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Technical Factors Affecting To Production of Pickled Baby Corn Canning

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Abstract.

Baby corn is a popular vegetable in Vietnam. The demand for baby corn is rapidly increasing day by day. There is a great demand of baby corn in international market mainly because of its freshness, taste, nutrition, free from pesticides and its multiuse. It is also considered as a green food. Baby corns are fresh during the harvesting season but perishable under the prevailing conditions of temperature and humidity as well as lack of adequate storage facilities. Processing of baby corn into more usable and shelf stable products is important. The lack of knowledge about the use and economic importance of baby corn and non-availability of appropriate production technology are the major constraints for its popularization. An alternative way of preserving surplus baby corn could be fermented to pickle products. Lactic acid fermentation as a means of food preservation is probably one of the oldest biotechnological processes. Preservation of the baby corn by fermentation can eliminate the undesired taste and improve flavor of the vegetable. Therefore we explored a lactic fermentation from baby corn by focusing on the effect of different parameters such as blanching time and temperature as pre-treatment, salt concentration, fermentation time to physicochemical, microbial and sensory characteristics of pickled baby corn. Experimental results revealed that blanching raw baby corn in water heated at 95^{o}C in 10 seconds with 0.25% $CaCl_2$, 6% salt, 3% sugar in 9 days of fermentation was appropriated to get a pleasant pickled baby corn quality. It is necessary to develop preservation method to increase the shelf life of pickled baby corn; canning is a case in point.

Keywords: *Baby corn, lactic fermentation, salt, blanching, physicochemical, microbial, sensory, canning*

1. Introduction

Baby corn (*Zea mays* L.) is a monoic annual plant which belongs to maideas tribe and the grass family of gramineae. It is very adaptable to different weathers. The maize has a very wide range of uses than any other cereal. It can be used as staple food for human consumption, animal feed and for many industrial uses. Maize is one of the oldest and most productive popular grains and can be consumed as food at various developmental stages from baby corn to mature grain (Akram Ahmadi and Parisa Ziarati, 2015). Presently baby corn is gaining popularity due to its short duration, high market rate, nutritive value and also its multiuse. Baby corn is dehusked immature maize ear, harvested within 2-3 days of silking but prior to fertilization (Pandey *et al.*, 1998). The desirable size of baby corn is 6-11 cm length and 1-1.5 cm diameter with regular row/ovule arrangement. The most preferred colour by the consumer is generally creamish to very light yellow (Pal, 2011). Baby corn is highly nutritive as 100 g of baby corn contains 89.1% moisture, 0.2 g fat, 1.9 g protein, 8.2 mg carbohydrate, 0.06 g ash, 28.0 mg calcium, 86.0 mg phosphorus, 11.0 mg ascorbic acid (Das *et al.*, 2009). Baby corn is a richer source of phosphorus (86 mg/100 g edible portion) than other vegetables (21 to 57 mg; Carol et al 1999). It is low in calories, high in fiber, and low in cholesterol. It is also free from residual effects of pesticides because it is harvested within a week of silk emergence and pesticides need not be applied during this time frame. Baby corn has a great potential to fetch foreign currency through international trade. There is a great demand of baby corn in international market mainly because of its freshness, taste, nutrition, free from pesticides and its multiuse. Therefore it is also considered as a green food. The net income from baby corn is four to five times higher from a single crop than grain maize crop. In addition, the net income from baby corn can be multiplied by growing of 3-4 crops of baby corn in a year (Garima Joshi and Aaradhana Chilwal, 2018).

Pickling is one of the ancient ways of food preservation, and it was a possible way of preserving the foods, especially seasonal foods, before the invention of modern preservative machines like the refrigerator. The pickling by fermentation is basically, conversion of sugar to acid by microorganisms that are lactic acid bacteria. Also, pickling is one of the oldest preservation methods of food by fermentation (Nurul and Asmah 2012). Pickle is the good source of antioxidants, probiotics, vitamins (vitamin C, A, K, and folate), and minerals (iron, calcium, and potassium). The fermented vegetables or pickle products made with characterized probiotic strain confirms the supplementation of probiotics to the consumers (Chaiyavat Chaiyasut et al., 2018). Some of the fermented fruits and vegetables contain coloured pigments such as flavonoids, lycopene, anthocyanin, β- carotene, and glucosinolates, which act as antioxidants in the body by scavenging harmful free radicals implicated in degenerative diseases like cancer, arthritis, and ageing (Kaur and Kapoor 2001). The salt also plays an important role in fermentation by draining out water and nutrients from vegetable and become substrates for lactic acid bacteria to grow. As sugar convert to the lactic acid the condition become acidic and inhibits the growth of pathogens and other non acidic tolerant microorganisms especially aerobic spoilage microorganisms. As a result from pickling, the vegetable will have a longer shelf life, translucent appearance, firm texture and pickle flavor. Fermentation of vegetables can occur spontaneously by the natural lactic acid bacteria that are present on the surface of vegetable, such as *Lactobacillus* spp., *Leuconostoc* spp., and *Pediococcus* spp (Karovicova et al., 1999). Salt suppresses the growth of microorganisms producing enzymes which act on the pectin substances and soften the pickles. To ensure desirable level of acid production, the salt strength at the early part of the fermentation should be controlled. Once fermentation is completed, salt concentration may be increased to 10-12% after equilibration for higher osmotic pressure to ensure product stability by preventing the growth of yeast and *Enterobacter*. Lactic acid bacteria have complex nutritional requirements, including sugars, amino acids, peptides, fatty acids, salts, nucleic acid derivatives and vitamins (Hebert et al 2004).

Several researches mentioned to baby corn processing. Sinha and Sharma (2013) studied the use of baby corn in diversified culinary preparation and evaluated them organoleptically and nutritionally. Six types of products namely preserve, candy, pickle, ladoo, halwa and kheer in major two categories i.e. preserved and sweet products were formulated using partial/full substitution of baby corn. All the organoleptic characteristics of baby corn preserved products excepting taste and texture of candy were found as good as control. Mehan et al (2014) evaluated the effect of storage on quality of minimally processed baby corn. They determined respiration parameters using closed system technique at the temperature viz 5°C, 12.5°C, 20°C and 75% relative humidity. They observed the most suitable packaging and storage conditions for extending the shelf life of baby corn were found to be packaging in 25 micron LDPE packages with 2 perforations followed by storage at 12.5°C.

Baby corn is an underutilized vegetable crop and still now there is very limited research available regarding to processing of this vegetable into value added product. The baby corn vegetable, which typically has high fermentable sugar composition, could be exploited as a substrate for lactic fermentation. Therefore, we utilized this vegetable as subtrate for lactic fermentation. We focused on the effect of different parameters such as blanching time and temperature, $CaCl_2$ concentration as pre-treatment; salt concentration, sugar concentration and fermentation time to physicochemical, microbial and sensory characteristics of pickled baby corn canning.

2. MATERIAL & METHOD

2.1 Material

Baby corn were cultivated and collected from My Xuyen district, Soc Trang province, Vietnam. They must be cultivated following VietGAP without pesticide and fertilizer residue to ensure food safety. After harvesting, they must be conveyed to laboratory within 8 hours for experiments. Apart from collecting baby corn, we also used other materials such as sugar, NaCl, $CaCl_2$, NaOH, phenolphthalein, phosphate buffer, onto MRS (de Man, Rogosa, and Sharpe)-agar. Lab utensils and equipments included knife, weight balance, thermometer, cooker, fermentation vessel, pH meter, buret, stomacher, colony counter, micropippetor.

Figure 1. Baby corn *(Zea mays)*

2.2 Research method

2.2.1 Effect of blanching temperature and time to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Baby corns were pre-treated by blanching in water containing 0.25% $CaCl_2$ with different time and temperature (100°C in 5 seconds, 95°C in 10 seconds, 90°C in 15 seconds and 85°C in 20 seconds). Effectiveness of blanching time and temperature in baby corn fermentation was evaluated on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score.

2.2.2 Effect of $CaCl_2$ concentration in blanching to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Baby corns were pre-treated by blanching in water at 95°C in 10 seconds containing different $CaCl_2$ concentration (0.15%, 0.20%, 0.25%, 0.30%). Effectiveness of $CaCl_2$ concentration in blanching to baby corn fermentation was evaluated on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score.

2.2.3 Effect of salt concentration in fermentation to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Baby corns were fermented with different salt concentration (2%, 4%, 6%, 8%). Effectiveness of salt concentration in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score.

2.2.4 Effect of sugar concentration in fermentation to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Baby corns were fermented with different sugar concentration (2.0%, 2.5%, 3.0%, 3.5%). Effectiveness of sugar concentration in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score.

2.2.5 Effect of fermentation time to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Baby corns were fermented with different fermentation time (3, 6, 9, 12 days). Effectiveness of fermentation time in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score.

2.3 Physicochemical, microbial, sensory evaluation

pH values were measured by using pH meter. The total acidity was determined by titrating 10 ml of pickle extract in 50 ml Erlenmeyer flask using 0.1N NaOH and 1% phenolphthalein as the indicator. The total acidity was expressed as lactic acid (AOAC, 2000). Plate count of lactic acid bacteria were conducted by diluting of 10 ml of fermented fluid in 90 ml phosphate buffer and then 1 ml pipetted onto MRS (de Man, Rogosa, and Sharpe)-agar, incubated at 37^{o}C for 2 days before counting the colony formed. Sensory score was based on 9-point hedonic scale.

2.4 Statistical analysis

Data were statistically summarized by Statgraphics Centurion XVI.

3. RESULT & DISCUSSION

3.1 Effect of blanching temperature and time to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Blanching is a short time heat treatment widely applied before processing (freezing, frying, drying, and canning) to inactivate deleterious enzymes and to destroy various microorganism present in fresh green vegetables. Commonly hot water blanching technique is applied in the food industries and particularly in the processing of green leafy vegetables (Prakash Kumar Nayaka et al., 2018).

Baby corn were pre-treated by blanching in water containing 0.25% $CaCl_2$ with different time and temperature (100^{o}C in 5 seconds, 95^{o}C in 10 seconds, 90^{o}C in 15 seconds and 85^{o}C in 20 seconds). Effectiveness of blanching time and temperature in baby corn fermentation was evaluated on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score. Results were depicted in table 1. It's clearly noticed that blanching at 95^{o}C in 10 seconds was optimal for baby corn fermentation. So we selected this value for next experiments.

Castro et al (1998) performed the controlled fermentation of peeled, blanched garlic, using a starter culture of *Lactobacillus plantarum* and compared it with that of unblanched garlic. Blanching was carried out in hot water (90°C) for 15 min. The starter grew abundantly in the case of blanched garlic, producing mainly lactic acid and reaching pH 3.8 after 7 days. The fermented blanched garlic was microbiologically stable during storage at 30°C in acidified brine. Aggarwal and Kaur (2010) studied the preservation of baby corn by steeping, which was followed by blanching. Blanched baby corn sample were prepared with steeping solution containing different levels of sodium chloride and acetic acid. The combination of 6% salt and 0.75% was found best for steeping preservation of baby corn.

3.2 Effect of $CaCl_2$ concentration in blanching to physicochemical, microbial and sensory characteristics of pickled baby corn

Baby corns were pre-treated by blanching in water at 95^{o}C in 10 seconds containing different $CaCl_2$ concentration (0.15%, 0.20%, 0.25%, 0.30%). Effectiveness of $CaCl_2$ concentration in blanching to baby corn fermentation was evaluated on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score. Results were depicted in table 2. It's clearly noticed that 0.25 $CaCl_2$ was adequate for baby corn fermentation. So we selected this value for next experiments.

Guillou et al (1992) evaluated cucumber fermentation characteristics and pickle quality in brines containing equilibrium concentrations of 0-0.4% CaCl2, 0-0.4% potassium sorbate and 0-105 NaCl. Obtained results indicated that cucumber spoilage would eventually take place if NaCl or potassium sorbate were not present in the brine. A synergistic action between NaCl, CaCl2 and potassium sorbate was seen, which allowed good quality pickles to be produced when moderate amounts of all three components were present in the brine. A study evaluated the quality of fermented corns produced commercially using an alternative calcium chloride ($CaCl_2$) brining process. $CaCl_2$ brined, fermented corns were 1.8 N less firm, which remained signifcant in the finished product. Color differences evidenced by higher hue and lower chroma values were consistent with increased photooxidation in $CaCl_2$ brined corns. Commercial implementation of $CaCl_2$ brines for corn fermentation in open tanks variably resulted in texture and color defects that can impact product quality (Erin K. McMurtrie and Suzanne D., 2018). Factors affecting the softening of pickled pasteurised corns were verified (M. Voldřich et al., 2009).

3.3 Effect of salt concentration in fermentation to physicochemical, microbial and sensory characteristics of pickled baby corn canning

The tremendous increase in consumers demand for fresh like products containing natural ingredients, changing food patterns and convenience have led to the development of minimally processed products using lactic acid bacteria (LAB) cultures (Joshi V K and Sharma S, 2009). Commercial corn fermentation is a preservation method that depends on high sodium chloride (NaCl) concentrations. This salt concentration enables a natural fermentation to occur by selecting for the lactic acid bacteria present on the corns and inhibiting salt-sensitive spoilage bacteria (Erin K. McMurtrie and Suzanne D., 2018). In the pickling industry, salt has historically been used for directing the fermentation of corns, radishes, and carrots (Thompson RL et al., 1979; Hudson JM et al., 1985; Fleming HP et al., 1995; Mcfeeters RF et al., 1997). Sodium chloride is an essential in food as it improves the preservative, technological and sensory quality of food (Brady M., 2002). NaCl is one of the most commonly employed agents for food conservation, allowing considerable increase in storage time by reducing water activity (Arghya Mani). Baby corns were fermented with different salt concentration (2%, 4%, 6%, 8%). Effectiveness of salt concentration in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score. Results were depicted in table 3. It's clearly noticed that 6% salt was adequate for baby corn fermentation. So we selected this value for next experiments.

Fermentation serves many benefits, which include food security, improved nutrition, and better social wellbeing of the people living in marginalized and vulnerable society (Montet et al 2006). Fermentation of vegetables can occur "spontaneously" by the natural lactic bacteria present as surface microflora, such as *Lactobacillus* spp., *Leuconostoc* spp., and *Pediococcus* spp.; however, the use of starter culture such as *L. plantarum*, *L. rhamnosus*, *L. gasseri*, and *L. acidophilus* provides consistency and reliability of performance (Ogunjobi et al., 2005). Panda et al (2009) studied the pickling of anthocyanin pigment-rich sweet potato cubes by lactic fermentation by brining the cut and blanched cubes in common salt (sodium chloride, 2 to 10%) solution. They were then inoculated with a strain of *Lactobacillus plantarum* (MTCC 1407) and incubated for 28 days. Treatment with 8 to 10% brine solution was found to be sensorially most acceptable.

Corn fermentations with and without NaCl in the fermentation brine were similar both in the chemical changes caused by the fermentative microorganisms and in the retention of firmness in the fermented corns. Salt Concentration in baby corn fermentation is responsible for three important purposes; it acts as a preservative, enhances the flavor of the product and also maintains the firm texture of the fruit (Fleming et al., 1987). To prevent non-lactic fermentations and inhibit the growth of *coliform* bacteria, it is important to maintain a high concentration of sodium chloride in the brine, but high concentrations of salt (12-16% after equilibration) in the brine retards the production of lactic acid by suppressing growth of lactic acid bacteria and favors the growth of halophilic microorganisms.

3.4 Effect of sugar concentration in fermentation to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Lactic acid bacteria growth is primarily influenced by various factors such as pH of the media, fermentation temperature, media composition (sugars and nutrients) and their mode of fermentation. Lactic acid bacteria maintain an alkaline cytoplasm when compared to its medium of growth. The ability to regulate the cytoplasmic or intracellular pH is one of the most important physiological characteristics of lactic acid bacteria which makes them acid tolerant when compared to numerous bacterial species (Hutkins and Nannen 1993). The organic acids produced by acid tolerant Lactic acid bacteria enter the cells of acid-non-tolerant microflora consequently collapsing the energy generated by the transfer of proton and electron across an energytransducing membrane used for chemical or mechanical work in a cell.

In current study, baby corns were fermented with different sugar concentration (2.0%, 2.5%, 3.0%, 3.5%). Effectiveness of sugar concentration in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score. Results were depicted in table 4. It's clearly noticed that 3.0% sugar was adequate for baby corn fermentation. So we selected this value for next experiments.

Table 1. Blanching temperature and time to physicochemical, microbial and sensory characteristics of pickled baby corn

Blanching temperature and time	pH	Total acidity (%)	Lactic acid bacteria (cfu/ml)	Sensory score
100^{o}C, 5 seconds	3.69±0.00^{bc}	0.65±0.03^b	2.24 x 10^6±0.00^b	6.31±0.01^b
95^{o}C, 10 seconds	**3.67±0.00^c**	**0.87±0.01^a**	**4.36 x 10^6±0.01^a**	**7.13±0.03^a**
90^{o}C, 15 seconds	3.72±0.01^b	0.41±0.02^c	1.14 x 10^6±0.00^c	5.12±0.02^c
85^{o}C, 20 seconds	3.80±0.02^a	0.30±0.00^d	8.33 x 10^5±0.01^d	3.04±0.00^d

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 2. Blanching $CaCl_2$ concentration to physicochemical, microbial and sensory characteristics of pickled baby corn

Blanching $CaCl_2$ concentration (%)	pH	Total acidity (%)	Lactic acid bacteria (cfu/ml)	Sensory score
0.15	3.61±0.03^b	0.78±0.00^b	3.11 x 10^6±0.01^b	6.04±0.02^c
0.20	3.64±0.01^{ab}	0.81±0.02^{ab}	3.24 x 10^6±0.03^{ab}	6.46±0.03^b
0.25	**3.67±0.00^a**	**0.87±0.01^a**	**4.36 x 10^6±0.01^a**	**7.13±0.03^a**
0.30	3.68±0.02^a	0.83±0.03^{ab}	4.20 x 10^6±0.03^{ab}	7.02±0.01^{ab}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 3. Salt concentration (%) to physicochemical, microbial and sensory characteristics of pickled baby corn

Salt concentration (%)	pH	Total acidity (%)	Lactic acid bacteria (cfu/ml)	Sensory score
2	3.67±0.00^a	0.87±0.01^b	4.36 x 10^6±0.01^b	7.13±0.03^b
4	3.65±0.03^{ab}	0.92±0.02^{ab}	6.49 x 10^6±0.01^{ab}	7.20±0.03^{ab}
6	**3.62±0.01^{ab}**	**0.95±0.01^a**	**8.55 x 10^6±0.02^a**	**7.87±0.00^a**
8	3.61±0.02^b	0.96±0.03^a	8.57 x 10^6±0.03^a	7.90±0.01^a

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 4. Sugar concentration (%) to physicochemical, microbial and sensory characteristics of pickled baby corn

Sugar concentration (%)	pH	Total acidity (%)	Lactic acid bacteria (cfu/ml)	Sensory score
2.0	3.62±0.01^a	0.95±0.01^b	8.55 x 10^6±0.02^b	7.87±0.00^b
2.5	3.60±0.03^{ab}	0.97±0.01^{ab}	9.25 x 10^6±0.01^{ab}	8.01±0.02^{ab}
3.0	**3.56±0.00^b**	**1.00±0.00^a**	**1.04 x 10^7±0.03^a**	**8.15±0.02^a**
3.5	3.55±0.02^b	1.01±0.03^a	1.06 x 10^7±0.00^a	8.16±0.00^a

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

Table 5. Fermentation time (days) to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Fermentation time (days)	pH	Total acidity (%)	Lactic acid bacteria (cfu/ml)	Sensory score
3	3.56 ± 0.00^{a}	1.00 ± 0.00^{b}	$1.04 \times 10^{7}\pm0.03^{a}$	8.15 ± 0.02^{b}
6	3.53 ± 0.00^{ab}	1.08 ± 0.01^{ab}	$2.25 \times 10^{7}\pm0.02^{ab}$	8.31 ± 0.01^{ab}
9	$\mathbf{3.48\pm0.01^{b}}$	$\mathbf{1.11\pm0.02^{a}}$	$\mathbf{4.68 \times 10^{7}\pm0.01^{a}}$	$\mathbf{8.43\pm0.03^{a}}$
12	3.47 ± 0.02^{b}	1.12 ± 0.02^{a}	$7.29 \times 10^{7}\pm0.00^{ab}$	8.45 ± 0.01^{a}

Note: the values were expressed as the mean of three repetitions; the same characters (denoted above), the difference between them was not significant (α = 5%).

3.5. Effect fermentation time to physicochemical, microbial and sensory characteristics of pickled baby corn canning

Naturally occurred lactic acid bacteria from the raw ingredients play an important role in fermentation of pickled vegtable (Sanit Kamdee et al., 2014). Baby corns were fermented with different fermentation time (3, 6, 9, 12 days). Effectiveness of fermentation time in baby corn fermentation was based on value of pH, total acidity (%), lactic acid bacteria (cfu/ml), sensory score. Results were depicted in table 5. It's clearly noticed that 9 days of fermentation was adequate for baby corn fermentation. So we selected this value for application.

Pickled products by lactic acid fermentation have unique flavor and great healthful effects. The consumption of lactic acid bacteria fermented vegetables helps to enhance human nutrition with the attainment of balanced nutrition, providing vitamins, minerals, and carbohydrates besides; they contain pigments such as flavonoids, lycopene, anthocyanin, β- carotene, and glucosinolates (Yamano et al 2006). Fermented vegetables are good sources of natural antioxidants such as vitamins, carotenoids, flavonoids and other phenolic compounds (Takebayashi et al 2013; Isa-belle et al 2010). Lactic acid fermentation retains all the natural plant ingredients while improving the quality, taste and aroma. Effects of temperature (22, 26 and 32°C) and salt concentration (2, 2.5 and 3%) were investigated on lactic acid fermentation of radishes by Joshi and Sharma (2009). Fermentation of grated radishes was carried out naturally and in the presence of *Lactobacillus plantarum*, *Pediococcus cerevisiae* and *Streptococcus lactis* var. diacetylis individually, or sequentially. Best results were obtained after sequential culture with 2.5% salt at 26°C. Sim and Han (2008) investigated antioxidative activities of red pepper seed kimchi extracts. 7% red pepper kimchi fermented for 6 days demonstrated the highest overall antioxidative activity, apart from nitrite scavenging activity, which was higher at the beginning than at the end of the fermentation period.

4. Conclusion

Fermentation plays an important role in preservation, production of wholesome nutritious foods in a wide variety of flavors, aromas, and textures which enrich the human diet and remove antinutritional factors to make the food safe to eat. Besides, nutritive advantage, baby corn is also free from residual effect of pesticides mainly because of the young cobs are wrapped up tightly with husk and well protected from enemies and also giving very little time for infestation to diseases and insect-pests, whereas other vegetables cannot be grown without the protected umbrella of pesticides and insecticides. Baby corn is a vegetable with good nutritional attributes but has short shelf-life under the prevailing weather conditions in tropical countries. Baby corn with their high composition of fermentable reducing sugars such as glucose, sucrose and fructose could serve as substrates for lactic fermentation thus transforming a perishable products to more stable and value added product. Pickled baby corn is one of the most consumed fermented vegetable in Vietnam. Therefore, production of pickle from this vegetable can help increase added values and reduce post-harvest losses. Pickling serves many benefits, which include food security, improved nutrition, and better social well being of the people living in marginalized and vulnerable society.

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