

Stability study of meat tenderizer POWDER

by:

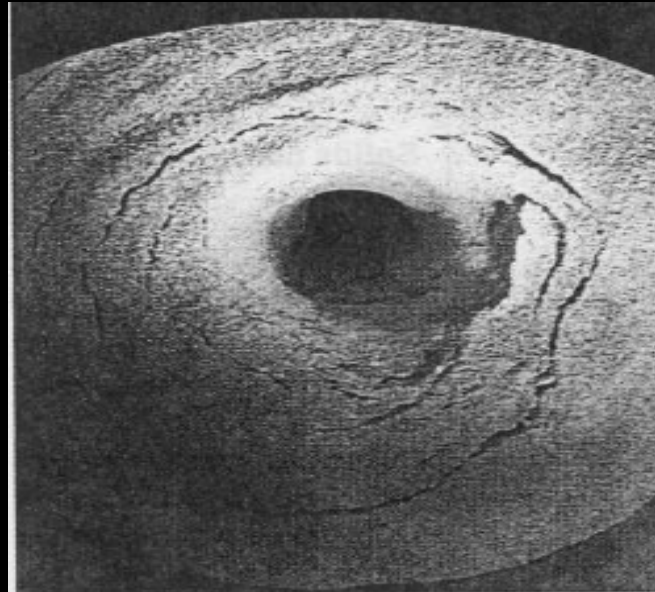
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Caking prevention methods..

- a) Drying to low moisture content
- b) Treatment of the powders at low humidity atmospheres & packaging in high barrier packages
- c) Storage at low temperatures
- d) In package desiccation
- e) Agglomeration
- f) Addition of anti-caking agents ✓





Anti-caking agent action:

compete with the host powder for available humidity due to its large water adsorptive capacity, thus reducing their hygroscopicity and tendency to cake

..SCOPES..

Determine..

- 1) effects of anti-caking agent percentage in the base formulation
- 2) effects of types of sugar & anti-caking agent used on the base formulation with time
- 3) effect of different types of storage container

..RESULTS & discussion..

Base: Salt, sugar, anti-caking agent



Active ingredient: Bromelain (5-6%)



Day 0

-anti-caking agent percent content (0,1.0,1.5,2.0%) and type of sugar (lactose, sucrose) were varied for this test

After 30 days of storage (air-tight container)..



► Guide :

- (1) Lactose+ NaCl+ MCC
- (2) Lactose + NaCl + Soda Bicarbonate
- (3) Lactose + NaCl + TPC
- (4) Sucrose+ NaCl+ MCC
- (5) Sucrose+ NaCl+ Soda Bicarbonate
- (6) Sucrose+ NaCl+ MCC
- (7) Lactose + Sucrose + NaCl+ MCC
- (8) Lactose+ NaCl (control)
- (9) Sucrose+ NaCl (control)

After 60 days of storage..



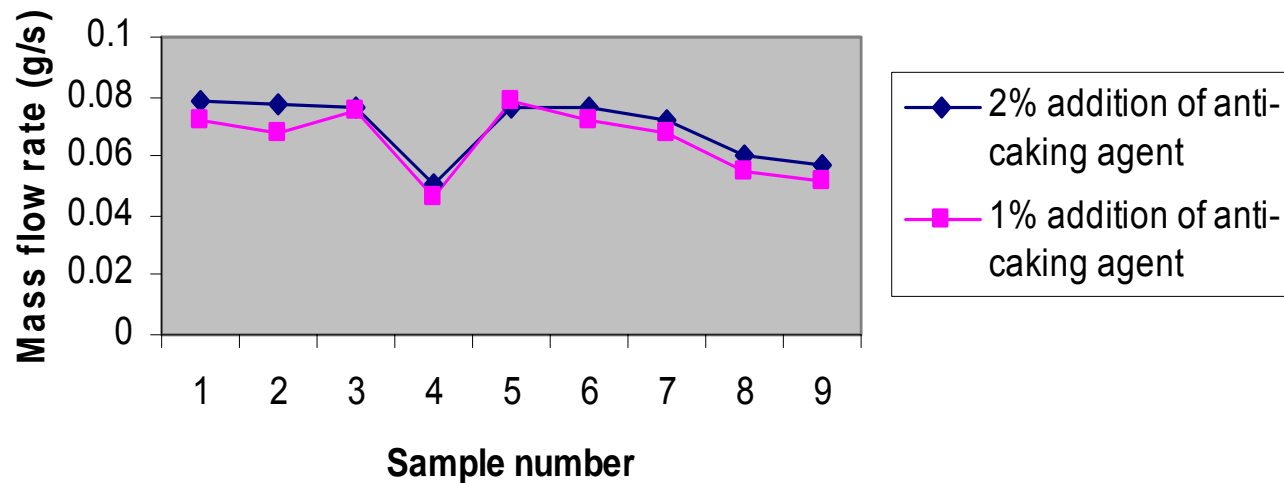
~ All of the base formulation are free-flowing and did not cake prior to storage

Method

- I- Measuring mass flow rate of powder
 - Measure the mass of powder
- 2) Start timer the moment the glass hour were turned upside-down
- 3) Divide mass of powder by period of powder to be totally fall down



Mass flow rate comparison of different percentages of anti-caking agent



(1) Lactose+ NaCl+ MCC

(2) Lactose + NaCl +
Soda
Bicarbonate

(3) Lactose + NaCl + TPC

(4) Sucrose+ NaCl+ MCC

(5) Sucrose+ NaCl+
Soda
Bicarbonate

(6) Sucrose+ NaCl+ TPC

(7) Lactose + Sucrose +
NaCl+ MCC

(8) Lactose+ NaCl
(control)

(9) Sucrose+ NaCl
(control)

Conclusion..

Higher percentage of anti-caking agent in the base formulation have higher ability to improve the powder flowability by maintaining its low moisture content

After 30 days of storage (non-airtight container)..

-early sign of caking showed when big lumps were formed



1% anti-caking agent



1.5% anti-caking agent



2% anti-caking agent

After 60 days of storage..



► Guide :

(1) 0% anti-caking agent

(2) 1.0% anti-caking agent

(3) 1.5% anti-caking agent

~ large chunks of powder mass were formed before it being shake for homogeneity

Conclusion..

- ➔ 1) None of the base formulation prepared in the air-tight container caked during storage

Potential factor: storage time is not long enough

- ➔ 2) Storage of powder in a non-airtight container could rapidly lead to caking phenomenon even with the addition of anti-caking agent

Potential factor: Non-air-tight container allow moisture to be absorbed by the powder inside

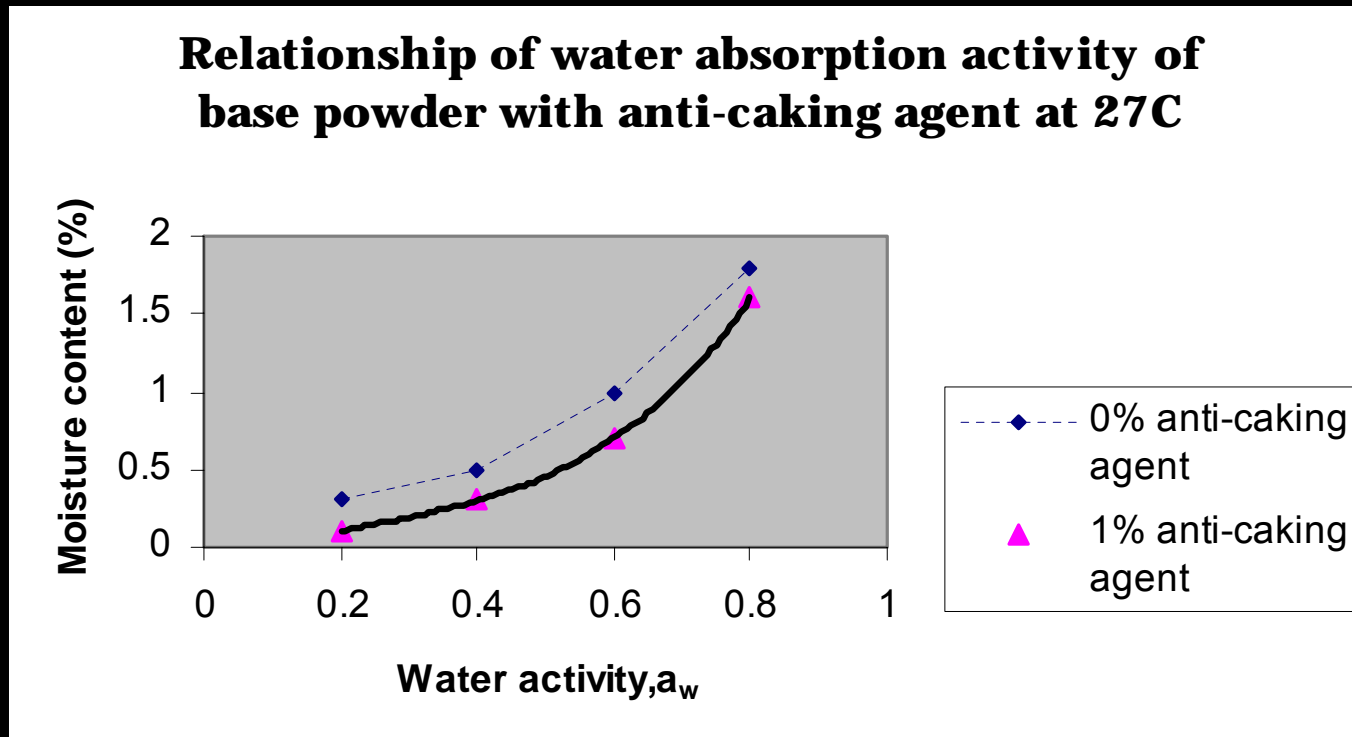
→ 3) Addition of anti-caking agent in dry product could effectively reduce the effect of caking

Potential factor: Its ability to absorb moisture will retain the low-moisture property of the host powder

→ 4) Lactose gives better stabilizing effect than sucrose

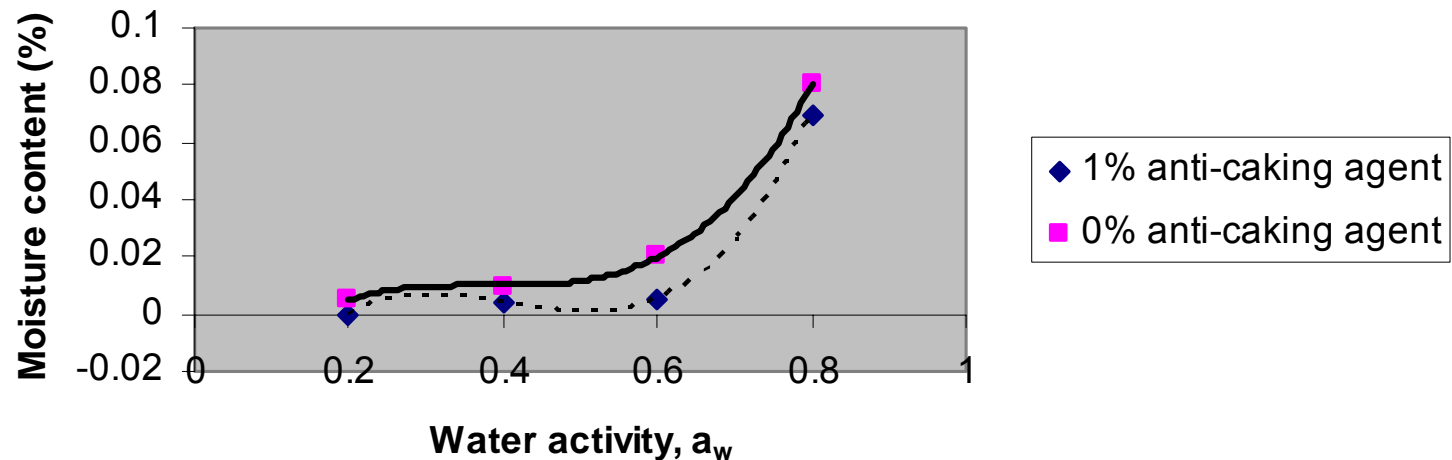
Potential factor: it has better non-hygroscopicity characteristic and thus reduce the water activity of the powder

III- Moisture sorption characteristics determination



~ Addition of anti-caking agent have slightly reduced water absorption of base powder

Relationship of water absorption activity of base powder with anti-caking agent at 47C



~ Significant water absorption could only be seen as water activity value exceed 0.6. Rate of absorption with or without the presence of anti-caking agent does not differ much

Conclusion..

- 1) Moisture content in powder increase with increasing water activity
- 2) Anti-caking agent addition in the powder are able to lower moisture intake from ambient
- 3) At higher temperature, moisture uptake decreased as the water molecules are activated. This will lower the water holding ability of the powder

...Thank You...

? Importance of knowing water activity of powders as a function of moisture content & temperature

..control water content during processing, handling, packaging and storage to prevent caking, collapse & stickiness.

? Caking

..when low moisture, free-flowing powder transformed into lumps & agglomerated solid
» loss of functionality & lowered quality

.. a_w , t & T dependent

? Factors affecting caking kinetics

- a) **the powder itself** (particle size distribution, hygroscopicity & charge of particles, state of the material, presence of impurities)
- b) **external factors** (temperature, relative humidity and mechanical stress applied to the substance)

? Water activity

definition: ratio of vapor pressure of water in a powder to the vapor pressure of pure water at the same temperature

= equilibrium relative humidity

= relative humidity of the air surrounding the powder when the water vapor pressure in the air is the same as in the powder

= $ERH/100$