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Together. Better Baking.
TORTILLA
TIA
INDUSTRY ASSOCIATION

Dough conditioners and oil uptake reduction in corn chips

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R&D

Agenda

- Nixtamalization process
- Corn flour differences
- How to prepare tortilla chips
- Water reduction in recipe/oil intake
- Customer preferences
- Conclusion

Nixtamalization process

Nixtamalization

Origin: **Mesoamerican**

- AZTECS
- MAYAN

NIXTLI: ASHES
TAMALLI: DOUGH

Ashes were the first calcium source to cook corn

Main objective: softening the pericarp and endosperm to allow an easier grinding

Nixtamalization process

Water

+

Lime

+

Corn Kernels

Traditional **Industrial**

- Time
- Lime Concentration
- Finished Product

MVAG – Micro-Visco Amylograph

- Flour suspension
- Heating and cooling
- Retrogradation

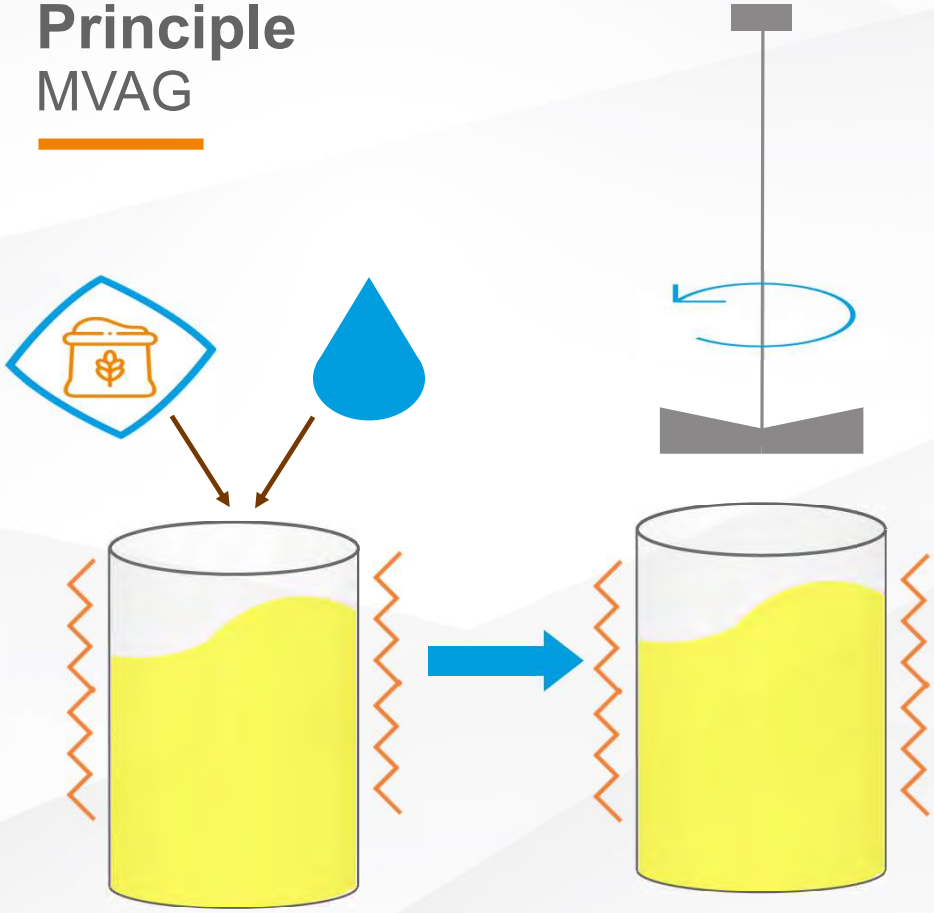
Micro-Amylograph Test

Viscosity measurements are useful to evaluate the quality and properties of corn flour.

Controlled mixing of water and corn flour with the addition of heat provides the parameters to measure the viscosity properties.

RVA/Viscoamylograph Brabender.

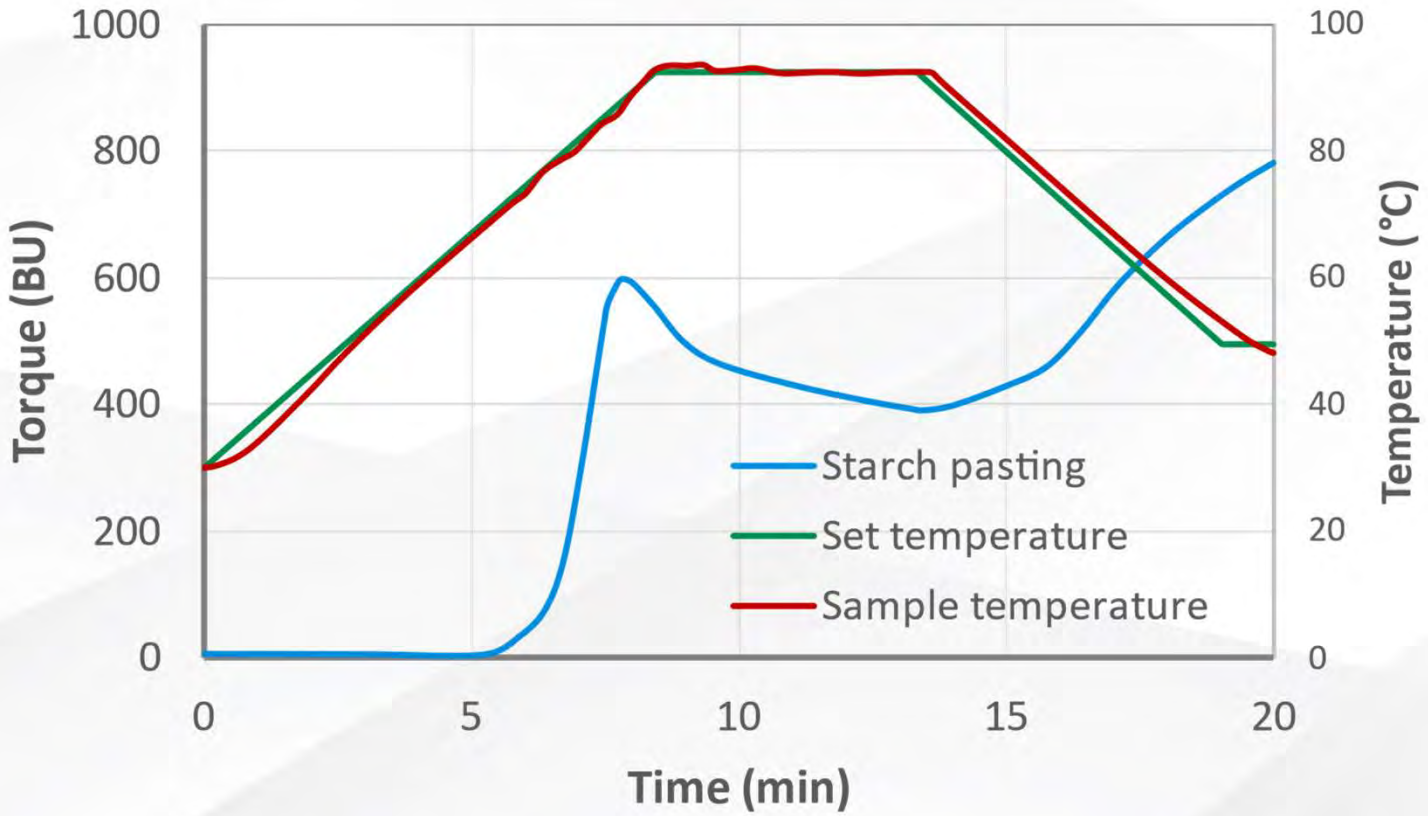
Principle
MVAG



Measured
Temperature
Resistance
Time

Curve

Micro-Visco Amylo-Graph–Pasting Curve of wheat flour



Food Additive Effects

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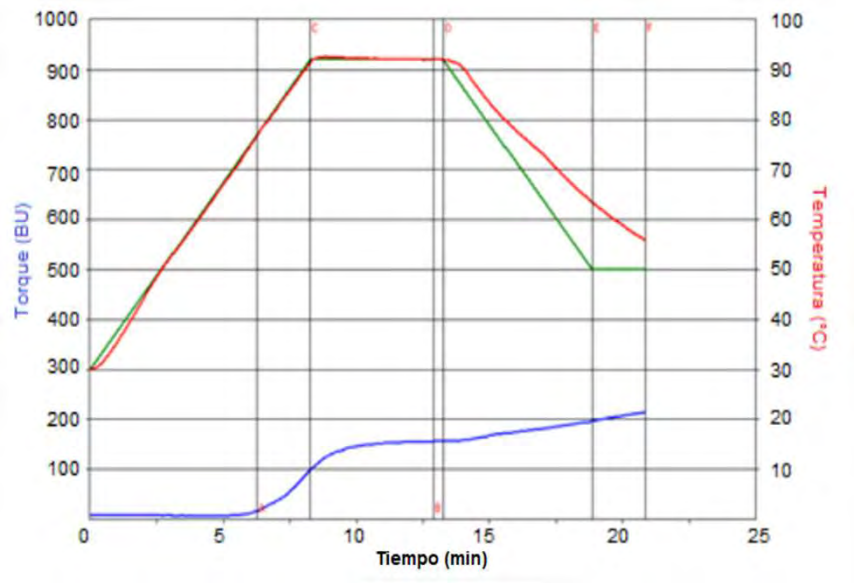
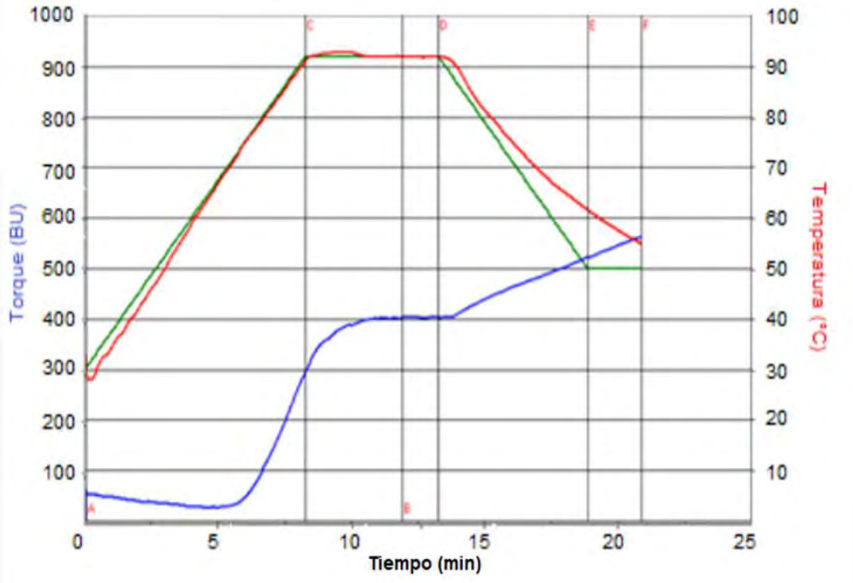
No Additives



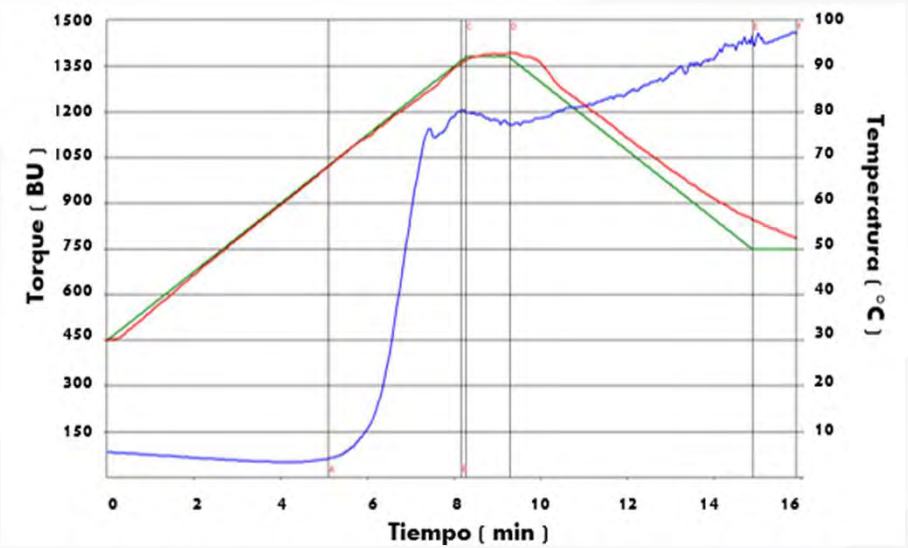
Hydrocolloid and Enzyme Mix



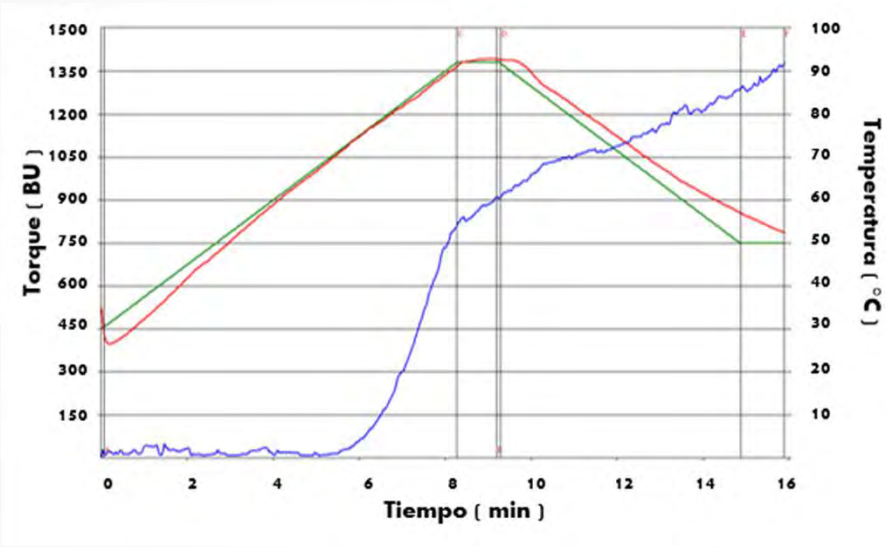
- Increased viscosity suggests corn flour with improver absorbs more water

STERNWYWIOL GRUPPE

Micro-Visco Amylo-Graph–Pasting Curve of Corn Flour



"Tortilla flour"



"Snack flour"

- Cooking level
- Particle size
- Water absorption

Main modifications on starch

Corn flour differences

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“Tortilla flour”

“Snack flour”

Particle size	**100 – 300 μm**	**200 – 700 μm**
Endosperm	**Partially modified**	**Slightly modified**
Other components	**Pericarp traces**	**Pericarp not hydrolyzed**

STERNWYWIOL GRUPPE

Texture Analyser Test

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Corn flour: No Additives

Hydrocolloid and Enzyme Mix

- Texture Analyser TA.TX plus
- TPA measures the dough's force to estimate the consistency of the dough

Texture Analyser

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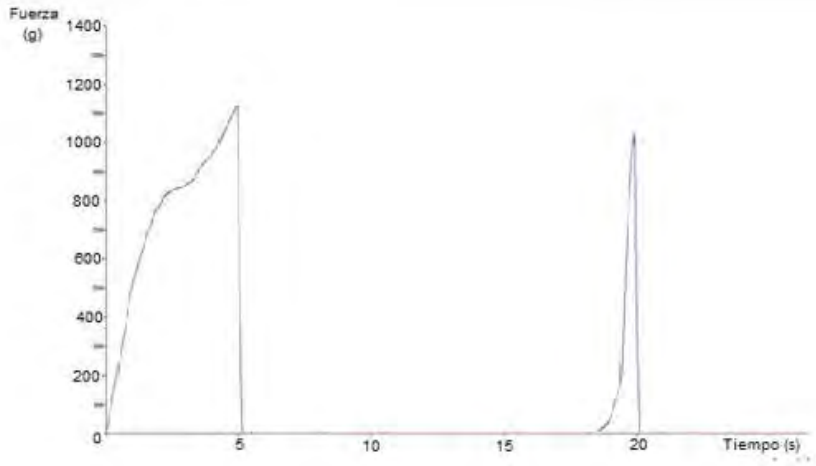
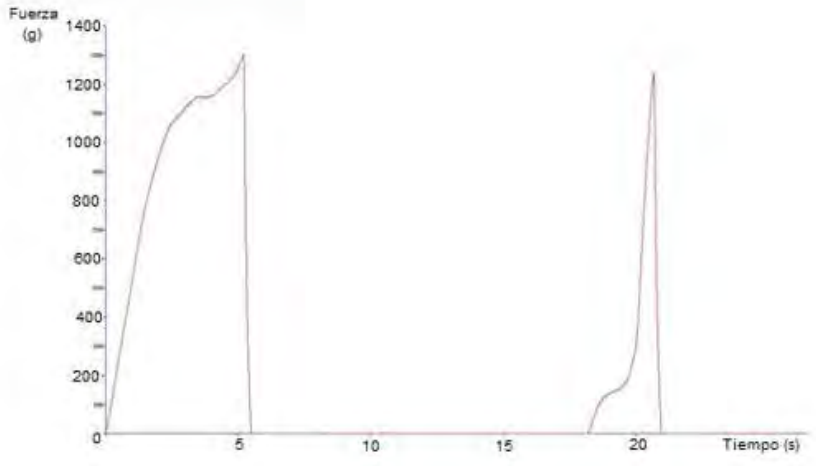
Reference: No additives



Hydrocolloid and Enzyme Mix



- Higher water absorption with the same (or better) consistency and dough structure.
- It is possible to improve water absorption and machinability.

STERNWYWIOL GRUPPE

Farinograph

- Mixing behavior
- Water absorption
- Dough development time
- Stability
- Softening

Principle
Farinograph Wheat

300 g

+

→

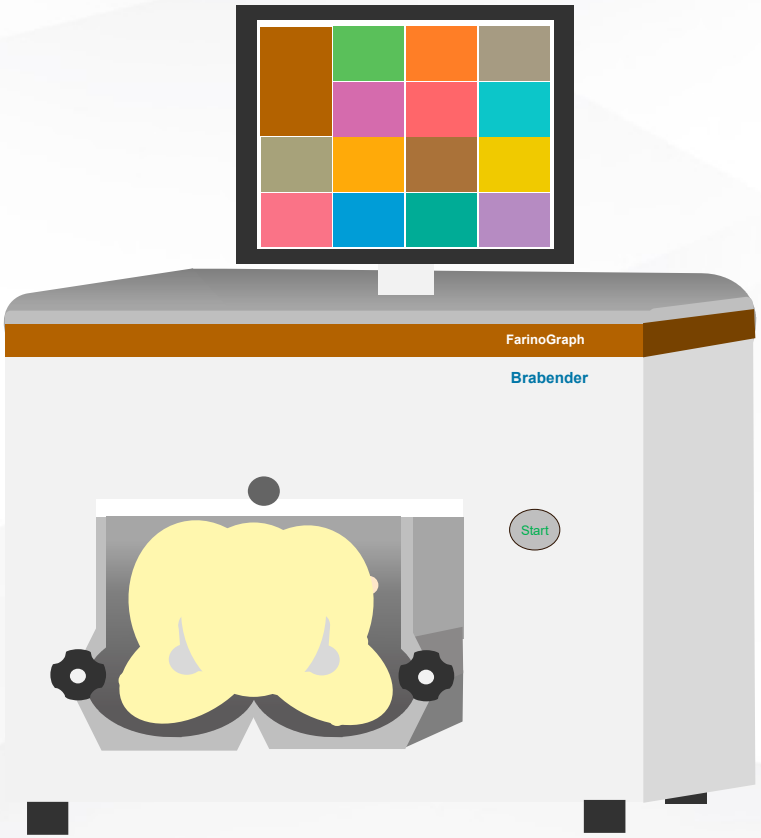
Optimum consistency

Principle
Farinograph Corn

100 g

Optimum consistency

Farinograph



Preparation

Process

Mixing

Sheeting

Transport

Drying

Frying

End product

Differences during preparation

Tortilla flour

Coherent masa
120–150% water absorption

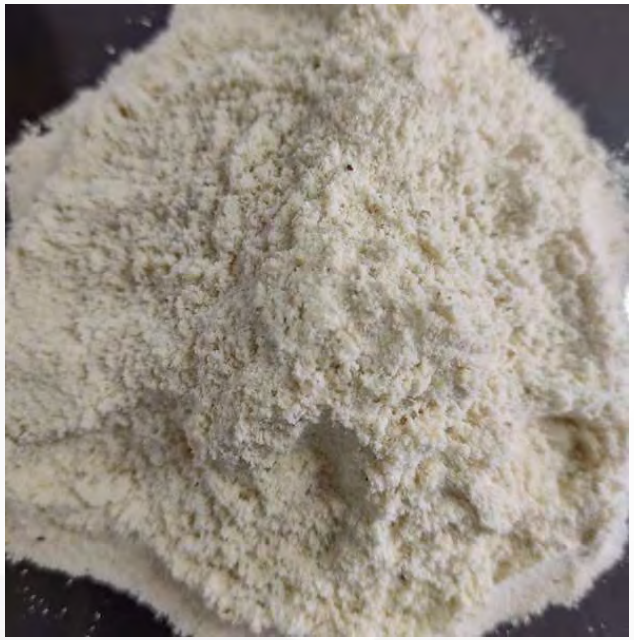
Snack flour

No cohesiveness. No MASA
80–90% water absorption

Recipe

Coarse milled corn (60%)
Standard Corn flour (40%)

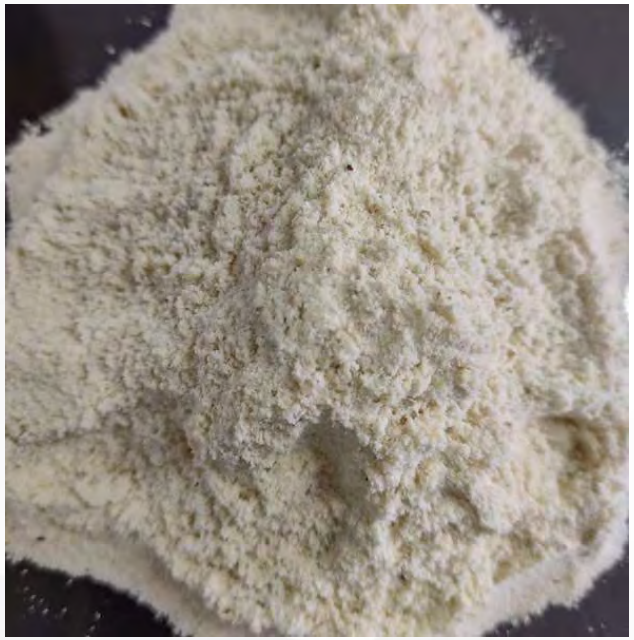
85-95% water absorption
75-85°F dough temperature
8-20min mixing time



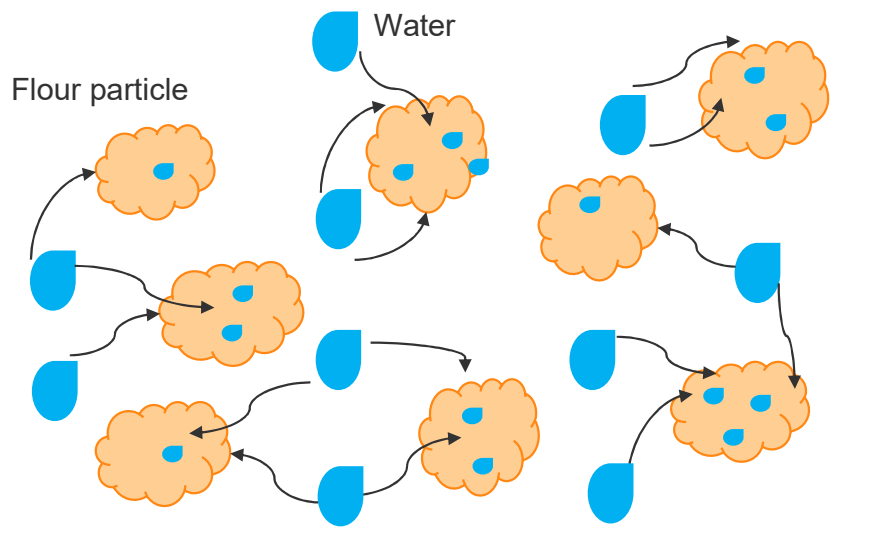
Recipe Modified

Coarse milled corn (100%)

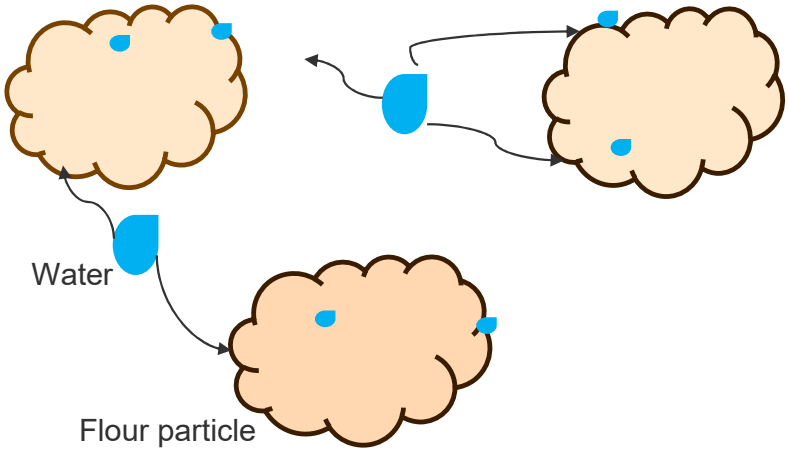
0,3-0,8% TopBake T-CH
60-70% water absorption
75-85°F dough temperature
4-15min mixing time



Particle size



Tortilla flour



Snack flour

Farinograph Test

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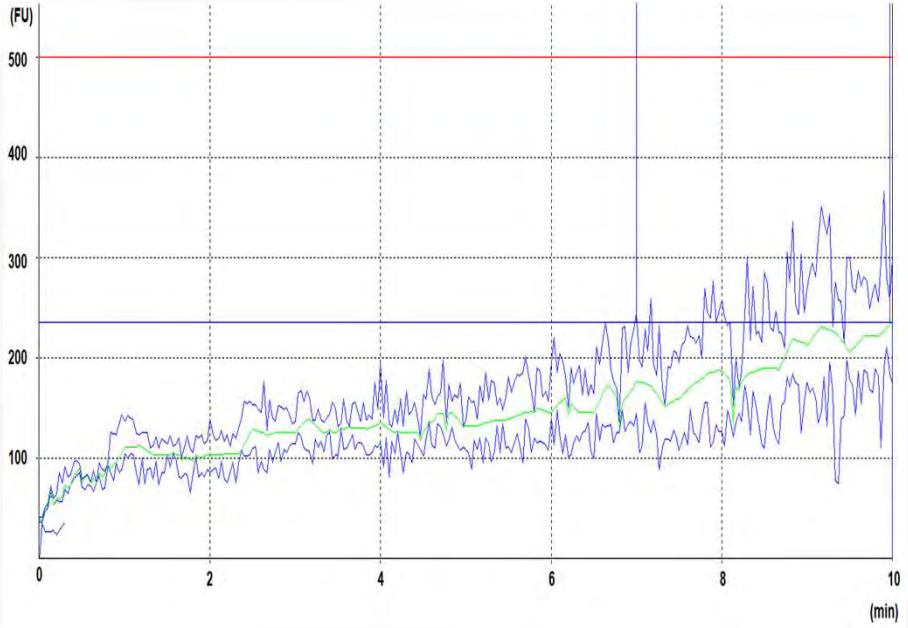
Snack flour



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Farinograph Test

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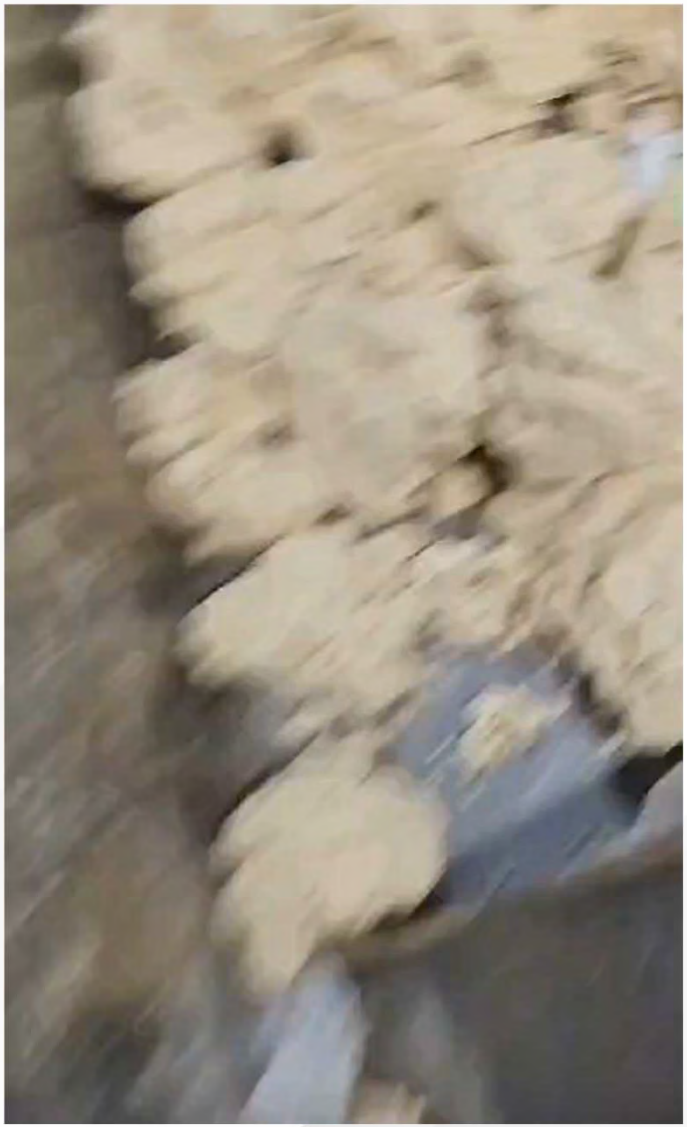
Snack flour and dough conditioner - 10% water

STERNWYWIOL GRUPPE

Dough Characteristics

- 90% Absorption
- 70°F Water
- 14 min



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Dough Characteristics

- 60% Absorption
- 70°F Water
- 2 min

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Dough Characteristics

- 60% Absorption
- 70°F Water
- 5 min

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Dough Machinability

- Stainless-steel roller
- Ambient dough temperature
- Improved machinability
- Reduced mixing time

Dough Characteristics

- 55% Absorption
- 70°F Water
- 8 min

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Dough Machinability

- Stainless-steel roller
- Ambient dough temperature
- Improved machinability
- Slightly reduced mixing time

Tortilla chips

- 350°F Baking temperature
- 45-50 sec baking time
- Humidity 23-25%

Tortilla chips

- 360°F frying temperature
- 45-50 sec. frying time
- Decrease oil absorption
- Sturdy products

Tostadas

- 355°F frying temperature
- 45-50 sec. frying time
- Decrease oil absorption
- Sturdy products

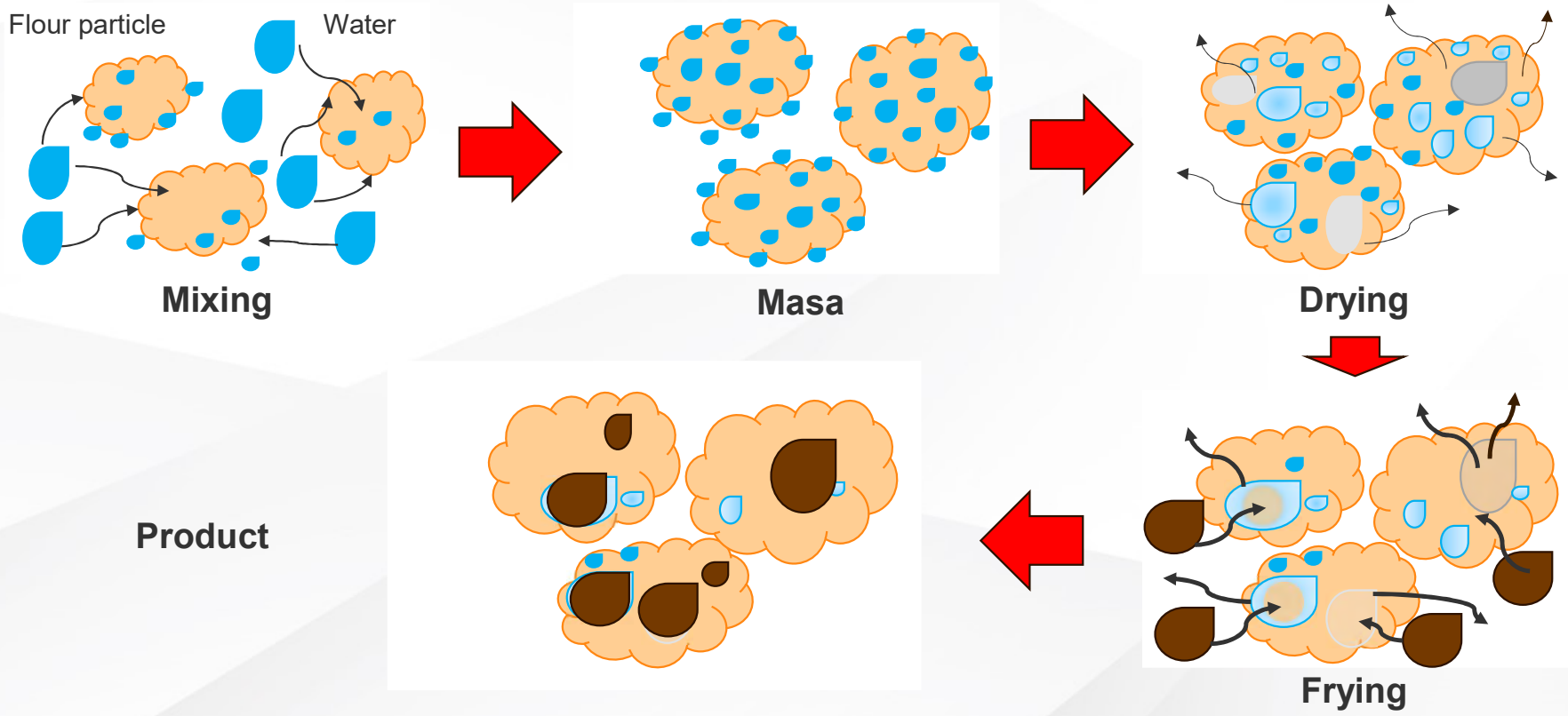
Resistance test

Tortilla chips

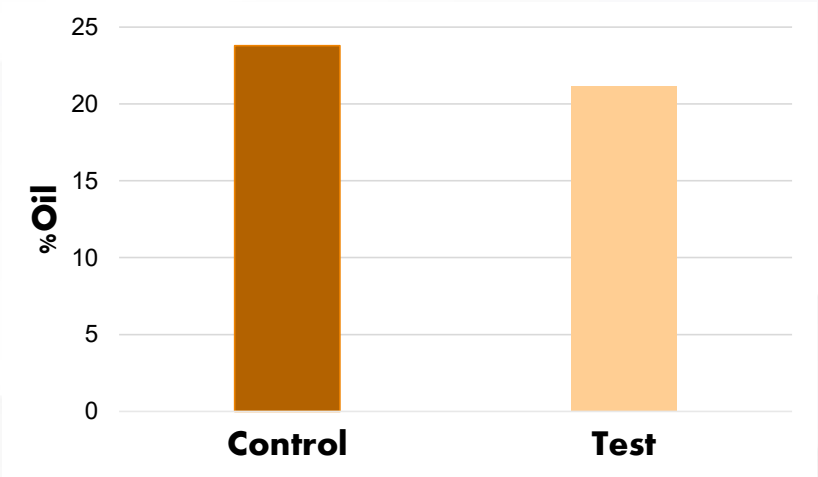
Reduced water:

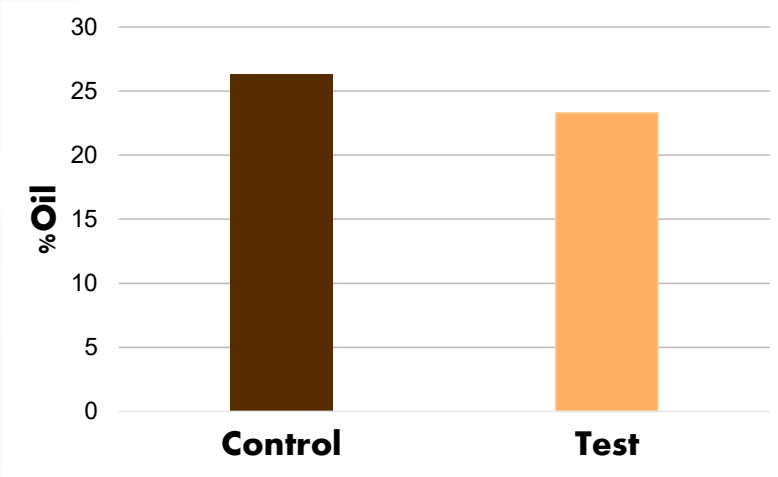
- ↓ Energy and time to evaporate water
- ↓ Oil absorption
- ↑ Resistance and force of products

Moisture ⟷ Oil



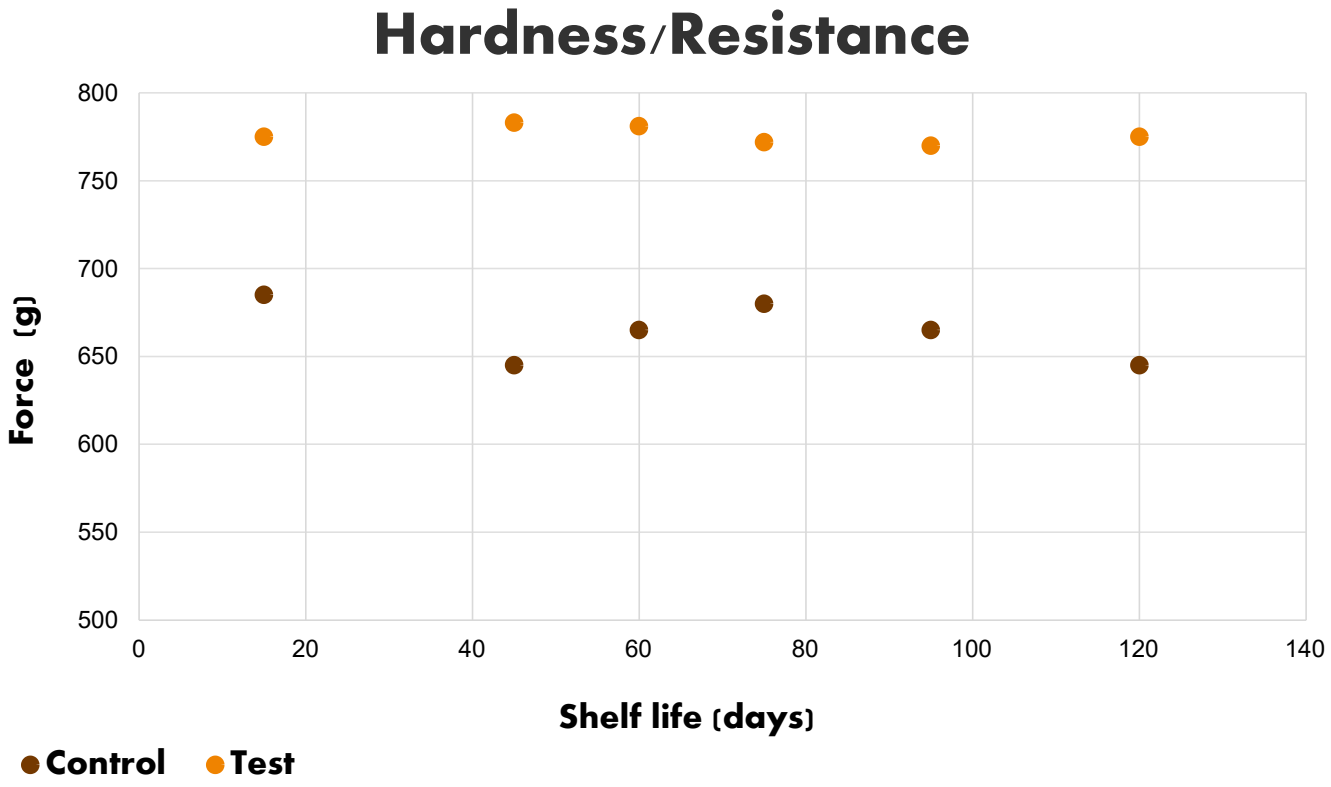
Oil content



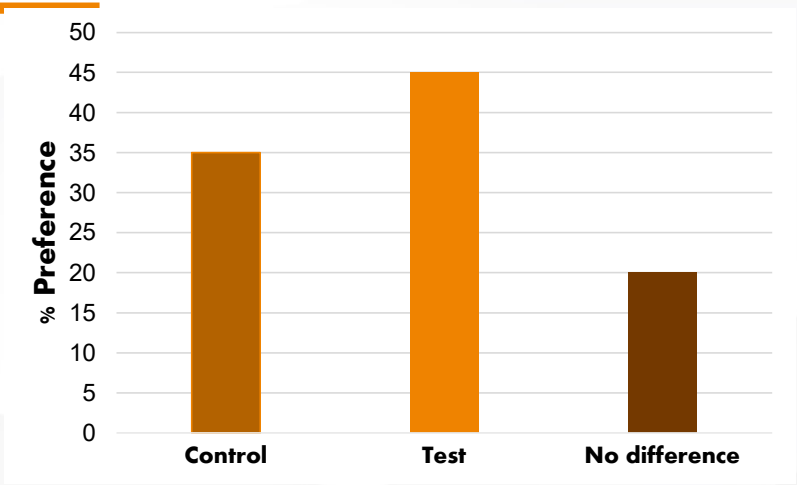


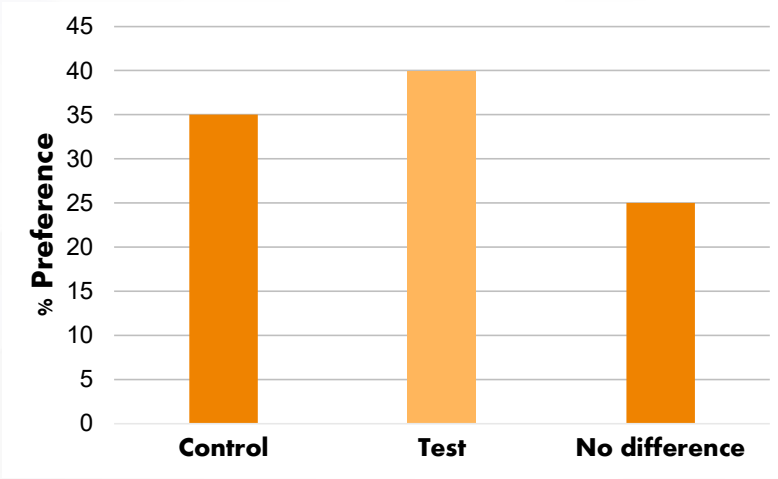
Customer Experience

Texture

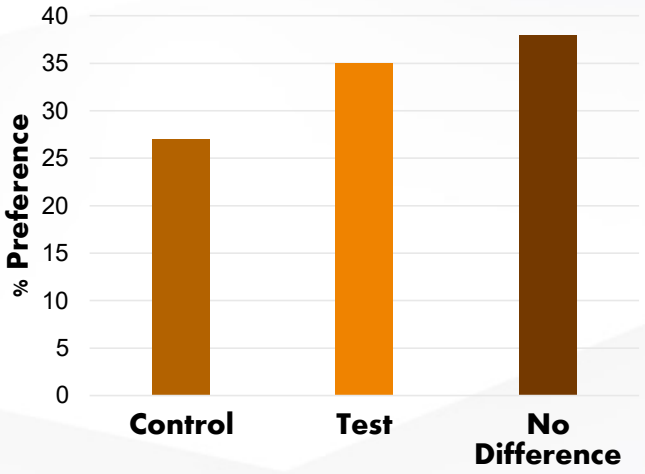

Hardness/Resistance
800
750
700
650
600
550
500
Force (g)
0
20
40
60
80
100
120
140
Shelf life (days)
Control
Test

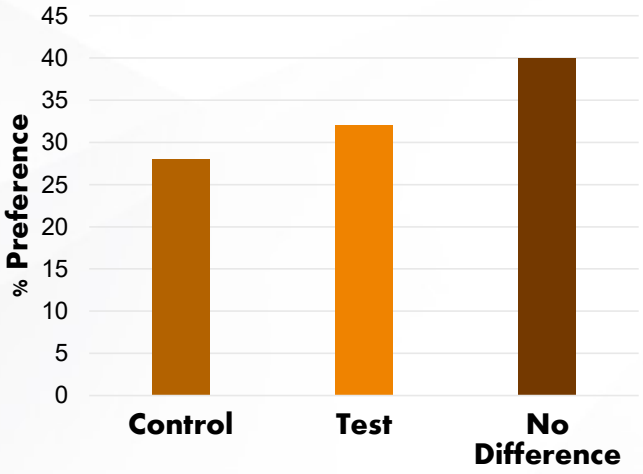
Crunchiness





Flavor


40
35
30
25
20
15
10
5
0
% Preference
Control
Test
No Difference


45
40
35
30
25
20
15
10
5
0
% Preference
Control
Test
No Difference

Conclusion

Enzyme blend

Corn dough conditioner

- Reduces the water in the formula
- Reduce mixing time
- The dough is machinable
- The chips absorbs less oil

Final Product

- Decreases oil absorption
- Improves crunchiness
- No bubbles

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Thank you very much for your attention

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