Characteristics of warm water species surimi

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Tropical fish used for surimi production

Threadfin bream (*Nemipterus* spp.), Itoyori

Croaker (*Pennahia* spp.), Guchi

Bigeye snapper (*Priacanthas* spp.)
Kinmedai

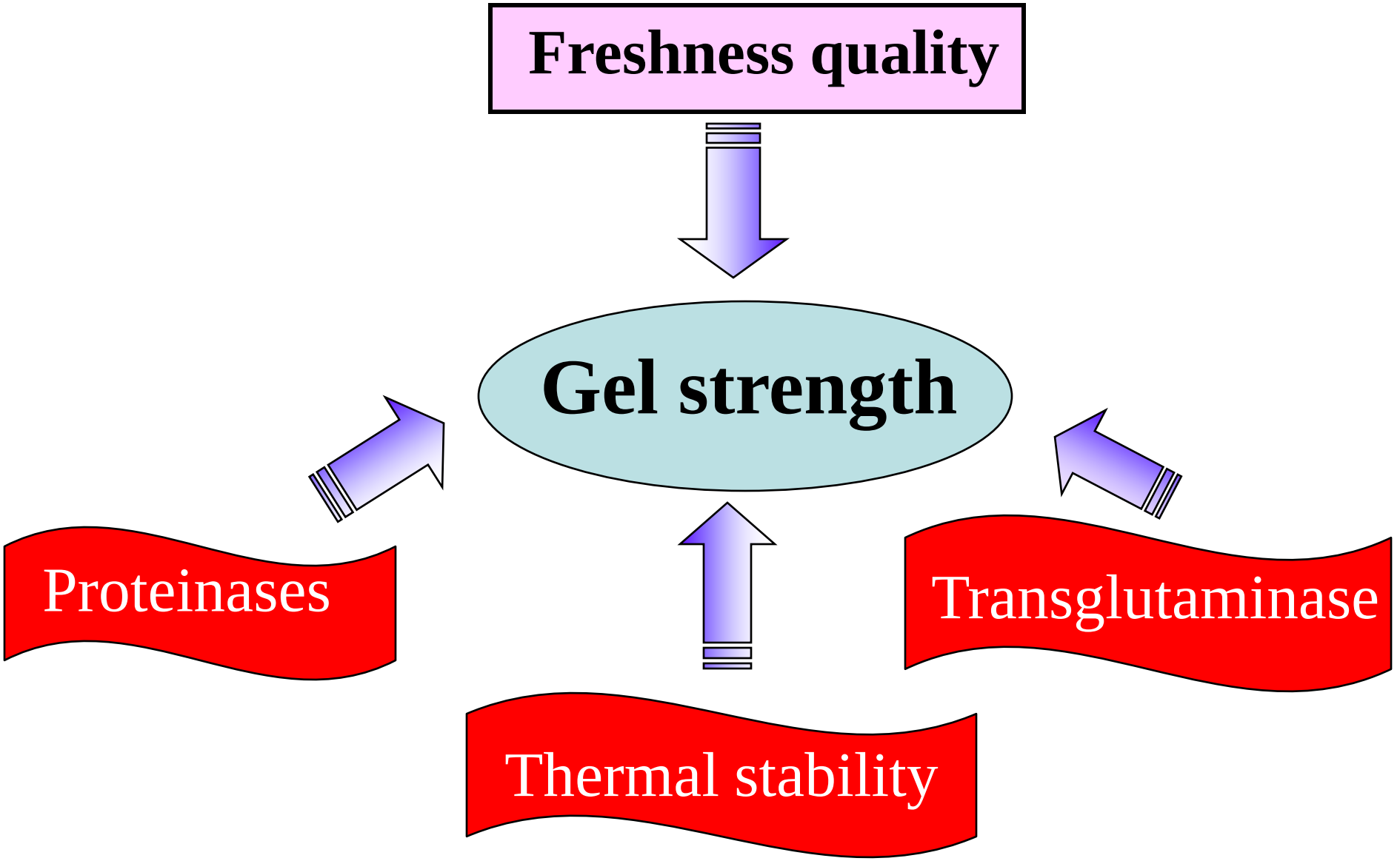
Lizardfish (*Saurida* spp.)
Eso

Goat fish (*Upenus* spp.)
Hemeji

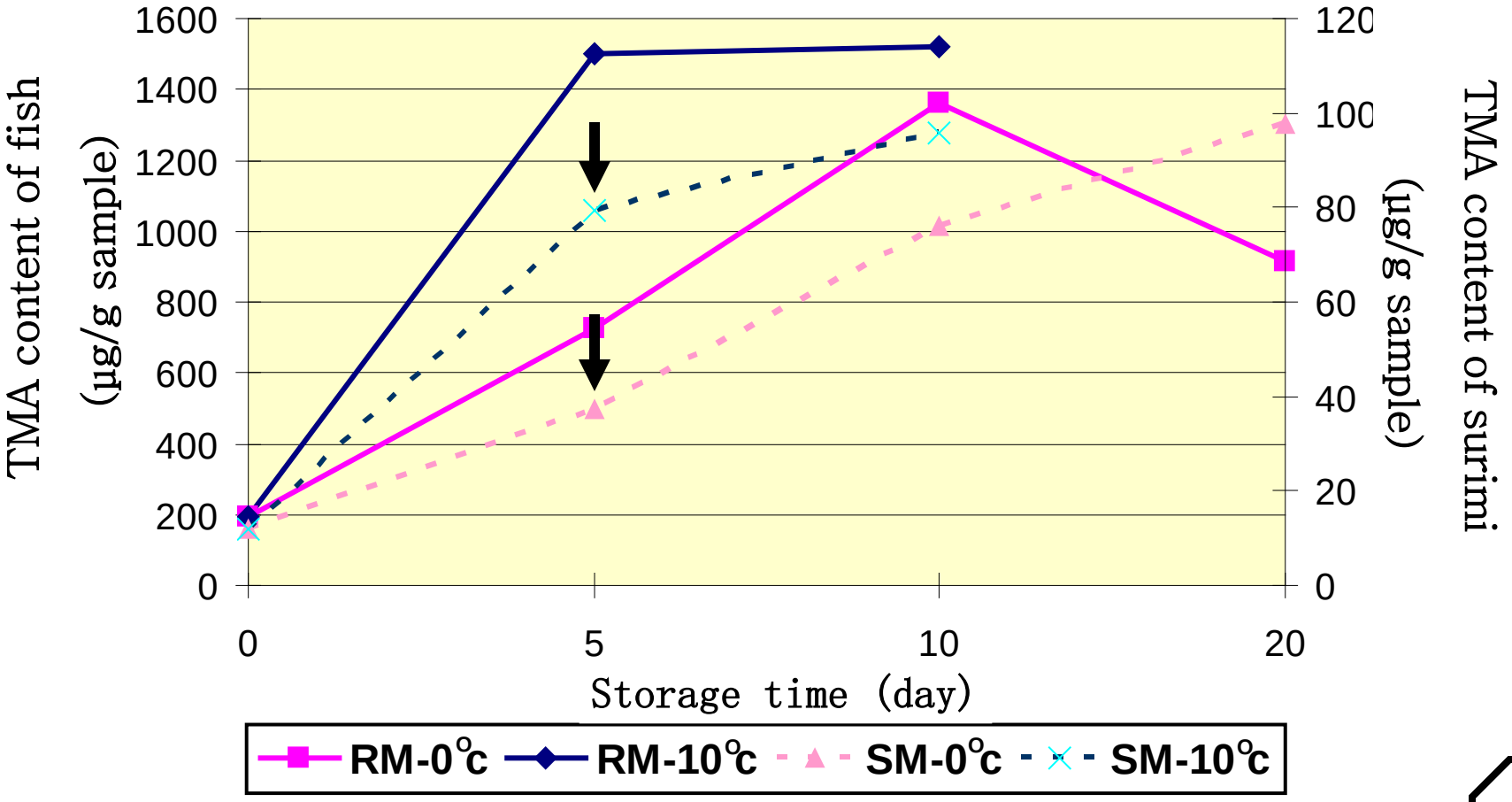
Tilapia

Rohu

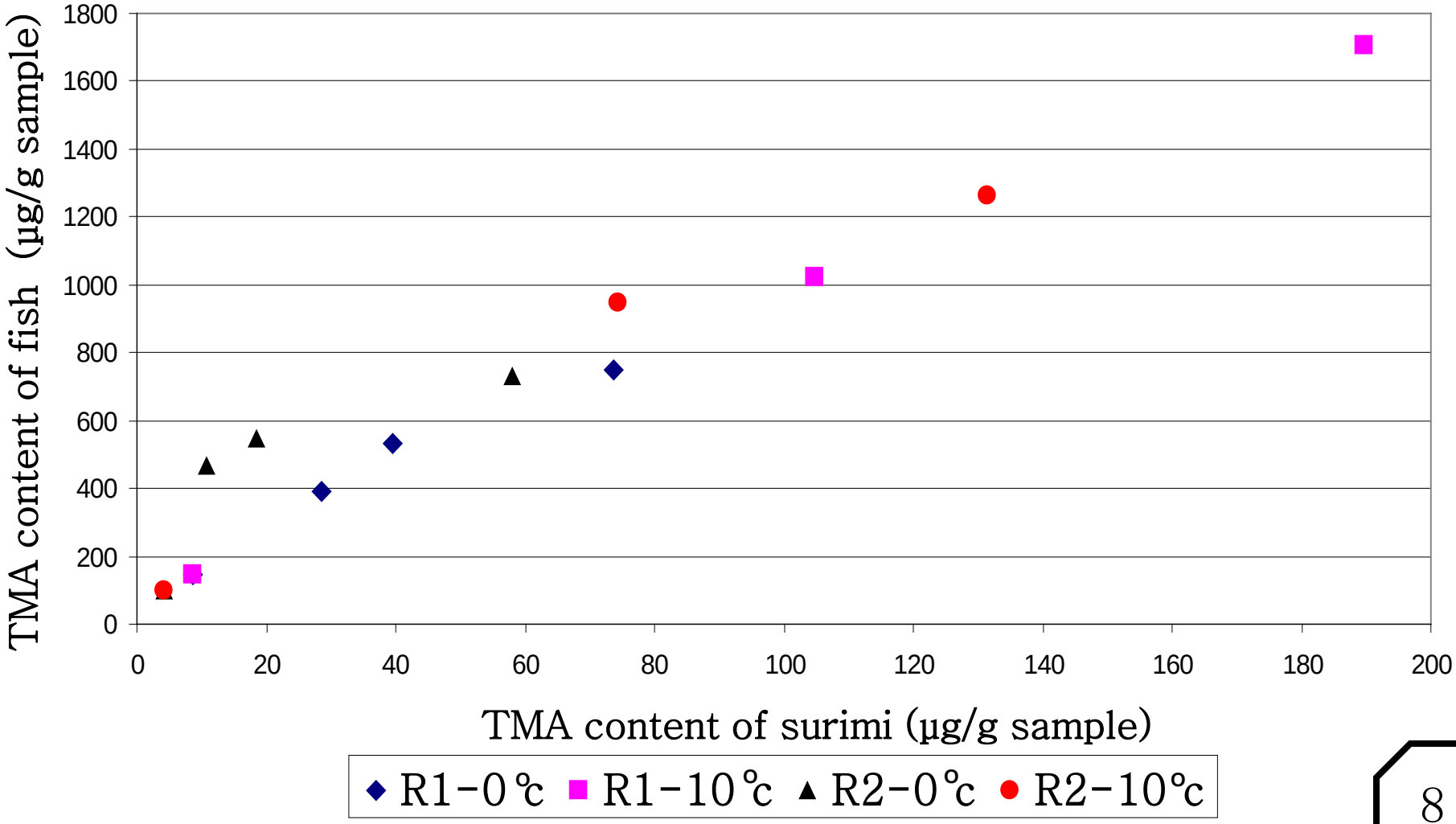
Mudcarp


Freshness quality
Gel strength
Proteinases
Transglutaminase
Thermal stability

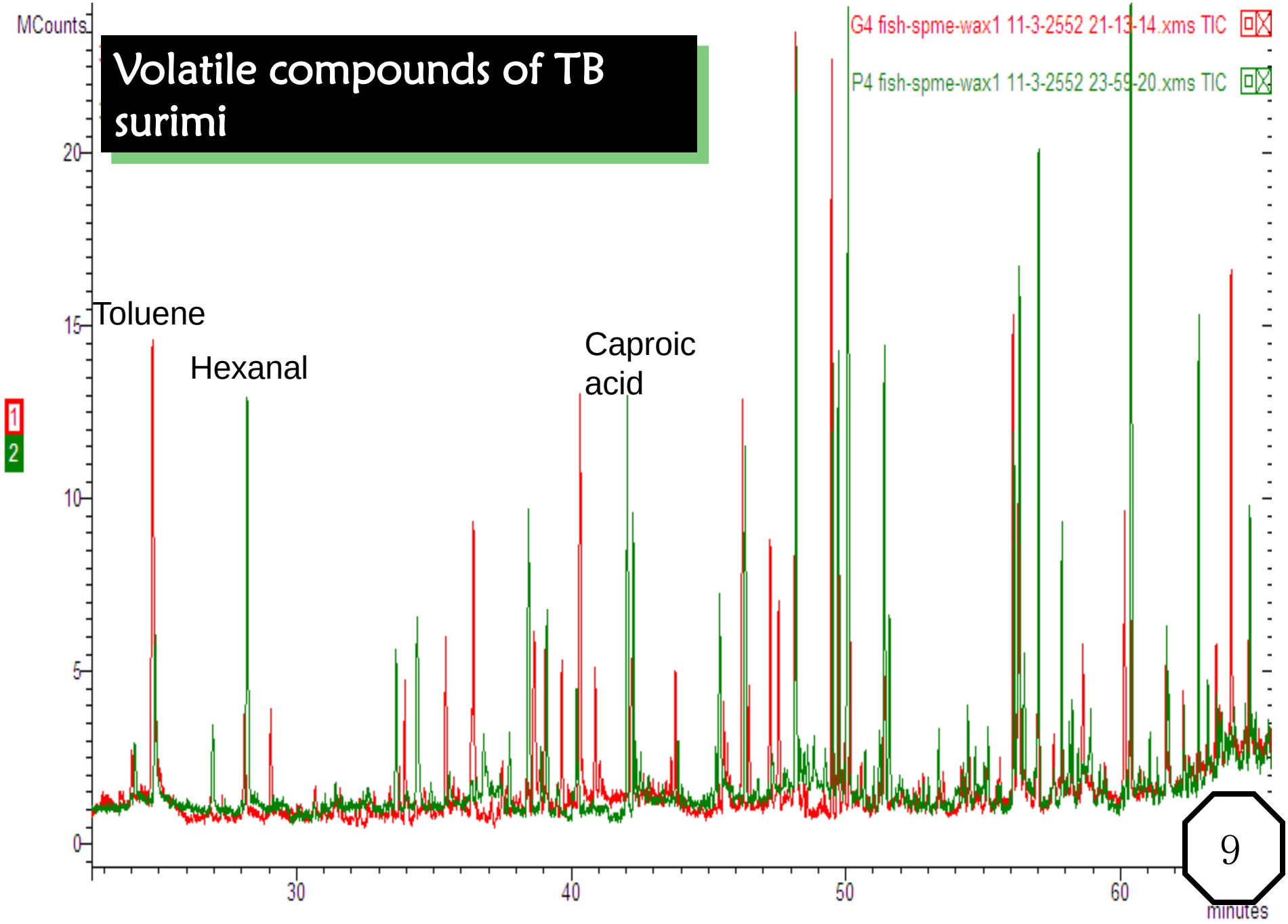
Freshness quality index of fish and surimi



Freshness quality index of fish and surimi



Volatile compounds of TB surimi



Freshness quality of raw material

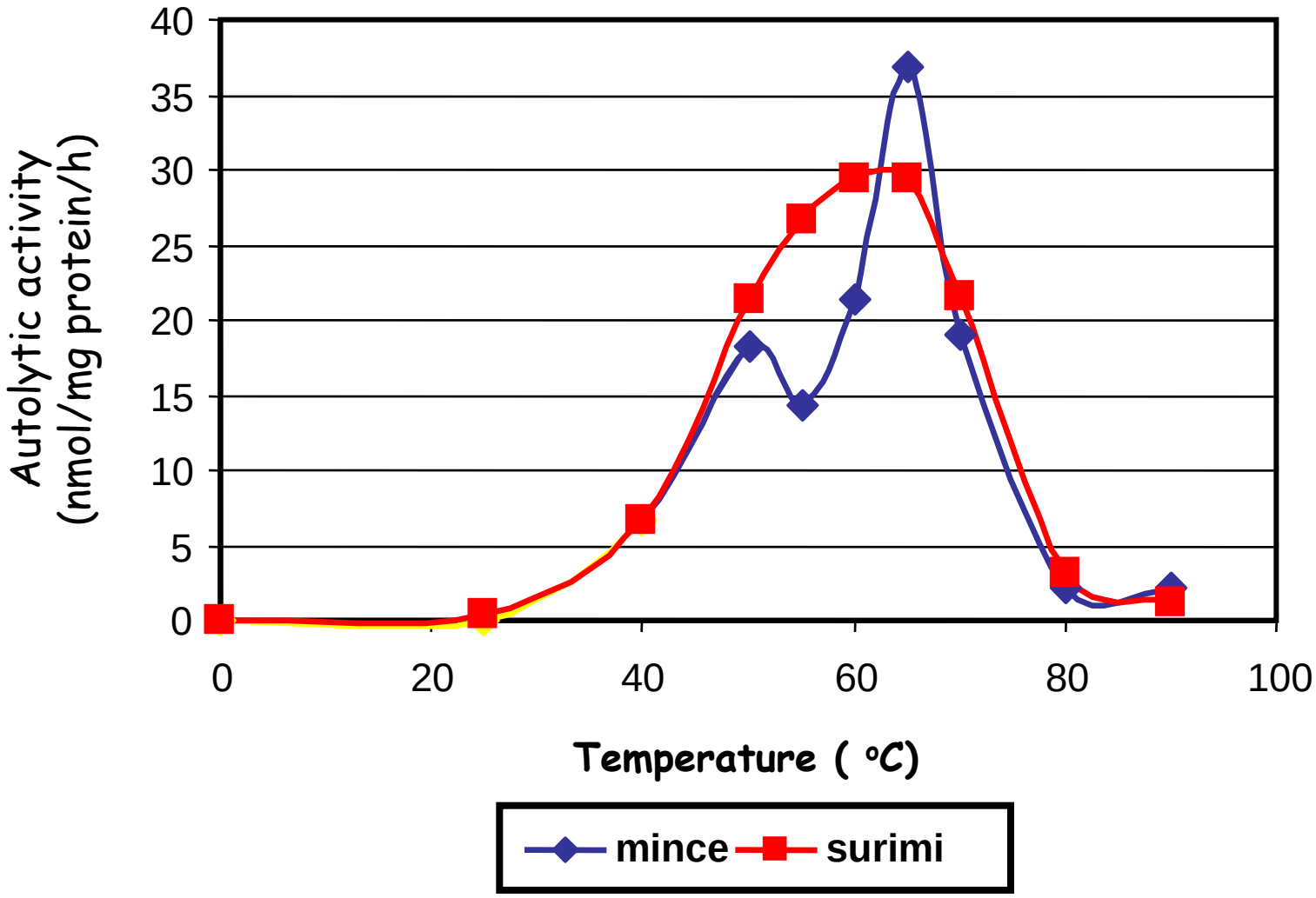
- TMA content of surimi increases as freshness quality of raw material decreases.

- Volatile compound(s) of surimi could be used as an index to trace back freshness quality of raw material.

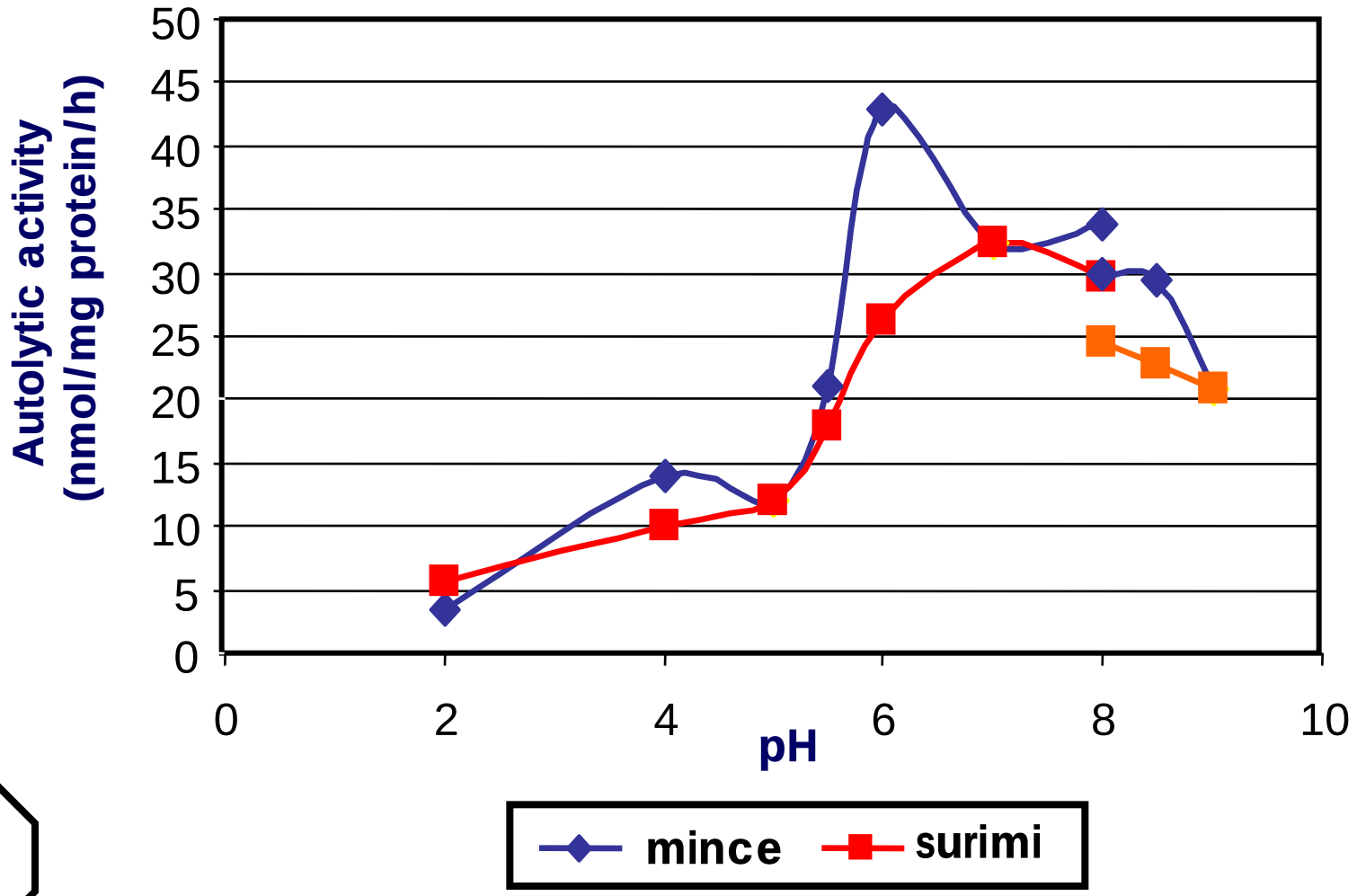
AUTOLYTIC ACTIVITY OF TROPICAL FISH

FISH	AUTOLYTIC ACTIVITY (nmole/ml/h)
Hairtail surimi	834.8
Goatfish surimi	657.4
Lizardfish surimi	350.2
Threadfin bream surimi	208.1
Rohu	203.0
Tilapia	197.3
Small scale mud carp	182.0
Silver carp	124.0
Striped snakehead	62.3
Common silver barb	40.0
Common carp	36.0

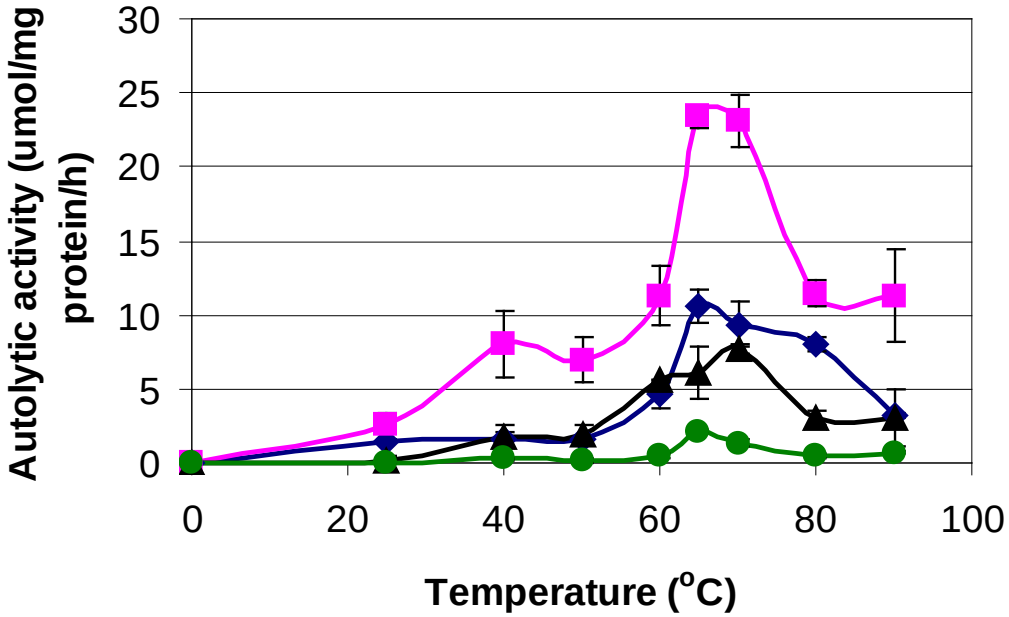
Autolytic activity of lizardfish



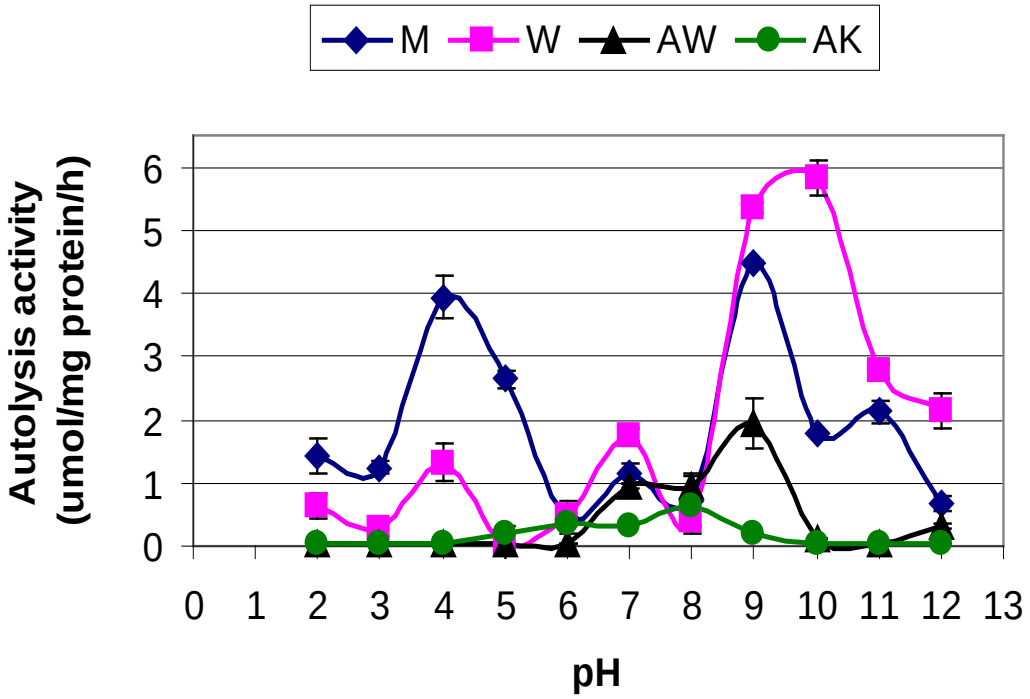
Autolytic activity of lizardfish

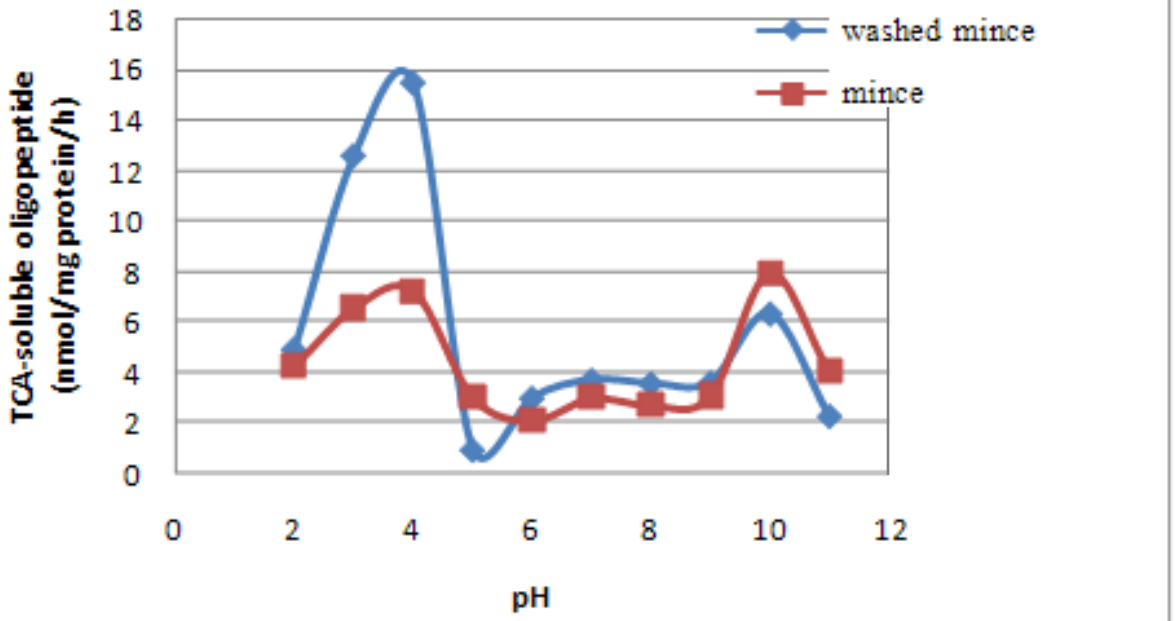


Yongsawatdigul & Piyadhammaviboon, 2003, Food Chem.



STRIPED CATFISH
PANGASIUS HYPOPHTHALMUS

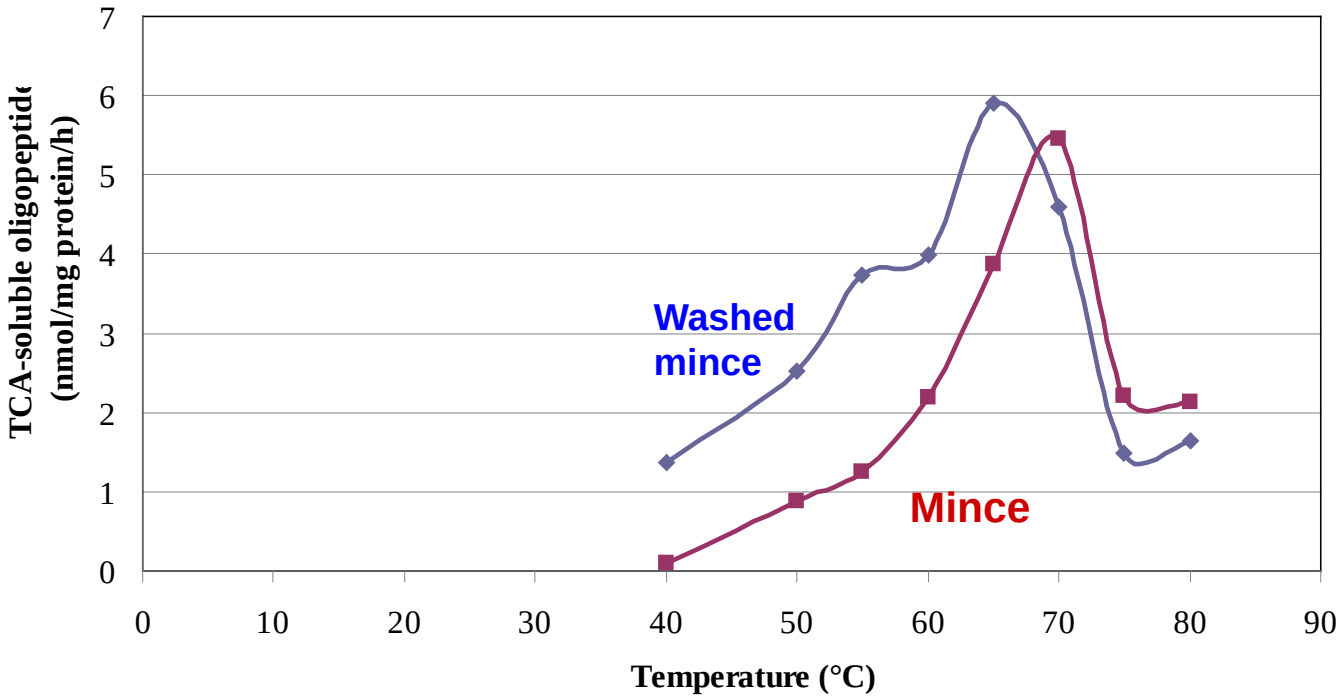




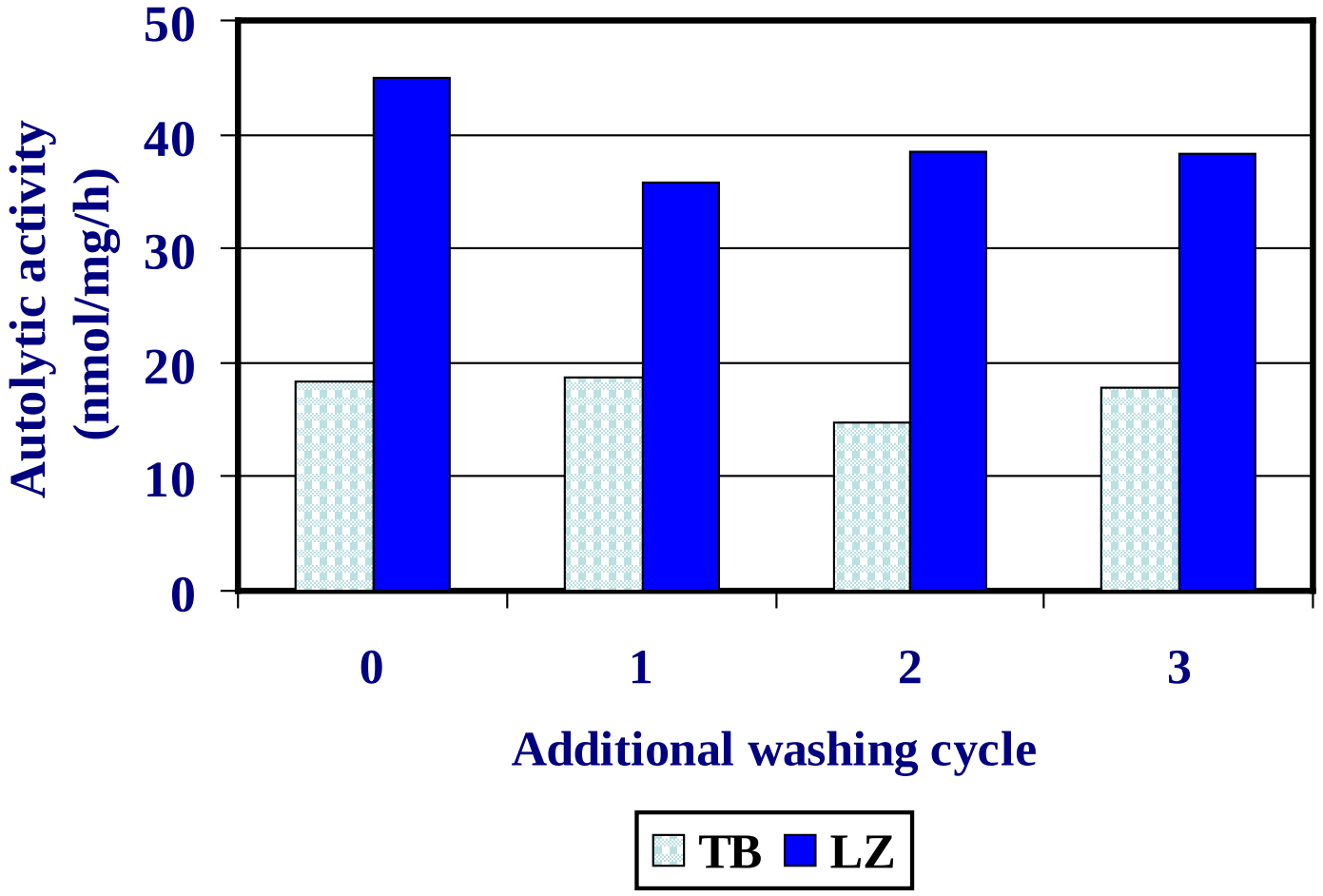
Mudcarp

pH profile

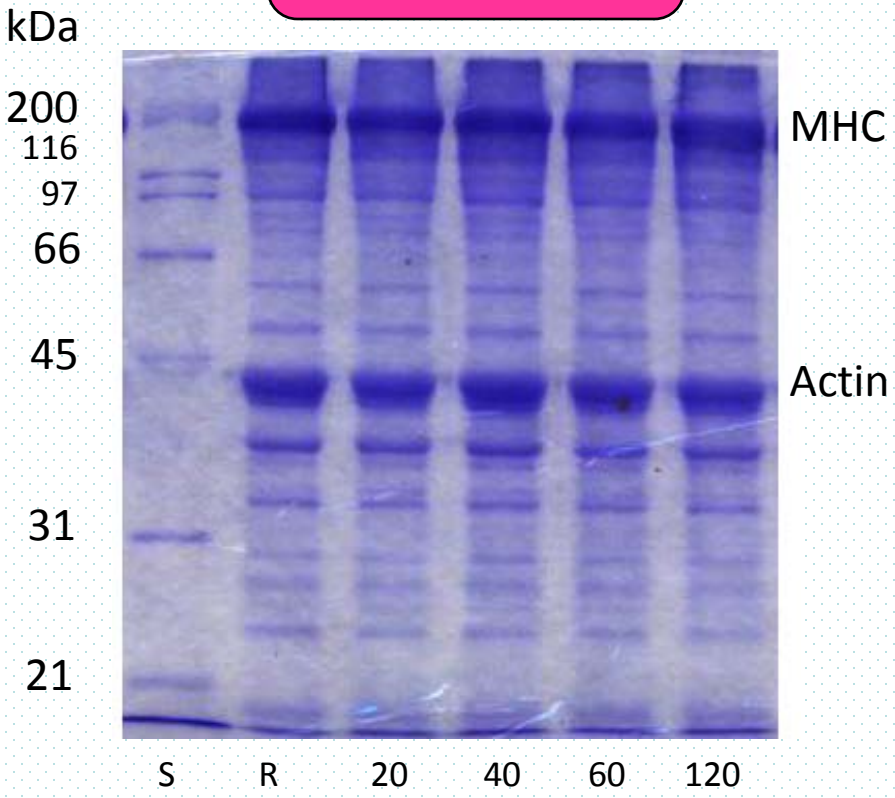
Temp profile



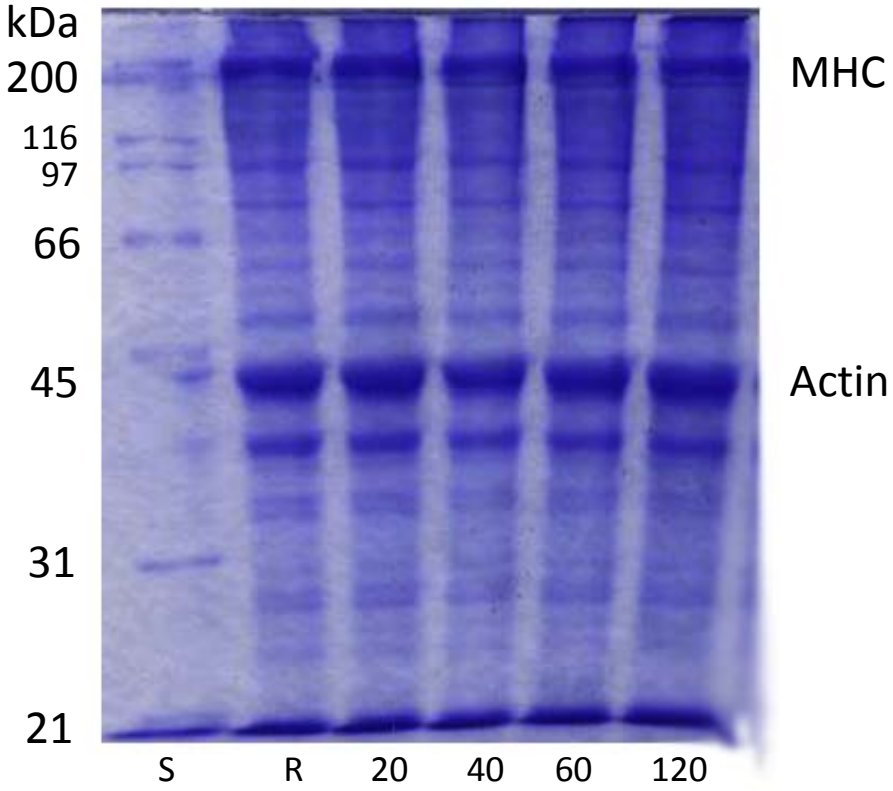
Myofibril-bound proteinases



Mud carp

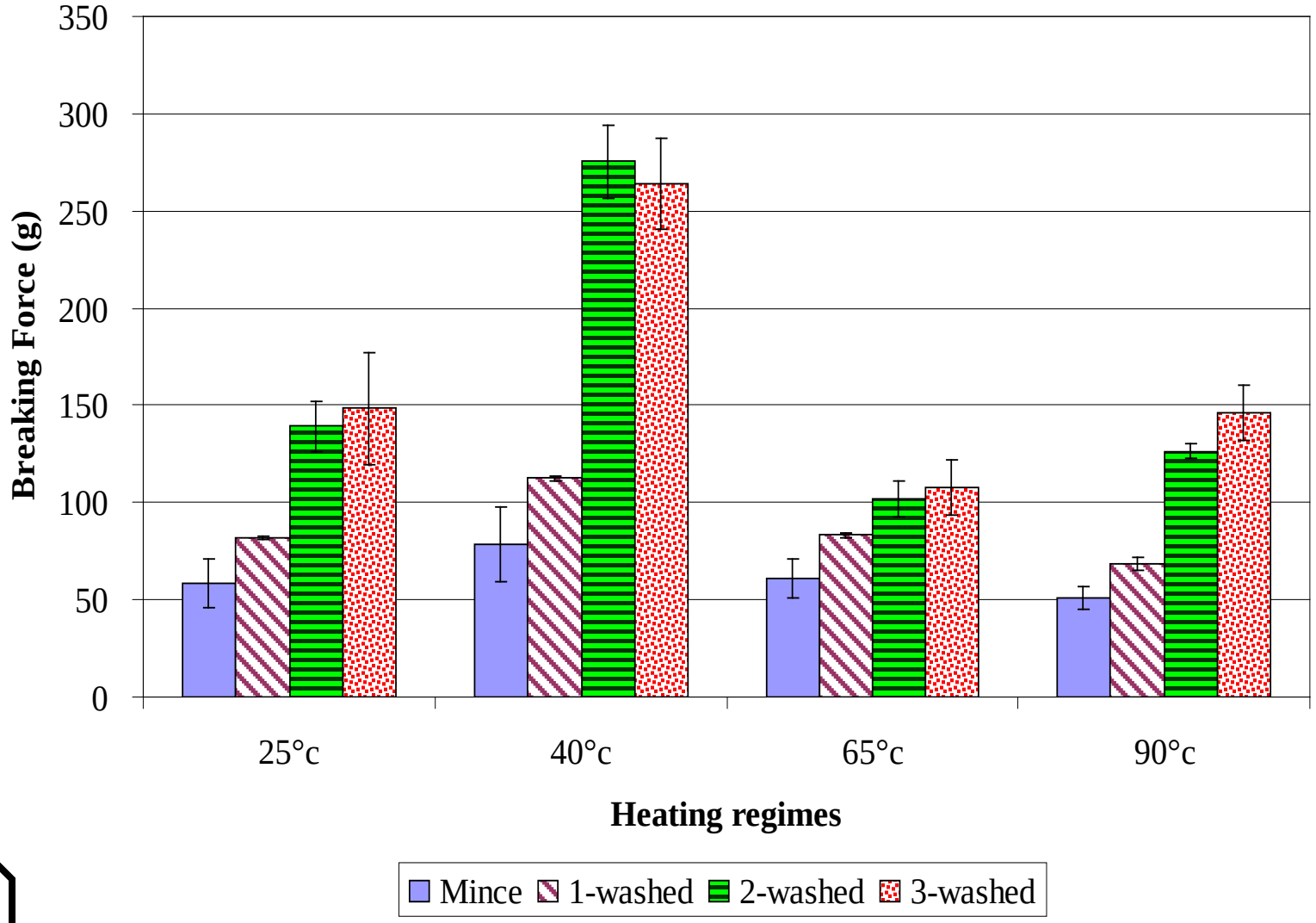


Common carp



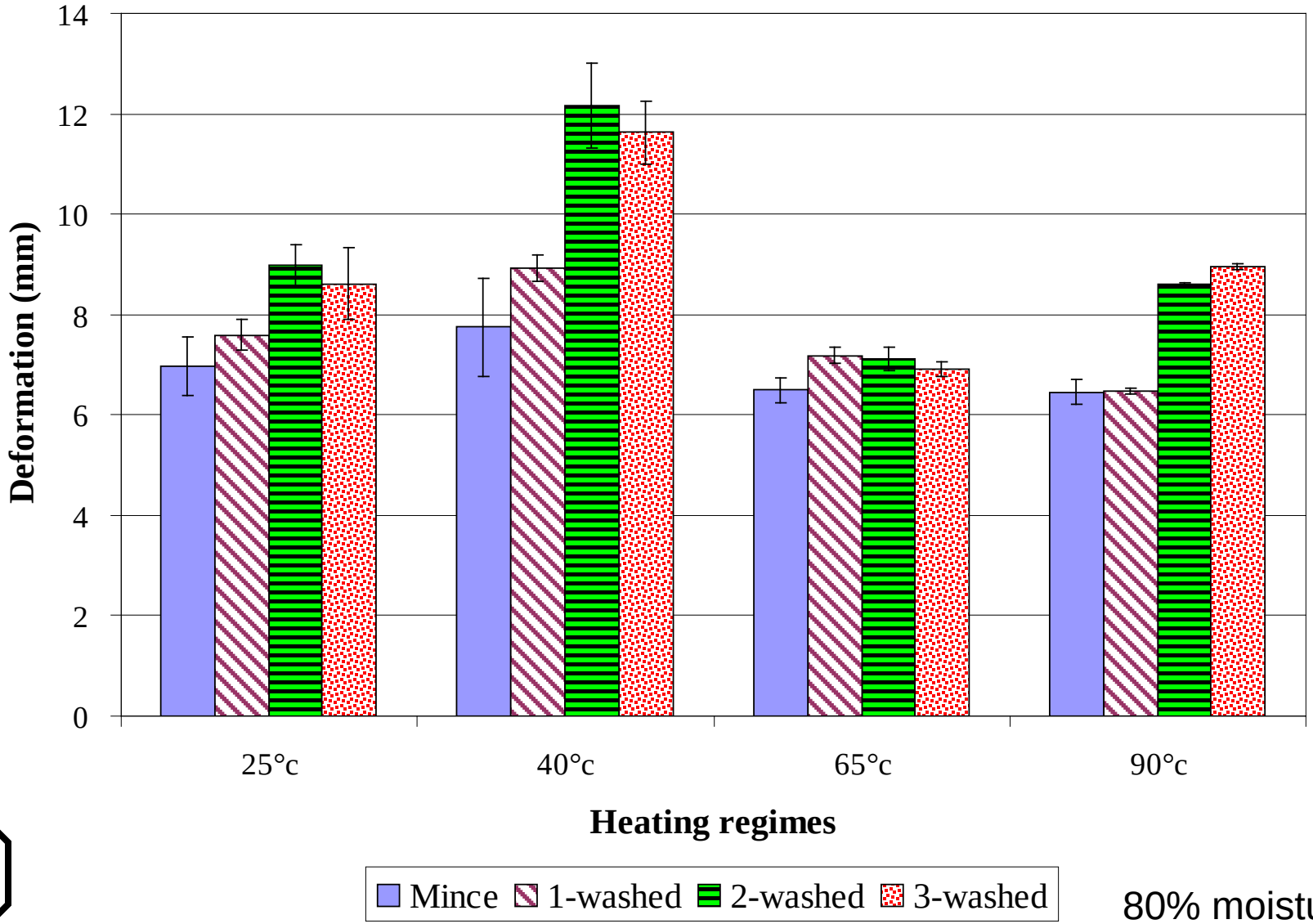
Incubate @ 65°C

Gel-forming ability of mudcarp



80% moisture

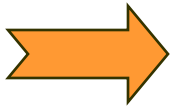
Gel-forming ability of mudcarp



80% moisture

Take-home messages

- Optimum temp. of autolytic activity is higher than cold water species.



60-70°C

- Serine myofibril-bound type

cannot be easily removed by washing

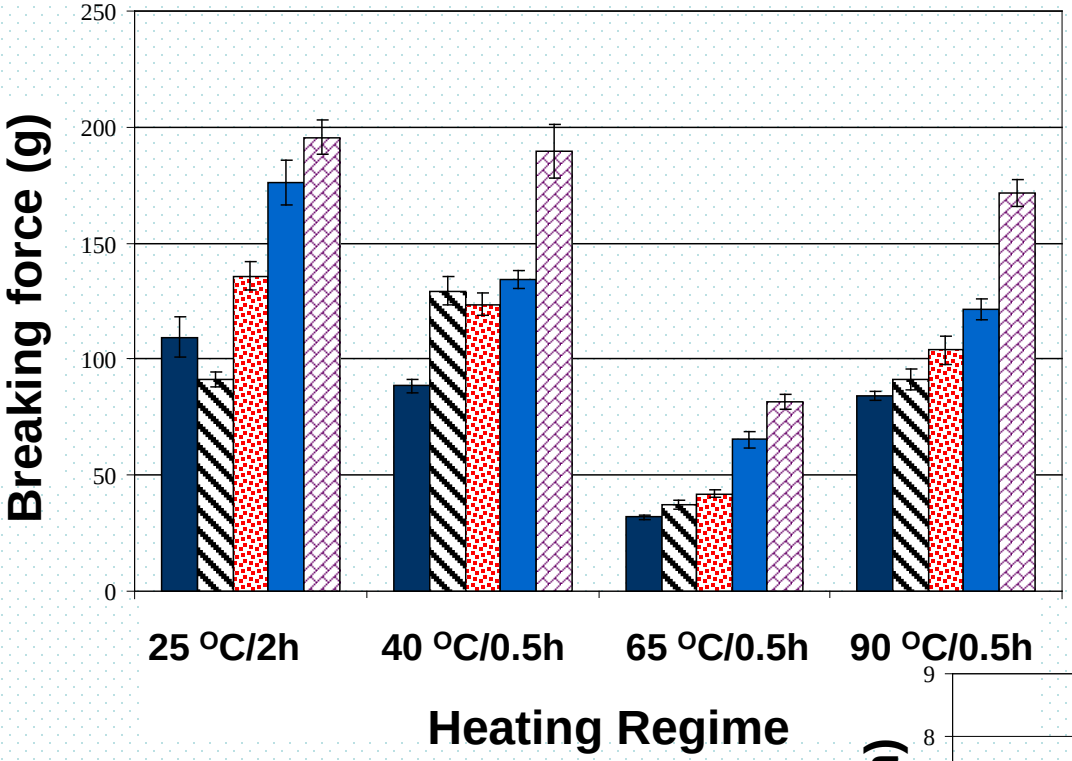
- Less problematic in freshwater fish

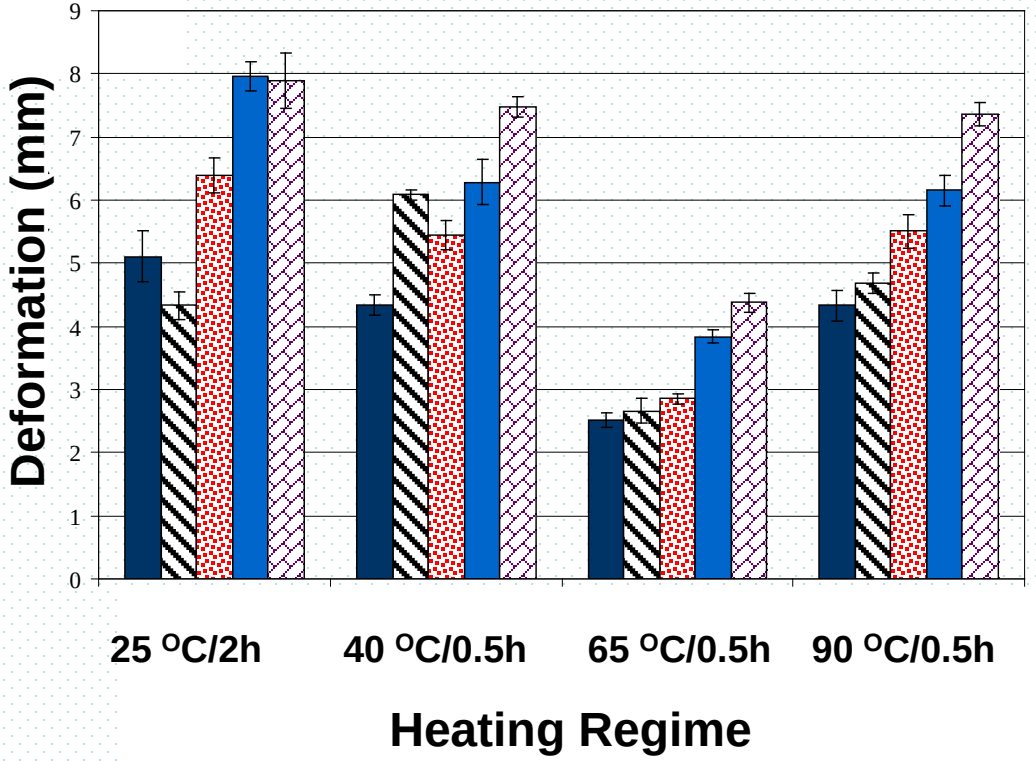
What can we do to improve gel-forming ability?

Protein additives

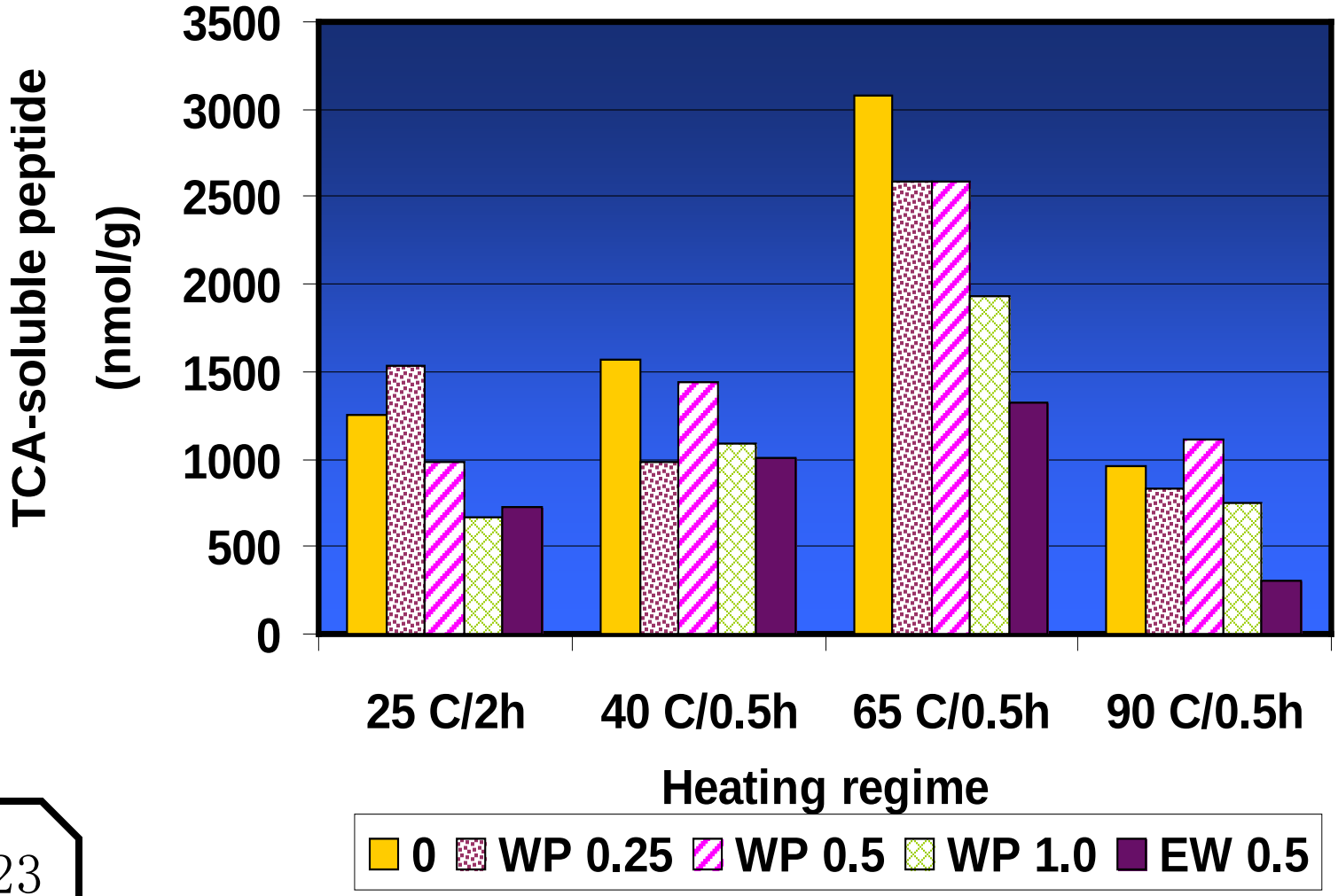
Rapid heating

Textural property of threadfin bream surimi added whey protein concentrate (WPC) and egg white (EW)

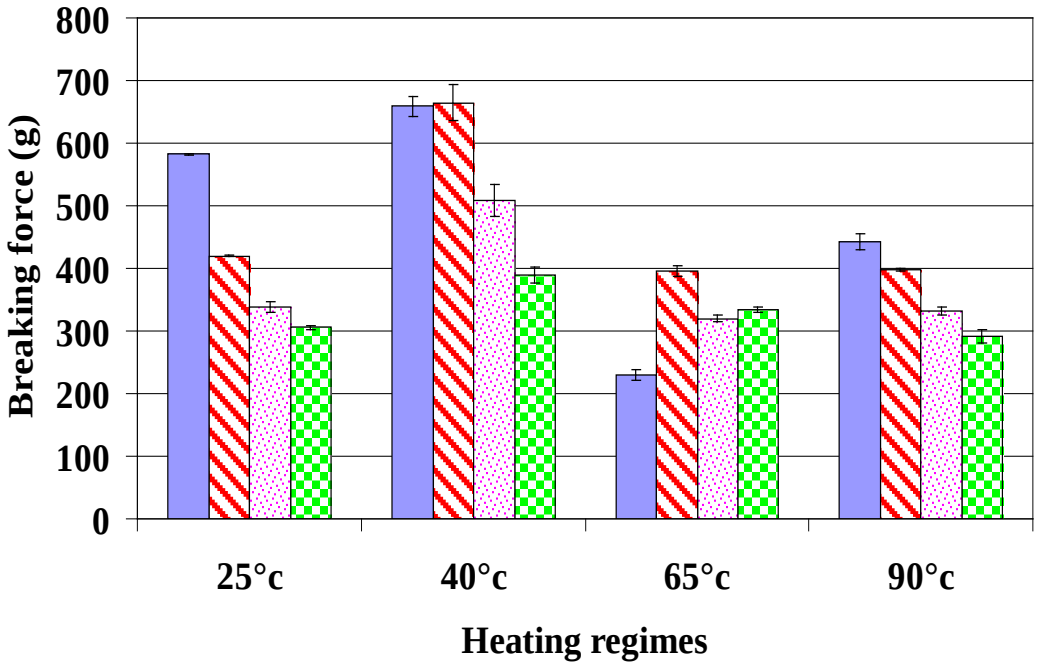


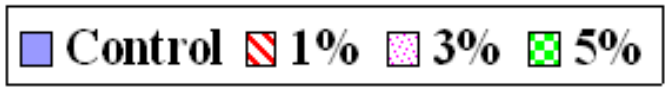


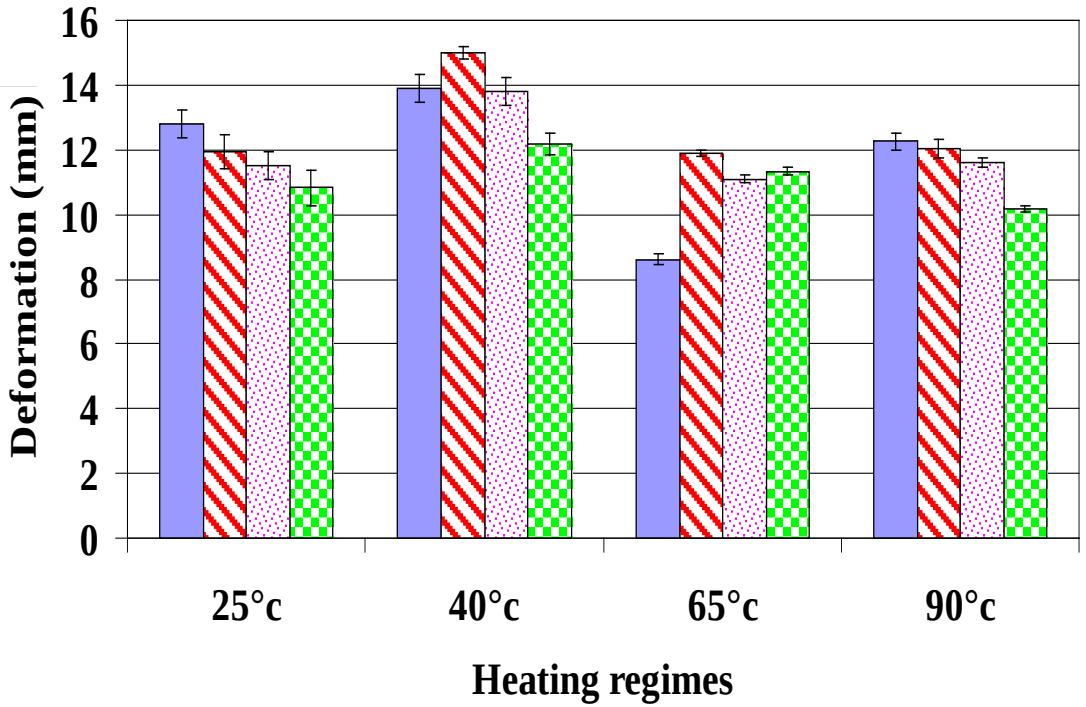
Inhibitory effect of EW & WPC on proteinase activity of threadfin bream surimi



Textural property of soy protein isolate (SPI) on threadfin bream surimi

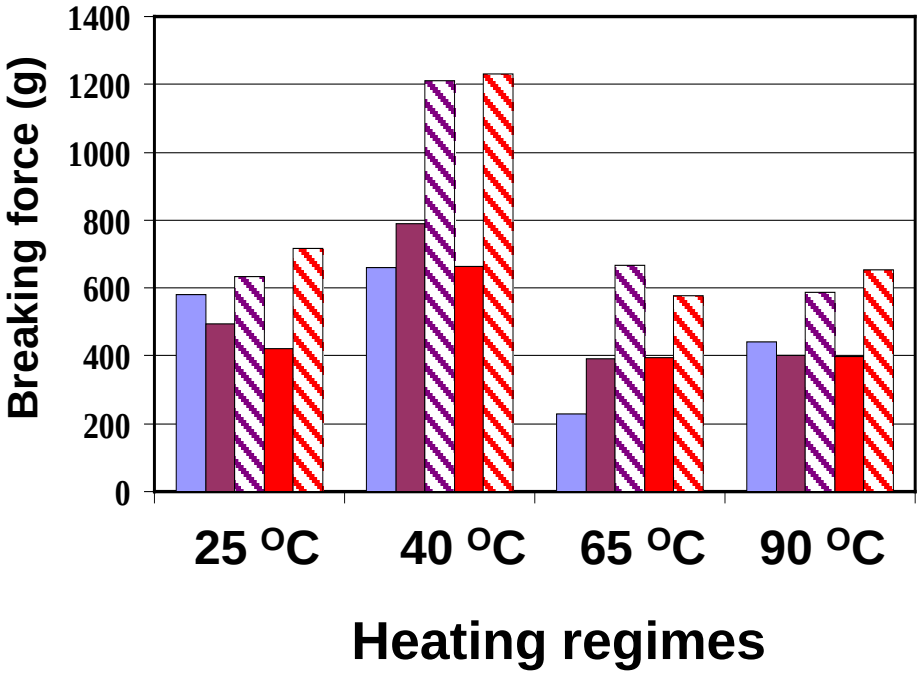


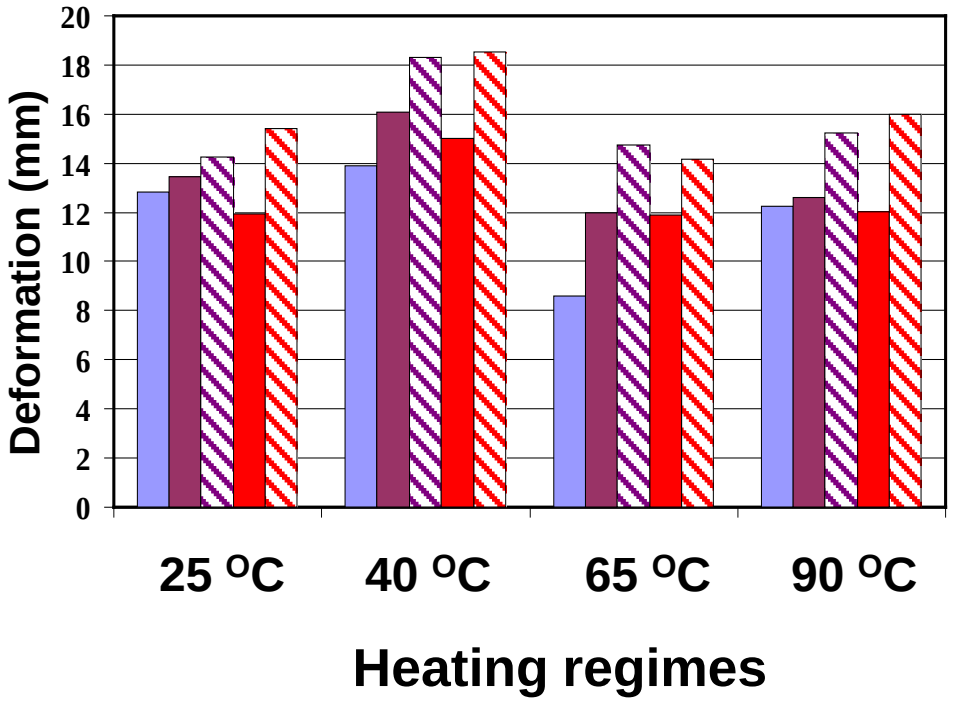




Supro® EX 45IP

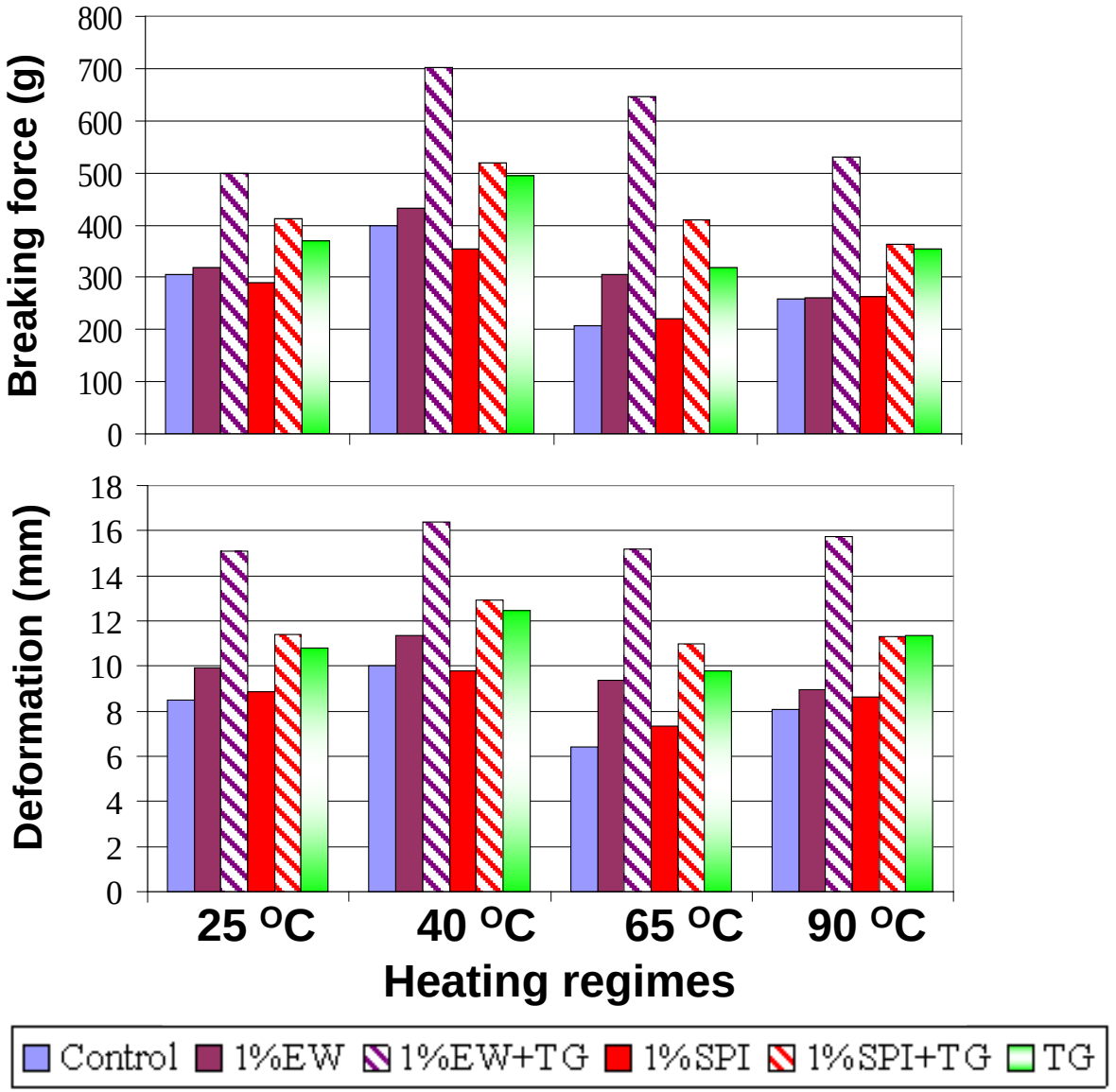
Soy protein isolate (SPI), EW, and tranglutaminase on textural property of threadfin bream surimi



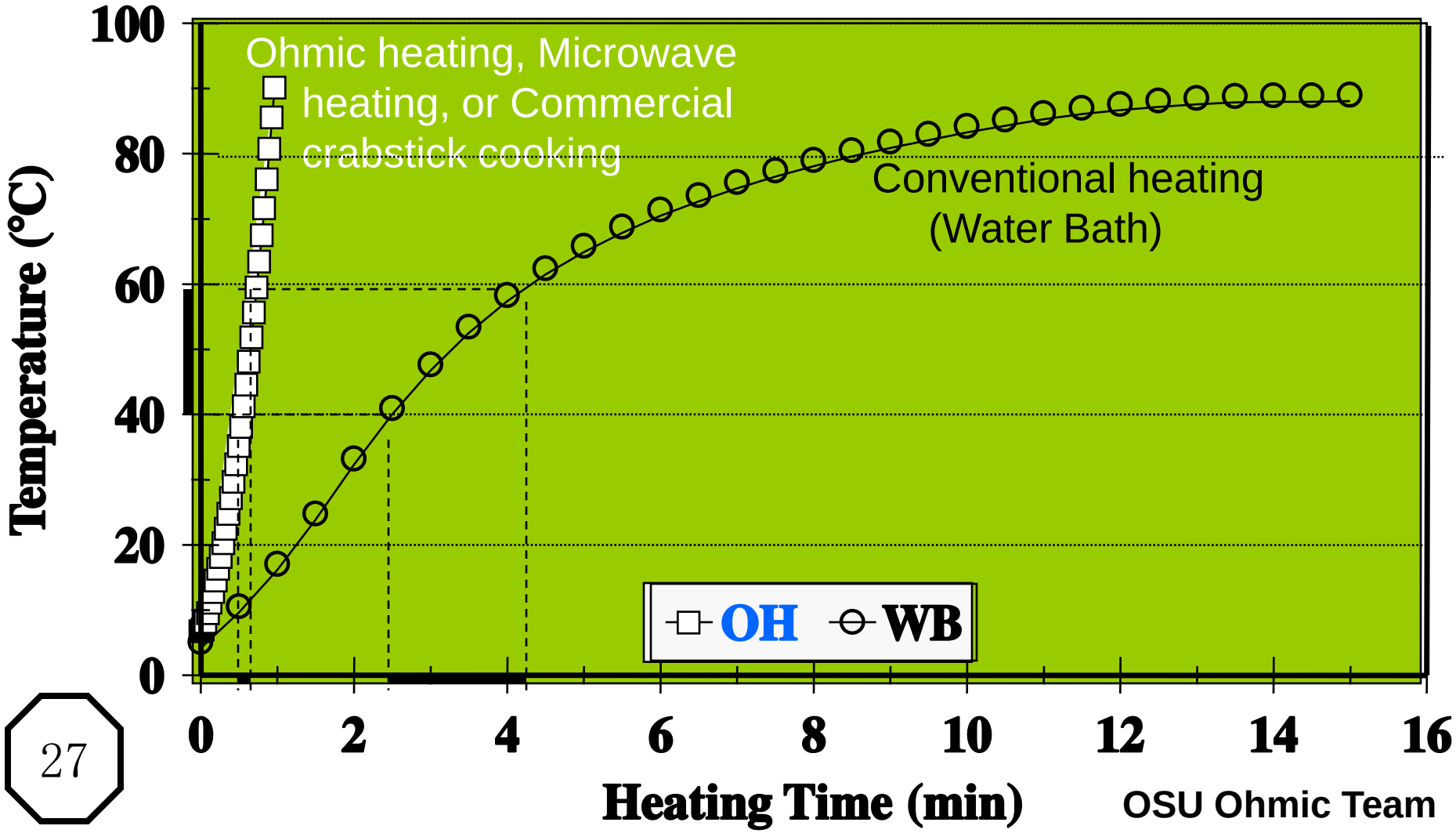


Control 1%EW 1%EW+TG 1%SPI 1%SPI+TG

Soy protein isolate (SPI), EW, and tranglutaminase on textural property of mudcarp surimi

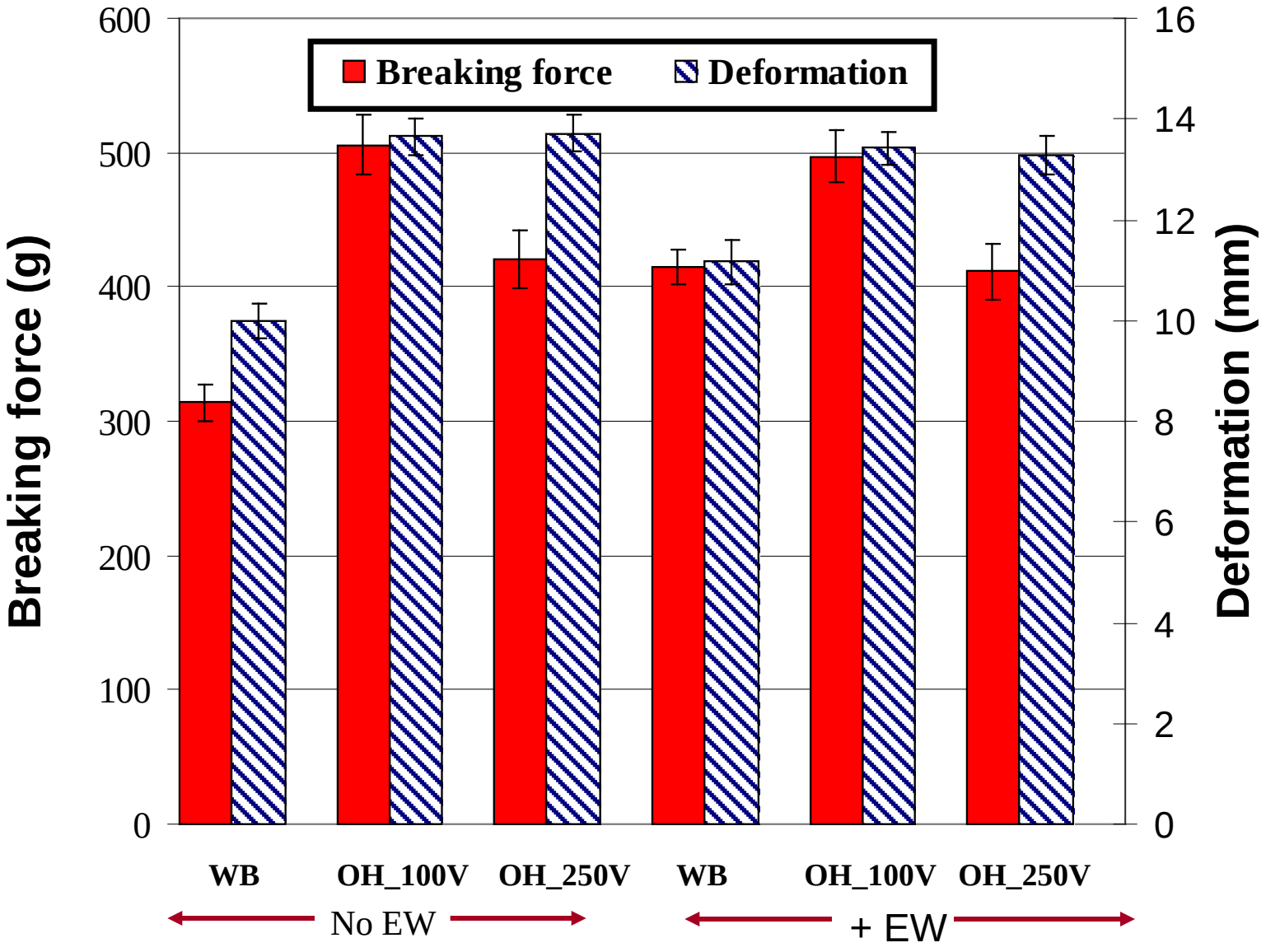


Temperature profiles during heating

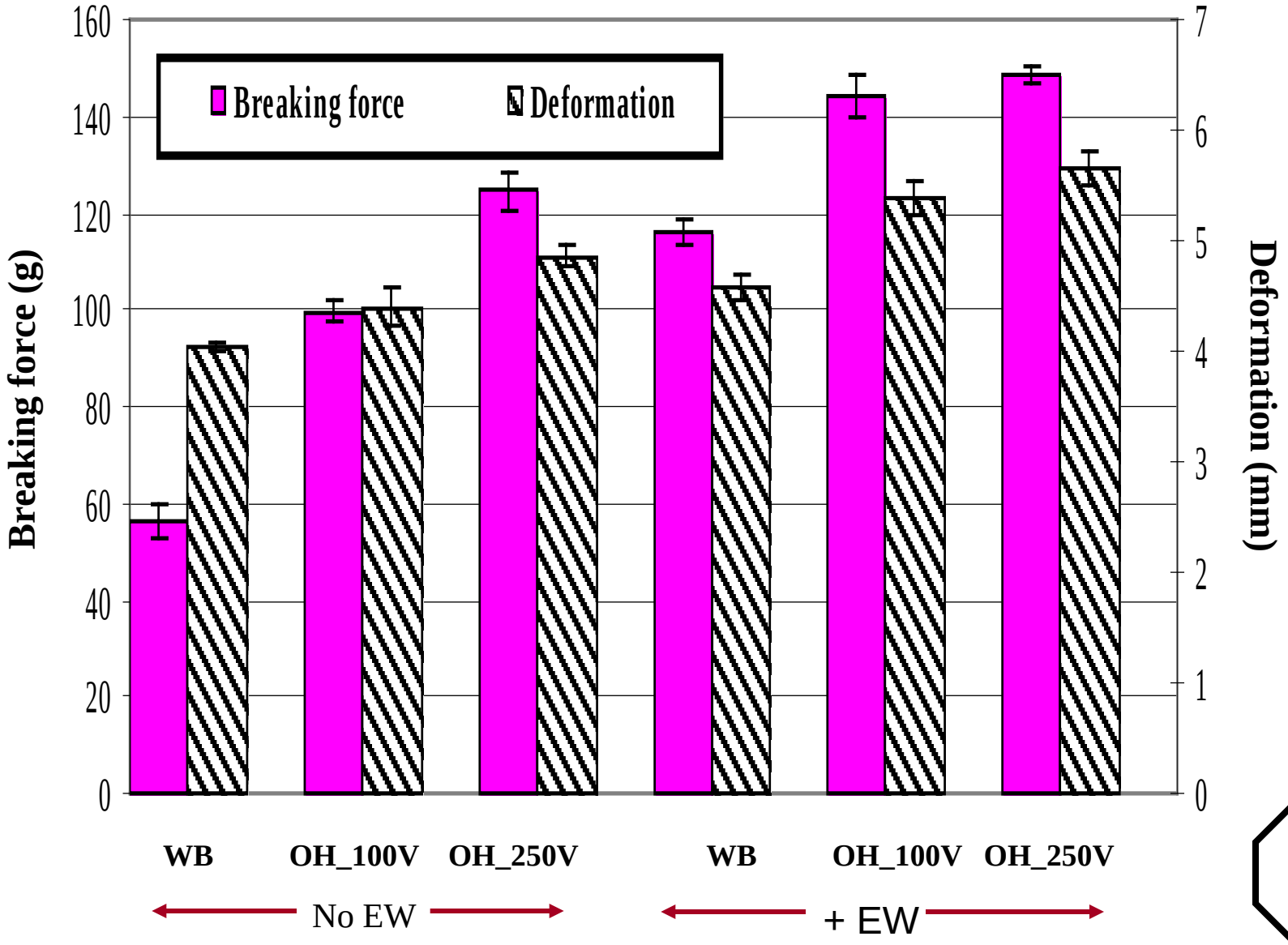


OSU Ohmic Team

Ohmic heating of threadfin brem surimi



Ohmic heating of lizardfish

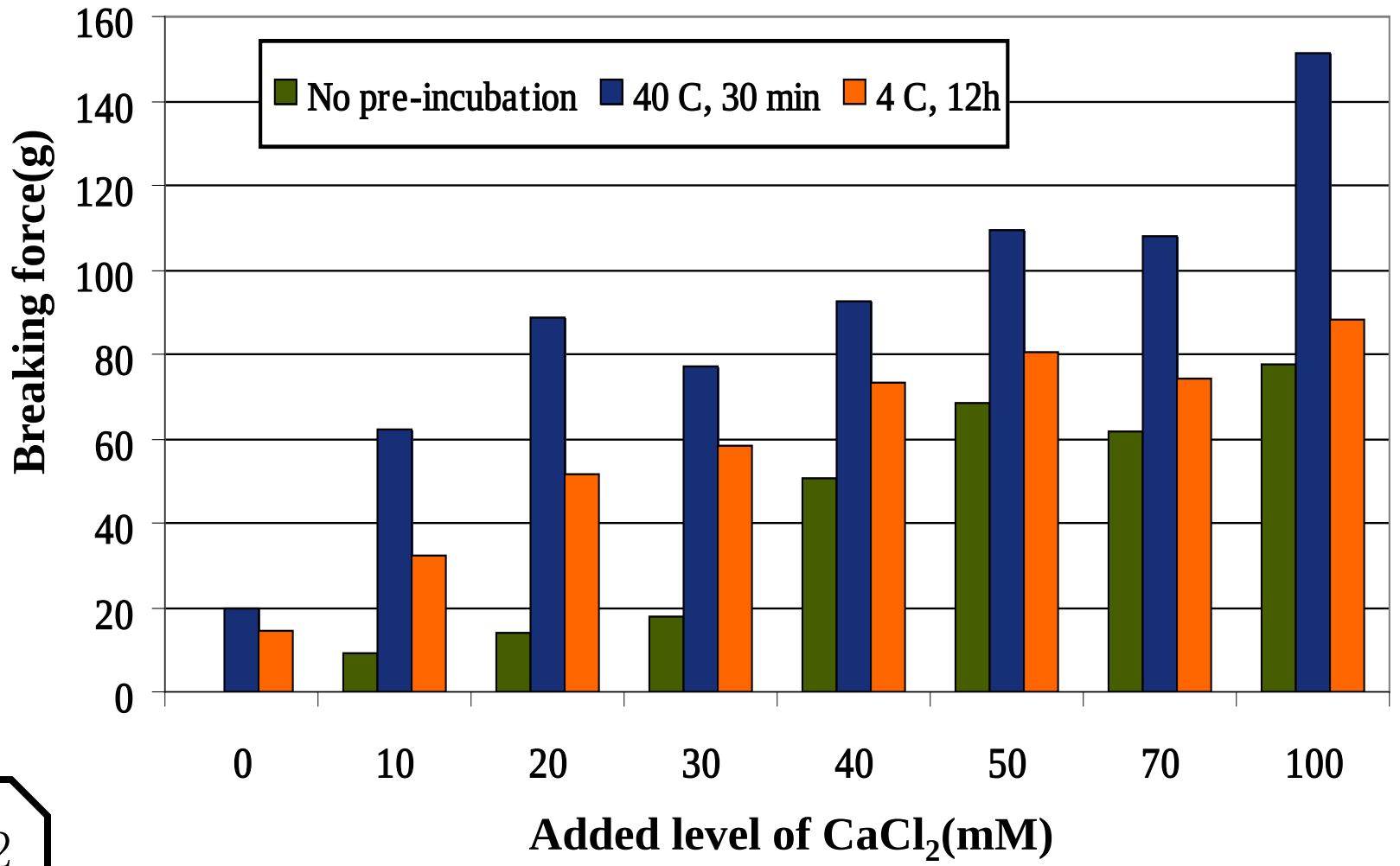


Take-home messages

- In the absence of proteinase inhibitor, either mild temperature setting (25^{o}C) or fast heating is preferred.
- EW is more effective to inhibit autolytic activity and improves textural properties of tropical surimi than WPC.
- EW and SPI improve textural properties to a similar extent. They are more effective when used in conjunction with MTG and incubated at 40^{o}C.
- Proteinase with low autolytic activity → ohmic
- Proteinase-laden surimi (lizardfish) → ohmic + EW

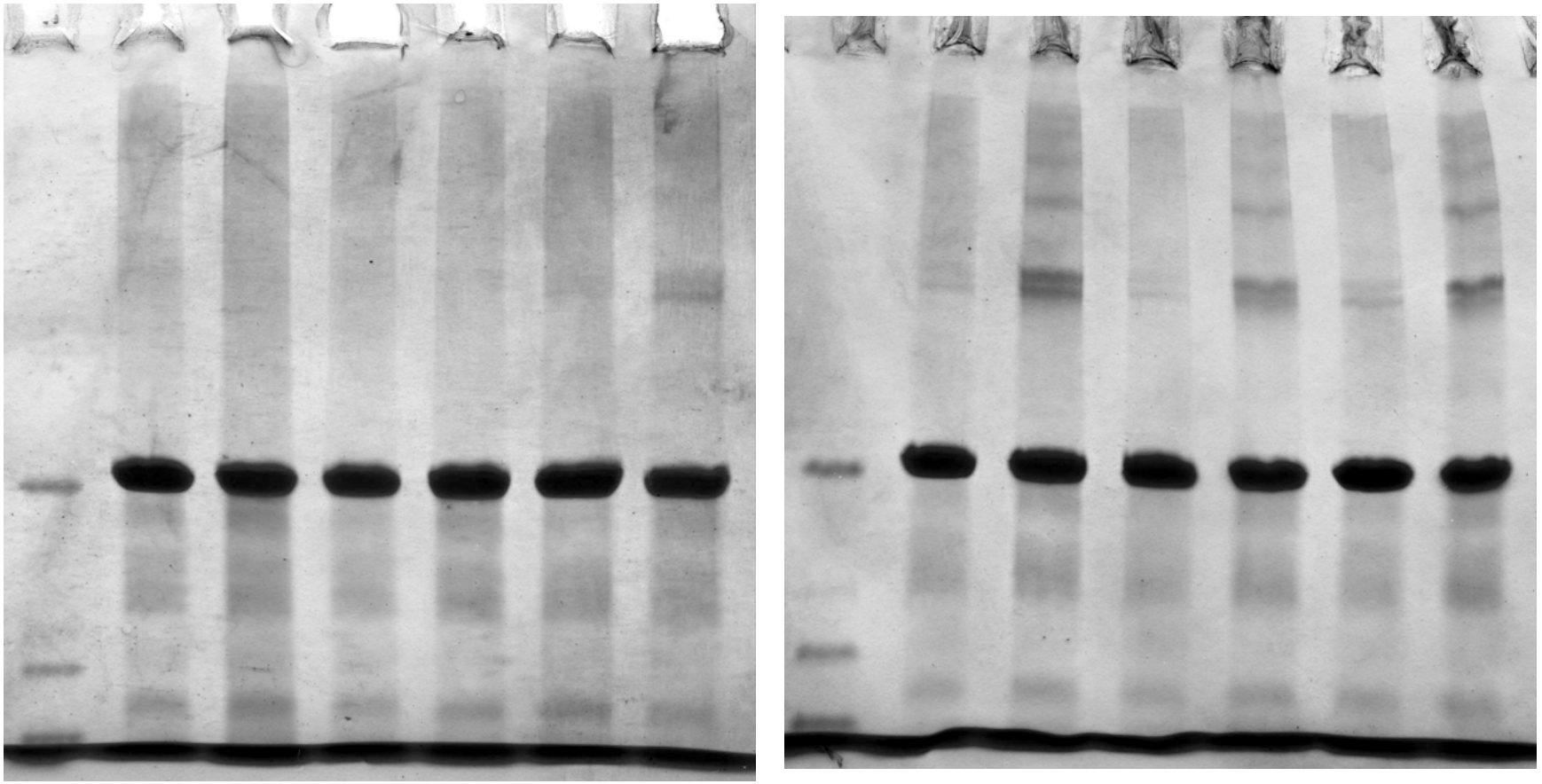
Thermal stability of warm water species

Ca^{2+} increases gel strength of tilapia actomyosin



Yongsawatdigul and Sinsuwan 2007

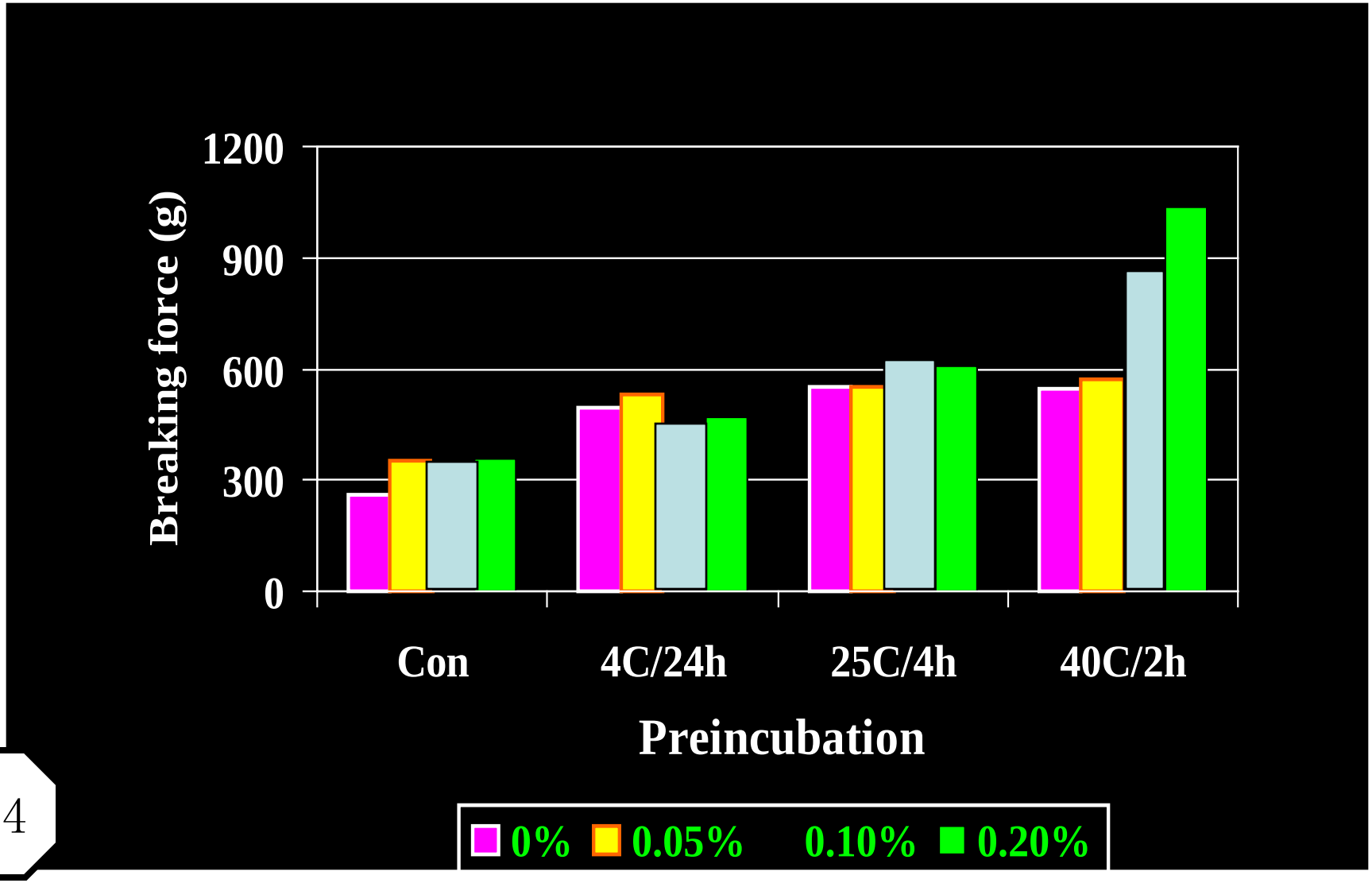
Protein cross-linking induced by Ca^{2+}



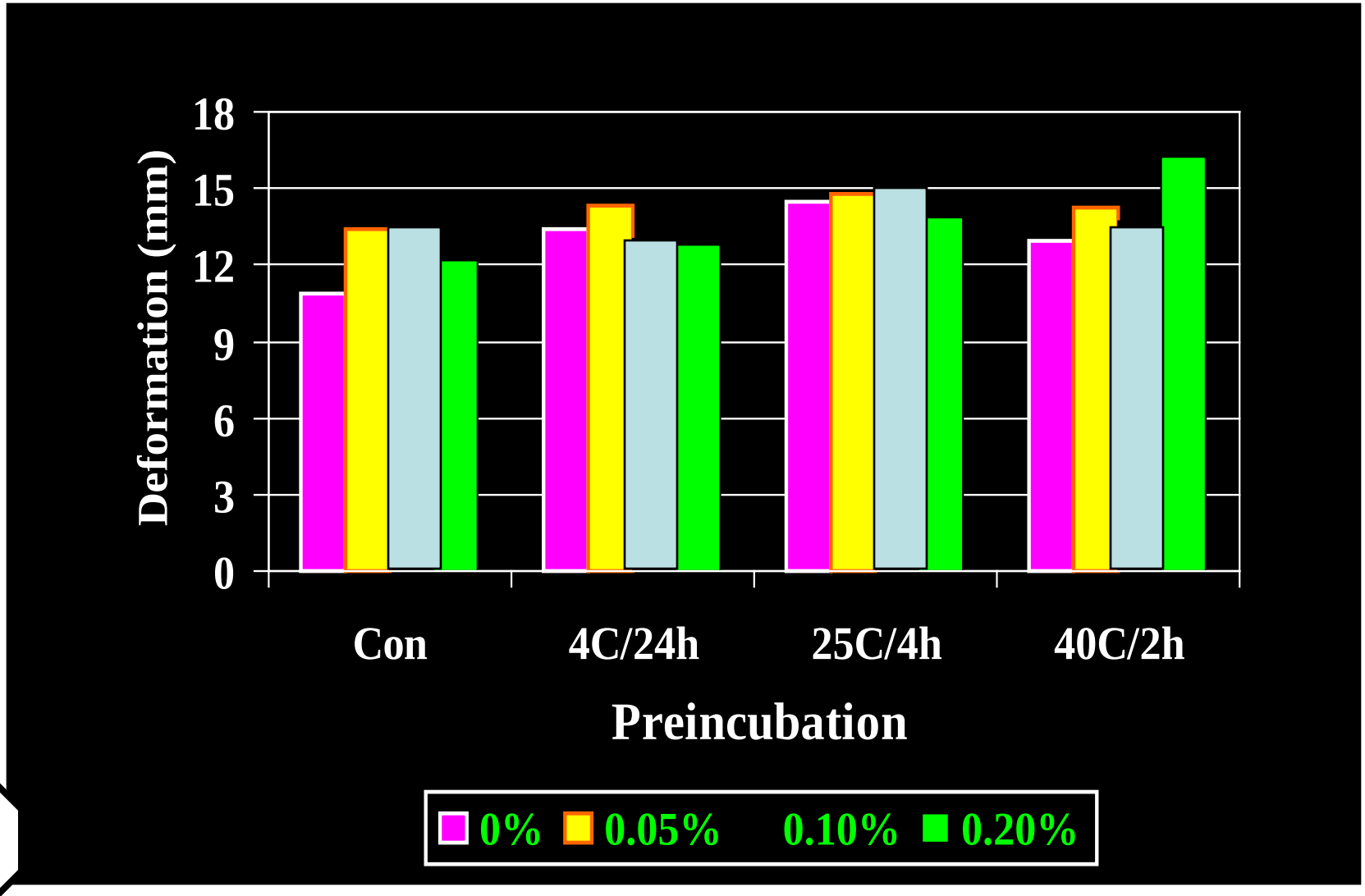
STD EGTA EGTA-H 0 0-H 10 10-H STD 50 50-H 70 70-H 100 100-H

Yongsawatdigul and Sinsuwan 2007

Effect of Ca^{2+} on textural properties of TB surimi

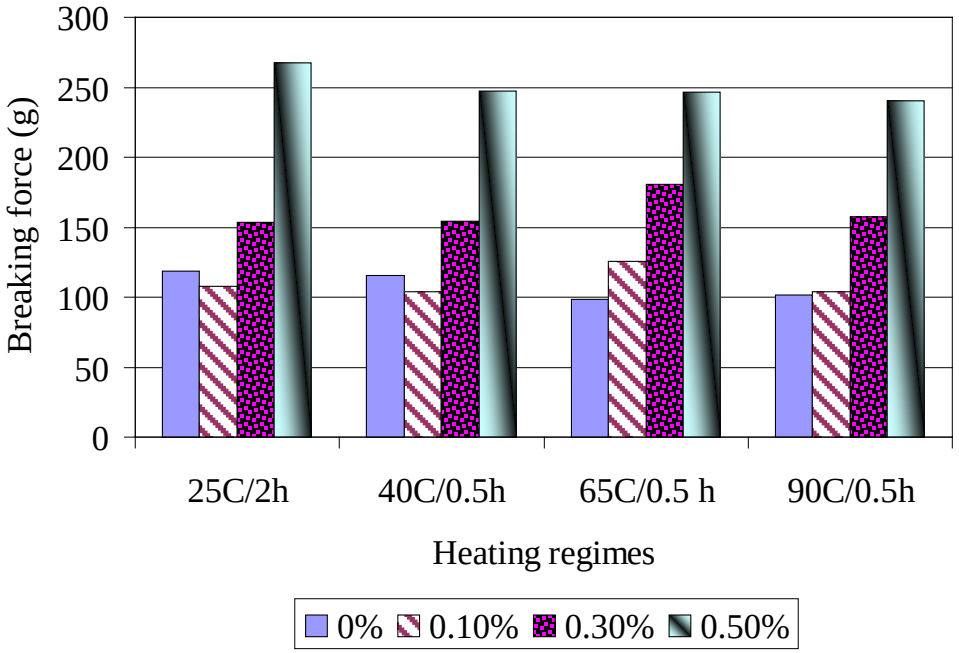


Effect of Ca^{2+} on textural properties of TB surimi

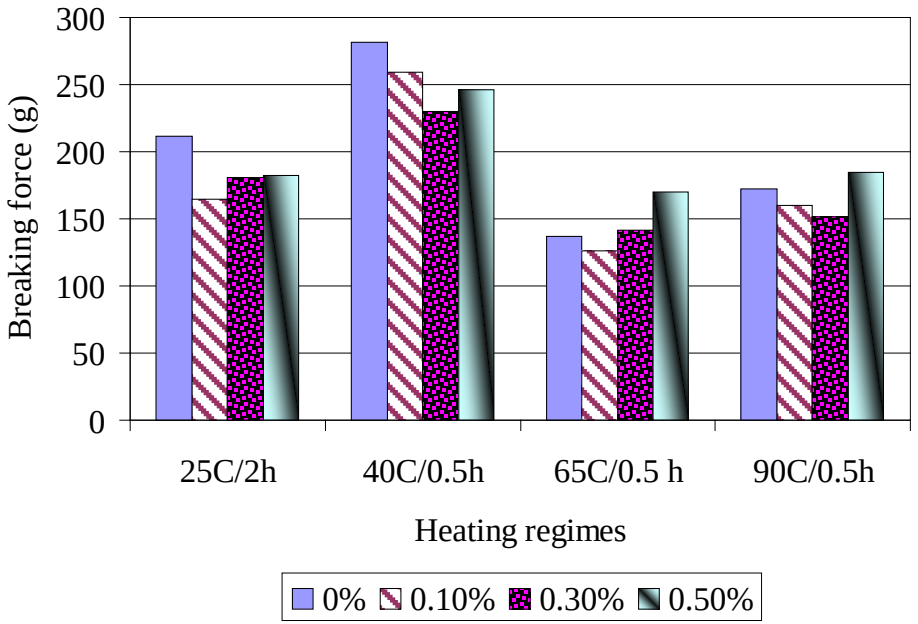


Effect of $CaCl_2$ on textural properties of mudcarp muscle proteins

Mince

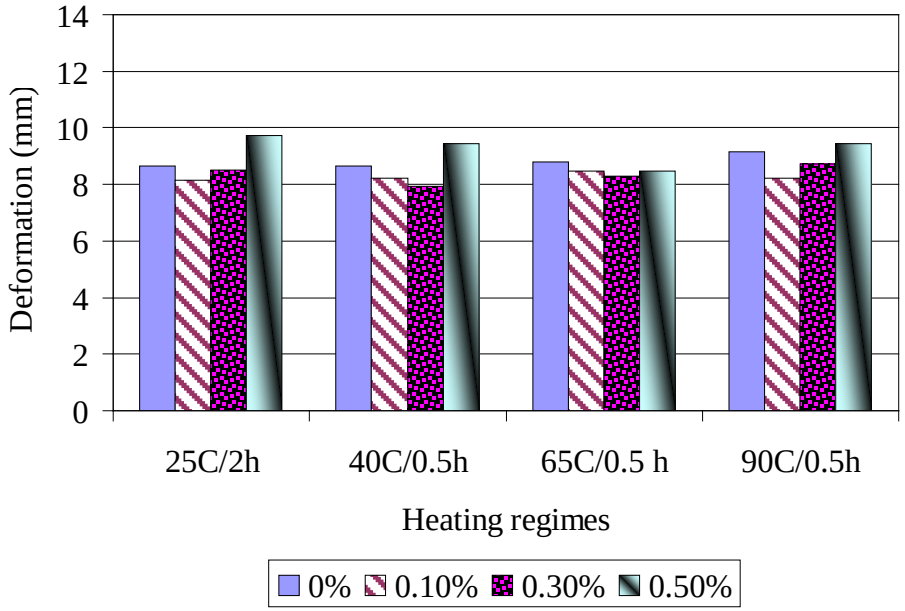


Surimi

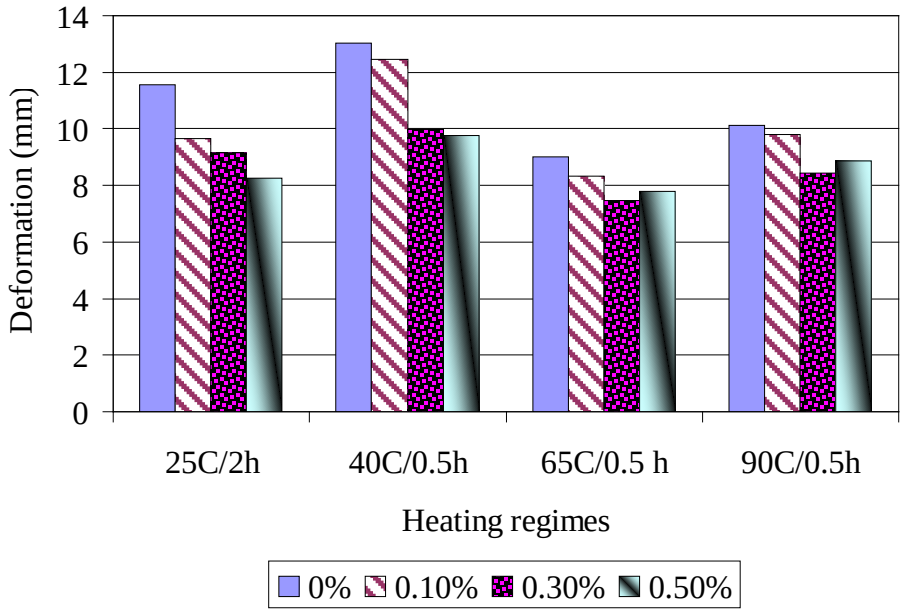


Effect of $CaCl_2$ on textural properties of mudcarp muscle proteins

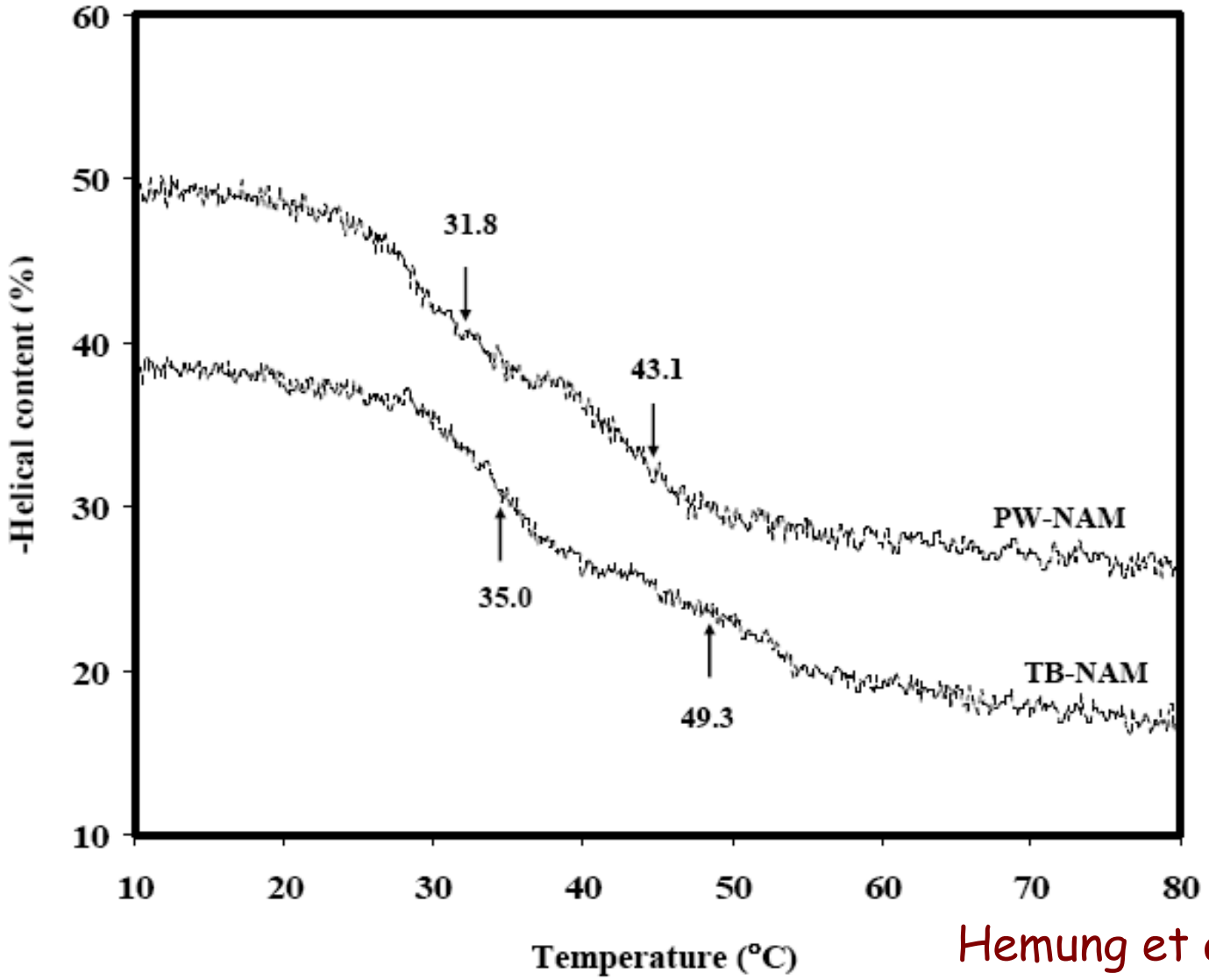
Mince



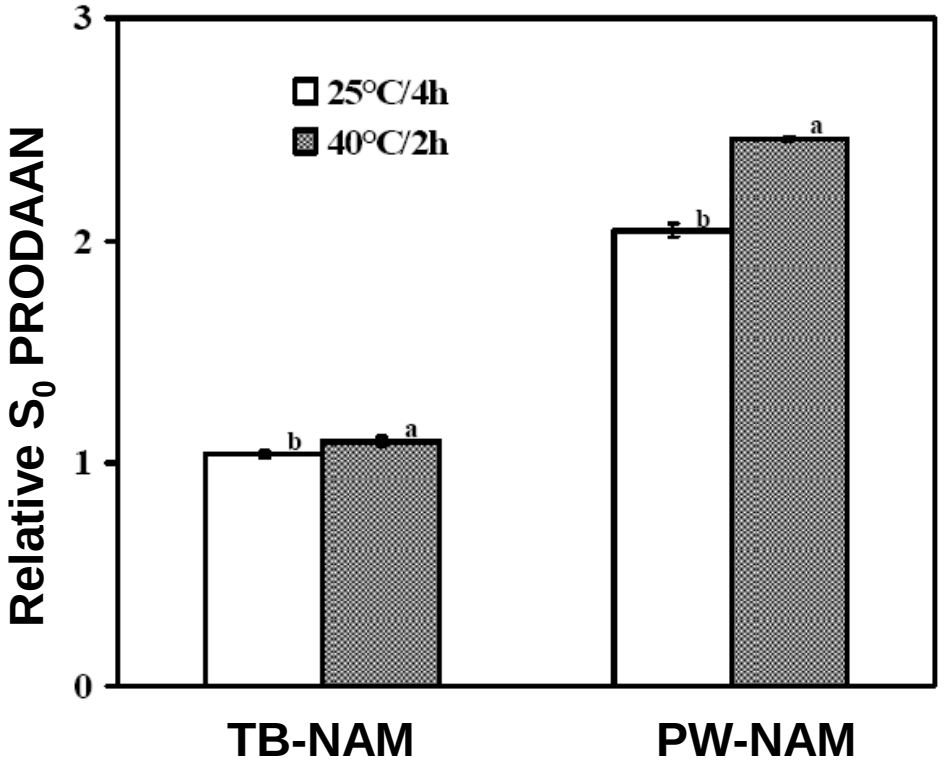
Surimi



Thermal stability of PW&TB

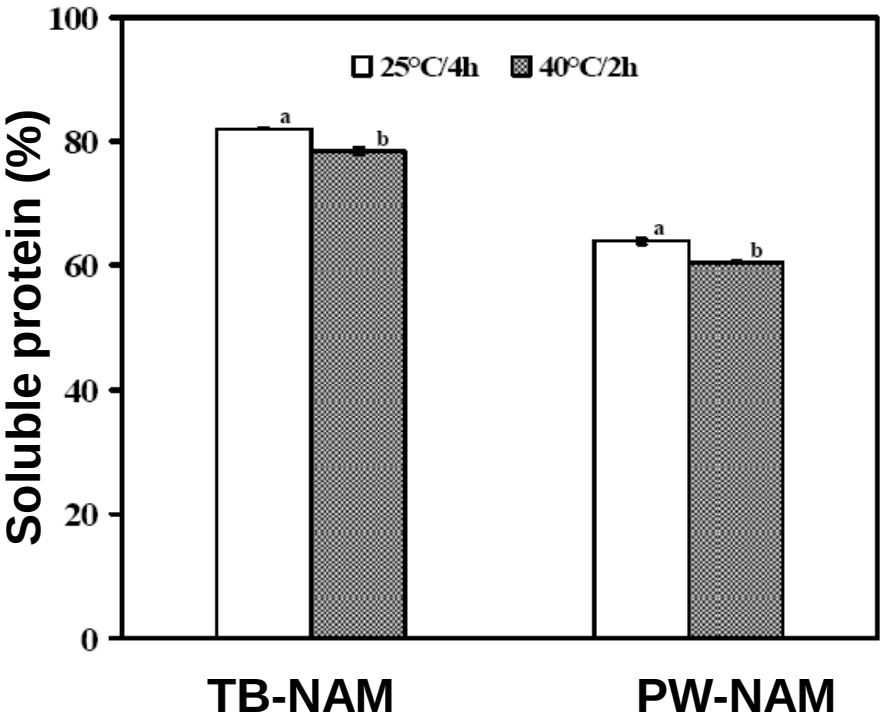


Hemung et al. (2008)

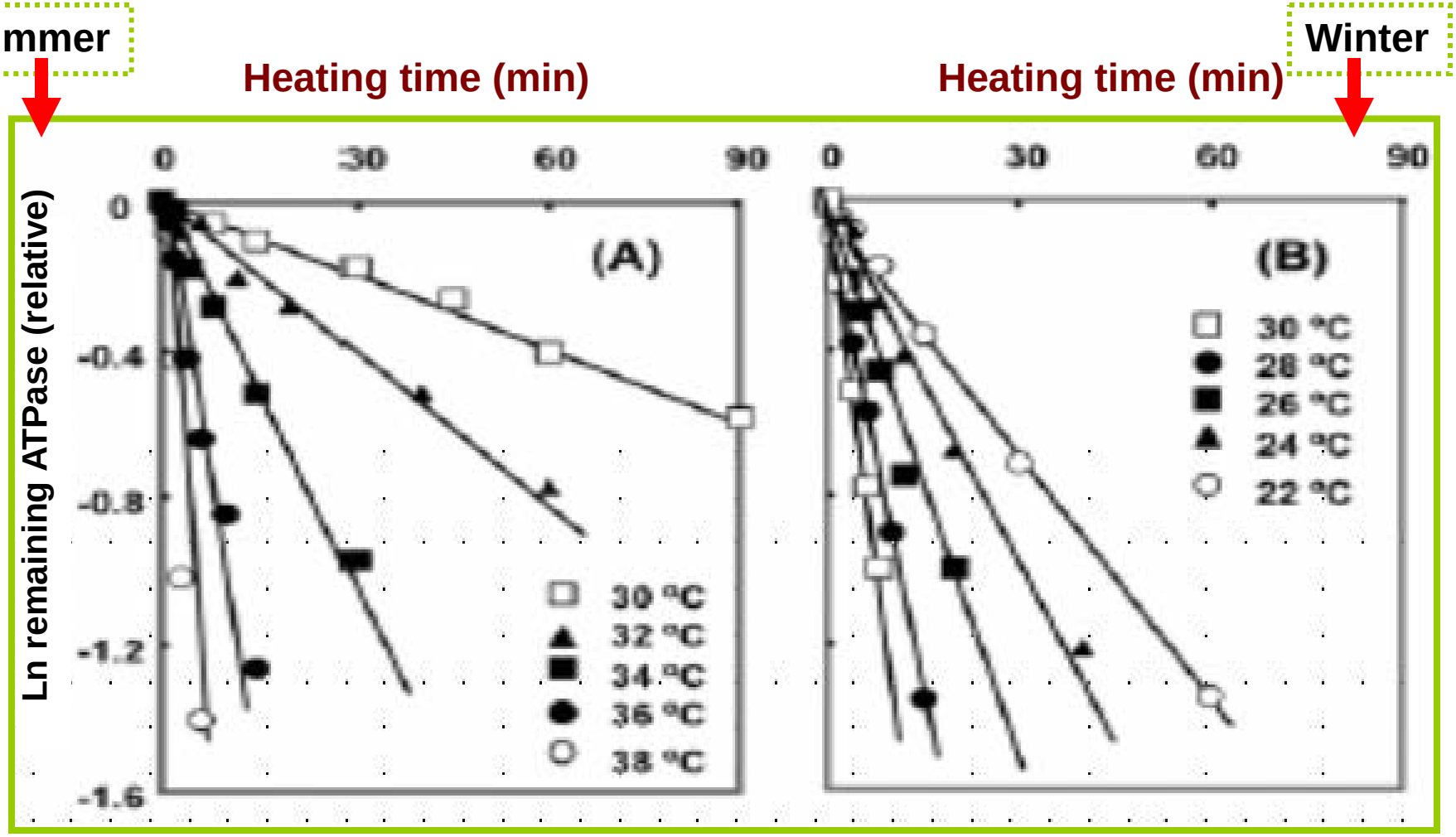


Surface hydrophobicity

Solubility



TB is more thermally stable than PW.



Temerature dependent ATPase inactivation of myofibrils in July and in February at 2 M KCl. (a) Myofibrils in July were heated from 30-38^{o}C. (b) Myofibrils in February were heated from 22-30^{o}C. M KCl. The inactivation rates in logarithmic values were plotted against the reciprocal of heating temperatures (absolute temperatures).

Yuan et al. (2006) J. Food Sci

Conclusions

- Endogenous TGase catalyzes the formation of covalent cross-linking, resulting in an increase in gel strength.
- Setting of MC mince can be enhanced by 0.5% $CaCl_2$.
- Setting of MC surimi is not promoted by $CaCl_2$ addition.
- Effect of $CaCl_2$ on textural properties is species-dependent.
- Warm water species exhibit higher thermal stability with optimum setting at 40^{o}C.