

**Proofing condition on the distribution of
isoflavones in
Soy Bread**

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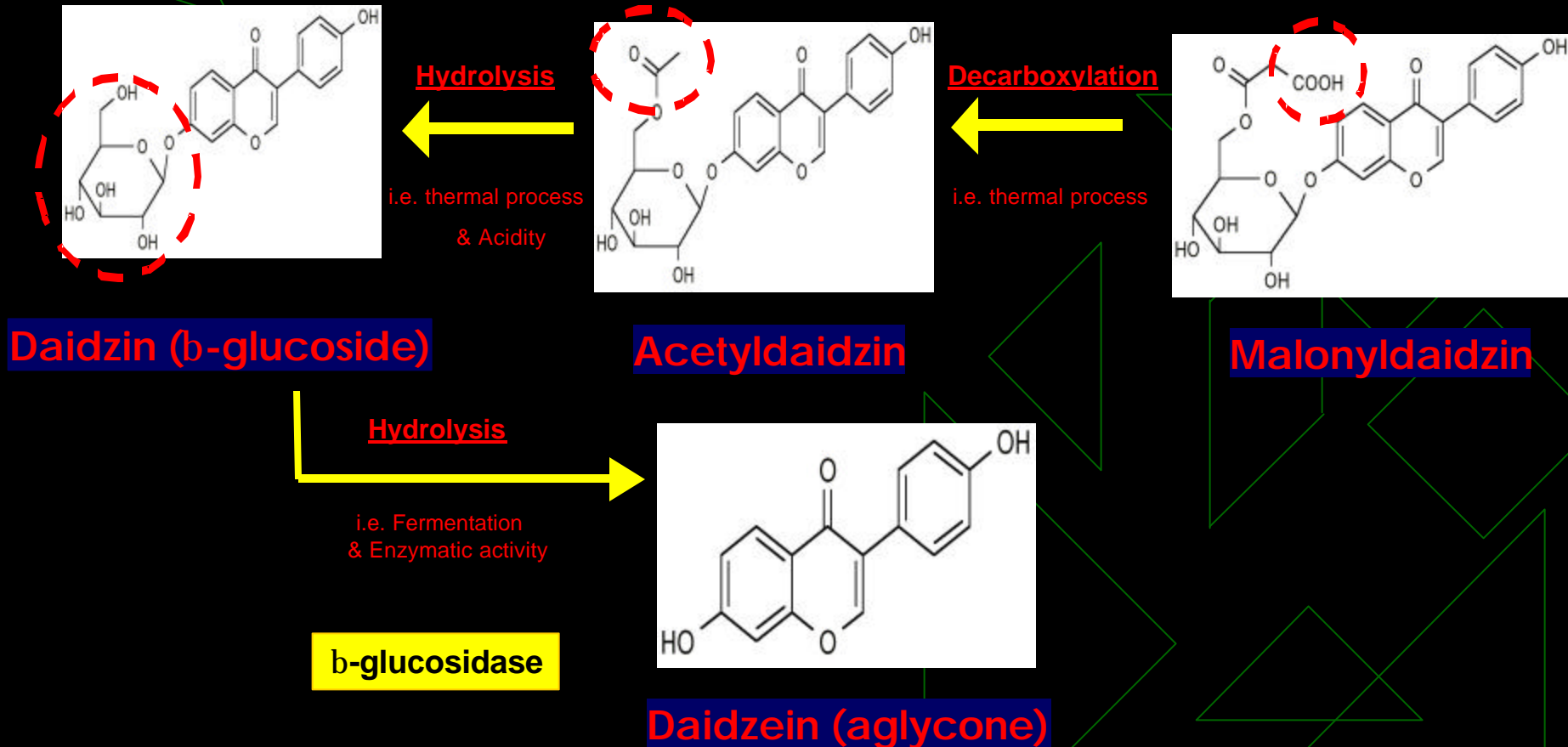
Soy Isoflavones

- ❑ Epidemiological and experimental studies associate high consumption of isoflavones with low risk of certain cancers and cardiovascular disease.
- ❑ Soy isoflavones consist of 3 major families, Genistein, Daidzein, Glycitein in 4 chemical forms, aglycone, b-glucoside, malonylglucoside, and acetylglucoside.

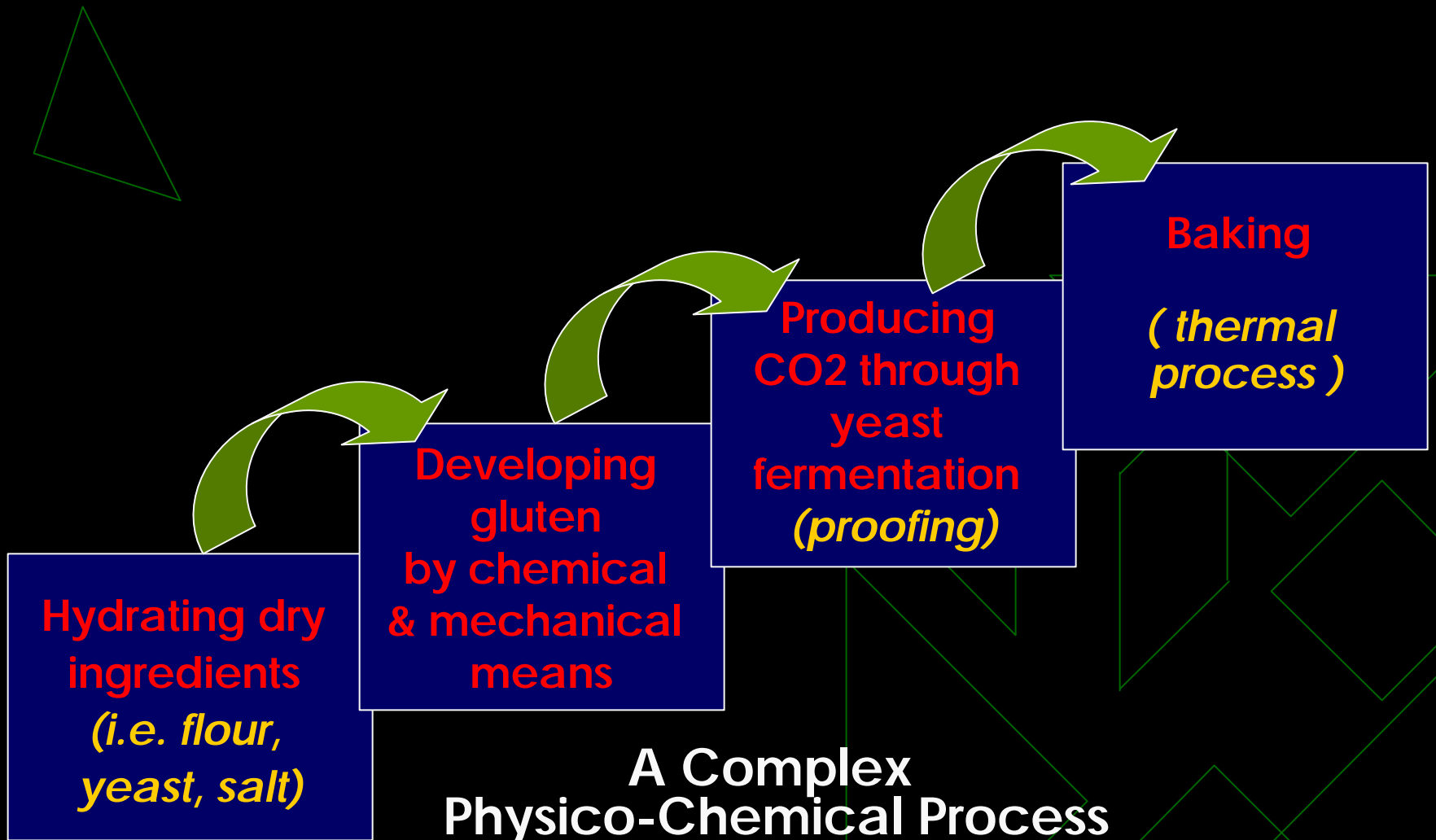
The bioavailability and biological activity of soy isoflavones depend greatly on the chemical forms of these compounds.

Soy Isoflavones

Isoflavone profile and level in soy foods depend on processing conditions.



Isoflavones in bread making



Research Questions

1. **Stability of isoflavones during bread preparation**
2. **Changes in isoflavone profile in soy bread during different stages of bread preparation**
3. **Correlation between b-glycosidase activity and isoflavone glycoside: aglycone ratio**
4. **Enhance isoflavone aglycones by modulating bread making condition**

Starting Point

A serving size of 50 g provides:

- Soy protein: ~7.3 g
- Isoflavones: 35 mg
- Low in saturated fat and low in cholesterol
- Highly acceptable



FDA Soy Health Claim requirements:

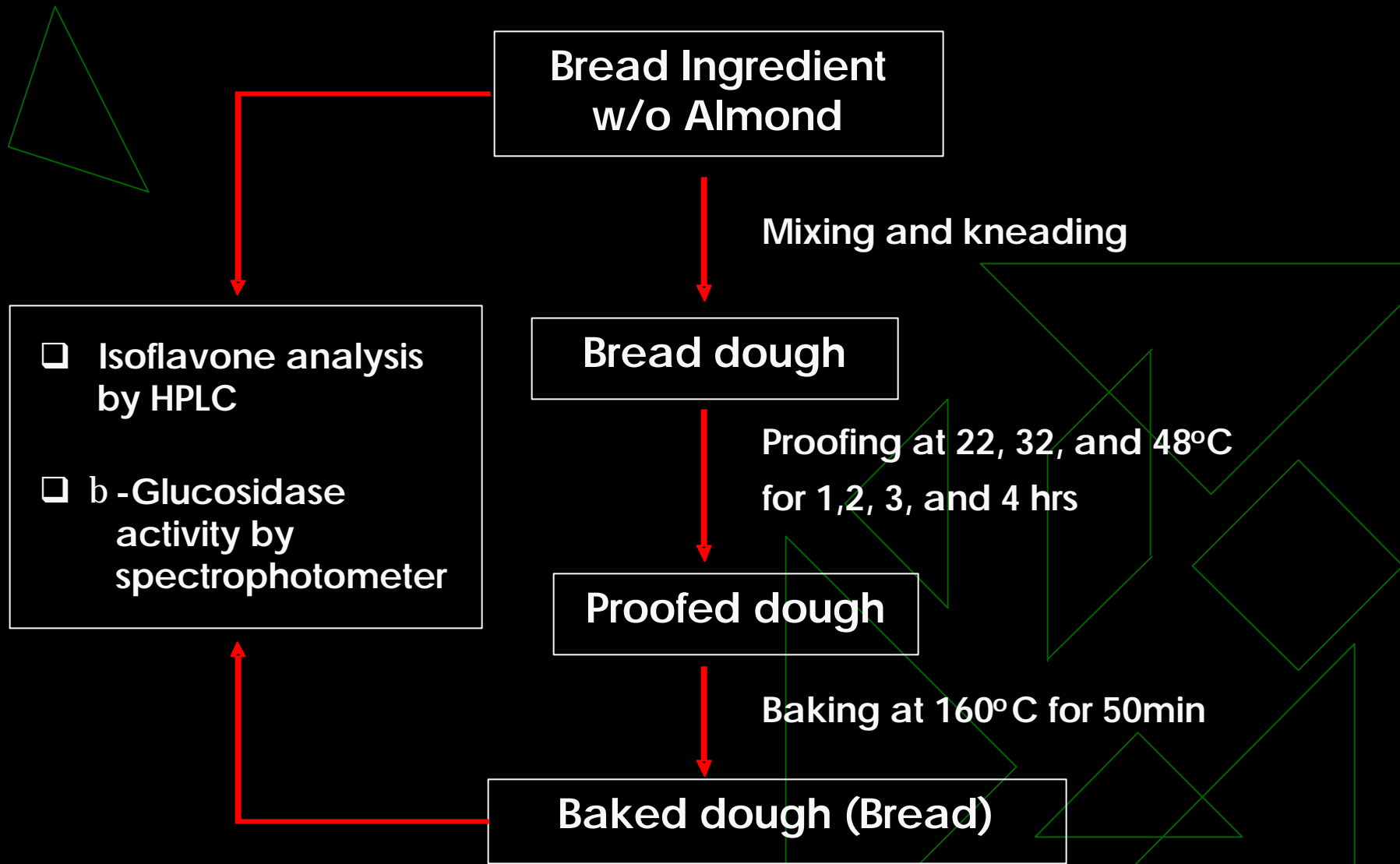
- Soy Protein: = 6.25 g/RACC
- Low in saturated fat and low in cholesterol

A bread with soy ingredients up to 60% level (flour basis) was developed.

Research Objective

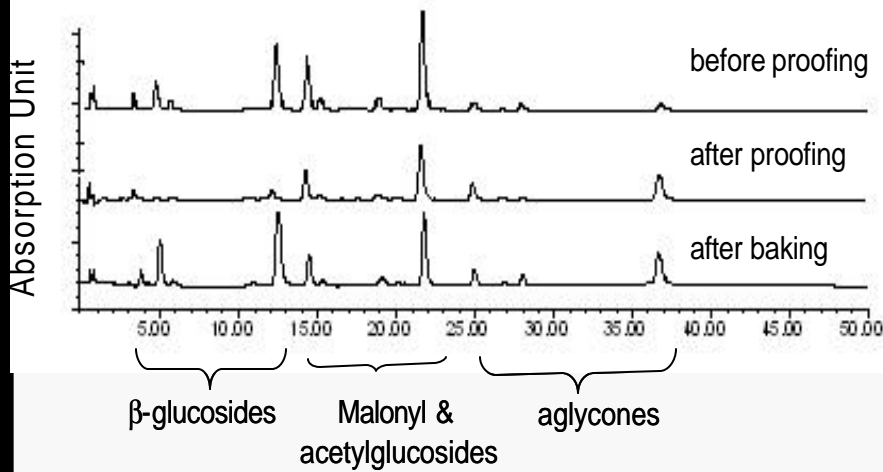
To investigate the effect of soy bread preparation (*i.e. proofing, baking*) on the quantity of isoflavone aglycones in the final product.

Experimental Design

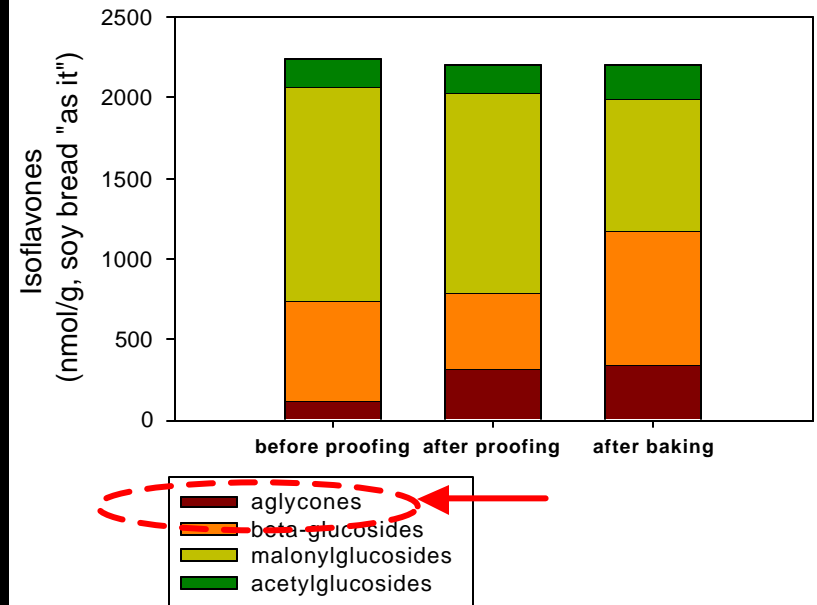


Effect of Bread Preparation On Isoflavones

Proofing at 48°C/1hr, Baking at 160°C/50min



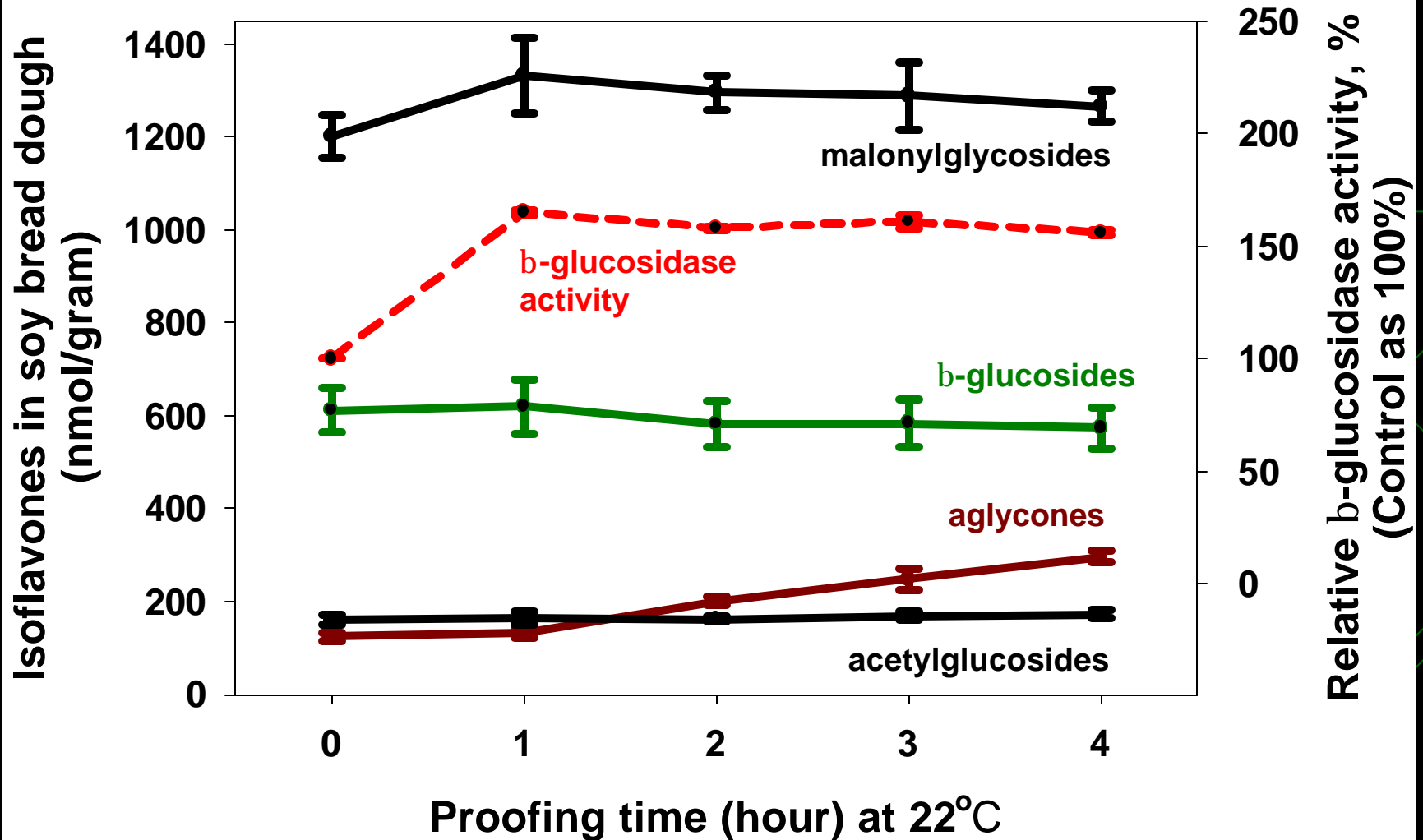
HPLC chromatogram of isoflavones in soy bread without almond during bread preparation.



- No degradation of isoflavones during soy bread making.
- Proofing and baking change the isoflavone profile in soy bread.
- Proofing is key in the production of aglycones in bread preparation.

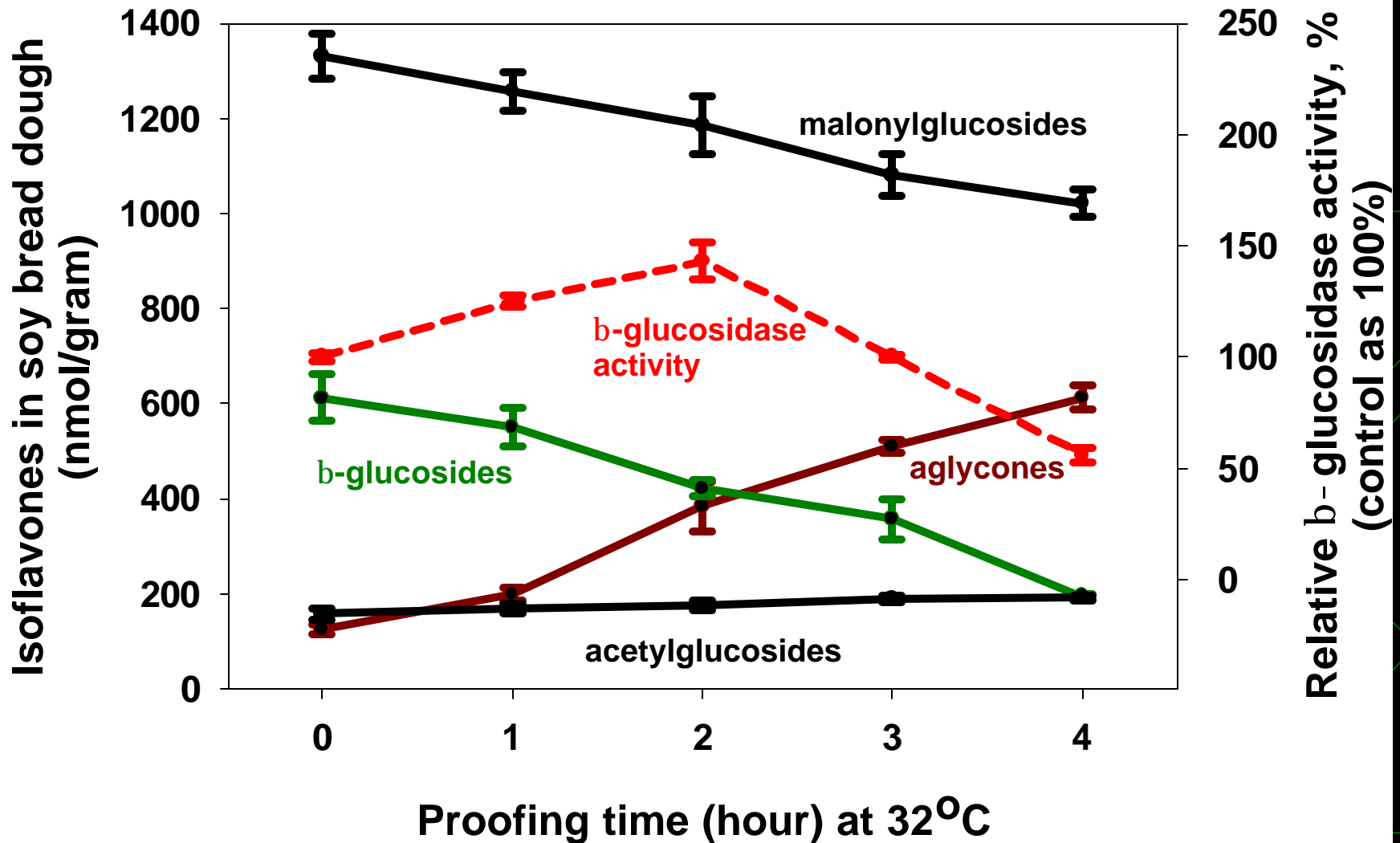
Effect of Proofing On Isoflavone Aglycones

Proofing at 22°C for 1, 2, 3, and 4 hours



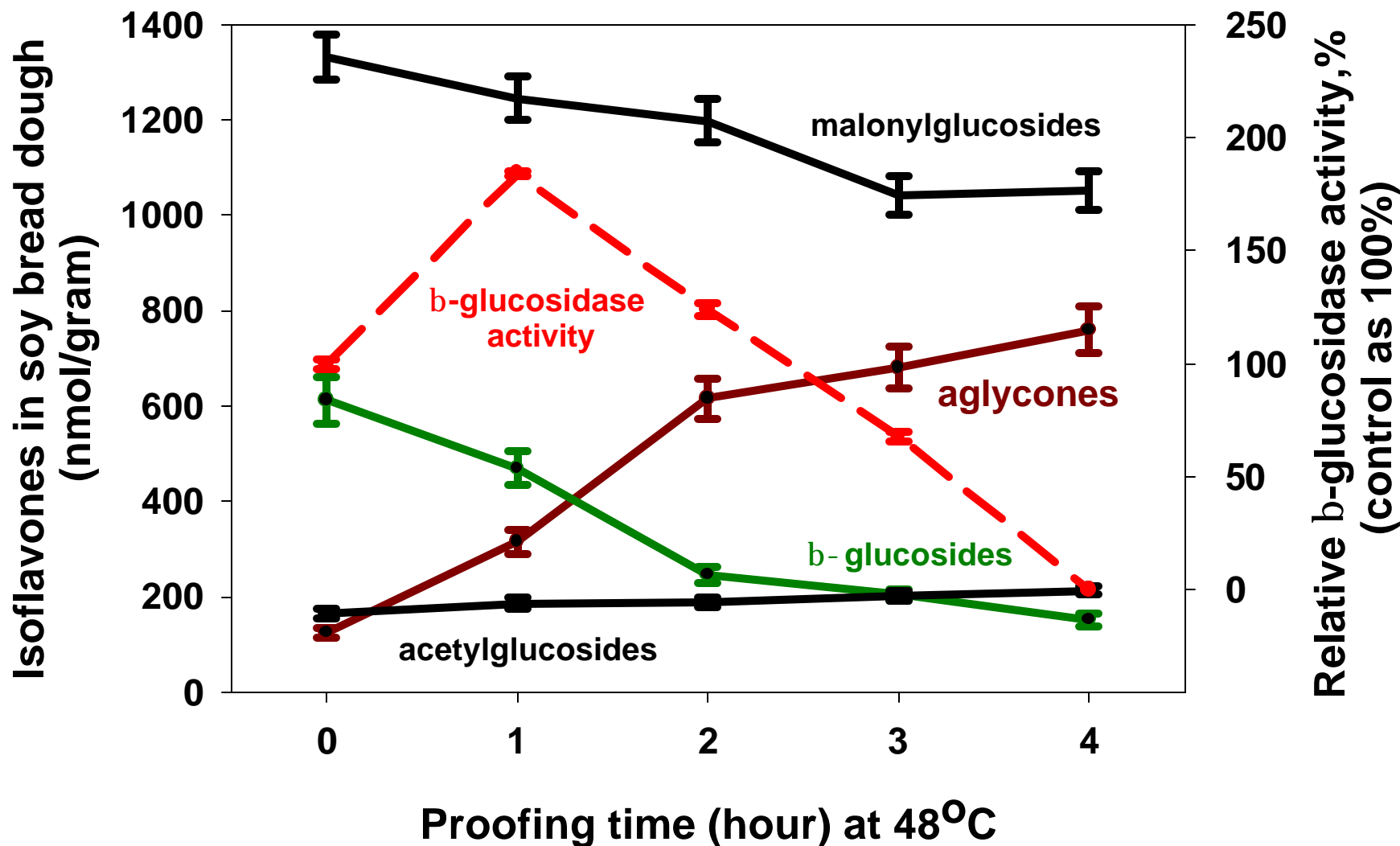
Effect of Proofing On Isoflavone Aglycones

Proofing at 32°C for 1, 2, 3, and 4 hours



Effect of Proofing On Isoflavone Aglycones

Proofing at 48°C for 1, 2, 3, and 4 hours



b-GLUCOSIDASE and AGLYCONES

Table. Isoflavone b-glucoside : aglycone ratio and b-glucosidase activity in soy bread dough after proofing at 22, 32, and 48 °C for 1, 2, 3, and 4 hours

Proofing temperature	Proofing time	b-glucosidase activity	Isoflavone b-glucosides to aglycone ratio
(°C)	(hour)	(mmol/ml · min)	ratio
N/A	0	27.7 ± 0.6	4.9
22.0	1.0	45.8 ± 2.3	4.7
	2.0	43.8 ± 0.4	3.5
	3.0	44.8 ± 1.3	2.8
	4.0	43.1 ± 0.4	2.3
32.0	1.0	26.6 ± 0.7	2.8
	2.0	39.7 ± 0.3	1.1
	3.0	38.8 ± 0.4	0.7
	4.0	15.1 ± 0.5	0.3
48.0	1.0	51.0 ± 1.0	1.5
	2.0	34.4 ± 0.5	0.4
	3.0	18.9 ± 0.6	0.3
	4.0	0.0 ± 0	0.2

Research Results

- The increased β -glucosidase activity in soy bread dough was paralleled by a decrease in isoflavone β -glucoside : aglycone ratio.
- Proofing at 48°C for 2 hours was the optimal condition for high isoflavone aglycone production in soy bread preparation.

Conclusions

- ❑ Isoflavones were stable through bread preparation conditions.
- ❑ Among the stages of bread preparation, the proofing stage was key in the production of more bioavailable isoflavone aglycones in soy bread.
- ❑ Proofing temperature and duration were important in controlling factors in regulating the amount of isoflavone aglycones released with proofing at 48°C for 2 hours being optimal for the maximum isoflavone aglycone production.

Significance

These findings :

provide a food process to potentially
improve the level of
bioactive components and
bioavailability of isoflavones
in soy bread and
other soy foods.