

# Shelf Life Determination of Korean Packaged Sauces

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## Objectives

- 1 To see initial microbial contamination level and food compositional characteristic of savoury sauce products used for Korean foods
- 2 To examine the storage stability of the sauce products in terms of microbiological and chemical quality changes
- 3 To extract or select primary quality indexes for typical savoury sauce products
- 4 To determine shelf lives of typical sauce products under different storage conditions

## Evaluation of Storage Stability of Sauce Products

Product	Physical state	Package unit & forms	pH	Water activity (%)	Soluble solid ('Bx)	Salinity (%)	Microbial counts (log(cfu/g))
Meat extract sauce for cool noodle	Liquid	340 g, PE pouch	4.32	0.983	7.0	1.74	<0
Watery <i>kimchi</i> meaty sauce	Liquid	100 g, PET bottle	4.20	0.981	9.9	1.85	<0
Skewer chicken coating	Fluidic paste	480 g, PET bottle	5.01	0.869	48.4	3.42	1.20
Breaded pork cutlet sauce	Fluidic Paste	285 g, PET bottle	4.31	0.897	24.5	2.65	<0
Broiled hot rice cake sauce	Paste	285 g, PET bottle	4.57	0.870	54.8	1.68	4.61
Mustard sauce	Semi-liquid	285 g, PET bottle	3.77	0.892	32.5	1.56	1.28

## Evaluation of Storage Stability of Sauce Products

Product	Physical state	Package unit & forms	pH	Water activity (%)	Soluble solid ('Bx)	Salinity (%)	Microbial counts (log(cfu/g))
Salad dressing	Liquid	50 g, PE pouch	4.03	0.911	26.1	8.03	<0
Non-curdled tofu stew seasoning	Paste	50 g, PE pouch	5.04	0.843	41.5	11.97	<0
Spawn stew seasoning	Paste	50 g, PE pouch	4.75	0.847	42.9	5.91	2.42
Soy-sauce/wasabi mix	Liquid	50 g, PE pouch	4.17	0.891	29.1	4.93	1.73
Seasoning for grilled eels	Semi-liquid	285 g, PET bottle	4.73	0.833	60.4	1.65	<0
Seasoned soybean paste	Paste	50 g, PE pouch	5.15	0.892	41.0	4.42	3.24

## Evaluation of Storage Stability of Sauce Products

Product	Physical state	Package unit & forms	pH	Water activity (%)	Soluble solid ('Bx)	Salinity (%)	Microbial counts (log(cfu/g))
Roast chicken sauce	Semi-liquid	285 g, PET bottle	4.23	0.875	56.8	0.82	<0
Sweet-and-sour pork sauce	Semi-liquid	285 g, PET bottle	4.21	0.857	28.9	1.37	<0
Seafood stew seasoning	Paste	50 g, PE pouch	5.05	0.756	64.9	5.25	3.24
Vinegared red pepper paste	Fluidic Paste	285 g, PET bottle	3.84	0.857	54.1	1.91	2.24
Soybean paste seasoning mix for cooked rice	Fluidic Paste	480 g, PET bottle	4.02	0.777	51.4	1.65	2.80
Sauce for sandwich bread	Semi-liquid	285 g, PET bottle	4.01	0.881	55.2	0	<0

## The selected items

Liquid Meat Extract Sauce

High water activity,  
Low pH

Soybean Paste Seasoning

Low pH and water activity,  
High aerobic bacteria counts

Semi-liquid Bread Sauce

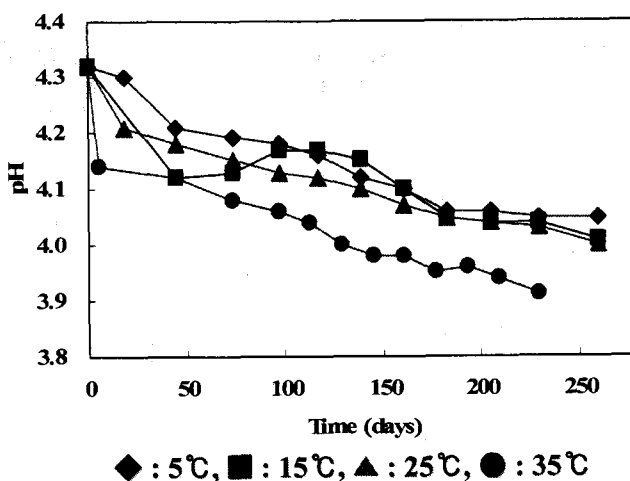
Low pH and water activity

## Liquid Meat Extract Sauce for Storage Test

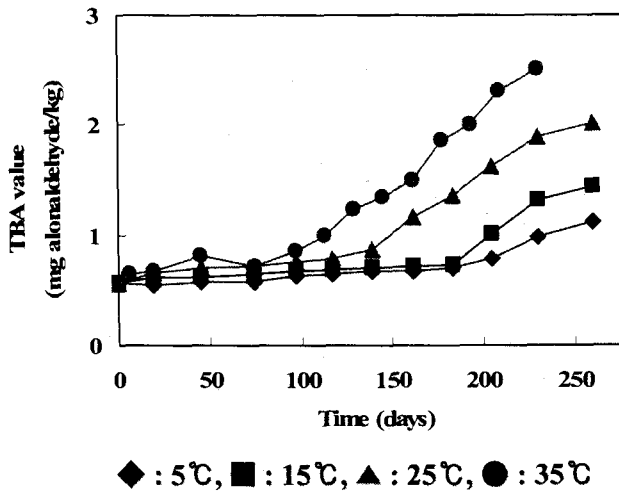
- ✦ Packaging – 340g, thickness 102  $\mu\text{m}$  PE pouch
- ✦ Storage temperature – 5, 15, 25, 35  $^{\circ}\text{C}$
- ✦ Quality measurement
  - pH (4.32), Salinity (1.74%), Soluble solids (7.0°Bx), Water activity (0.98), Colour, Thiobarbituric acid value (TBA value, 0.56mg/kg), Microbial load ( $>1$ )



## pH Change of Liquid Meat Extract Sauce



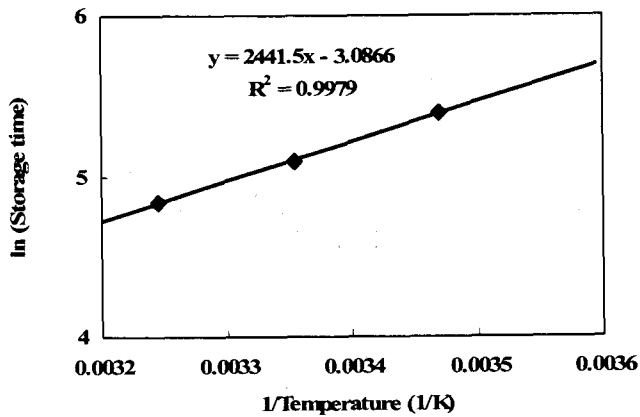
### TBA Value Change of Liquid Meat Extract Sauce



### Other Quality Change Of Liquid Meat Extract Sauce

- ✦ Increase in salinity and soluble solid, decrease of water activity resulting from of water loss through packaging film
- ✦ No growth of microorganisms

### Temperature Dependence of TBA of Liquid Meat Extract Sauce – time to reach 1.2mg/kg



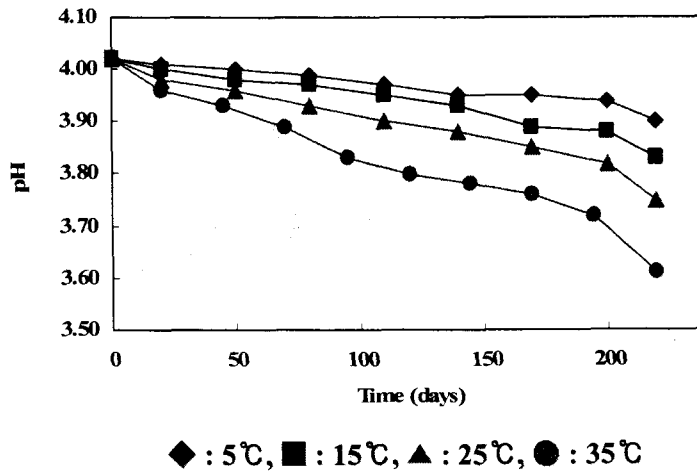
Activation energy : 20.3 kJ/mol

### Soybean Paste Seasoning for Rice for Storage Test

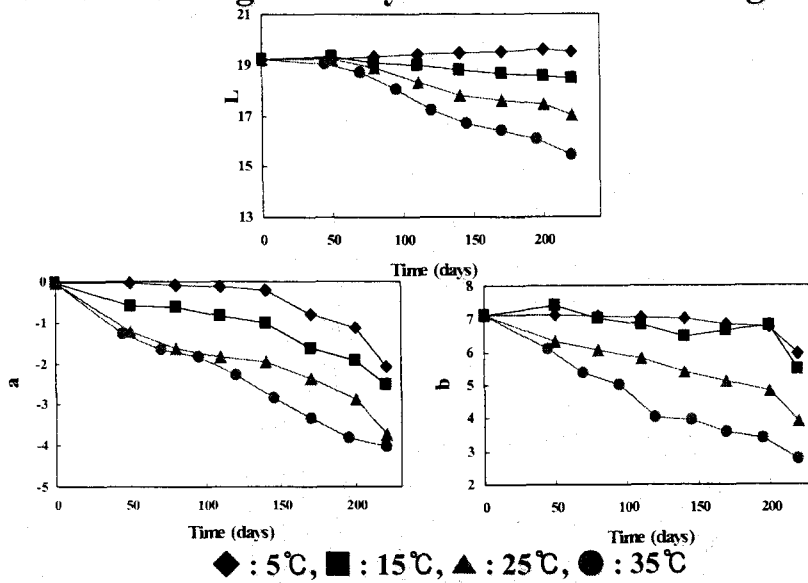
- ✦ Packaging – 480g, PET plastic bottle
- ✦ Storage temperature – 5, 15, 25, 35 °C
- ✦ Quality measurement
  - pH (4.02), Salinity (1.65%), Soluble solids (51.4°Bx), Water activity (0.78), Colour, Microbial load (2.80(log(cfu/g)))



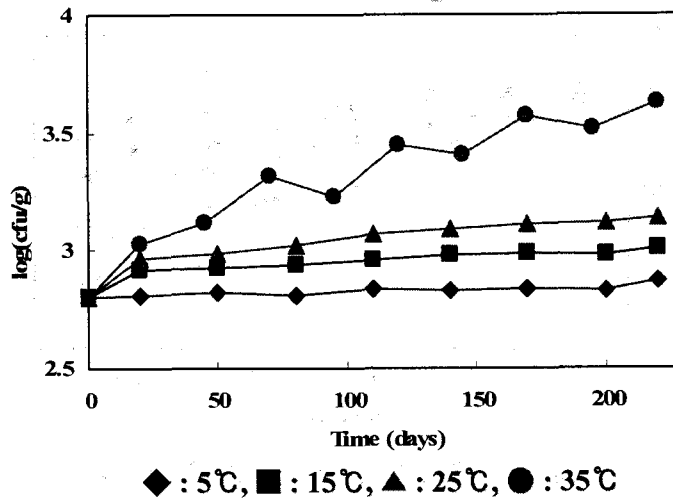
## pH Change of Soybean Paste Seasoning



## Colour Changes of Soybean Paste Seasoning



## Aerobic Bacteria Counts Change of Soybean Paste Seasoning



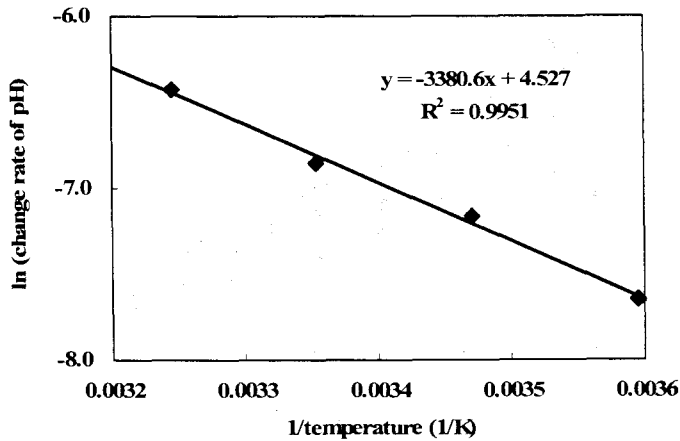
## Soybean Paste Seasoning Stored for 200 days



No significant change in salinity, soluble solid and water activity



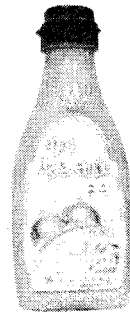
## Temperature Dependence of pH Change of Soybean Paste Seasoning



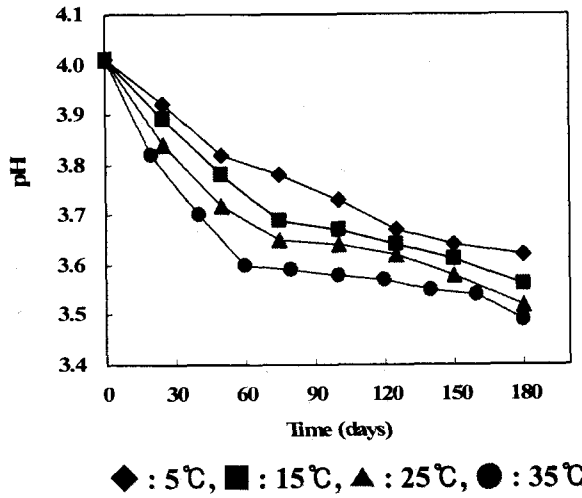
Activation energy : 28.1 kJ/mol

## Semi-liquid Bread Sauce for Storage Test

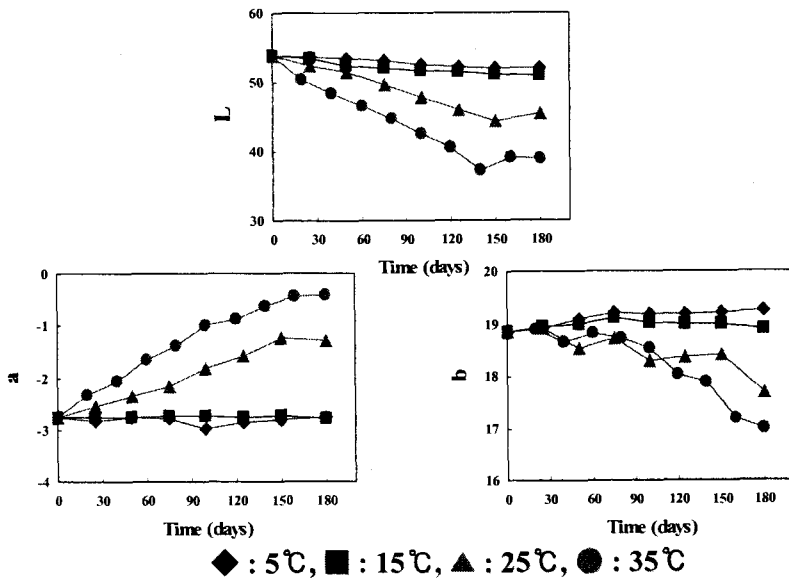
- + Packaging – 285g, PET plastic bottle
- + Storage temperature – 5, 15, 25, 35 °C
- + Quality measurement
  - pH (4.01), Salinity (0 %), Soluble solids (55.2°Bx), Water activity (0.88), Colour, Microbial load (>1)



### pH Change of Semi-liquid Bread Sauce



### Colour Change of Semi-liquid Bread Sauce

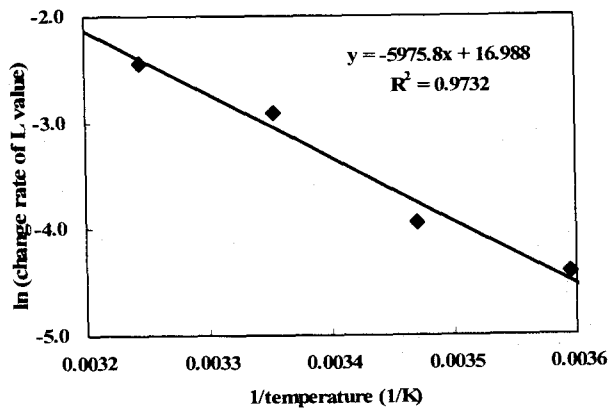


## Semi-liquid Bread Sauce Stored for 160 days



- ✦ No significant changes in salinity, soluble solid and water activity,
- ✦ No microbial growth

## Temperature Dependence of Colour Change of Semi-liquid Bread Sauce



Activation energy : 49.7 kJ/mol

### Summary of Primary Quality Changes and Shelf Life Determination Based on These

Sauce	Sensitive quality index	Activation energy (kJ/mol)	Temperature (°C)	Shelf life (days)
Liquid sauce of meat extract for cold-immersing noodle	pH, TBA value	20.3	5	296
			15	220
			25	162
			35	127
Soybean paste seasoning for cooked rice	pH, microbial load, colour	28.1	5	448
			15	213
			25	106
			35	55
Semi-liquid sauce for sandwich bread	pH, colour	49.7	5	308
			15	202
			25	136
			35	94

## Conclusion

Primary quality change indexes were determined for liquid meat extract sauce for noodle, soybean paste seasoning for rice and semi-liquid sauce for bread. The temperature dependence of those primary quality attributes could be described by Arrhenius equation to give the shelf life estimation as function of temperature.