Use of Enzymes in Marinades
Prepared Foods R & D Conference
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Types of Enzymes

- Papain
- Bromelain
- Ficin
- *Aspergillus oryzae* protease
- *Bacillus subtilis* protease
Papain

- Derived from latex of unripe papaya
- Longest history of use
- Highest Temperature of inactivation
Bromelain

- Derived from Pineapple
- Slightly lower temperature of inactivation compared to papain
- No odor
- No added sulfites
- More effective on connective tissue
Ficin

- Derived from latex of fig tree
- Lowest temperature of inactivation of the botanical proteases
- Limited production/ highest cost
Aspergillus oryzae Protease

- Fungal protease
- Limited use in market
- May have amylase side activity
- Low temperature of inactivation
- Very mild tenderizer
Bacillus subtilis Protease

- Only recent USDA approval
- Mild tenderizer
- Low temperature of inactivation
- Possible alternate to Ficin
Formulation with enzymes

• Most hazardous – “Match the Label”
  – Activity of the enzyme is NOT consistent
  • Example Add .01% Papain on dry wt. basis
    – Supplier One 70 MCU/mg
    – Supplier Two 300 MCU/mg
    – Supplier Three 1,400 MCU/mg
    – One Gram from #3 is 20X that of #1
Formulation with enzymes

• Typical Dose with botanical proteases 500 – 3000 MCU per pound of meat
• Need to calculate uptake of marinade per pound of meat
Other Factors that influence

• Hold time before cooking
• Hold temperature before cooking
• Maximum cook temperature
• Storage after cooking
  – Immediate consumption or further hold time