Almond Addition Enriches Isoflavones Aglycones in Soy Bread

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INTRODUCTION

ISOFLAVONES

? PHYTOCHEMICALS

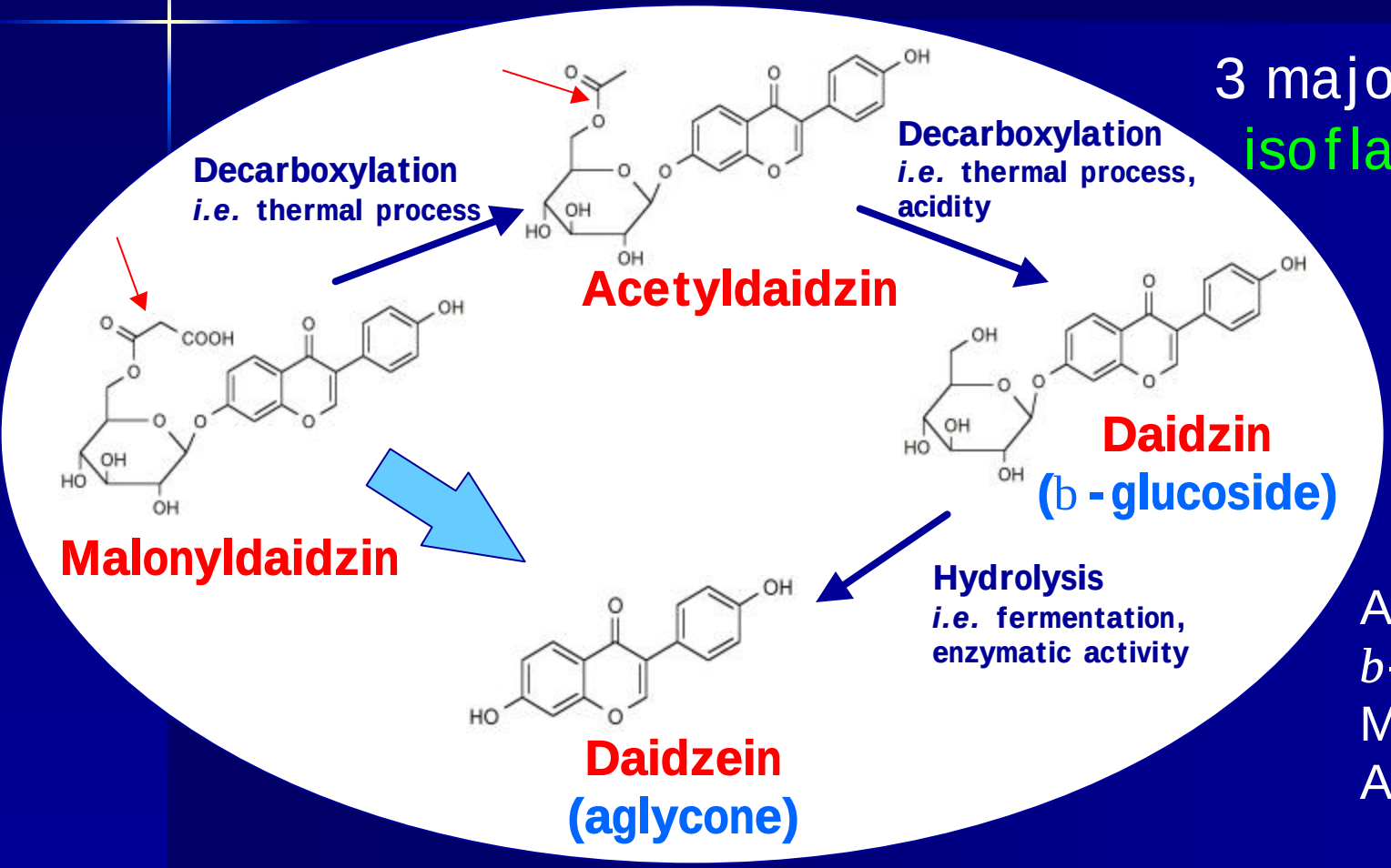
- Compounds found in plants and common in SOYBEANS

? PHYTOESTROGENS

- Hormonal and non-hormonal properties

? Epidemiological and experimental studies associate isoflavones consumption and a REDUCED RISK FOR CARDIOVASCULAR (antioxidant properties) & some CANCER DISEASES

Isoflavone Profile & Processing Conditions



3 major families of isoflavones in soy:

- Genistein
- Daidzein
- Glycitein

4 chemical forms

Aglycone
b-glucoside
Malonylglucoside
Acetylglucoside

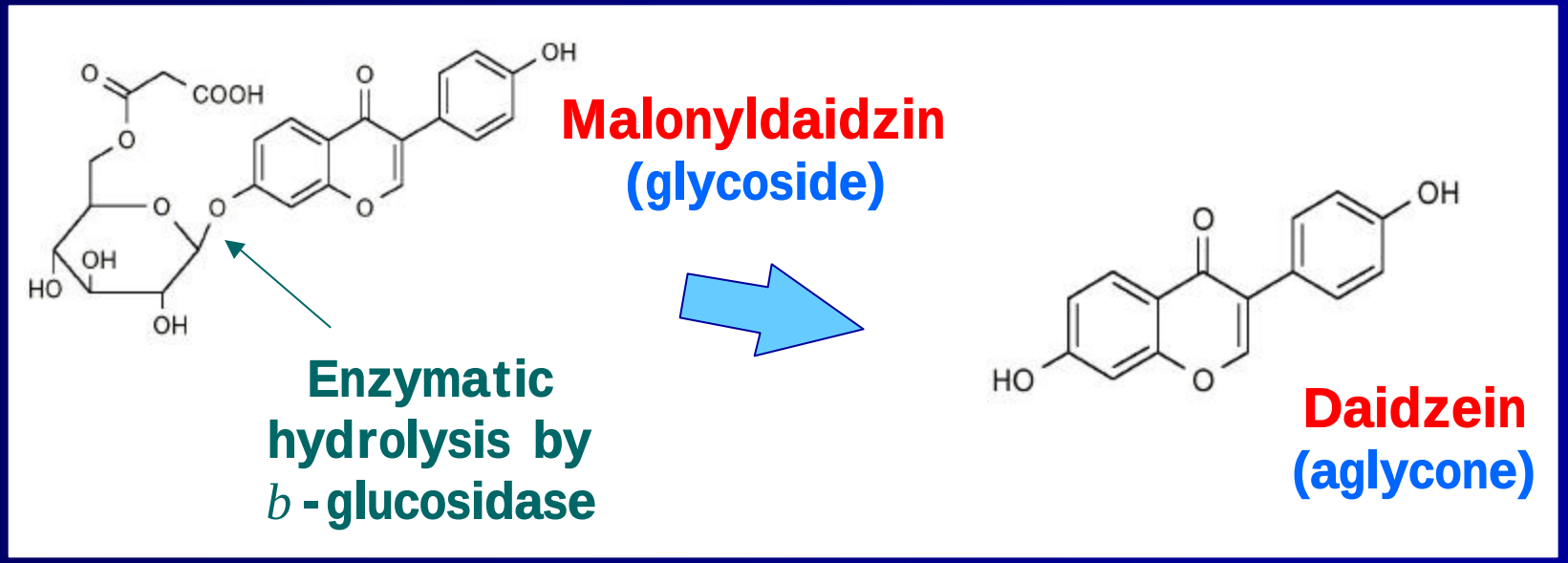
Aglycone BIOAVAILABILITY higher than glycosides

THE ROLE OF *b*-GLUCOSIDASE: AGLYCONES ENHANCEMENT

***b*-glucosidases** from food sources (*i.e.* soybeans, wheat) capable of converting

ISOFLAVONE GLYCOSIDES ➡ AGLYCONES

(Hsieh & Graham 2001; Sue et al. 2000; Matsuura et al. 1989)



OBJECTIVE

SOY CONSUMPTION & HEALTH BENEFITS

? SOY-BASED products development

incorporation of soy ingredients in food products ➡ mask taste

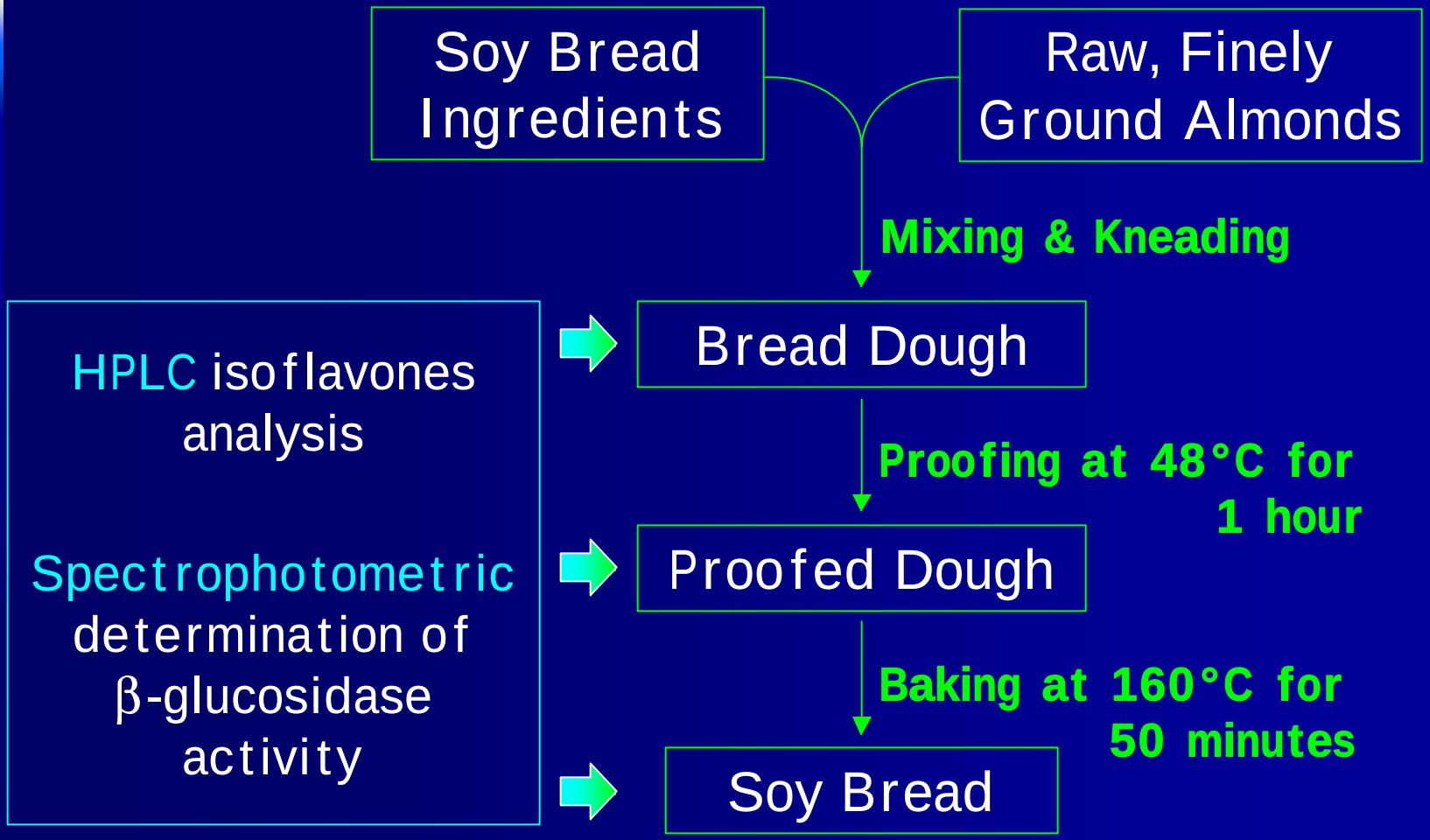
➡ increase consumption of soy

Development of a soy bread meeting FDA Soy Health Claim requirements

? ALMOND-ADDITION ➡ possible improvement of health promoting activity from soy ingredients

Material & Methods

Bread Preparation & Experimental Design



Material & Methods

HPLC Analysis

- Solvent extraction of isoflavones from bread
- Dried extract dissolved in methanol
- HPLC analysis within 10 hours of extraction
- Calibration curve construction using 12 standard solutions

Daidzin	Daidzein	Malonyldaidzin	Acetyldaidzin
Glycitin	Glycitein	Malonylglycitin	Acetylglycitin
Genistin	Genistein	Malonylgenistin	Acetylgenistin

Material & Methods

HPLC Analysis

? C18 reversed-phase column

? HPLC mobile phase **gradient** conditions:

Time (minutes)	Solvent A (%)	Solvent B (%)
0	85	15
5	85	15
36	71	29
44	65	35
45	85	15
50	85	15

? Solvent A: 1% acetic acid in water

? Solvent B: 100% acetonitrile

MATERIAL & METHODS

β-GLUCOSIDASE ACTIVITY ASSAY

Procedure based on modified McCue and Shetty method

- Extraction of β-glucosidase enzyme
- Samples preparation

  Sample: Extract

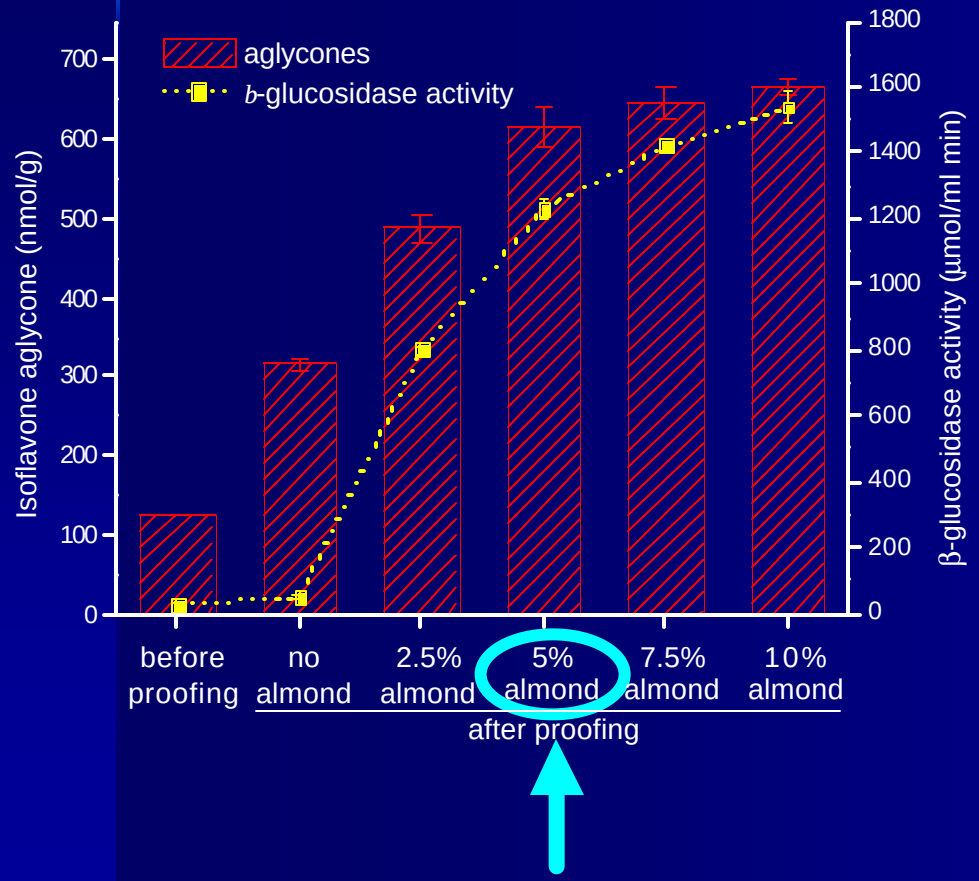
  Blank: Distilled H_2O

  } with p-nitrophenol-β-D-glucopyranoside and sodium acetate buffer (ph 4.6)

- Reaction: tubes incubated at 37°C for 30 minutes
- Stop reaction : addition of 1ml of cold (4°C) 100mM Na_2CO_3 (pH=8)
- Spectrophotometric determination of adsorbance at 400nm

RESULTS

EFFECT OF ALMOND ADDITION ON AGLYCONES CONTENT IN SOY BREAD

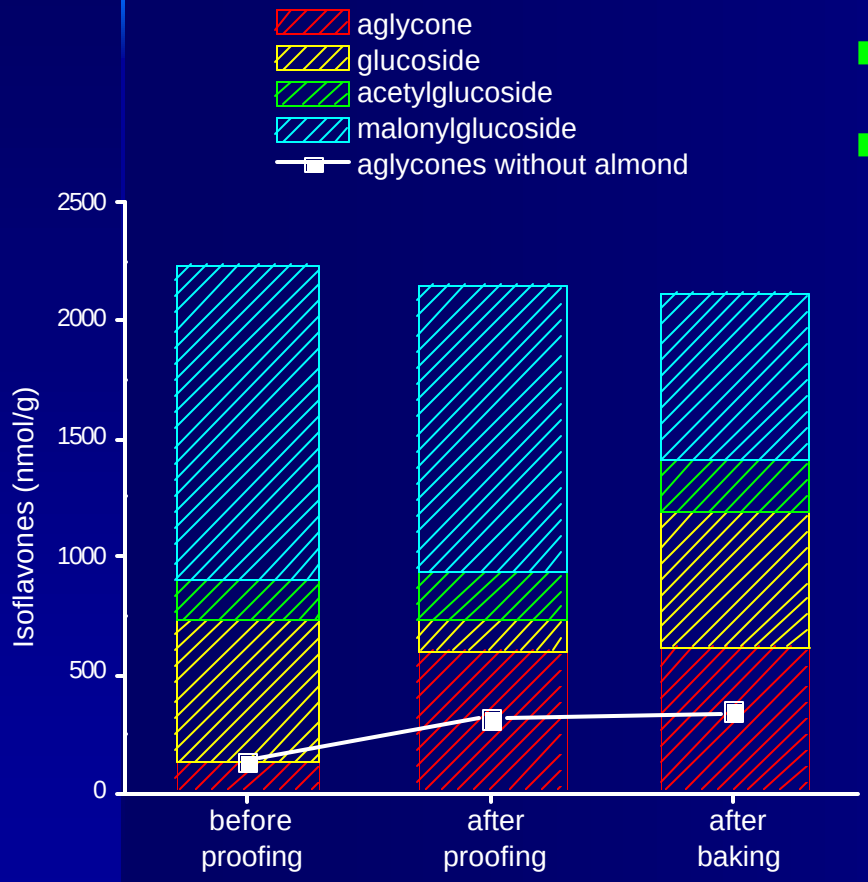


? Almond addition caused **relevant increase** of **b-glucosidase activity**

? **5% w/w almond addition** ➡ **most effective** and **economic** level for enhancing isoflavone aglycones

RESULTS

EFFECT OF BREAD PREPARATION ON ISOFLAVONES CONTENT IN SOY BREAD



- **Proofing at 48°C for 1hr**
- **Baking at 160°C for 50min**
- **5% w/w almond addition**

? **No** significant **degradation of isoflavones** during bread preparation

? **Aglycones almost doubled** in soy bread containing 5% almond as compared to bread with no almond

CONCLUSION

ISOFLAVONES BIOAVAILABILITY ENHANCEMENT IN SOY BREAD

? The addition of ground almonds to soy bread

➡ increased β-glucosidase activity

➡ did not affect isoflavones total content

} **Profile changes**

? Proofing stage provides greatest enhancement in isoflavone aglycones in soy bread

? Optimal conditions for aglycone form enhancement: 5% almond addition & proofing at 48°C for 1 hour

Future Studies

Soy Bread Containing Almonds

Further evaluations during production & storage:

- Water mobility
- Molecular interactions between soy proteins, starch and other components

using various techniques such as:

- Nuclear Magnetic Resonance (solution & solid state),
- Magnetic Resonance Imaging
- Fourier Transform Infrared