

FOOD ENZYMES AND THEIR APPLICATIONS

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FOOD ENZYMES



Bromelain



Papain

Pancreatin

Proteases
Amylase
Lipase



Rutosid

Trypsin



Chymotrypsin



Food Enzymes – General properties

- Enzymes are proteins that function as biological catalysts
- They have one (or more) active sites in their structure that have great specificity for certain substrates (bind only to these)
- Speed up chemical reactions from their ability to bind to their substrates, significantly lowering the activation energy (E_a)
 - They are essential for reactions to occur in cells
 - They have dramatic impact on the food quality deterioration
 - They can be used to perform positive reactions in food and beverage processing (also textile, leather, pharma)
 - Very rapid and catalyze specific reaction
 - Only need small amount (active at low concentration)
 - Can easily control them by adjusting their environment, under mild conditions- e.g. pH, temperature, chemicals,
 - They are natural and non-toxic

Enzymes – Classifications

- There are six main types/groups of enzymes classified based on their chemical reaction mechanism

1. Oxidoreductases

- Catalyze oxidations or reductions of substrates
- Important in food reaction examples:
 - Lipid oxidation – lipoxygenase (adds an oxygen on fatty acids)
 - Browning – polyphenol oxidase (oxidizes phenols in food)

2. Transferases

- Catalyze a shift of a chemical group from a donor to acceptor substrate
- Not so important in foods

Enzymes – Classifications

3. Hydrolases

- Catalyze the hydrolysis (with help of water) of substrates (i.e. breaking of bonds)
- By far the most important enzymes with respect to food quality and use in food processing
- Some important food reaction examples:
 - Texture, protein modification – proteases (cleave the peptide bond)
 - Texture, carbohydrate modification – e.g. amylases (cleave glycosidic bonds) and pectinases (act on several groups/bonds)
 - Hydrolytic rancidity, fat crystallization modification – lipases (cleave ester bonds)

Enzymes – Classifications

4. Lyases

- Catalyze the removal or addition of chemical groups to substrates
- Not so important in foods

5. Isomerases

- Catalyze intramolecular rearrangements
- An important food reaction example:
 - Sweetness (Glu → Fru) – glucose isomerase (converts aldose to ketose)

6. Ligases

- Catalyze combinations of substrates
- Not so important in foods