation the gels set at higher temperatures and are more elastic; in fact, a wide range of gel types from very elastic to very brittle is possible, depending on the degree of deacetylation. The gels appear to be more similar to agar than to kappa carageenan, primarily because of the large hysteresis between setting and melting temperatures. It should be emphasized that they are difficult to melt and the gel-sol transition is difficult to observe. On the other hand, the gelling temperatures can be easily defined since the gels set sharply within a few degrees from incipient gelation to solid gel.

EXAMPLE 4

Agar Replacement Using Deacetylated Clarified S-60

Several different media are prepared as follows:

Nutrient Agar

- (A) 0.8% Nutrient Broth (Difco)
1.5% Agar (Difco)
- (B) 0.8% Nutrient Broth (Difco)
0.2% KCl
0.9% S-60

Trypticase Soy Agar

- (A) 2.75% Trypticase Soy Broth (BBL)
1.5% Agar (Difco)
- (B) 2.75% Trypticase Soy Broth (BBL)
0.2% KCl
0.9% S-60

Potato Dextrose Agar

- (A) 2.4% Potato Dextrose Broth (Difco)
1.5% Agar
- (B) 2.4% Potato Dextrose Broth (Difco)
0.2% KCl
0.9% S-60

YM Agar

- (A) 2.1% YM Broth (Difco)
1.5% Agar (Difco)
- (B) 2.1% YM Broth
0.2% KCl
0.9% S-60

Brain Heart Infusion Agar

- (A) 3.7% BHI Broth (Difco)
1.5% Agar
- (B) 3.7% BHI Broth (Difco)
0.2% KCl
0.9% S-60

Burk's Agar

- (A) 0.0584% K₂HPO₄
0.0225% KH₂PO₄
0.0174% K₂SO₄
0.0164% MgCl₂·6H₂O
0.0064% CaCl₂·2H₂O
0.0005% FeCl₃·6H₂O
0.00002% Na₂MoO₄·2H₂O

(B)

Same as (A)