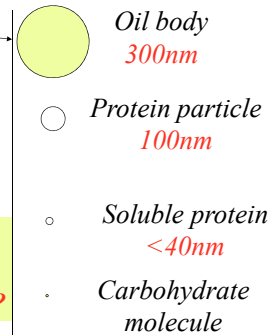




Soymilk: colloidal solution



Why soluble protein and protein particle could disperse stably in soymilk?

(1)Tozan 205, T;

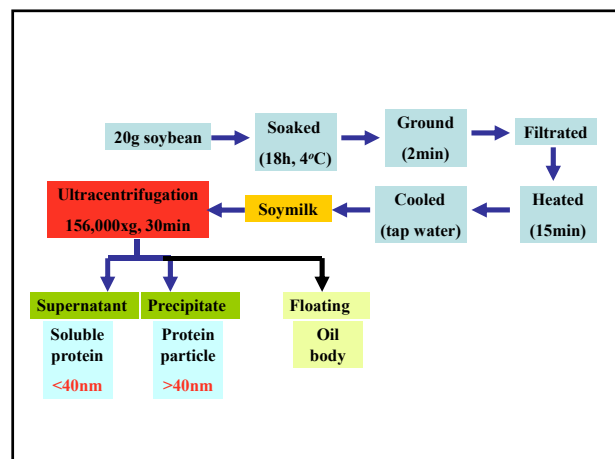
(2)Suzuyutaka, S;

(3)Fukuyutaka, F;

(4)Yumeminori, Y;

β -conglycinin

Glycine and whey



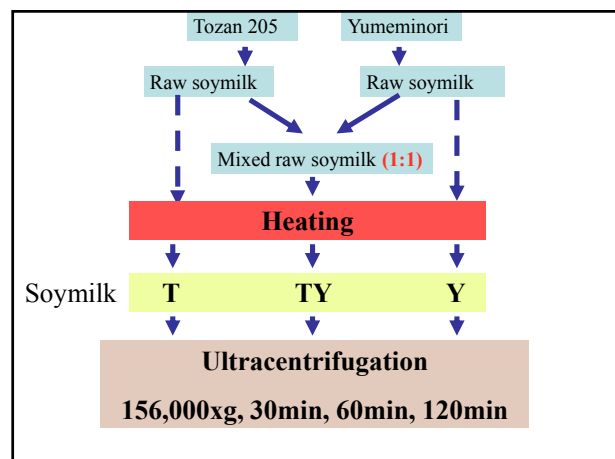
Tozan 205 (11S deficiency)
Yumeminori (α' , α deficiency)

Soluble protein: α' , α , Acidic peptide

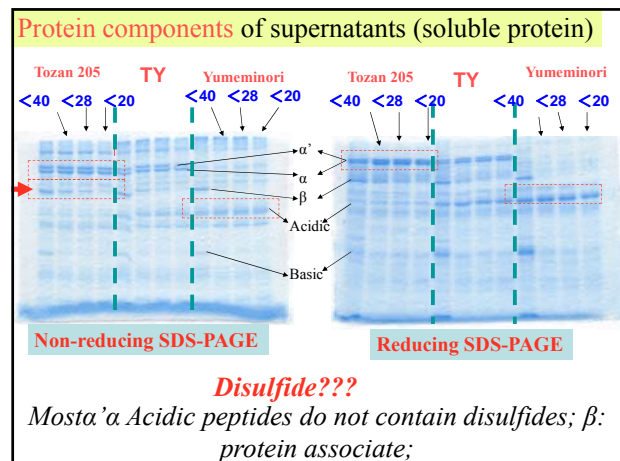
Their existing states ???

Monomer or Protein associate

Size Monomer < protein associate < protein particle
 <40nm >40nm

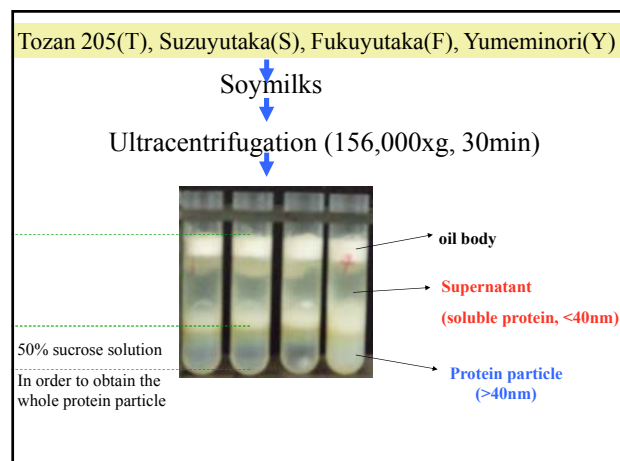
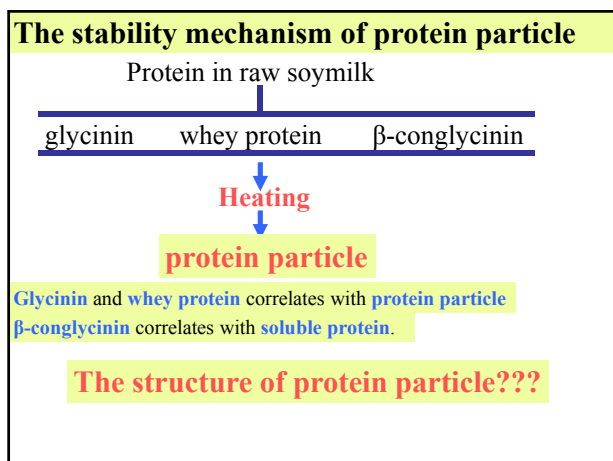
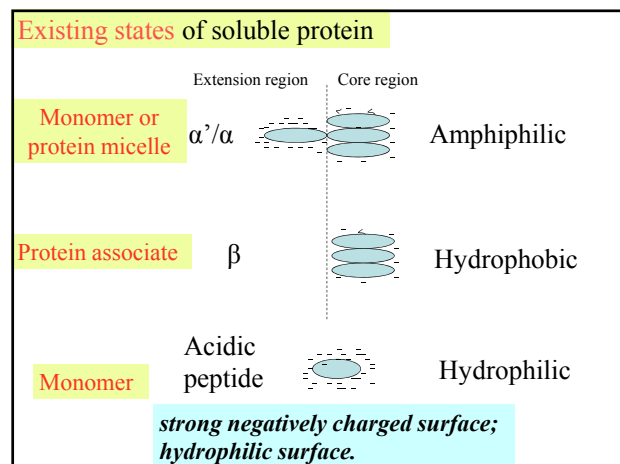


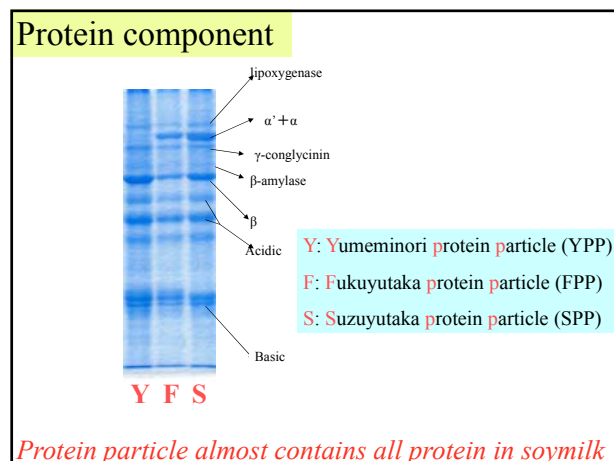
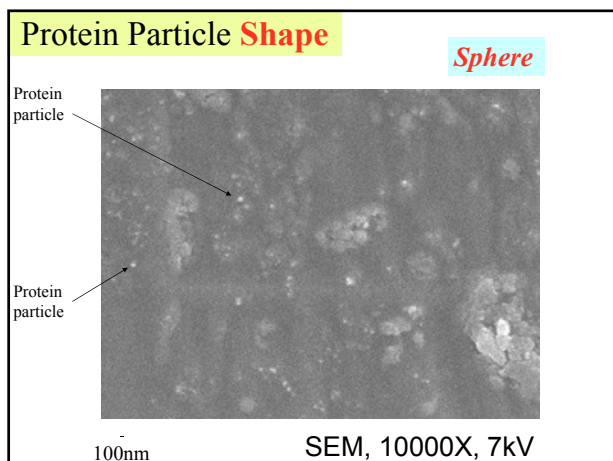
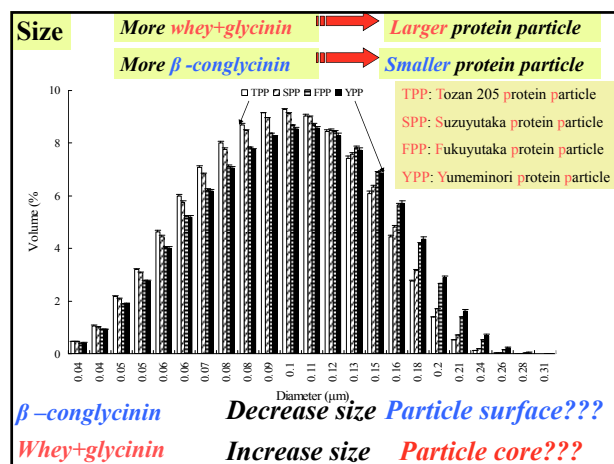
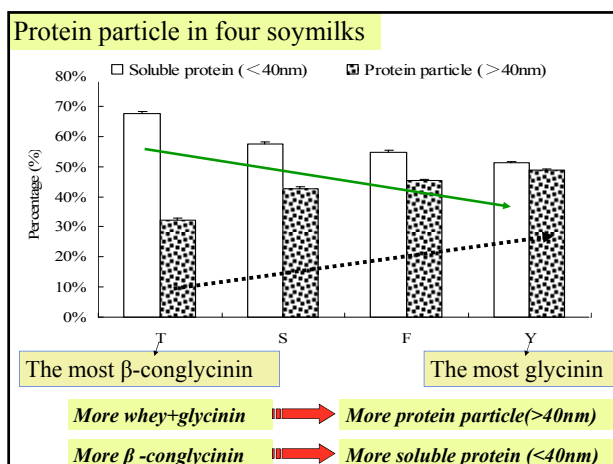
soymilk				
	T	TY	Y	
Ultracentrifugation(1) 156,000xg, 30min >40nm precipitate	65% <40nm	60% <40nm	50% <40nm	Soluble protein in whole soymilk protein (%) → Supernatant → Precipitate
Ultracentrifugation(2) 156,000xg, 60min >28nm precipitate	58% <28nm	57% <28nm	47% <28nm	Tozan 205: much protein associate (20-40nm) Yumeminori: a little protein associate (20-40nm)
Ultracentrifugation(3) 156,000xg, 120min >20nm precipitate	51% <20nm	51% <20nm	45% <20nm	About 50% whole protein has a small size (near the protein monomer , 10nm)



Isoelectric points		
α', α, Acidic: <i>Negative charged surface</i>	β-Conglycinin	4.73
	α-subunit	5.14
	α'-subunit	5.59
	β-subunit	5.59
	Glycinin	
	G1 A1a-B2-subunit	5.84
	G3 A2-B1a- "	5.24
	G2 A1b-B1b- "	5.02
	G5 A3-B4- "	5.46
	G4 A5A4-B3- "	5.18
	Ala-polypeptide	5.63
	A2- "	4.88
	Alb- "	4.88
	A3- "	4.83
	A5A4- "	4.55
	A4- "	4.45
	A5- "	5.43
	B2-polypeptide	8.22
	B1b- "	5.61
	B4- "	9.78
	B3- "	10.21

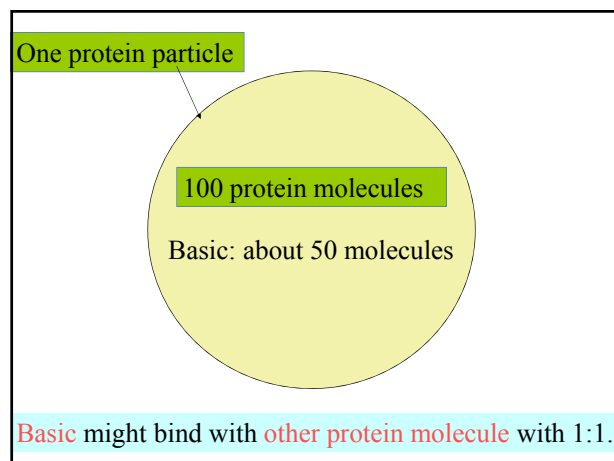
Strong acidic
Weak acidic
Strong acidic
Soymilk
About pH 6.5





Mol percentage of subunits in protein particle

	PPS	PPF	PPY
Lipoxygenase	2%	1%	2%
α' + α	7%	5%	0%
γ -conglycinin	3%	3%	3%
β -amylase	1%	2%	3%
β	9%	6%	10%
A3	5%	4%	6%
Acidic	14%	14%	13%
X	10%	9%	7%
→ Basic	48%	55%	57%

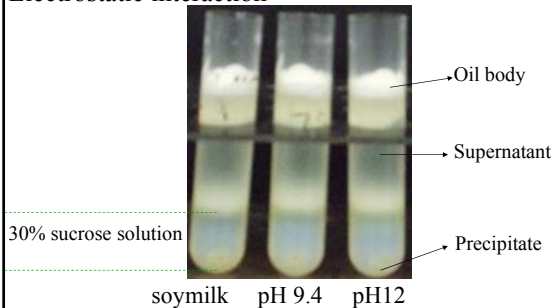


The molecular interactions in protein particle

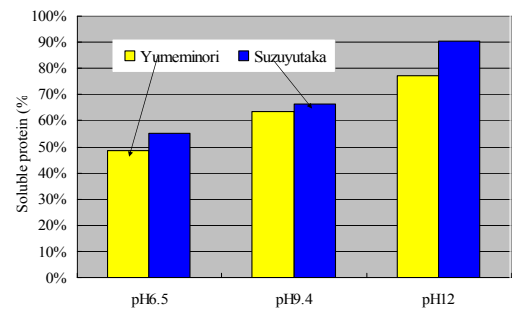
Yumeminori (Y) and Suzuyutaka (S)

Hydrophobic interaction is important for protein aggregation.

Electrostatic interaction? ? ?

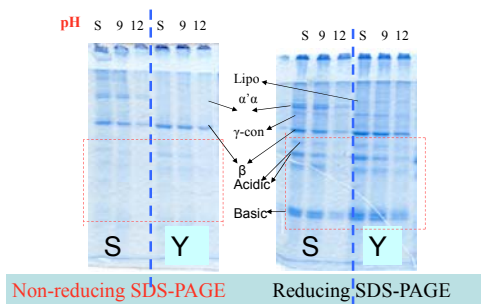


Percent of soluble protein in soymilk with different pH

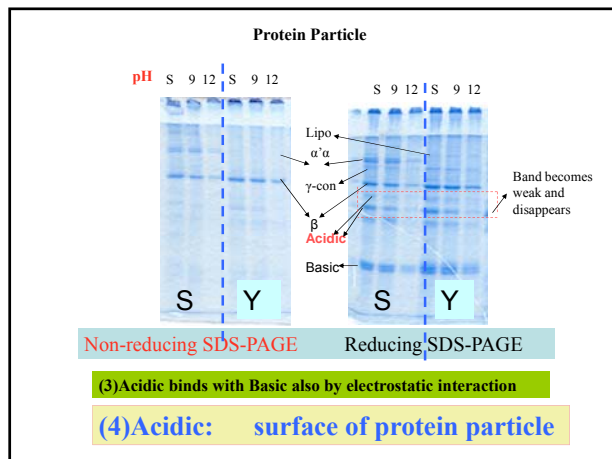


Electrostatic interaction should be also one important molecular interaction in protein particle.

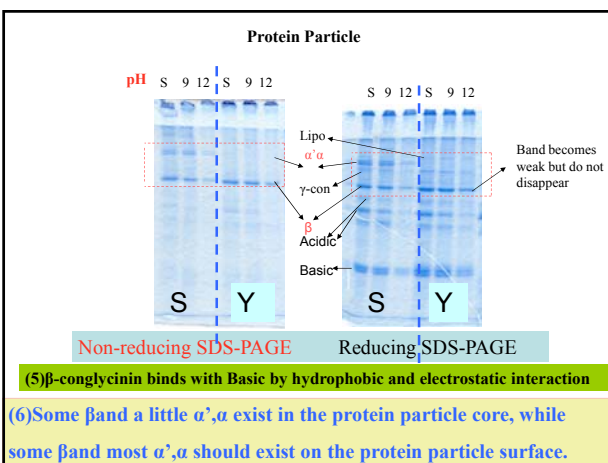
Protein components of Protein Particle from soymilk with different pH



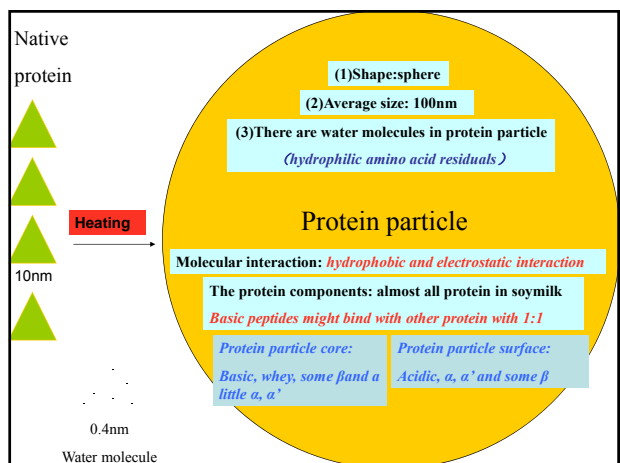
- (1) Basic peptides: disulfide and hydrophobic interaction
- (2) Basic and Acidic: disulfide



- (3) Acidic binds with Basic also by electrostatic interaction
- (4) Acidic: surface of protein particle

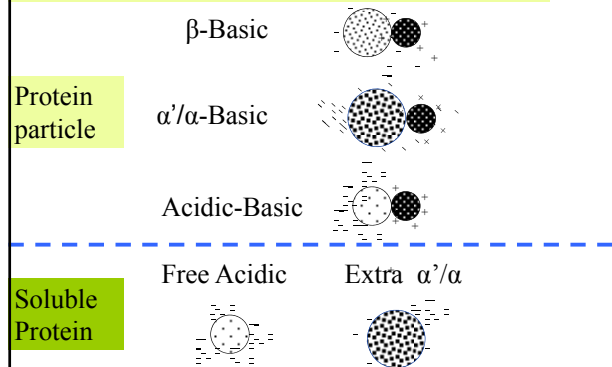


- (5) β -conglycinin binds with Basic by hydrophobic and electrostatic interaction
- (6) Some β and a little α' , α exist in the protein particle core, while some β and most α' , α should exist on the protein particle surface.

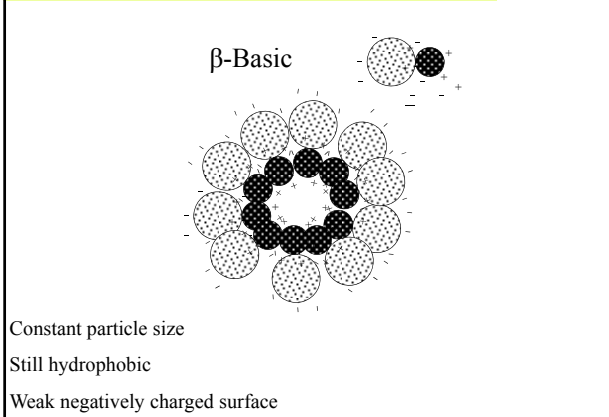


α'/α , 64kDa	Amphiphilic	
β , 48kDa	Hydrophobic	
Acidic, 32kDa	Hydrophilic	
Acidic-Basic	Amphiphilic	
Basic, 20kDa	Hydrophobic	

First: double interactions
(hydrophobic and electrostatic interactions)



Second: Strong hydrophobic interaction



Third: Weak hydrophobic and electrostatic interaction

