VARIETAL DIFFERENCES IN CAPSULE GRADE GELATINS: DRYING

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It has been reported that gelatins derived by acid hydrolysis (Type A) dry faster than those manufactured by liming (Type B) (U.S. Patent 836,082). If true, this would have important implications in the production of hard gelatin capsules for, other properties (such as mechanical strength) being equal, using a greater proportion of the less expensive Type A gelatin in the blend would confer advantages of both cost and time saving. Drying rates might also provide an insight into the behaviour of "rogue" batches of limed gelatins that produce brittle capsules which are poor performers on filling machines.

The drying of freshly-cast gelatin film has been observed under conditions similar to those used industrially to dry the wet capsule shell and a comparison made between acid-derived pigskin and ossein, and limed osseins of known performance on capsule machines.

After spreading a 30% gelatin solution at 50°C onto glass plates, covering to prevent water loss, and allowing 10 mins setting time, a piece of film 2cm^2 in area and 0.40-0.41mm thick was cut using a template (0.4mm is the approximate thickness of a newly cast capsule shell).

The sample was hung on the arm of a microforce balance head enclosed within a previously equilibrated closed circuit, air-circulating system. Humidity was maintained at 43%R_H by bubbling the air through a saturated solution of potassium carbonate. Temperature was controlled by enclosing the whole apparatus within an incubator maintained at 25 ± 0.2°C, and monitored by means of thermocouples. A 2 l ballast bottle ensured that the air introduced in mounting the sample was small in comparison to the volume of the system. Airflow past the sample was 3cm min^{-1}.

A continuous trace of weight against time was obtained until the weight loss was less than 0.1mg min^{-1}, whereupon the sample was removed and dried at 105°C for 18 h and reweighed to determine moisture content (B.S. Method 757).

A program was written to convert weight against time traces to drying rate against % mean moisture content, and was verified by plotting manually-determined tangent values. The computer traces gave the more precise evaluation of rate values. Composite curves of four samples for each gelatin and set of conditions were compiled. Drying rates varied from 1.1 x 10^{-3}g min^{-1} at 70% mean moisture content to 2.0 x 10^{-4}g min^{-1} at 20% moisture with standard deviations of 0.04 x 10^{-3} and 0.01 x 10^{-4} respectively.

The effect of differing temperature, humidity and sample thickness on the drying rates was evaluated. Wet film thickness had no effect on drying rates between 0.32mm and 0.56mm.

The different gelatins dried at 43%R_H and 25°C showed no significant differences in their drying rates. Nor was a "rogue" limed ossein gelatin distinguishable from one that produces satisfactory capsules, in terms of drying rate.

In conclusion, under the drying conditions employed in these investigations and in subsequent studies in which increased air velocities reduced the drying time from 120 min to the commercial capsule drying time of 40 min, the drying rates of Type A gelatins were indistinguishable from those of Type B and hence this work failed to substantiate the claims of U.S. Patent 836,082.

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