UNIVERSITI PUTRA MALAYSIA

BERILMU BERBAKTI

THE RHEOLOGICAL AND GELLING BEHAVIOR OF TILAPIA SURIMI WITH ADDED SAGO STARCH

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Objective

- To evaluate
  - -textural properties
  - -the viscoelastic properties which contributes to structural properties

Surimi-based products

Fish cakes

Fish balls

Fish sausage

Desired characteristics

- Surimi-based products are textured products
- -a balance between hardness & springiness
- -Meat analogues requires some degree of chewiness

Why tilapia surimi?

Texture modifiers

- Starches/hydrocolloids are used as texture modifiers
- -potato starches (modified & native)
- -tapioca
- -sago*
- Corn starch
- Gums
- Non-fish proteins & others(egg whites)

METHODOLOGY

- Surimi preparation
- Gel-forming ability (Hwang etal.,2007).
- Texture analysis (Julavittaynukul *et al*. 2006)
  - Breaking force
  - Deformation
- Rheological properties (Hwang *et al*.,2007)
  - storage modulus (G'),
  - loss modulus (G")

Surimi processing-deboning

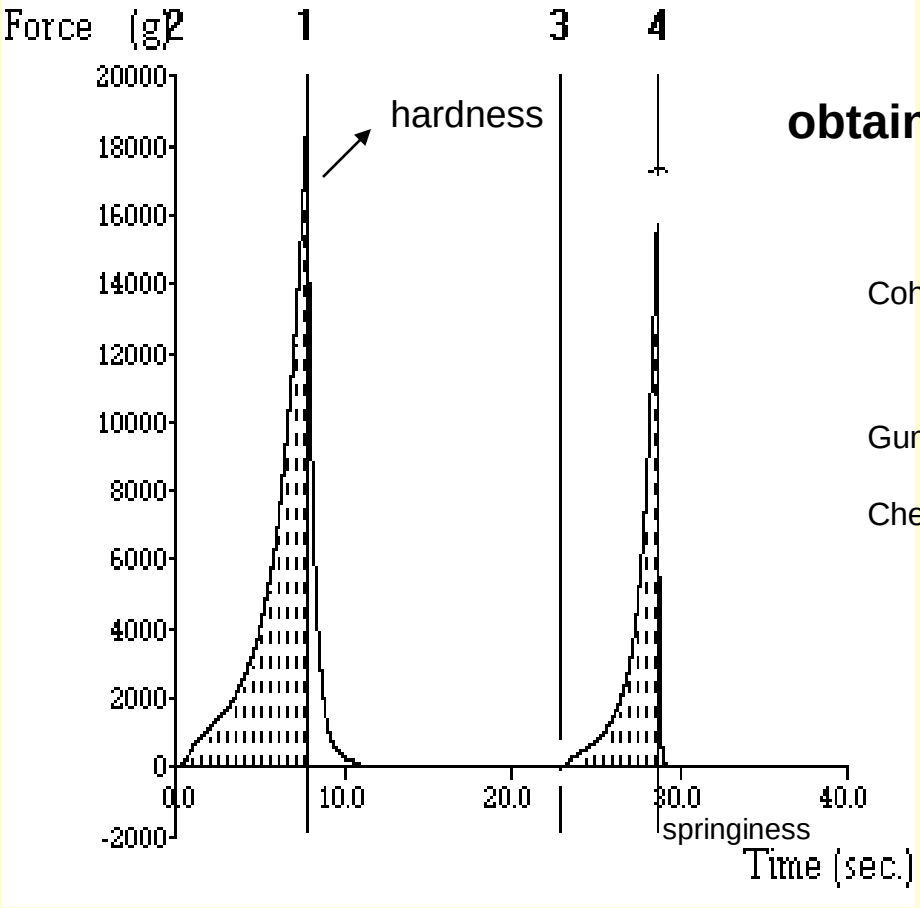
Washing & rinsing

Minced fish meat & dough

IDENTIFICATION OF THE GEL STRENGTH

- specimens subjected to 75% deformation with a 50 mm diameter aluminum cylinder probe (P/50).

TPA trace



A TPA curve obtained by the texture analyser

$$\text{Cohesiveness} = \frac{\text{Positive area of } 2^{nd} \text{ peak (A2)}}{\text{Positive area of } 1^{st} \text{ peak (A1)}}$$

Gumminess = (Hardness) X (Cohesiveness)

Chewiness = (Gumminess) X (Springiness)

Rheological properties

- A stress Rheometer (HAAKE, RT 20, ROTOVISCO, Germany) with cone-plate geometry (35 mm diameter, 2 cone angle)

- The modulus development -scanned from 30 to 90^0 C at a rate of 20^0 C/ min during heating; cooling from 90 to 30^0 C at a rate of 40^0 C/ min heating.

- All measurements were conducted at a frequency of 1 Hz and stress value of 10Pa.

Gel preparation

- Directly heated gels:

  heating the sol at 90^0 C for 20 min.

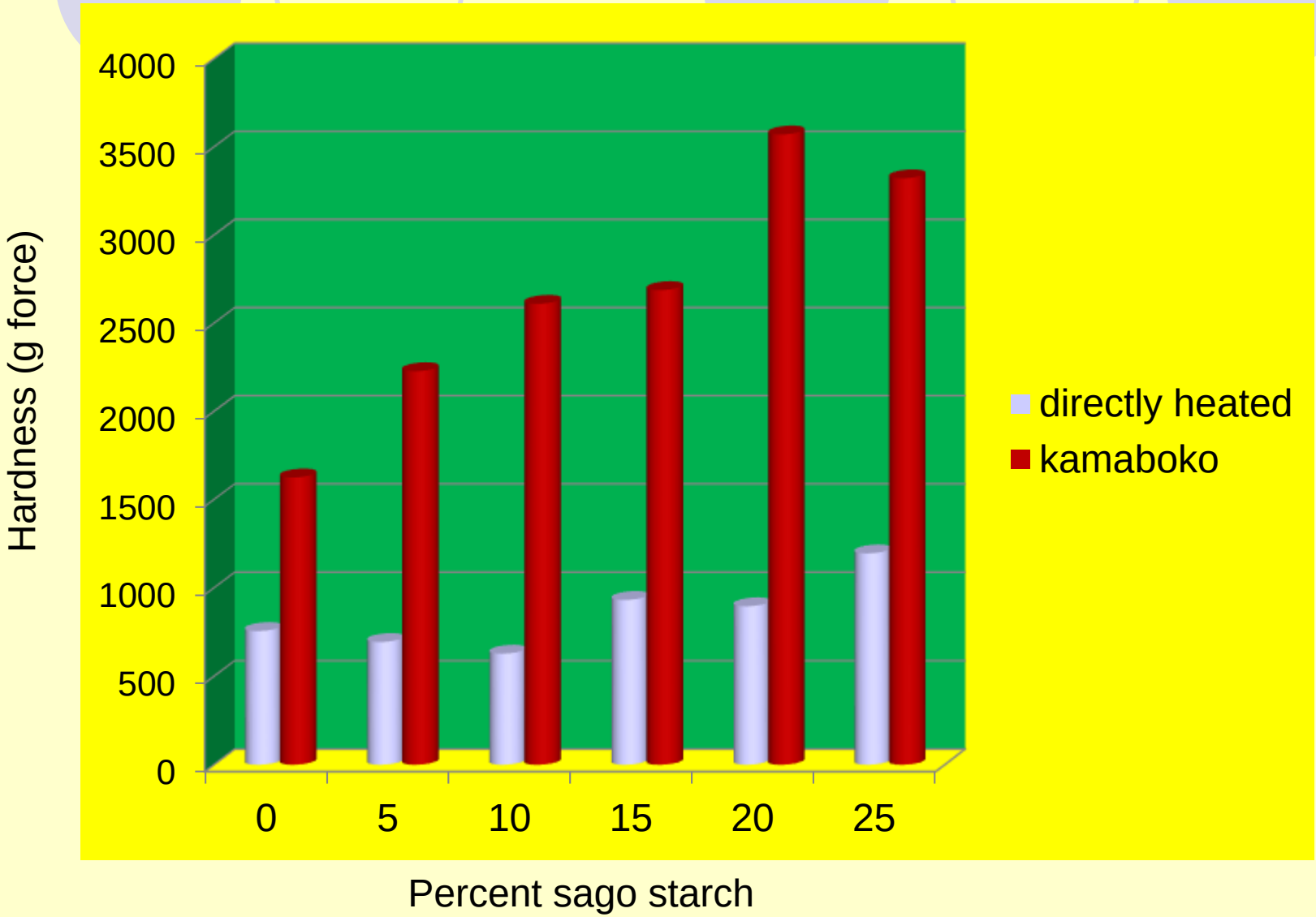
- Kamaboko gels:

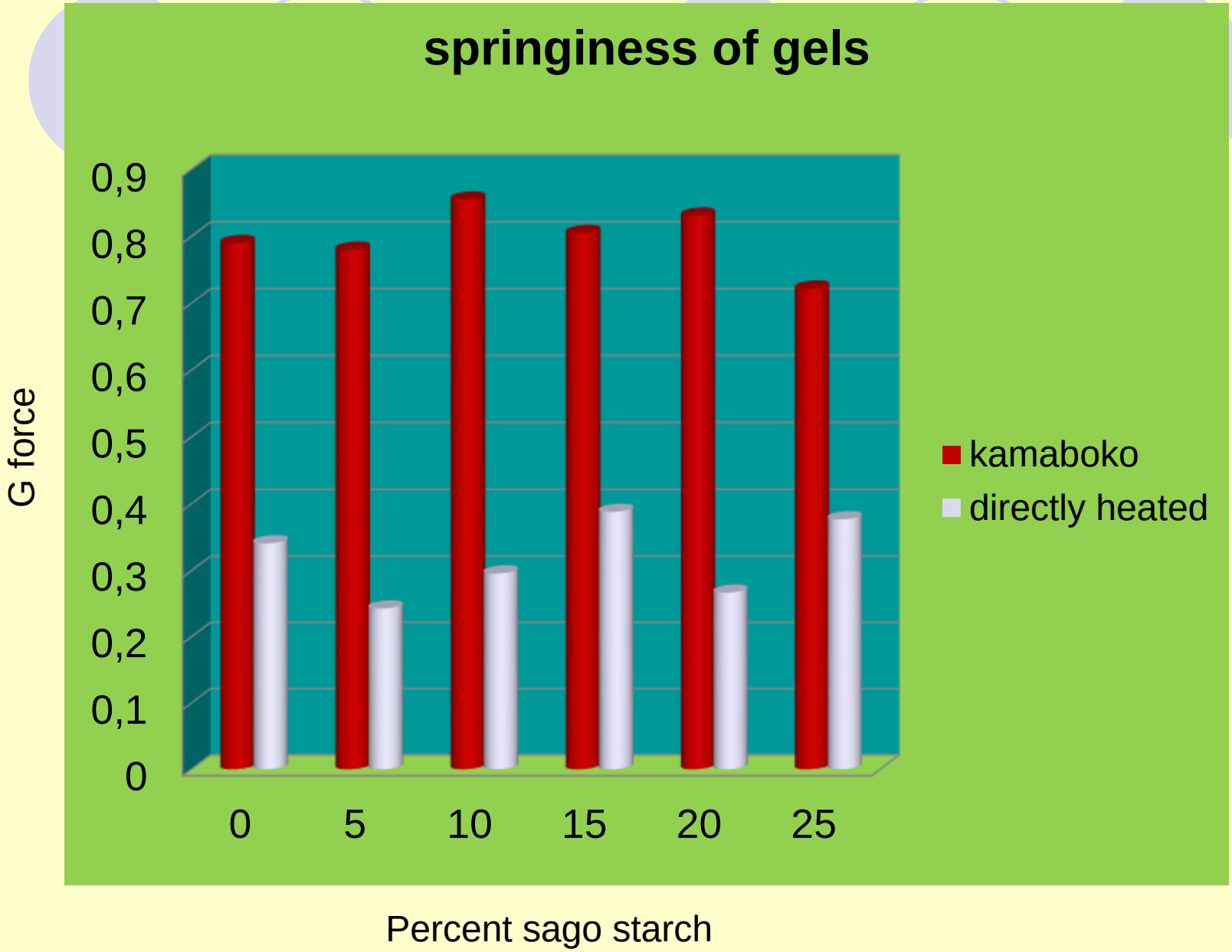
  incubating the sol at 40^0 C for 30 min, followed by heating at 90^0 C for 20 min.

TEXTURAL PROPERTIES AS AFFECTED BY SAGO STARCH-STARCH-KAMABOKO GEL

% Sago starch	Hardness	Springiness	Cohesiveness	Gumminess	Chewiness
control	1625	0.79	0.224	342	267
5	2228	0.782	0.264	589	479
10	2610	0.855	0.249	661	555
15	2688	0.805	0.252	614	431
20	3571	0.831	0.274	986	746
25	3322	0.722	0.233	735	583

Gel hardness



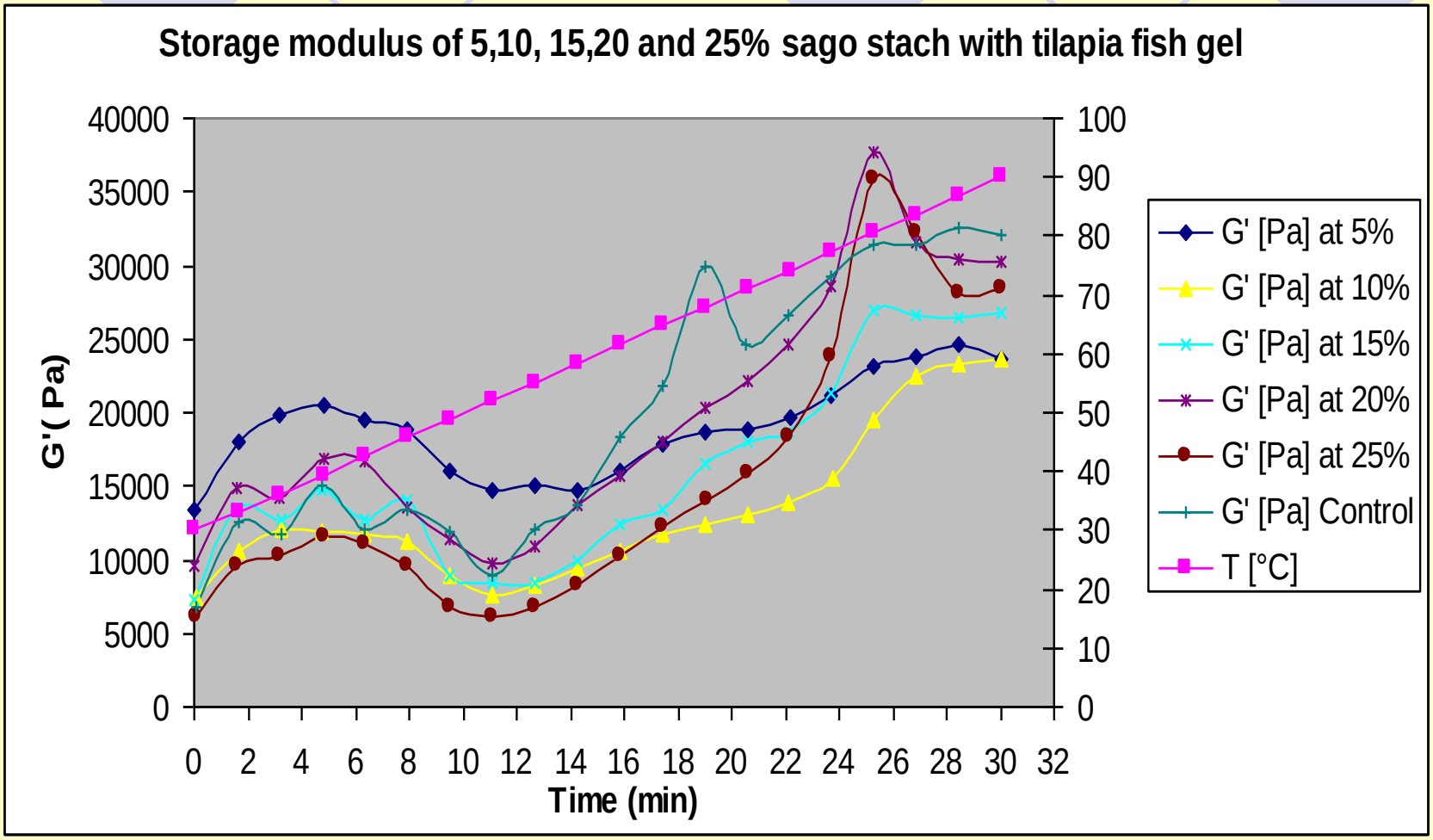

springiness of gels
G force
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
5
10
15
20
25
kamaboko
directly heated
Percent sago starch

Storage and loss modulus

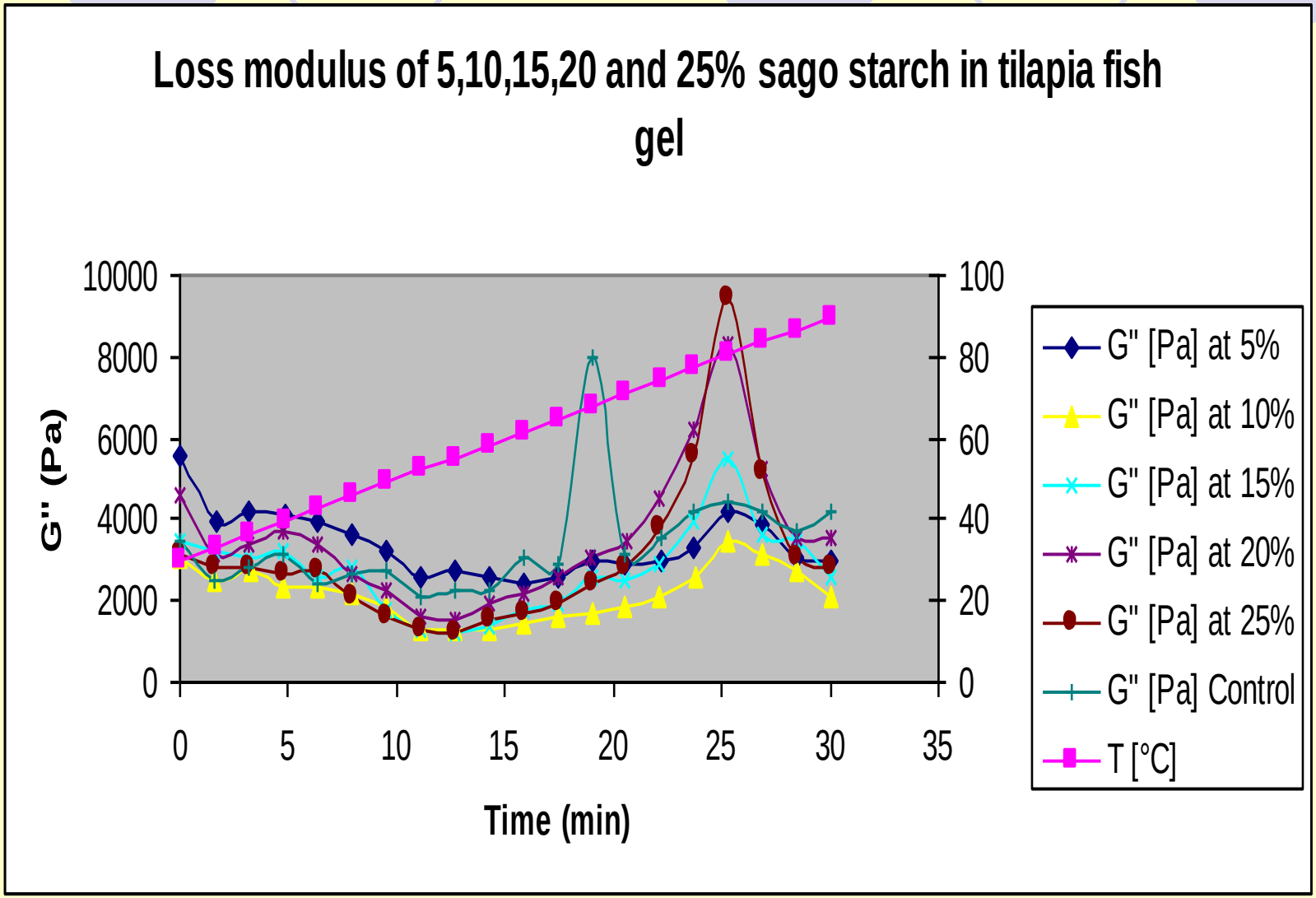
- The G’ (storage modulus)- measures the elastic component of the network and represent the type of structure contributing to a three dimensional network.

- The G” (loss modulus)- measures of the viscous component and may represent interaction which do not contribute to the three dimensional nature of the work.

Storage modulus-sago starch



The loss modulus-sago starch



Conclusion

- Springiness, was not strongly affected by the sago starch, except at 10%

- Based on the loss and storage modulus, 20% sago starch was able to maintain the elasticity of the mixture even for prolong heating. Even though, control was more elastic at shorter heating period.