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Different factors affecting to mung bean (*Phaseolus aureus)* tofu production

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Abstract
Mung bean is a popular food among vegetarians since it contains a lot of protiens and fibre and the main advantage of mung beans is that it helps in digestion and also mung beans control the amount of cholesterol content in our body. Mung bean contains a lot of minerals like calcium and potassium which was essential for enhancing the strength of bones and teeth. Fat content in mung bean is very low so it is highly recommended for people who want to shed pounds from their body. We examine the possibility of making a new tofu from mung bean to diversify tofu products. Our results are as follows: ratio of mung bean/water 1:5, heating temperature 90 ^oC in 15 minutes, coagulant 3% (g/100 gram mung bean), tofu preservation time 4 days in 10 ^oC.

Keywords: Mung bean, coagulant, preservation, tofu.

1. Introduction
1.1 Tofu
Tofu, or doufu, also known as bean curd, is a food made by coagulating soy milk and then pressing the resulting curds into soft white blocks. It is a component in East Asian and Southeast Asian cuisines. There are many different varieties of tofu, including fresh tofu and tofu that has been processed in some way. Tofu has a subtle flavor and can be used in savory and sweet dishes. It is often seasoned or marinated to suit the dish. Tofu has a low calorie count and relatively large amounts of protein. It is high in iron and depending on the coagulants used in manufacturing (e.g. calcium chloride, calcium sulfate, magnesium sulfate), it is often high in calcium and/ormagnesium.

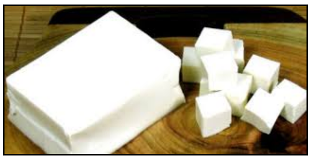

Fig 1: Tofu

The term *tofu* by extension can be used in similarly textured curdled dishes that do not use soy products at all, such as "almond tofu" (almond jelly), *tamago-dōfu* (ja) (curdled egg), *goma-dōfu* (ja) (sesame), or peanut tofu.

1.2 Mungbean

Fig 2. Mung bean

The mung bean was also known as green gram or golden gram and is mainly cultivated in the south of Vietnam. It is a store house of nutrients and it is a nutrition giving food and they are rich in vitamin B, vitamin C, protein, manganese and a lot of other essential nutrients required for effective functioning of the human health. Mungbean (*Phaseolus aureus*) contains about 20-27% protein and has an amino acid profile comparable to soybean. Mung beans when cooked and consumed in the right way provides the path for clearing toxins and unwanted

Chemicals from the body and modern sciences has vindicated this statement. Mung beans are low in calories and rich in protiens and fibre and so eating a small amount of mung beans gives you the feeling of fullness which reduces the carvings for unwanted foods and it is a high nutritious food which has low fat content so it is highly recommended to people who are planning to lose weight. Eating mung beans helps to reduce the cholesterol level in the body and helps in regulating the blood pressures in a healthy manner and in that process it maintains the arteries and veins in good condition. Mung beans are rich in protien inhibitors which was helpful in reducing the manipulation of tumour cells including those of breast cancer. So it is highly recommended for women to consume mung beans on a daily basis. Mung beans are a diabetic friendly food.Mung beans are low glycemic index foods which enhances healthy sugar levels and eating low glycemic index foods reduce the body fat percentage which reduces the blood glucose level and blood urea nitrogen levels. Mung beans are a member of a legume family of plants. The consumption of 5 or more servings of beans\ week decreases the heart disease y 22% according to a study reported by US. A cup of mung bean sprouts provides 14mg Vitamin c which acts as an anti-oxidant activity and they supports healthy vision. Each serving of mung bean contains 60g of carbohydrates which is 20% of the daily recommended value and they are rich in soluble fibre which improves digestion and prevents digestion and stroke.There are 30 g of protiens in each serving of mung beans which is 60% of the daily recommended value and they are used to replace damaged body parts. Due to their high content in fibre, mung bean sprouts can help improve intestinal motility and relieve the signs of motility. Phytoestrogens an enzyme present in mung beans helps in the secreation of collagen and elastin which helps in enhancing the skin tone.So, regular intake of mung beans enhances the anti-ageing properties of skin. Due to the lack of vitamins like protien and zinc the strength of nails and hairs gets fragile and for those people who are suffering from these deficiencies mung beans comes as a rescue as it contains a lot of these minerals which helps in preventing the loss of nails and hair. Mung beans are rich in lecithin which reduces the liver fat which in turn reduces liver fat and regulates the normal functioning of the liver.

A.E. Mubarak (2005) demonstrated nutritional composition and antinutritional factors of mung bean seeds (*Phaseolus aureus*) as affected by some home traditional processes. The effects of some domestic traditional processes, such as dehulling, soaking, germination, boiling, autoclaving and microwave cooking, on the nutritional composition and antinutritional factors of mung bean seeds were studied. Germination and cooking processes caused significant (p < 0:05) decreases in fat, carbohydrate fractions, antinutritional factors and total ash contents. All processes decreased the concentrations of lysine, tryptophan, threonine and sulfur-containing amino acids. However, all treatments were higher in total aromatic amino acids, leucine, isoleucine and valine contents than the FAO/WHO reference. Dehulling, soaking and germination processes were less effective than cooking processes in reducing trypsin inhibitor, tannins and hemagglutinin activity contents. Also, germination was more effective in reducing phytic acid, stachyose and raffinose. Germination resulted in a greater retention of all minerals compared to other processes. In vitro protein digestibility and protein efficiency ratio were improved by all processes. The chemical score and limiting amino acids of mung bean subjected to the various processes varied considerably, depending on the type of process.

1.3 Researches regarding to mungbean products

Rita Singh Raghuvanshi *et al.*, (2011) studied the processing of mungbean products and its nutritional and organoleptic evaluation. Four mungbean products namely, whole fried *namkeen*, dehusked fried *namkeen*, roasted *namkeen* and salad were formulated using three different cultivars of mungbean viz. UPM 98-1, Pant Mung-5 and Pant Mung-2 and the effect of different processing methods on texture and nutrient composition were studied. All the products were found to be acceptable by the panel. Salad was found to be the most acceptable product with overall acceptability of 8.31 out of 10 followed by dehusked fried *namkeen* (7.80), whole fried *namkeen* (7.61) and roasted *namkeen* (7.02). Moisture and protein content increased significantly after germination for 24 h. Fat content increased significantly for deep fried products. Total ash, crude fibre and mineral content decreased significantly after processing whereas *in-vitro* iron bioavailability and *in-vitro* protein digestibility increased significantly after processing. Texture analysis revealed that dehusked fried*namkeen* of Pant Mung-5 and roasted *namkeen* of Pant Mung-2 had maximum crispness and hardness, respectively, which are preferred attributes.

1.3.1 Mungbean starch

R. Hoover et al., (1997) verified physicochemical characterization of mung bean starch. Starch from mung bean (Vigna radiata) was isolated and some of the important characteristics determined. The yield of starch was 31.1% on a whole-seed basis. The shape of the starch granule was oval to round to bean shaped, with granules 7–26 μm in diameter. Scanning electron micrographs revealed the presence of smooth surfaces. The gelatinization temperature range was 58–67–82 °C and the enthalpy of gelatinization was 18.5 J/g. The total amylose content was 45.3%, of which 12.1% was complexed by native lipids. The X-ray diffraction pattern was of the ‘C’ type and the X-ray intensities were much stronger than in other legume starches. The starch exhibited a high swelling factor (43.6 at 95 °C) in water. The viscoamylographic examination of the starch paste (6% w/v) showed the absence of a peak viscosity, a low 95 °C viscosity [200 Brabender units (BU)], an increase in consistency (140 BU) during the holding cycle at 95 °C and a set-back of 220 BU. Native granules were readily hydrolyzed by porcine pancreatic α-amylase (76.4% in 72 h). Retrogradation of mung bean starch (as measured by changes in syneresis, gel strength, enthalpy and X-ray diffraction intensities) appeared to be more severe than in other legume starches.

Jasim Ahmed (2012) studied rheometric non-isothermal gelatinization kinetics of mung bean starch slurry. Gelatinization of mung bean starch (MBS) was studied by oscillatory rheological measurement. The effect of sodium chloride (5% and 10% w/w), sucrose (5% and 10% w/w) and sodium chloride–sucrose blend (5% + 5%) was also studied and compared during non-isothermal heating from 40 to 95 °C. The addition of sodium chloride and sucrose shifted the peak gelatinization temperature ($T_{G'_{max}}$) to higher value. The starch gelatinization kinetics was evaluated by a non-isothermal technique as function of elastic modulus (G') and G' vs. time (t) data up to the gelatinization peak G'_{max} value were considered for rate estimation. A 1st-order reaction kinetics described well the gelatinization process of MBS individually and sample incorporated with 10% sodium chloride and 10% sucrose. Interestingly, addition of 5% sodium chloride, 5% sucrose and a blend of sodium chloride and sucrose (5% + 5%) followed 2nd-order gelatinization kinetics. The process activation energy ranged from 19.7 to 84.9 kJ/mol. The work demonstrated that non-isothermal rheological measurement could be applied adequately to characterize the gelatinization process and to evaluate reaction kinetics pertaining to gelatinization. Sun-Jin Park *et al.*, (2012) investigated physicochemical properties of mung bean starches in different Korean varieties and their gel textures. To compare the mung bean starches (MBS) and starch gel properties, Korean varieties, 'Geumsung', 'Dahyeon', 'Sohyeon' and 'Eohul', were purified using water and alkaline steeping methods. The physicochemical properties of starches, the texture and structure of starch gels were investigated. The apparent amylose and protein contents were significantly different depending on varieties and steeping mediums. Water binding capacities were higher in 'Geunsung' and 'Eohul'. The granule sizes were ranged 7.8–23.3 μm and the shapes were oval and jelly bean, and 'Dahyeon' granule had a distinct hilum. The trough, final, and setback viscosities were significantly different and the viscosities of 'Sohyeon' showed lowest values. MBS gels formed a regular shaped 3-dimensional network. The gel structure of 'Sohyeon' changed irregularly during storage, but the structures of 'Geumsung', 'Dahyeon', and 'Eohul' retained regular shaped networks with decreasing inner cells. Resilience of MBS gels was higher in 'Dahyeon' and 'Eohul' than in 'Geumsung' and 'Sohyeon'.

1.3.2 Mungbean noodle
Ho Minh Thao and Athapol Noomhorm (2011) indicated physiochemical properties of sweet potato and mung bean starch and their blends for noodle production. Physiochemical properties of four types of sweet potato starch (SPS) and mung bean starch (MBS), and their blends for noodle production were accessed. The results indicated that MBS was significantly higher in amylose content (40.69%), gel hardness, hot paste stability and cold paste viscosity; but substantially lower in protein, lipid, ash content, and gel stickiness than those of all sweet potato starches. Among all sweet potato varieties, the white skin and yellow-red flesh color sweet potato variety (SP1_W_YR) was the most suitable for noodle production due to its the highest starch yield (17%) and starch purity as well as the best starch color. The MBS noodle quality was superior to SPS noodle quality, and blending SPS with MBS for noodle production resulted in markedly reducing quality. However, the quality of noodles made from mixture of 20% SPS and 80% MBS was not significant difference to that of MBS noodles. The increase of solid content of starch slurry resulted in considerable increasing in cooking time, cooking loss, rehydration and tensile of noodles while aging time only markedly affected cooking loss and tensile. For noodles prepared from mixture of 20% SPS and 80% MBS, the most suitable initial solid content of starch slurry and aging time at 4oC were 35% and 10-20 hrs respectively.

1.3.3 Mungbean protein hydrolysate
Chanikan Sonklin *et al.*, (2011) performed physicochemical and flavor characteristics of flavoring agent from mungbean protein hydrolyzed by bromelain. Enzymatic bromelain mungbean meal protein hydrolysate (eb-MPH) was produced from mungbean meal protein isolate (MPI). Enzymatic bromelain, with a known protease activity of 98,652 (unit/g), was used at concentrations of 0, 2, 6, 10, 14 and 18% (w/w) and with hydrolysis times of 0.5, 3, 6, 12, and 24 h. The pH and temperature were controlled at 6.0 and 50 °C, respectively. It was found that the best treatment combination for eb-MPH production by response surface methodology (RSM) was 18% bromelain and a hydrolysis time of 3 h, resulting in the greatest degree of hydrolysis (% DH) and percent yield, with values of 61.04 and 45.63%, respectively. Results also showed that the phenylalanine, tyrosine and leucine contents of the optimally produced eb-MPH were 20.88, 14.50 and 10.93%, respectively. Twelve volatile compounds were identified using gas chromatography mass spectrometry in eb-MPH; benzaldehyde, 2-pentylfuran and furfural were the predominant odorants Nawaporn Lapsongphon, Jirawat Yongsawatdigul (2013) conducted production and purification of antioxidant peptides from a mungbean meal hydrolysate by *Virgibacillus* sp. SK37 proteinase. Antioxidant peptides of mungbean meal hydrolysed by *Virgibacillus* sp. SK37 proteinases (VH), Alcalase (AH) and Neutrase (NH) were investigated. The antioxidant activities based on 2,2′-azinobis (3-ethyl-benzothiazoline-6-sulphonate) (ABTS) radical-scavenging, ferric-reducing antioxidant power (FRAP) and metal chelation of VH were comparable to those of NH. VH was purified using ultrafiltration, ion exchange and gel filtration chromatography. The purified peptides (F37) from VH, which had the highest specific antioxidant activity, consisted of four peptides containing an arginine residue at their C-termini. In addition, the ABTS radical-scavenging activity of the purified peptides (F42) at 0.148 mg/ml was comparable to that of 1 mM of butylated hydroxytoluene (BHT). These two fractions were stable over a wide pH (4-10) and temperature (25-121 °C) range. *Virgibacillus* sp. SK37 proteinase is a potential processing-aid for the production of a mungbean meal hydrolyzate with antioxidant properties.

1.3.4. Mung bean protein concentrate
Suhaila Mohamed *et al.*, (1996) demonstrated differences in functional properties of mungbean protein concentrate and the effect of incorporation into fish sausages. The physico-chemical and functional properties of mungbean protein concentrate prepared by (i) calcium sulphate precipitation (MBC-Ca) and (ii) isoelectric point precipitation (MBG-pI) containing 21.6 and 67.3% protein respectively, were compared. The solubility ofthe concentrates was positively correlated with pH within the range of 4-7. Thefoaming ability was closely correlated with percentage ofsoluble N (r2 = 0.98) and pH (r2 = 0.88) while the foam stability was correlated with the hydrophilicity (l = 0.98) of the concentrates. All concentrates were able to reduce the weight loss, shrinkage and increase the firmness of cookedfish sausages. The weight loss and shrinkage were negatively correlated with the soluble protein, pH and foaming ability of the concentrates. The functional properties of the conc~ntrates, when added at a level of 1-2%, influenced the texture of the fish sausages. In organoleptic evaluations, fish sausages incorporating the plant proteins scored higher for overall acceptability, even though there was no significant difference in flavour or texture and a decrease in juiciness ofthe product compared to the control.

1.3.5 Mung bean protein isolate
E Helmy Rahma *et al.*, (2000) examined the physicochemical characterisation of mung bean (*Phaseolus aureus*) protein isolates. Protein isolates were prepared from mung bean (*Phaseolus aureus*) our by two different methods, ie by traditional alkaline water extraction/isoelectric precipation and by micellisation, and studied with regard to chemical composition and protein fractional distribution. Micellisation decreased the phytic acid content, whereas the `isoelectrical' isolate preparation resulted in an increase in phytic acid. Using size exclusion liquid chromatography (SE-HPLC) and analytical ultracentrifugation, it has been shown that the major

protein component in both isolates is a 7S globulin, which was most enriched in the micelle isolate. The results of one- and two-dimensional SDS gel electrophoresis give evidence for the absence of interchain disulphide bonds in the polypeptide chains, which are typical for the 7S globulin class. The presence of minor protein zones corresponding to disulphide-linked a and b chains of 11S globulin-like storage proteins in the protein isolates has also been shown.

Hong C. Lee and Koo B. Chin (2013) evaluated mungbean protein isolates at various levels as a substrate for microbial transglutaminase and water binding agent in pork myofibrillar protein gels. The objective of this study was to investigate the effect of mungbean protein isolate (MPI) on the potential possibility of water binding agent and as a substrate for the microbial transglutaminase (MTGase) in myofibrillar protein. Cooking loss (CL,%), gel strength (GS, gf), sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE), differential scanning calorimetry (DSC) and scanning electron microscopy (SEM) were measured. The addition of MPI reduced CL, indicating that it has a water binding capacity during cooking. The major protein band (53 kDa) of MPI appeared when MPI was mixed with MP, but it disappeared when MTGase was incorporated. MPI treatment changed the endothermic peaks as compared with those of CTL. MTGase (1%) mediated pork MP increased CL and GS ($P < 0.05$), and reduced peak temperatures with vanishing of endothermic intensity at 1st and 3rd peaks, suggesting the structural changes of protein gelation. In microstructures, MTGase treatment showed a finely stranded structure in MP gels, while MPI showed a conglomerated surface in MTGase-mediated MP gels. These results indicated that MPI appears to be a water binding agent during cooking and function as a substrate for MTGase in MP gelation.

Tanaji Kudre *et al.*, (2013) showed the effects of protein isolates from black bean and mungbean on proteolysis and gel properties of surimi from sardine (*Sardinella albella*). Effects of protein isolates from black bean (BBPI) and mungbean (MBPI) on proteolysis and gelling properties of surimi from sardine (*Sardinella albella*) were investigated. Both BBPI and MBPI showed inhibitory activity against proteolysis in kamaboko (40/90 °C) and modori (65/90 °C) gels in a concentration-dependent manner. Myosin heavy chain (MHC) was more retained in both gels when the concentration of both protein isolates increased up to $1\ g\ 100\ g^{-1}$. This was associated with the increased breaking force and deformation as well as lowered degradation as evidenced by the decrease in trichloroacetic acid-soluble peptide content ($p < 0.05$).

Whiteness of kamaboko and modori gels slightly decreased with increasing BBPI or MBPI levels ($p < 0.05$). However, water-holding capacity of both gels increased with increasing levels of both protein isolates. Microstructure of kamaboko and modori gels added with $1\ g\ 100\ g^{-1}$ BBPI or MBPI was finer and denser with more ordered structure than that of the control. Generally, BBPI showed slightly higher gel strengthening effects and inhibition against proteolysis of surimi gels than MBPI. Therefore, proteolysis of sardine surimi, associated with endogenous proteases, could be retarded by the addition of BBPI or MBPI, leading to the increased gel strength.

Purpose of our research is to examine different factors influencing to mung bean tofu production such as ratio of mung bean/water, heating time, heating temperature, coagulant concentration, preservation time.

2. Material & Method

2.1 Material

Mung bean is purchased in Tra Vinh local market. Chemical CaSO4.2H_2O is supplied from Dong Nam Co. Ltd in HCM City, Vietnam.

2.2 Research method

2.2.1 Experiment #1: Effect of milk protein concentration by different mung bean/water ratios to tofu quality (gel formation)

Soaked mung bean is grinded with different water ratio such as: 1: 3, 1: 4, 1: 5, 1: 6. Tofu is then checked firmness, color and sensory characteristics.

2.2.2 Experiment #2: Effect of heating time to tofu quality (gel formation)

Samples are heated in different times: 5, 10, 15, 20 minutes. Tofu is then checked firmness, color and sensory characteristics.

2.2.3 Experiment #3: Effect of heating temperature to tofu quality (gel formation)

Samples are heated in different temperatures: 70 °C, 80 °C, 90 °C, 100 °C. Tofu is then checked firmness, color and sensory characteristics.

2.2.4 Experiment #4: Effect of coagulant concentration to tofu quality (gel formation)

Samples are coagulated by different coagulant concentration ($CaSO_4.2H_2O$): 1%, 2%, 3%, 4%. Tofu is then checked firmness, color and sensory characteristics.

2.2.5 Experiment #5: Shelf-life of mung bean tofu

Tofu samples are kept in cool store at 10oC in 4 days. Tofu is then checked firmness, color and sensory characteristics.

2.3 Statistical analysis

All data are processed by Excell 2003

3. Result & Discussion

3.1 Experiment #1: Effect of milk protein concentration by different mung bean/water ratios to tofu quality (gel formation)

Table 1: Effect of mung bean/water ratio to tofu quality (gel formation)

Mung bean:water	pH	Stress (g)	Strain (g)	Lightness (L)
A1 (1 : 3)	6.35	46.67^a	142.00^a	90.24^b
A2 (1 : 4)	6.44	56.89^b	120.67^a	91.08^b
A3 (1 : 5)	6.34	95.00^d	385.67^c	90.49^b
A4 (1 : 6)	6.37	72.33^c	201.33^b	90.27^a

We can see the significant difference in structure but there is not difference in color. At ratio mung bean: water 1:5, we get the best tofu quality.

Table 2: Sensory score by different mung bean: water ratios

Mung bean:water	Color	Aroma	Structure	Average score
1:3	3.26^{b}	3.73^{b}	3.80^{ab}	3.60
1:4	3.80^{bc}	3.26^{ab}	3.26^{a}	3.44
1:5	4.33^{c}	4.00^{b}	4.13^{b}	4.15
1:6	2.40^{a}	2.80^{a}	3.20^{a}	2.80

We can see the significant difference in color but there is not difference in structure and aroma. At ratio mung bean: water 1:5, we get the best tofu quality (sensory characteristics).

3.2 Experiment #2: Effect of heating time to tofu quality (gel formation)

Table 3: Effect of heating time to tofu quality (gel formation)

Heating time (minutes)	Stress (g)	Strain (g)	Lightness (L)
5	50^{b}	157^{c}	91.37^{c}
10	38^{a}	128^{b}	89.93^{a}
15	54^{c}	172^{c}	90.09^{ab}
20	38^{a}	98^{a}	91.28^{bc}

We can see the significant difference in color and structure. Heating time at 15 minutes has the best tofu quality (gel formation).

Table 4: Sensory score by heating time

Heating time (minutes)	Color	Aroma	Structure	Average score
5	3.8^{bc}	3.86^{b}	3.46^{bc}	3.71
10	3.73^{ab}	3.20^{a}	3.33^{a}	3.42
15	4.26^{c}	4.20^{b}	4.20^{c}	4.22
20	2.20^{a}	2.73^{a}	3.00^{ab}	2.64

We can see the significant difference in the heating time. Heating time at 15 minutes has the best tofu quality (sensory characterisitics)

3.3 Effect of heating temperature to tofu quality (gelformation)

Table 5: Effect of heating temperature to tofu quality (gel formation)

Heating temperature (°C)	Stress (g)	Strain (g)	Lightness (L)
70	33.56^{ab}	126.00^{b}	90.81^{b}
80	29.67^{a}	73.00^{a}	88.97^{a}
90	37.56^{b}	127.33^{b}	90.95^{b}
100	55.44^{c}	143.67^{c}	89.10^{a}

At temperature 70, 80, 90 °C, there is not significant difference in structure but there is significant difference at 100 °C. There is not significant difference in color. Sample heated at 90 °C has the best quality (gel formation).

Table 6: Effect of heating temperature to tofu quality (sensory characteristics)

Heating temperature (°C)	Color	Aroma	Structure	Average score
70	3.93^{bc}	3.86^{bc}	3.67^{bc}	3.82
80	3.13^{ab}	3.20^{ab}	2.60^{a}	2.98
90	4.20^{c}	4.20^{c}	4.30^{c}	4.23
100	2.73^{a}	2.73^{a}	3.00^{ab}	2.82

There is significant difference in sample treated at 90 ^{0}C. This temperature is optimal and selected for further experiments.

3.4 Effect of coagulant concentration to tofu quality (gel formation)

Table 7: Effect of coagulant ($CaSO4.2H_2O$) concentration to tofu quality (gel formation)

Coagulant concentration (%)	Stress (g)	Strain (g)	Lightness (L)
1	31.00^{a}	77.67^{a}	89.88^{b}
2	41.67^{b}	81.00^{a}	90.11^{b}
3	84.87^{d}	276.00^{c}	89.85^{b}
4	51.33^{c}	119.00^{b}	88.68^{a}

There is significant difference in samples regarding to structure, but not color. Coagulant ($CaSO4.2H_2O$) at 3% shows the best tofu quality (gel formation).

Table 8: Effect of coagulant (CaSO4.2H_2O) concentration to tofu quality (sensory characteristics)

Coagulant concentration (%)	Color	Aroma	Structure	Average score
1	3.27^a	3.26^a	2.47^a	3.00
2	4.00^b	4.01^b	4.10^c	4.04
3	4.20^b	4.20^b	3.90^{bc}	4.10
4	2.60^a	2.70^a	3.33^b	3.41

There is significant difference in samples regarding to structure at 2% and 3% coagulant, but not in 1% and 4%. At 3% coagulant, we get the best tofu quality (sensory characteristics) so we choose this concentration for further experiments.

3.5 Shelf-life of mung bean tofu in preservation

Pack mung bean tofu PE bad and preserve it in cool store at 10 ^{O}C, we monitor changes in color, aroma and structure of tofu in 4 days.

Day 1st: Color, aroma, structure is still good.

Day 2nd: Color, aroma, structure is still normal

Day 3rd: Color, aroma, structure is still normal but there is a mucos layer on surface

Day 4th: There is blue-yellow color, sour taste, and damaged appearance

4. Conclusion

Mung beans are commonly used in the preparation of Chinese dishes, where they are called lǜ dòu. They are also used extensively in Thailand, Taiwan, Japan, Korea, Pakistan, India, and Southeast Asia. In Vietnam, mung beans are called đậu xanh. Generally, these beans are eaten either whole or as bean sprouts. They are also used to make soups and desserts. The starch extracted from them is used to make jellies and noodles. Mung beans are known to be very healthy and packed with a variety of nutrients. We have successfully defined some major factors affecting to the mung bean tofu production with the purpose of diversification of tofu products.

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