J. Agric. Food. Tech., 1(9)149-152, 2011

ISSN 2090 – 424X
Journal of Agriculture and Food Technology
www.textroad.com

Production Process Control in Small-scale Tempe Chips Industry

Indria Purwantiningrum

Jurusan Teknologi Hasil Pertanian, Fakultas Teknologi Pertanian, Universitas Brawijaya, Malang, Indonesia

ABSTRACT

Good Manufacturing Practices (GMP) is one of the well-known food safety program,which includes policy, procedures and methods as guidance for complying quality standards and hygiene. In Indonesia, good manufacturing practices are also known as Cara Produksi Makanan Yang Baik, CPMB. The objective of this research is to develop CPMB application guidelines for small-scale tempe chips processor, serve as clearer guidance for application of good manufacturing practices is obviously necessary in facilitating the production of safe food product. This research is consists of four phases: 1) field observation, 2) the development of application guidance, 3) implementation of the developed application guidance, and 4) evaluation and verification of the developed guidance. Assessment of CPMB for home industry conducted in "DIAN" tempe Chips Company showed that minimum adjustment should be made to implement the developed guidance. The process daily operation conforms to application guidance developed in Phase II. The implementation has also been conducted successfully. Packaging material for tempe chips has also been specified as HDPE plastics with 0.5 mm thickness and dimension of 25x14cm that conforms to chips size of 5x10cm. This research recognized two critical factors affecting product quality, 1) oil absorption factor, 2) tempe: oil ratio and time of frying. Oil absorption factor for tempe chips was measured as 43.48%, while the best ratio level is 1:30 with the least frying time and more consistent product quality.
Key words: Food safety, manufacturing practices, oil absorption factor, oil ratio, time of frying.

INTRODUCTION

Every food companies regardless of their size and reach (multinational corporations or small local companies), make an effort to attain a high standard of quality/safety in each phase of their operations [1][2]. They should prioritize quality assurance and food safety as the main concern in running the business. They should realize that food safety is not only a method, but moreover it is a preventive attitude of all personals, towards the occurrence of errors and defects by immediately taking the correct action [3][4][5].

Good Manufacturing Practices (GMP) is one of the well-known food safety program, developed by Food and Drug Administration-USA, as a guideline for the food, cosmetics and drug producers, handlers, retailers, etc. [6][7]. GMP includes policy, procedures and methods as guidance for complying quality standards and hygiene. It provides guidelines for producing food that complies specific requirements to aid food producers in the manufacture and distribution of unadulterated and no misbranded foods. These guidelines are located in the Code of Federal Regulations 21CFR part 110 as Current Good Manufacturing Practice in Manufacturing, Packing or Holding Human Food. Inside this tome are the rules and regulations for food manufacturers and distributors in producing clean, safe, and wholesome foods; therefore, it is the standard by which the government determines if the food is adulterated [7][8]. As such, it is critical that every food manufacturer and distributor understand the regulations and develop systems and programs that prove adherence to the letter of this law [9][10]

In Indonesia, good manufacturing practices are also known as Cara Produksi Makanan Yang Baik, CPMB. CPMB is written in Government Regulation (PP). Since 1978, Indonesian Health Department has introduced GMP via Regulation No. 23/MEN.KES/SK/I/1978 about Guidelines for Good Processing Practice for Food [11]. This regulation was developed into CPMB by Directorate of Food and Drink Control—General Directory of Food and Drug Control, Health Department in 1996 [12][13].

Food companies in Indonesia, especially small-scale ones, face safety and quality problems due to three areas of causes [14]. These areas include: unproper processing of food, lack of awareness and responsibility toward handling and food additive uses, and lack of knowledge upon food preparation and production environment requirements. As the education level of the food processor are usually low [11], a clearer guidance for application of good manufacturing practices is obviously necessary in facilitating the production of safe food product.

MATERIALS AND METHODS

As a case study, Tempe chips industry was chosen to be the sample in developing guidance of

***Corresponding Author**: Indria Purwantiningrum, Jurusan Teknologi Hasil Pertanian, Fakultas Teknologi Pertanian, Universitas Brawijaya, Malang, Indonesia. E-mail : airdni@yahoo.com; airdni@ub.ac.id

CPMB application. This research is consists of four phases: 1) field observation, 2) the development of application guidance, 3) implementation of the developed application guidance, and 4) evaluation and verification of the developed guidance.

Phase I : Field Observation

On-site survey on three companies producing tempe chips were conducted. The objective of the observation is to obtain the real condition of the tempe chips industry and develop a standard flow chart of the production process.

Phase II : The Development Of CPMB Application Guidance

The activities for this phase include: (1) selection and determination of company who is ready to apply CPMB program (selection criteria had been developed in accordance to BPOM, 2003 and Direktorat Pengawasan Makanan dan Minuman, 1996 [13], (2) development of CPMB application guidance focusing on process control.

Phase III : Implementation of The Developed CPMB Guidance

The activities for this phase include: (1) constructing preparation steps for implementing CPMB application guidance plan, (2) applying CPMB plan developed in phase II, (3) supervise and solving the problems emerged during the implementation step.

Phase IV : Evaluation and Verification of CPMB Application Guidance

The activities involved in this phase are: (1) validation on CPMB application especially for process control including its critical factors, (2) verification to ensure effectivity of the guidance.

RESULTS AND DISCUSSION

Phase I : Field Observation

The main material in producing tempe chips in tempe—soy bean fermented by *Rhizopus sp*. Tempe is usually obtained from tempe producers surround the industry site. Other ingredients used in tempe chips making are rice flour, tapioca, salt, garlich, corriander, eggs and cooking oil. Common tempe making process consists of raw material receiving, shifting/sorting, boiling, dehulling, soaking, second boiling, dewatering, fermentation, and incubation. The tempe making process usually finished in 72- 96 hours. Tempe chips production flow chart is shown as in Figure 1 below.

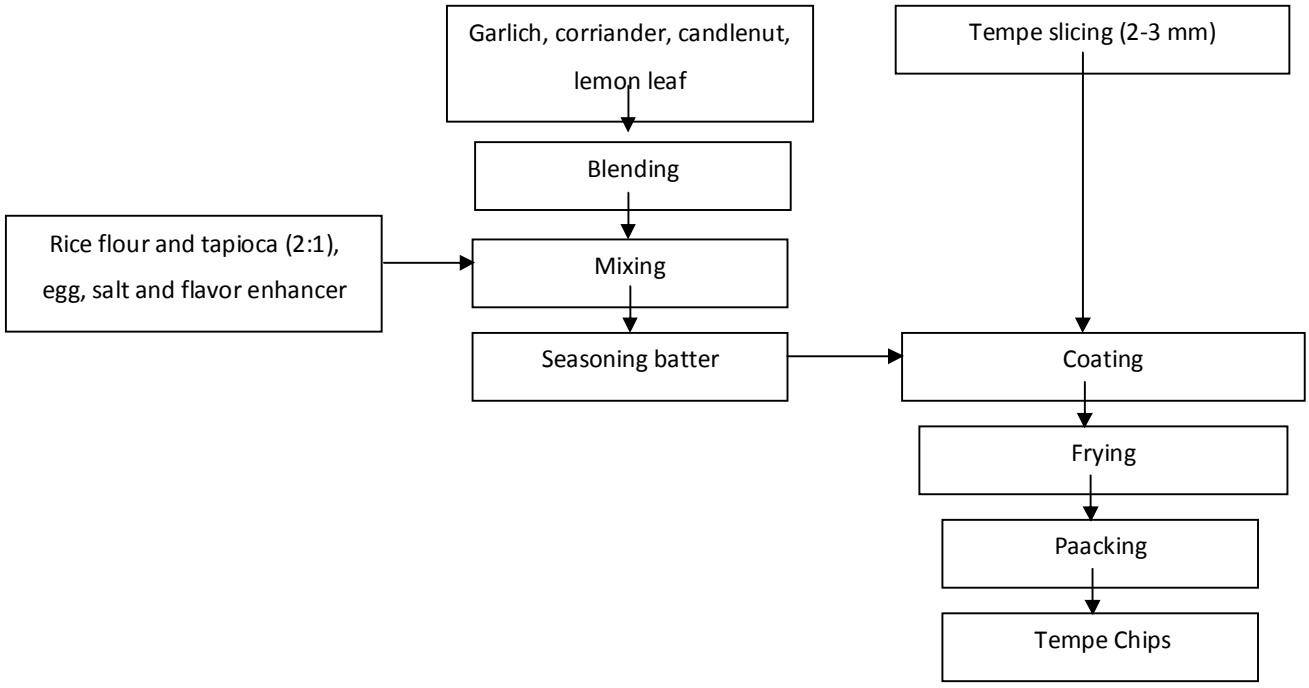

Figure 1Tempe Chips Production Flow chart

Production process in the surveyed home industry was consistently conducted. Process control in batter formulation usually conform to the recepy, however seasoning senses of the operator may sometimes play significant role in altering the seasoning composition.

Production flowchart was conducted accordingly as shown in the diagram. There are no significant changes nor difference in production process between different companies. Production equipments are commonly the same although insignificant variation may exist. The heating equipment is mainly gas stove, while batter blending usually utilizes electric blender. Packaging material for the product is Polyethylene, with dimension 25 x 14 cm and 0.5mm thickness.

Phase II : The Development Of CPMB Application Guidance

The selected company for guidance application is "DIAN" Tempe Chips who had fulfilled the determined criteria. Development of CPMB application guidance focusing on process control can be seen below.

I. Tempe preparation
- Texture of tempe must be solid and compact
- Tempe slicing must concern its thickness uniformity which is 2-3 mm
- Knife or blade for slicing tempe must be sharp and clean

II. Seasoning and batter preparation
- Proportion and formulation of seasoning should always consistent
- Seasoning mixing by using electrical blender should ensure homogeneity
- Container used for batter mixing should be clean

III. Frying
- Tempe : cooking oil ratio should be proper to facilitate fast frying process yielding crunchiness in chips texture
- Discovering oil absorption factor, frequency of oil addition can be predicted to maintain tempe : cooking oil ratio
- De-oiling should be conducted as the fried chips turn to gelden brown in color
- Cooling should utilize paper-covered container to reduce oil absorbed on the surface of the chip

IV. Packaging
- Product to be packaged should be cold enough to prevent moisture trap
- Plastics for packaging should have minimum thickness of 0.5 mm and have the ability to resist remaining oil
- Sealing should be tight and prevent foreign material entrance

Phase III : Implementation of The Developed CPMB Guidance

Assessment of CPMB for home industry conducted in "DIAN" tempe Chips Company showed that minimum adjustment should be made to implement the developed guidance. The process daily operation conforms to application guidance developed in Phase II, starting from raw material preparation, batter and seasoning preparation, frying and packaging as well.

Determination of raw material specification, as well as batter formulation and preparation has been conducted accordingly to the developed guidance. The implementation has also been conducted successfully. Packaging material for tempe chips has also been specified as HDPE plastics with 0.5 mm thickness and dimension of 25x14cm that conforms to chips size of 5x10cm.

Production process procedure, especially in frying stage has not yet standardized. Tempe : cooking oil ratio hace not been determined, thus the yield quality is widely varied. Oil absorption factors has not been discover as well. The absorption causes reduction of oil volume, thus tempe : oil ratio is altered. Considering the significant impact, subsequent phase will focus in discovering the optimum tempe : oil ratio to obtain the optimum tempe chips quality characteristics.

Phase IV : Evaluation and Verification of CPMB Application Guidance

The previous phase recognized two critical factors affecting product quality, 1) oil absorption factor, 2) tempe: oil ratio and time of frying.

➢ **Oil Absorption Factor**

Oil absorption factor was assessed by measuring the weight of the cooking oil after it had been used for frying tempe chips. Average reduction of 8.33% (0.5 kg) from the initial oil weight (6 kg) was resulted from frying 1.15 kg of coated tempe. The oil absorption factor was counted as percentage of oil reduction (kg)/fried material (kg). Hence the oil absorption factor is (0.5 kg/1.15 kg)x 100% = 43.48%.

➢ **Tempe : Oil Ration and Time of Frying**

Three levels of tempe : oil ratio was selected to obtain the optimum level for producing consistent product quality as well as measuring the frying time needed in yielding the desired quality attribute of the chips. The result of the research is shown as in Table 1 follows.

Table 1 Oil Ration and Time of Frying

Tempe : oil ratio	Tempe weight (g)	Oil weight (g)	Frying time (min)	Product characteristics
1:30	200	6000	13	Brownish, dry, crunchy
1:20	400	6000	17	Brownish, dry, crunchy
1:10	600	6000	22	Brownish, oily, not crunchy

As shown on the table, the best ratio level is 1:30 with the least frying time and more consistent product quality. The consistency should be maintained constant by adding cooking oil after frying.

CONCLUSION

Small-scale tempe chips processor has been selected and assessed for developing CPMB application guidance. Implementation of the guidance as well as the verification process has been conducted. The critical factors affecting quality of the fried chips are oil absorption factors and tempe : oil ratio. When applied properly, CPMB program offers an opportunity to obtain more consistent and less variation in product characteristics. Further study on other aspects of CPMB in small-scale food processors is needed to ensure CPMB effectiveness and increasing personnel awareness on hygiene and good practices in food processing.

REFERENCES

1. Heijden, Kees Van der (ed), 1999, *International Food Safety Handbook*, Marcel Dekker Inc., New York
2. Ehresman, Terry, 1994, *Small Business Success Through TQ***M**. ASQC Quality Press., New York
3. Luning, P.A.; L. Bangob, J. Kussagac, J. Rovirad and W.J. Marcelis, 2008, *Comprehensive analysis and differentiated assessment of food safety control systems: a diagnostic instrument,* Trends in Food Science & Technology 19 (2008) 522-534. Elsevier
4. Marriot, N.G., 1994, *Principles of Food Sanitation* 3rd ed., Chapman & Hall, New York
5. Foster, T.S.,Jr., 2001, *Managing Quality : An Integrative Approach*, Prentice Hall, Upper Saddle River, New Jersey
6. Advancing Food Safety. 2006. *Good Manufacturing Practice (GMP) Policy Manual***.** http://www.scbs.net.au. Accessed on 17 Februari 2007
7. Food and Drug Administration. 2003. *Code of Regulations: 21 CFR part 110 Current Good Manufacturing Practice In Manufacturing, Packing, or Holding Human Food.* http://www.cfsan.fda.gov/~lrd/FCF110.html. Tanggal akses 6 Februari 2008
8. Aramouni, Fadi. 2001. *Current Good Manufacturing Practices (cGMPs) in Manufacturing, Packing, or holding Human Food.* http://www.oznet.ksu.edu/library/fntr2/mf2505.pdf. Tanggal akses 2 Maret 200
9. Shapton, D.A. and Norah F. Shapton, 1998. *Principles and Practices for the Safe Processing of Food*, Woodhead Publ. Ltd., Cambridge, England.
10. Forsythe, S.J. *and* P.R. Hayes, 1998, *Food Hygiene, Microbiology and HACCP* 3rd ed., Aspen Publishers Inc., Gaithersburg, Maryland
11. Menteri Kesehatan RI telaah No. 23/MEN.KES/SK/I/1978 tentang Pedoman Cara Produksi Yang Baik untuk Makanan
12. Direktorat Pengawasan Makanan dan Minuman. 1996, Pedoman Penerapan Cara Produksi Makanan Yang Baik, CPMB Direktorat Jendral Pengawasan Obat dan Makanan Departemen Kesehatan Republik Indonesia
13. Badan Pengawas Obat dan Makanan Republik Indonesia (BPOM), 2003, Surat keputusan Kepala Badan POM Nomor : HK. 00.05.5.1639 Tanggal 30 April 2003
14. Fardiaz, S., 1991, *Quality Assurance*, Makalah pada Pentaloka Pengawasan Makanan, Dirjen POM Departemen Kesehatan, Cipayung - Jabar, 18 Oktober 1991.