

FUNCTIONS OF THE ENZYMES ON FLOUR QUALITY



Pinar ERDAL

Head of R&D of Mirpain
Milling&Baking Ingredients
Company



In most of the countries, the most staple food of the people is bread. Wheat (*Triticum aestivum* L. and other triticum species) is one of the types of grain traditionally associated with bread making. Wheat flour provides unique properties amongst cereal flours and is, therefore, the basis for the successful production of bread. Wheat flour is the major ingredient for producing products in baking and pastry industry.



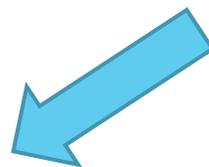
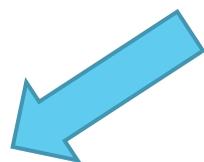


Wheat flour quality particularly depends on three factors: the individual genetic disposition of wheat cultivar, the agricultural practices used during cultivation, and the environmental effects the plant was exposed to.

These external and internal factors have extreme impact on the individual components of wheat flour and, therefore, on its overall baking quality. These properties can be improved with additives and in this way fluctuating wheat quality can be compensated for.

Therefore, due to the variable technological quality of flour, the use of additives has become important to standardize the flour in terms of gluten strength, color and fermentability.

FLOUR QUALITY INDICATORS



MILL PERFORMANCE

- **Intake requirements**
 - ✓ Protein content&quality
 - ✓ Falling Number
 - ✓ Specific Weight
 - ✓ Endosperm formation
- **Output requirements**
 - ✓ Milling Yield
 - ✓ Colour
 - ✓ Starch Damage

BAKING PERFORMANCE

- **Dough rheology**
 - ✓ Extensibility
 - ✓ Elasticity
 - ✓ Mixing tolerance
 - ✓ Water absorption
- **Baking performance**



The overall aims of the miller are to produce:

- *Consistent quality is a MUST*
- *A range of flours suitable for a variety of functions*
- *Flours with anticipated performance*



As a sloppy view; flour quality is related to protein content, particle size distribution, amylase content and starch damage which are also important for final product quality.



Intended Use of Additives

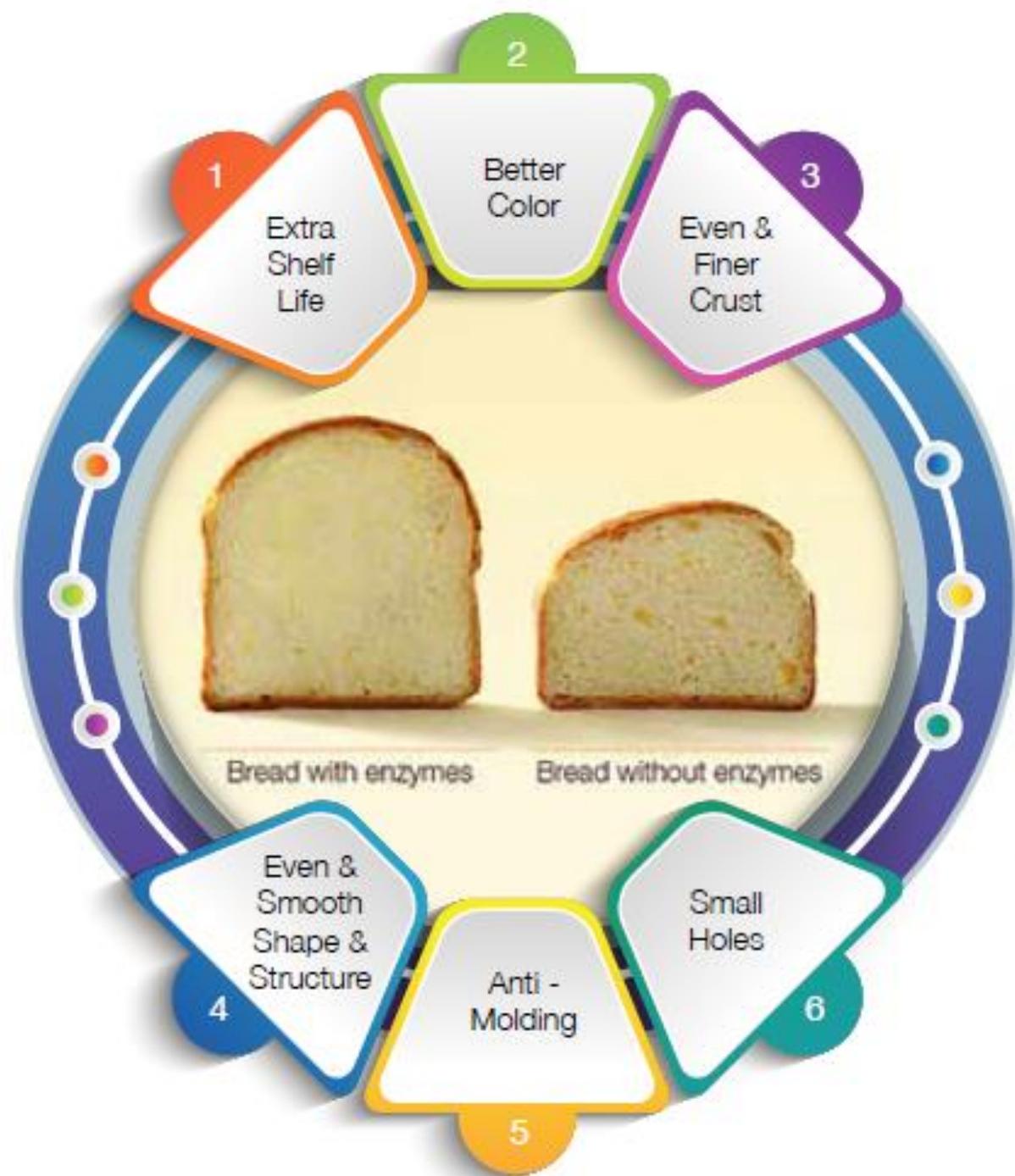
- Ensuring Standardization
- Improving quality
- Enhance consumer acceptance
- Restore the deficiency
- Reducing cost



For correct use of additives;

- 1) Flour quality analysis should be done.
- 2) Results and desired criteria should be compared and correct diagnosis should be made.
- 3) Appropriate improver should be determined.
- 4) Finally, the result should be confirmed by baking trials.

The main components of flour and bread additives are enzymes.

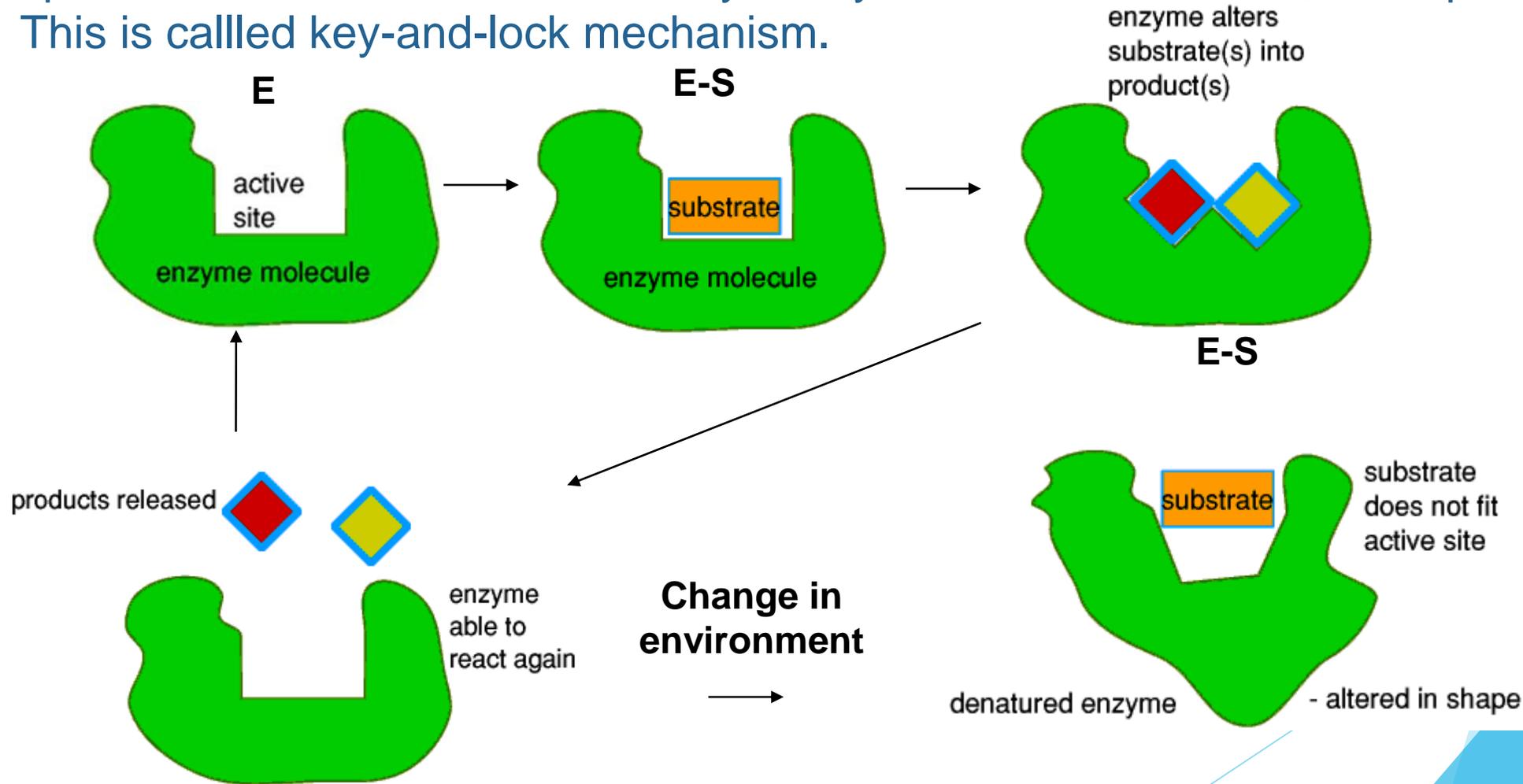




What are enzymes?

- Enzymes are proteins with the unique capability of being able to act as catalyst in bio-chemical reactions.
- Catalyst is a substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.
- They are vital for life and serve a wide range of important functions in the body, such as aiding in digestion and metabolism.

Enzymes have one or more active sites in their structure. These regions are specific for certain substrates. They catalyze the reaction to a specific product. This is called key-and-lock mechanism.





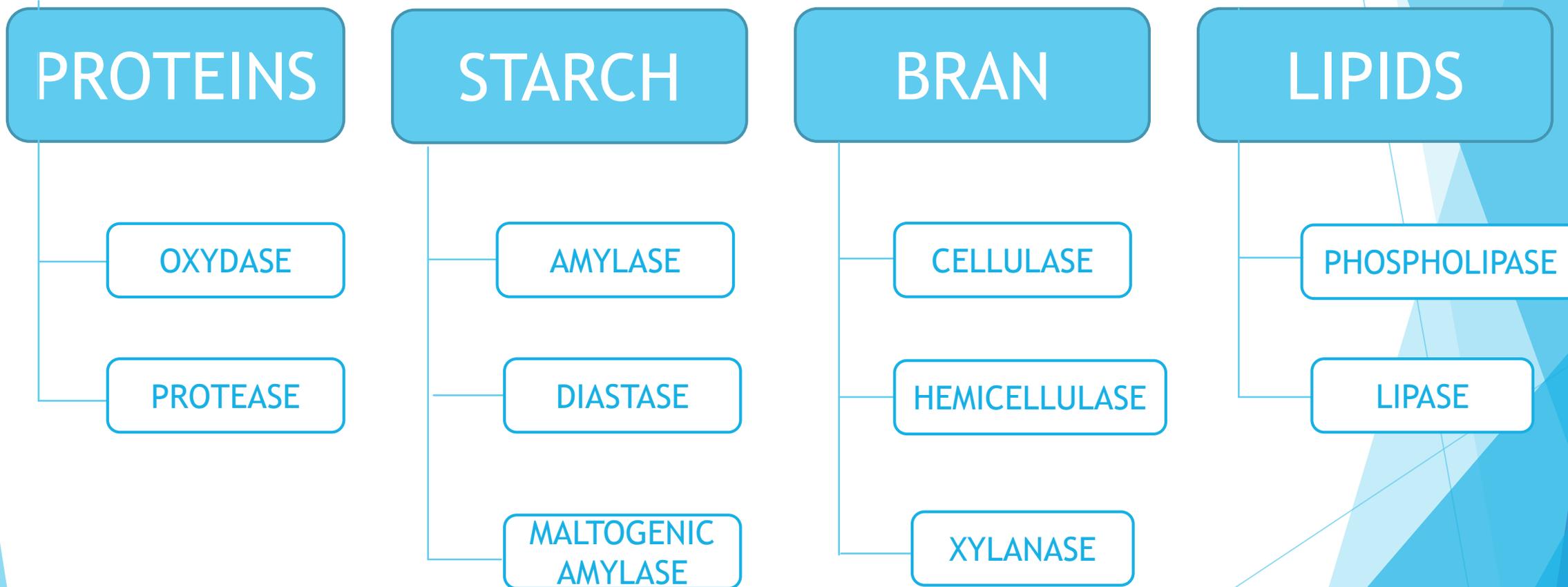
STABILIZATION AND IMPROVING THE QUALITY OF FLOUR WITH ENZYMES

The ingredients for flour improving especially ultra concentrated enzymes catalyze chemical reactions in the case of flour/dough. As they are ultra concentrated they are used at very low dosages(ppm) and yield big desired effects on the flour quality.



Some of the flour treatment enzymes used in effecting flour quality are; Amylases, Hemicellulases, Xylanases, Lipases, Glucose Oxidase, Protease... For years, enzymes such as malt and fungal α -amylases have been used in breadmaking. Due to the changes in baking industry and increasing demand for more natural products, enzymes have advanced real importance in breadmaking, where they improve dough and bread quality leading to improved dough flexibility, machinability, stability, loaf volume and crumb structure.

Each enzyme is specific for a certain substrate.





RHEOLOGY

One quick and economical way to determine the effects of enzymes is using flour rheology test equipments which are

Farinograph

Alveograph

Mixolab

Falling Number

ENZYMES VERSUS FLOUR RHEOLOGY

AMYLASE

Amylase has significant effects on the Rheofermentometer with improved gas production and dough height.
Amylase have an effect on Falling Number (reducing the falling number)
Increases L value on alveograph

XYLANASE

Xylanase might has positive effects on Alveograph P/L ratio by increasing L.

LIPASE PHOSPHOLIPASE

Lipase and phospholipase, normally would not have significant rheological effects.

OXIDASE

Glucose Oxidase improves the Farinograph stability and reduces the Farinograph degree of softening.

PROTEASE

Protease has a strong, measurable effect on the Alveograph; the addition of a protease strongly reduces W values leaving P/L ratio almost unchanged



*If you desire the accurated and proven result on effects of the enzymes, **BAKING TESTS** will tell you the **TRUTH**.*

ALPHAMILL PF
ALPHA
AMYLASE

- Gas production,
- improves volume, crust colour,
- retards staling

OXIMILL QP
GLUCOSE
OXIDASE

- Strengthen flour,
- improves flour stability and dough machinability
- provides better knife opening

HEMIMILL
SPRING
XYLANASE

- Improves dough machinability,
- increases volume and oven spring

MIRPAIN XL
MALTOGENIC
AMYLASE

- Improves bread freshness
- reduces staling

LIPOMILL(S)
LIPASE

- Improves volume and dough strength
- Preserves freshness

PROMILL
PROTEASE

- reduces flour strength
- destroys gluten

EXPERIMENTS WITH THE ENZYMES ON VARIOUS FINISHED PRODUCTS



w/o ALPHAMILL PF



with 8 ppm ALPHAMILL PF





w/o ALPHAMILL PF

with 8 ppm ALPHAMILL PF

w/o HEMIMILL SPRING



with 5 ppm HEMIMILL SPRING



w/o HEMIMILL SPRING



with 5 ppm HEMIMILL SPRING



w/o HEMIMILL SPRING



with 5 ppm HEMIMILL SPRING





w/o HEMIMILL SPRING



with 5 ppm HEMIMILL SPRING

SOME RESULTS



w/o LIPOMILL (S)



with 3 ppm LIPOMILL (S)





TEST BAKING WITH MIRPAIN ENZYME BLENDS



TEST BAKING WITH MIRPAIN ENZYME BLENDS

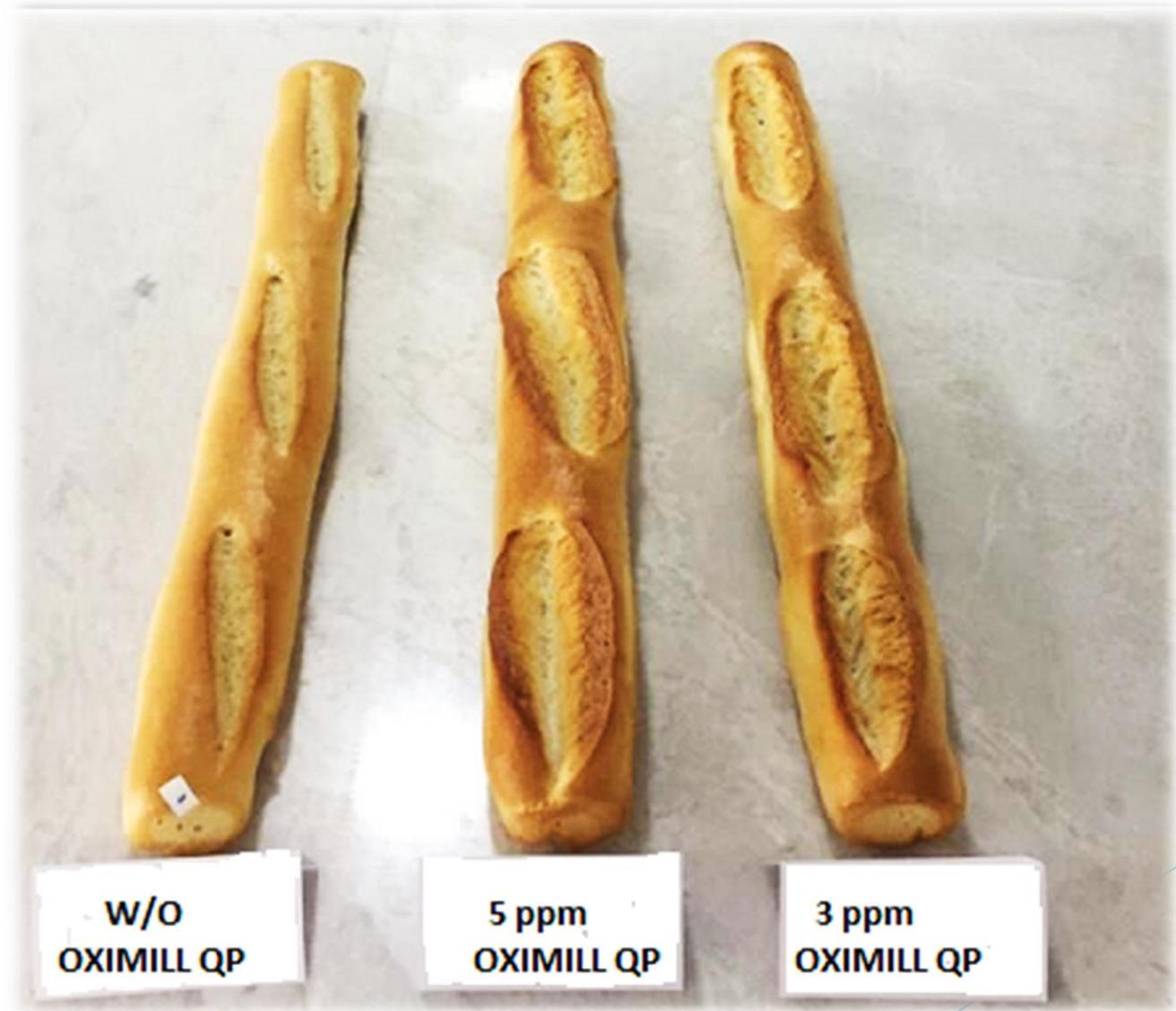


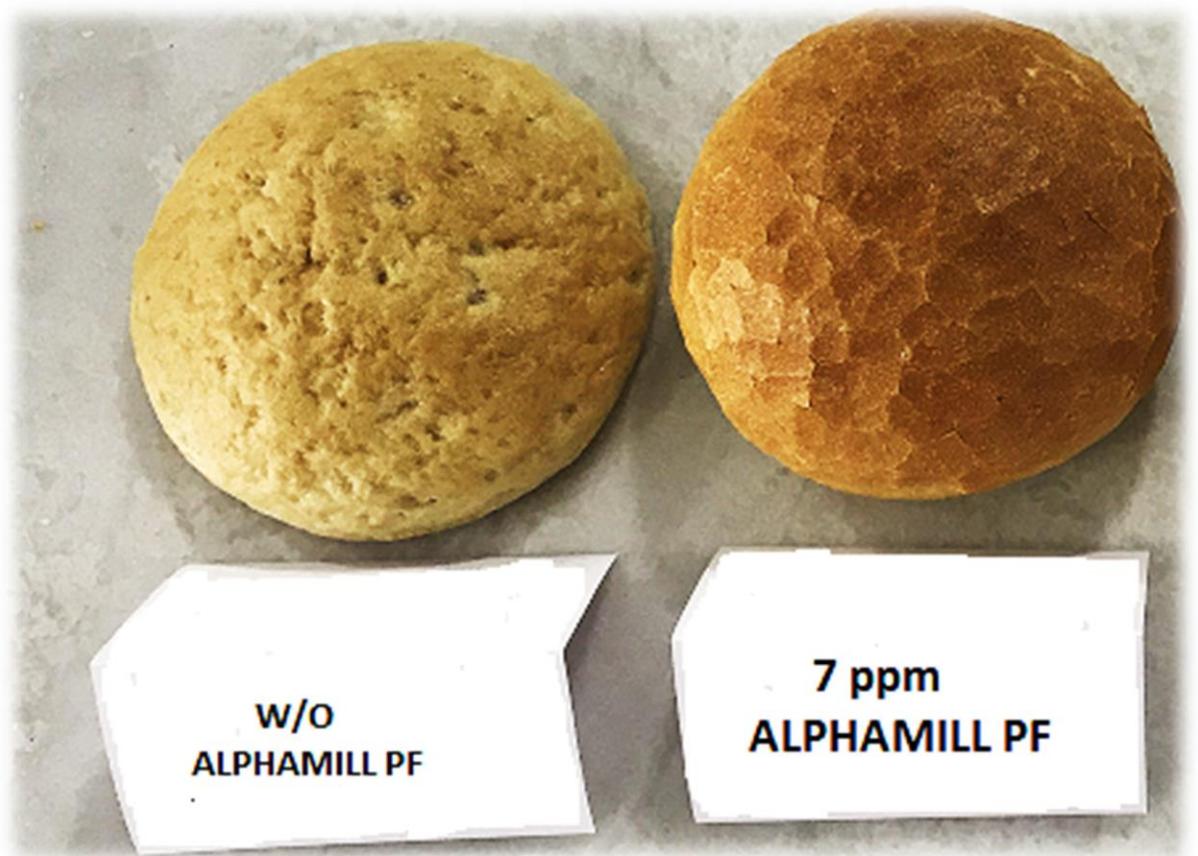


w/o
Hemimill SPRING

3 ppm
Hemimill SPRING

5 ppm
Hemimill SPRING





**w/o
ALPHAMILL PF**

**7 ppm
ALPHAMILL PF**



MIRPAIN'S TAILOR MADE ENZYMATIC FLAT BREAD SOLUTIONS

Most common problems of flat bread:

- Springing back or shrinkage of the dough
- Falling off the wall of the oven during baking
- Drying too quickly, not enough browning
- Poor dough stability
- Poor sheeting quality
- Breaking of the loaves during shelf-life



Criteria evaluated in sensory analysis of Flat Bread

Layers Separation

Foldability

Chewiness

Biting Quality

Freshness

Shape

Homogeneity of Color



When are enzymes used in pasta production?

Nowadays pasta is made from unconventional commodities in many countries of the World due to the high price of durum wheat.

Sufficient processing and balanced formulations are required to eliminate unconventional commodities poor technological properties.



Economically speaking, the use of soft wheat flour for pasta production could be advantageous; however, the poor sensory attributes and cooking quality of such products have dictated that durum semolina be used. Attempts to overcome the poor quality of non-conventional pasta have primarily relied on the use of additives.

It has been reported that firmness, color intensity and cooking quality have been improved with the appropriate drying program and additives.

What is the difference between Normal wheat and Durum wheat structurally ?

Durum wheat has very high protein content relative to normal wheat . A dough made with durum wheat has high extensibility, so it can be stretched out into long pieces of pasta without breaking, but low elasticity, which means that it doesn't bounce back like a normal wheat dough when kneaded.

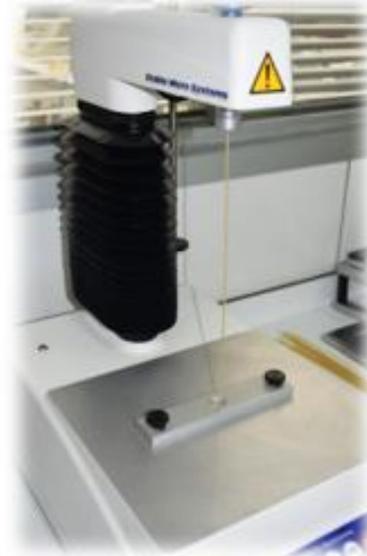
Pasta Quality Parameters

- Stickiness
- Firmness
- Elasticity
- Brightness
- Cooking tolerance
- Bite quality
- Color



Benefits of Pasta Improvers use;

- Reduces cooking losses & stickiness
- Improves cooking tolerance
- Advances bite quality
- Improves elasticity and chew ability
- Enhances color and brightness
- Eliminates the cracking problem
- Increase surface firmness





Untreated

Pastamill T





For your milling and
baking solutions
Stay tuned with
MIRPAIN!



THANK YOU FOR
LISTENING !