

Application of Titanium Dioxide to Whiten Mozzarella Cheese

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Abstract

Titanium dioxide, in a range of approximately 0.02 to 0.05% by weight of milk, introduced into milk for Mozzarella cheese to improve color qualities showed uniform whitening without adverse effects on texture or flavor. The larger amount of pigment may be required only with high-fat Jersey or Guernsey milk, obtained in late spring and early summer when carotene levels are at a maximum; for most blended cheese milk, levels as low as 0.025% appear satisfactory in giving Mozzarella cheese a uniform, white, satiny appearance.

Concentrations of titanium dioxide of 0.1%, or higher, by weight of cheese milk, result in white sediment or dust on walls of vats and on utensils and in an irregular deposition of powder in the cheese, often culminating in flaking.

Effective uniform distribution of titanium dioxide in cheese depends upon adding the powdered pigment to cheese milk as a water suspension accompanied by vigorous, continuing agitation of milk until rennet addition and distribution.

Mozzarella cheese from cow's milk with a uniform, lively white appearance is much sought after by manufacturers, but attainment has proved difficult. Present permissive whitening methods include bleaching of the milk fat with benzyl peroxide and homogenization of the cheese milk (3, 6). The benzyl peroxide treatment is a time-consuming process and does not whiten the cheese to the degree desired by processors. Furthermore, contact of milk fat with this chemical often leads to an oxidized flavor in the cheese and to a reduction of vitamin A activity. Homogenization of milk produces a lighter-colored cheese but the yellow still is apparent, and both benzyl peroxide treatment and homogenization adversely affect the stretching and melting qualities of the cheese. Blue and green food dyes have been used to decolorize blue-veined cheese milk, but experience with Mozzarella cheese is limited.

Titanium dioxide, an inorganic white pigment

accepted by the United States Food and Drug Administration for use in candies (1), is considered here as a potential whitening agent for Mozzarella cheese. The present study deals with its effectiveness, with maximum levels required under different conditions, and with necessary precautions of administration.

Materials and Experimental Methods

Purified titanium dioxide powder, containing not less than 99% pigment, from H. Kohnstamm and Company, New York, New York, was used in the present investigation.

Cornell University whole milk from a mixed herd of Holstein, Jersey, and Ayrshire cattle, and from a Jersey herd at the University was obtained separately during spring, summer, and winter months, for cheesemaking trials, conducted over one year and involving 31 vats of cheese milk.

Mozzarella cheese was made independently from 117.3-kg quantities of mixed-herd milk and high-fat Jersey milk in stainless steel cheese vats. For each experimental trial, four or five vats of whole pasteurized (72 C for 16 sec) milk treated with varying amounts of titanium dioxide were made into pasta-filata curd, according to directions outlined in the text, Cheese and Fermented Milk Foods (4).

Following acid ripening to pH 5.3, the curd blocks were plasticized in hot water. The hot curd was pulled or stretched manually into approximately one-pound smooth patties and wrapped in Saran. Visual and spectrometric examinations for color were conducted on two-day-old cheese held at 5 C.

A Hunterlab Model D 25 Color and Color Difference Meter, Hunter Associates Laboratory, Fairfax, Virginia (2), was employed to establish finite values of color in the cheese. The instrument, standardized with a white standard no. 3429, is designed to give values for colors as they are seen by the eye. Two measurements of significance are L and b_L , of which L measures lightness with a perfect white having a value of 100, and b measures yellow when plus or on the positive side of zero. A cover glass was applied to cheese to obtain a flat, uniform surface for measurement and the samples were rotated through 90 degrees between duplicate readings.

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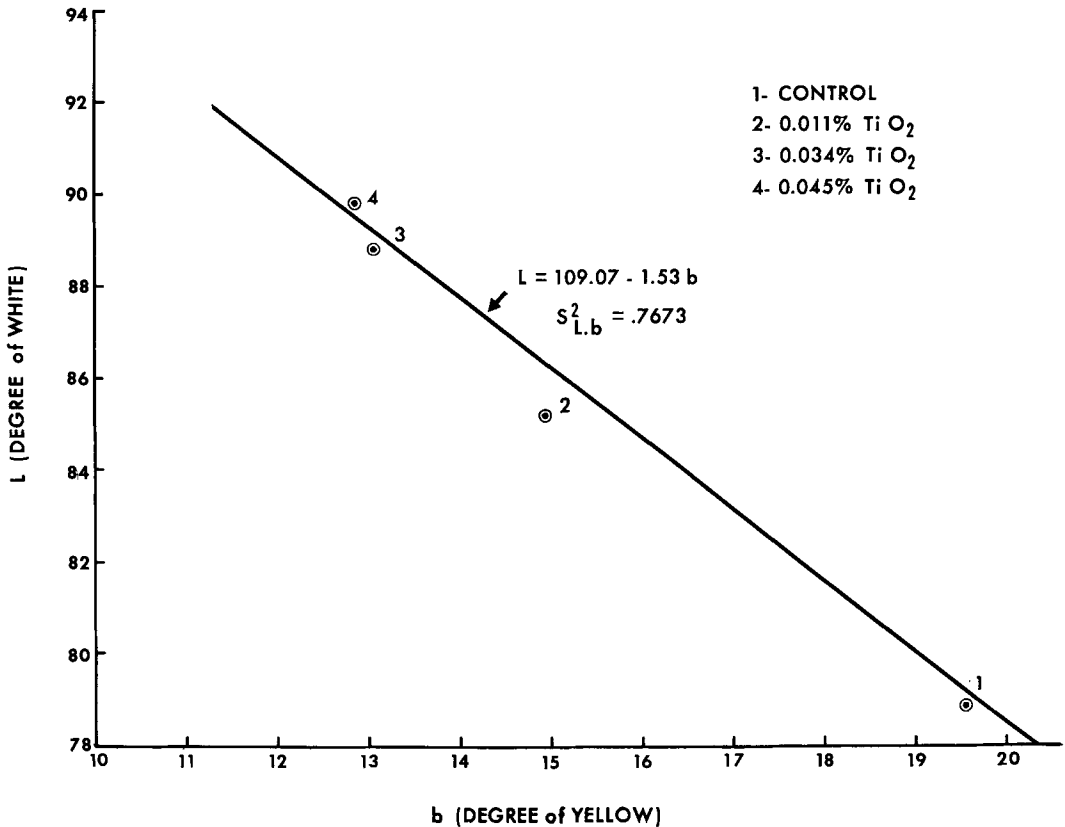


FIG. 1. Effect of titanium dioxide on white and yellow color in Mozzarella cheese.

the yellow pigment. At optimum levels this masking is unnoticeable, other than in the yellow-to-white color transformation, but when titanium dioxide is used in excess, a lack of physical cohesion is reflected by dusting or flaking of pigment. This phenomenon may serve as a self-regulating industrial control against excessive additions of the pigment to cheese milk.

Application of titanium dioxide apparently satisfies most of the requirements for an effective whitener. It is an accepted food ingredient, it produces a lively uniform white—so much so that cheesemakers now experimenting with it call the powder “snow.” Furthermore, the pigment is applied easily and relatively inexpensively without obvious adverse effects on texture or flavor.

References

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