



Micro Ingredients action **On** enhancing Flour Quality

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Wheat grain and its derivatives are important components of our daily diet.

On average , wheat alone can meet the daily needs of some vitamins (thiamine and niacin) and more than half of daily requirements of iron and riboflavin.

The net dietary protein calories of wheat bread was reported to be around 5.9 percent and can meet the protein requirement of adults if consumed in adequate amounts.

***The most important value of wheat is
; its quality ...***

***.... Depends on various parameters ; the most
common ones are wheat variety , harvest season
(winter or spring),climatic effects (rainfall),storage
conditions-durations,crop and after-crop treatment,
planting regime ,biological effects,etc...***



Some millers categorise wheat into 4 groups that almost completely identify the purposes of them.

The 1st and 2nd group ; contain wheats that are suitable for bread making, 3rd group contains that are suitable for biscuit making and 4th group contains that are mainly used for animal feed.

WE ARE FOCUSING HERE ; 1st-2nd & 3rd group wheat flours ...

What is the Correlation between Flour Quality and End-product quality & properties;

Wheat flour quality depends on its compounds, which means depending on many varieties which are mentioned above...The below mentioned end product properties determine the quality of flour ;

Even crumb colour

Even crust colour

Even & smooth crumb texture

Higher water absorption

Even&uniform crumb structure

Uniform loaf shape

Better knife-opening

Higher tolerance to various process





***When your flour can't supply the
above factors ;***

***Flour improvers (flour treatment agents) take a big
role on this field.***

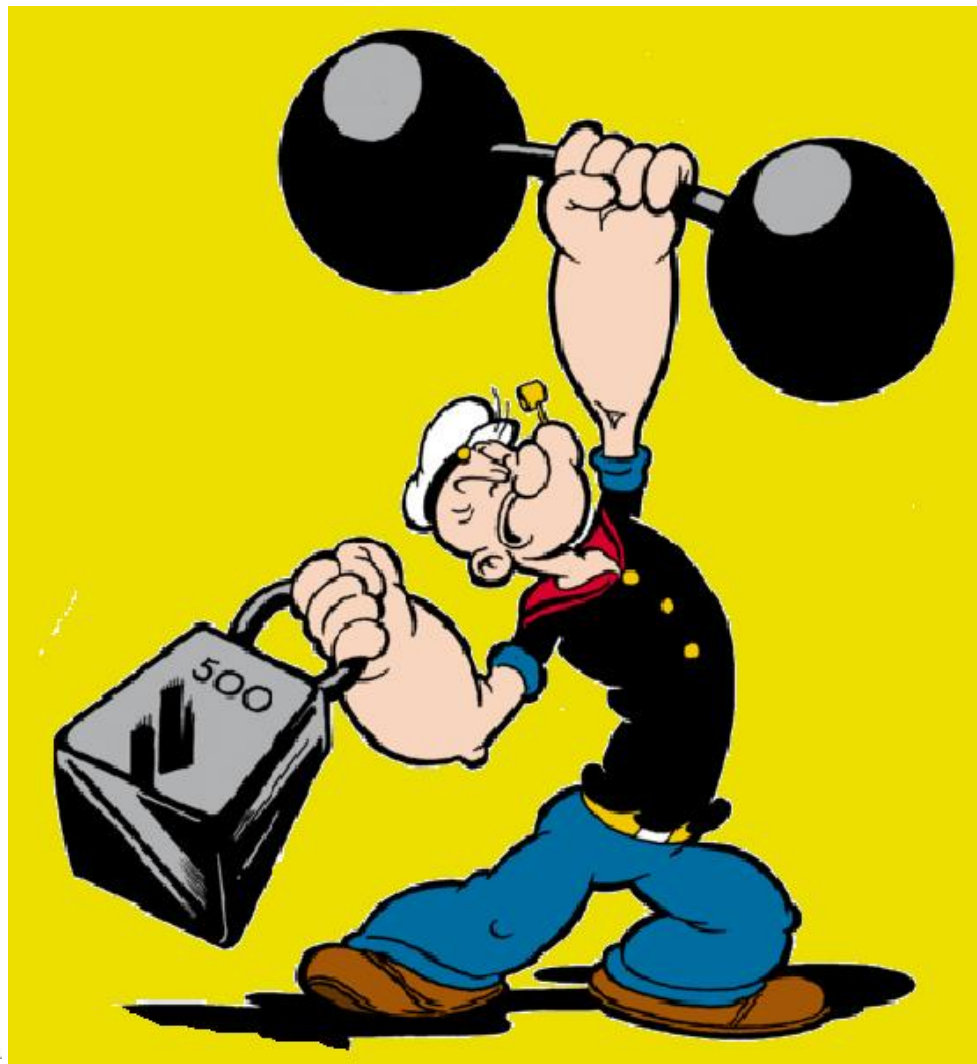
***There is a relationship between the improvers and
wheat flour (depending on intended purposes)
such as below ;***



Before



After





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

As an example ; they enhance gas production by yeasts and can help control the strength of the dough.





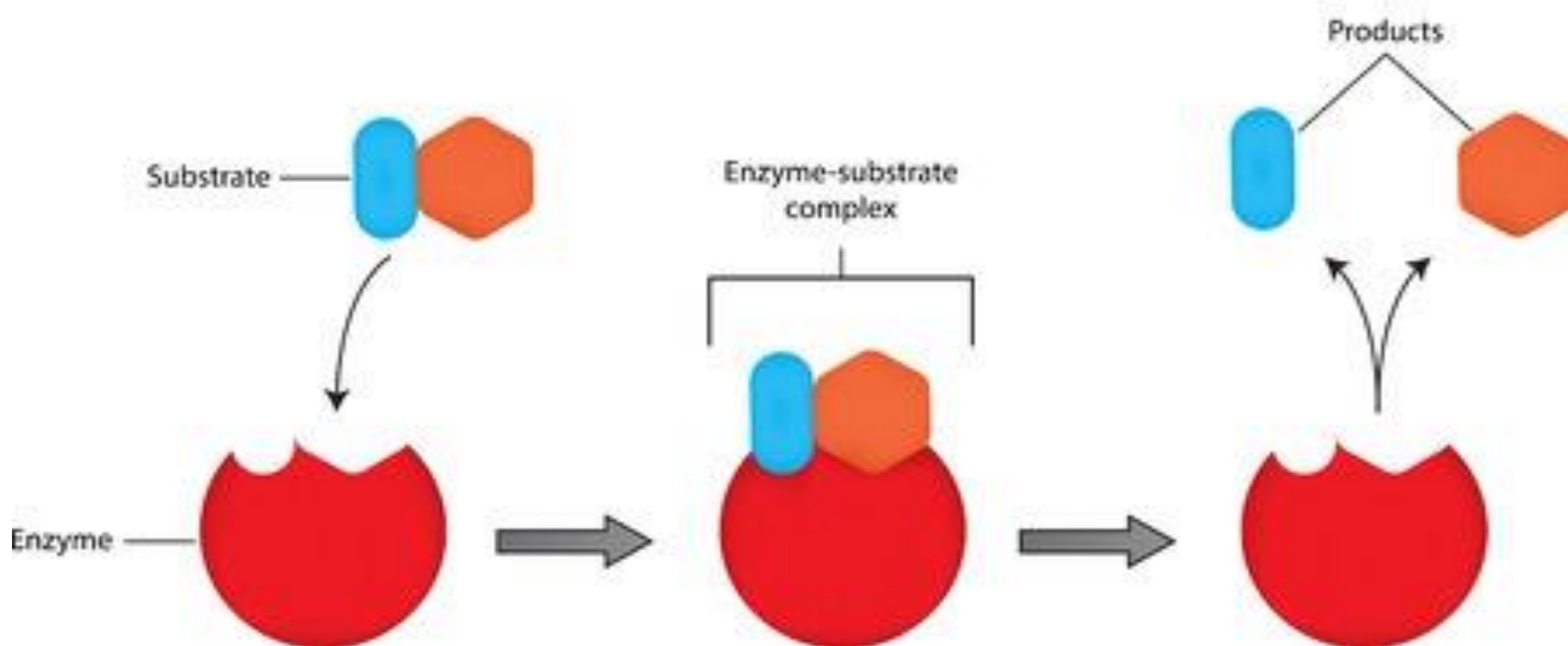
Some of the flour treatment enzymes that used in effecting flour quality are ;

- Alpha Amylases*
- Hemycellulases*
- Lipases*
- Glucose Oxidases*
- Proteases*



Enzyme structure

The Lock and Key Mechanism



Alpha Amylases



- *Amylases were the first enzymes to be added to bread doughs. Interestingly they are also the topic of most current research on enzymes in dough..While the initial use was maximising the fermentation process to obtain an even crumb structure and a high loaf volume, current interest centers on their ability to retard crumb firming, the anti-staling effect...*
- *Alpha amylases are also added to flour to generate fermentable sugar for yeast activity*
- *Improves crust color*
- *Amylases action on damaged starch granules produce dextrans and oligosaccharides, reducing their ability to immobilize water. This increases dough mobility (lowers consistency)*

Xylanases



- *Xylanases, enhance dough quality characteristics like stability, flexibility, extensibility, coherency by modifying the elasticity of gluten network which results in better crumb structure, improvement of crumb porosity, firmness, texture profile, higher moisture retention and extend shelf life of the bread.*
- *Reducing the viscosity of the gelling starch and allowing greater and longer expansion in the oven (improves the oven spring)*
- *Xylanases transform water-insoluble hemicellulose into soluble form, which binds water in the dough, therefore decreasing dough firmness, increasing volume and creating finer and more uniform crumbs. They significantly improve manufacturing conditions.*

Lipases

- *Glyco-lipids aid the gluten forming proteins in retaining the carbon dioxide gas produced in fermentation*
- *The form thin lipid layer contribute to plasticity of dough*
- *They increase oven spring*
- *Lipids seem to be sealing the burst gas cells during baking, preserving volume*
- *They help in preserving freshness in the baked bread*





Glucose Oxidases

- *Can be used as alternative oxidizing agent instead of potassium bromate in bread making, potassium bromate is an oxidizing agent that was traditionally used in baking and it is prohibited in many countries after it was recognized as carcinogenic.*
- *A reinforcement of strengthening of wheat dough and improvement of bread quality can be obtained with the addition of glucose oxidase.*
- *Better developing the dough and improving its machinability*

Proteases

- ***It reduces the strength of the flour protein, therefore reducing mixing time and elasticity of the dough and increasing the extensibility and softness of the dough.***
- ***The flow characteristics of flour is improved***
- ***The protease allows for easier working of the dough into thin sheets without shrink back or wrinkling on the band oven.***

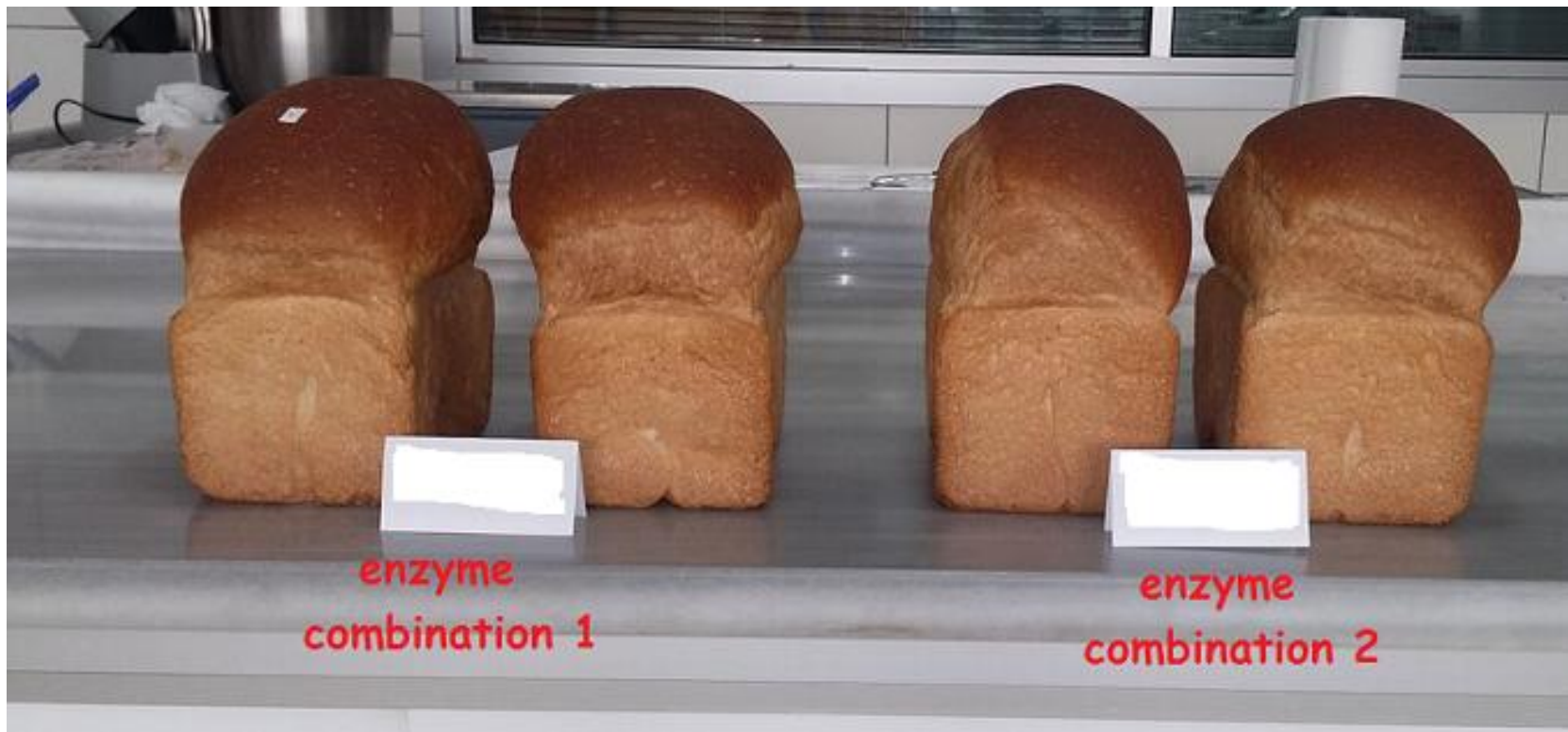
Some studies on enzymes functions



Oven spring effects of different combinations of enzymes



volume effects of different combinations of enzymes



volume effects of different combinations of enzymes



All the parameters were kept same during this baking test...The only difference between these trials was ; Trial C contained some enzymes while Trial Y didnt contain any enzymes.



Effects of enzymes on baguette breads



Quality Control Parameters

There are many ways to control quality of the improvers, some companies have enzyme activity measurement kits, some has equipments of the measurement of percentage /activity of the additives..like ; spectrophotometric methods,titration methods, sensory analyzing methods....

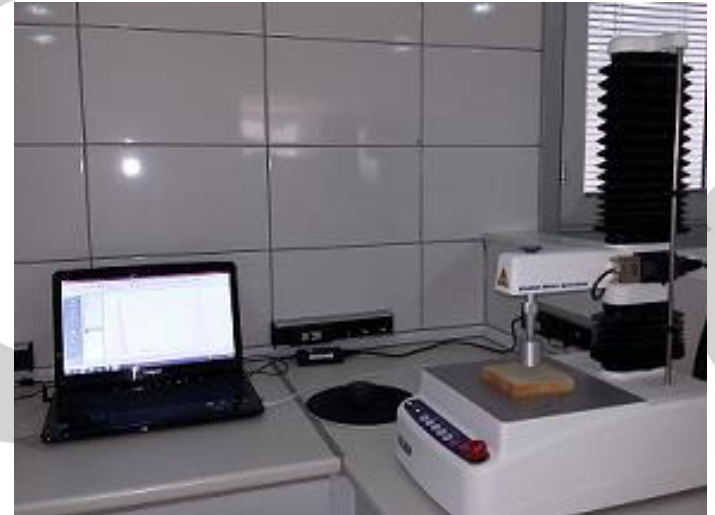
But the best way on quality control is : Baking test (You need just 1 demo-baking unit)

- *With one Baking Test, you can check below parameters ;*
 - Volume/specific Volume*
 - Crumb firmness*
 - Crumb Colour*
 - Knife opening (if there is)*
 - Even crumb holes*



Alveograph and Mixolab are rheological instruments for quality check of flour and improvers.

Texture analysing method for the quality check of improvers





Spectrophotometric reading method for the quality check of improvers



Titrimetric method for the quality check of improvers

Steps of a Baking Test



To compare properly two or more products , testing the all products together is a must.



Resting the doughs on the table for first proofing



Handling, cutting and putting into pans/trays



Rest the doughs in fermentation cabin for main proofing



Baking the doughs



Measuring the volume/specific volume of the breads and evaluating all the results





Future Trends

Regarding baked goods, the use of enzymes to obtain dietary fiber enriched bread, for the development of gluten free products, to obtain products with increased contents of arabinoxylan oligosaccharides with prebiotic potential, has been reported. The enzymes are also used as shelf life extenders of end-product. «Today's enzymes offer label-friendly answers with clear-cut activity»





Benefits

*Enriching quality of the end-product and properties, such as ;
higher loaf volume, increased machinability, increased shelf life
of end-product , increased yield,*

*Fine crumb & crust, desired colour, even crumb holes, increased
oven spring, increased fermentation tolerance, reduced mixing
time, reduced fermentation time, etc..*

KEEP CALM

AND

USE

FLOUR IMPROVERS





REFERENCES

- *Quality Evaluation of Wheat Flour Consumed in Rawalpindi and Islamabad – M.Akmal Khan, Javed Rashid and M.Khalid - Pakistan J.Agric.Res.Vol.8.No.4,1987*
- *Nabim – Wheat and Flour Testing*
- http://aciar.gov.au/files/node/3875/Session%20VII-Wheat_Quality.pdf
- *Xylanases and Their Applications in Baking Industry*
Masood Sadiq Butt, Muhammad Tahir-Nadeem*, Zulfiqar Ahmad and Muhammad Tauseef Sultan
National Institute of Food Science and Technology, University of Agriculture, December 20, 2006
- *INFLUENCE OF LIPASE PRODUCTS ON TECHNOLOGICAL PROPERTIES OF THE BREAD FLOUR*
Alexandrina Sîrbu, V. Pâslaru
A. Sirbu, et al. Scientific Researches. Agroalimentary Processes and Technologies, Volume XI, No. 1 (2005), 185-19
- *Enzymes in Bakery: Current and Future Trends* <http://dx.doi.org/10.5772/53168>
- *Aib Technical Bulletin- Enzymes Used in Bread Baking :An Application Update - Volume XXVI, Issue 10 –October 2004*
- *Aib Research Department Technical Bulletin- Enzymes Used in Bakery Products I.FUNDAMENTALS OF ENZYMES –Volume XVI, Issue 4 – April 1994*
- *Aib Research Department Technical Bulletin- Enzymes Used in Bakery Products II.Applications of Enzymes – Volume XVI, Issue 5- May 1994*



- *GLUCOSE OXIDASE EFFECT ON DOUGH RHEOLOGY AND BREAD QUALITY : A STUDY FROM MACROSCOPIC TO MOLECULAR LEVEL - A. Bonet¹, C.M. Rosell^{1a}, P.A. Caballero², M. Gómez², I. Pérez – Munuera³, M.A. Lluch³ - ¹Instituto de Agroquímica y Tecnología de Alimentos (IATA-CSIC). PO Box 73 Burjasot-46100. Valencia. Spain- ²Departamento de Ingeniería Agrícola y Forestal, Tecnología de los Alimentos, E.T.S. Ingenierías Agrarias, Universidad de Valladolid, 34004, Palencia, Spain-³Departamento de Tecnología de Alimentos, Universidad Politécnica de Valencia, P.O. Box. 22012, 46071, Valencia, Spain.*
- *Effects of Different Ovens and Enzymes on Quality Parameters of Bread- A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES OF MIDDLE EAST TECHNICAL UNIVERSITY –SEMIN OZGE KESKIN*
- *THE INFLUENCE OF GLUCOSE OXIDASE AND PEROXIDASE ON RHEOLOGICAL PROPERTIES OF DOUGHS OBTAINED FROM WEAK FLOURS -Alexandru Stoica- Annals. Food Science and Technology 2013*