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Microbiological Evaluation of Skewers and Grilled Beef and Chicken in Antananarivo (67ha and Ankatso Areas)

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ABSTRACT

The aim of this study was to assess the microbiological quality of beef skewers and grilled chicken available in a restricted area of Antananarivo : 67ha and Ankatso. Hygiene of the products, the types of consumers and the frequency of consumption are studied. Samples from these two areas were aseptically collected. The samples were analyzed within an hour of procurement. Isolation, enumeration and identification of the prevalent bacteria (*Escherichia coli, Staphylococcus aureus*, pathogenic germs like *Salmonella spp* and *Campylobacter jejuni*) were carried out following the standard procedures. Surveys of one hundred fifty vendors show that 57.74% are composed by men, 42.25% by women and 70.16% between the age of 18 and 50. The survey has shown that the product is mostly consumed by students (88.46% at Ankatso and 47.8% at 67 ha). The microbiological analysis show that the skewers are contaminated by *E.coli* (up to $3{,}3.10^3$CFU/g for the skewers and $5{,}3.10^3$CFU/g for the grilled chicken). Pathogenic germs as *Campylobacter jejumi*, *Salmonella spp* are observed. It shows a lack of hygiene and preparation : poor hygiene at any stage of the food chain, lack of preventive during processing and preparation of the food, incorrect use of the materials, contaminated raw materials, water.

Keywords-street food, skewers, grilled chicken, hygiene quality, microbiological quality

I. Introduction

The field of street food has a big place in African urban life. In underdeveloped countries like Madagascar, selling street food is a source of supply to be consumed by almost the population who work all day away from home [20]. In Antananarivo city, 9 per 10 household members do not have lunch together [17]. Street food can satisfy the population's needs as it is quick and cheap [5]. Skewers and grilled chicken are some of the most consumed street foods in Antananarivo [18]. They provide a source of revenue for many families. The main risks linked this small business are the preparation and cooking hygiene, the sanitation of the sale environment, the infrastructure for the sale and the bad handling of the products [6]. Particularly in Madagascar, not respecting the right hygiene is one of the biggest problems for the public health [4]. So that, diseases provoked by contaminated and unsafe food is prevalent [15]. Recently, faced to the increase in numbers of the street food vendors; a study about the hygienic quality of street food like 'Misao', 'Oysters' and 'Koba ravina' had been done [2,19, 21]. Those studies proved the existence of food-borne outbreak germ and infectious disease from food. So, this study is to evaluate the hygienic quality of grilled chicken and beef sold around 67ha and Ankatso in Antananarivo city. The general objective of this work is to contribute to the protection of the consumers of street food. In a specific way, it is necessary to evaluate the microbiological quality of these foods, to know the hygiene of the vendors during the preparation and sale of the products.

II. Materials and methods

2.1. Survey

The surveys were done depending on the availability of the vendors. The study took place in six (6) quarters: 67ha Center, 67ha North-West, 67ha North-East,Ankatso 119 and Ankatso-Tsiadana. We have chosen those places according to the number ofthe vendors and the frequency of the consumption. In addition, 67ha is a popular place near to the new bus station at Andohatapenaka, the bus stop to National Road 4 and studentswho circulate there. Ankatso has been selected for this study to check the foods served tothe students and workers at the university.

2.2. Sampling

We have also applied random stratified sampling during the work. Vendors in the twostudy areas were divided into two sections related to the number of quarters. We selected five vendors in each zone to get five samplings from each of them (n=5). We have chosen thismethod to represent all quarters in the areas. Sixty (60) samplingswere chosen for the collection of samples: 30 beef skewers and30 grilled chicken. All the samples were aseptically collected in sterile containers, stored at 4°C and analyzed within an hour of procurement.

2.3.Microbiological analysis

- Enumeration of Total Aerobic Bacteria
  Plate Count Agar (PCA) (Oxoid Ltd, United Kingdom) was used for Total Aerobic Bacteria and wasdone in conformity with the recommendation of the norm ISO 4833 (7, 21).
- Detection of *Salmonella spp*.
  Salmonella sppwas detected with the recommendation of the norm ISO 6579. Twenty-five grams (25g) of each sample was mixed with 225 ml of buffered peptone water and incubated at 37oC for 16 h.One ml of this culture was pipetted into 10 ml of Rappaport-VasilliadisSoya broth (RVS). These wereincubated at 41oC for 24 h. The culture was streaked intoHektoen Agar. The agar plate wereincubated at 37oC for 24 h. The plate were examined for typical green blue colonies of *Salmonella* (8,16, 19, 21).
- Detection of *Escherichia coli* βglucuronidase +
  1 ml of the dilution of each food sample was plated onto Eosin Methylen Blue Agar Medium andincubated at 44°C for 24h to 48 h. Black green metallic colonies were subjected to appropriatebiochemical tests according to the norm ISO16649(11,14).
- Detection of *Campylobacter jejuni*
  25 g of the food sample was mixed with 100 ml Preston broth (Oxoid) and homogenized for 2 min.The enrichment broth was incubated at 42°C for 24 to 48 h. The broth culture was streaked ontoSkirrow's agar plates (Oxoid), which were then incubated at 42°C. Colonies were Gram stained andtested for oxidase reaction. Suspect colonies were subjected to appropriate biochemical tests, done inconformity with the recommendation of the norm ISO 10272: 2006 (10, 21).

2.4.Statistical analysis

XLSTAT was used for the statistical analysis of results. The Main Component Analysis (MCA) permit to know the most contaminated zone and the most incriminated microorganism.

III. Results

3.1. Surveys

The surveys about the respect of hygiene in the sampling sites permitted to show the state of vendors and dwellers, the way of conservation of the products and the environment in theselling points. In total, 150 vendors around 67ha and Ankatso were surveyed.

- **Vendors :** most of them are between the age of 18 and 50 (70.16%, 57.74% are men and 42.25% are women, only 20% have attended high school education, 65 % have completed the primary and secondary education, and 15% are illiterate. Figure 1 shows knowldges of the vendors about hygiene, during the preparation and sale of the products.

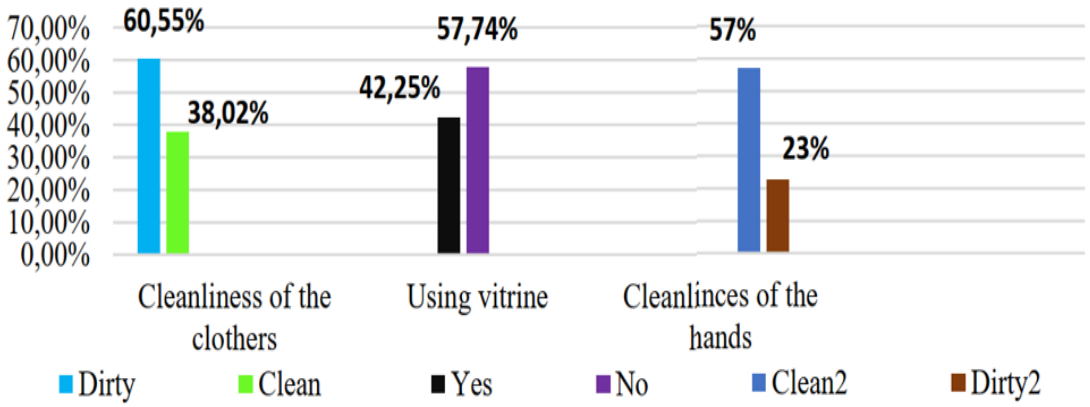


Figure 1 : Hygiene of vendors

- **Consumers**: In total, 300 consumers were interviewed around 67ha and Ankatsoincluding 68.64% men and 31.35% women. Their age is between 16 and 54. The majority of the consumers of the products is student: 88.46% at Ankatso and 47.88% at67ha.Skewers are mainly consumed with beverages (53.49%). Results show that 10.16% of people consume the product three times a week, 17.79% consume it twice a week, 26.27% once a weekand the rest consume it occasionally. Skewers and grilled chicken are especially consumedduring parties (44.27%) and on week-ends (33.58%).According to the survey results, 10.45% of the consumers told that they got digestive disorderfrom the product and 20.55% could not confirm the cause of their discomfort after eating theskewers.

- In total, 300 consumers were interviewed around 67ha and Ankatso including 68.64% men and 31.35% women. Their age is between 16 and 54. The majority of the consumers of the products is student: 88.46% at Ankatso and 47.88% at 67ha. Skewers are mainly consumed with beverages (53.49%). The consumers surveyed (10.16%) consume the product three times a week, 17.79% consume it twice a week, 26.27% once a week and the rest consume it occasionally. Skewers and grilled chicken are especially consumed during parties (44.27%) and on week-ends (33.58%). According to the survey results, 10.45% of the consumers told that they got digestive disorder from the product and 20.55% could not confirm the cause of their discomfort after eating the skewers. This next figure shows us the identified symptoms of consumers.

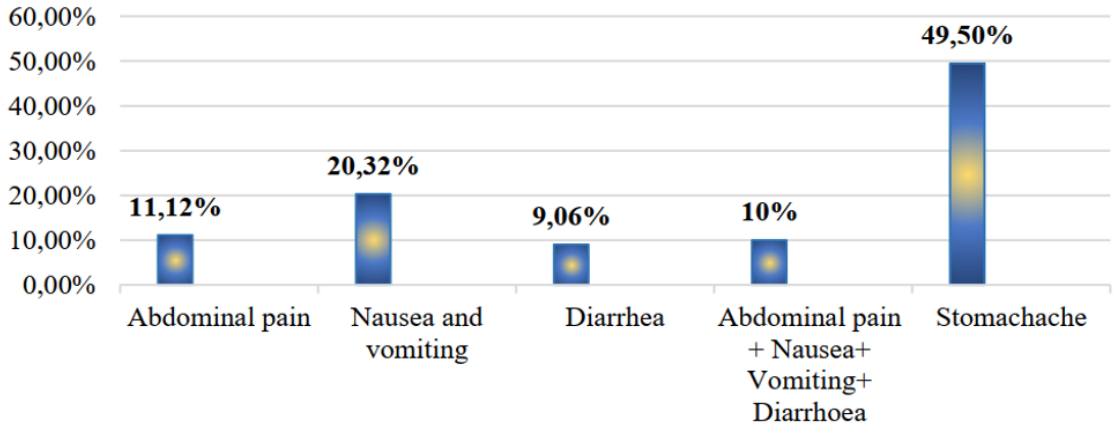


Figure 2 : Identified sypmptoms

- Five types of symptoms were identified during the interview: 49.50% are stomachache, 20.32% are nausea and vomiting, 11.12% are abdominal pain, 9.06% are diarrhoea and 10%got the three last symptoms.

3.2. Results of the microbiological analysis

The average value of the germ analysis results in the skewers and grilled chicken taken in the six quarters is conclude in this following table.

Table 1 : The average value of the microbiological results in the skewers

	Beef skewers samples (n=5)							
	South 67ha	67 ha Center	67ha North-West	67ha North-East	Ankatso-119	Ankatso-Tsiadana	Criterias (CE n°02007 3/ 2005)	Quality
FMAT (CFU/g)	$1,1.10^6$a	$8,6.10^5$a	$9,3.10^5$a	$1,04.10^6$a	$1,3.10^6$a	2.10^6a	m= 3.10^5 M= 3.10^6	Ac
E. coli (CFU/g)	$3,05.10^3$a'	6.10^2a'	$2,4.10^3$a'	$2,2.10^3$a'	$1,7.10^3$a'	$3,3.10^3$a'	m= 1.10^2 M= 1.10^3	U
S. aureus (CFU/g)	$1,5.10^4$a''	$4,06.10^3$a''	$1,4.10^3$a''	$3,4.10^3$a''	$3,2.10^3$a''	$1,08.10^3$a''	m= 1.10^2 M= 1.10^3	U
Salmonella spp (CFU/g)	3/5 (60%)	1/5 (20%)	2/5 (40%)	2/5 (40%)	3/5 (60%)	3/5 (60%)	Abs/25 g	U

TAMF : Total Aerobic Mesophilic Flora *; E.coli : Echerichia coli* β-D-glucuronidase positive *; S. aureus : Staphylococcus aureus ;* AC *: acceptable ;*U *: unsatisfying ;* CFU/g : *Colony-Forming Units per gram of sample* ; n=numbers of samples *;* Abs 25 g : absence in 25 g of sample.

The numbers with the same letter in one column are not significantly different (p 0.05). The table 2 indicates that the microbiological quality of the beef skewers in the six quarters is acceptable in TAMF, unsatisfying in *E. coli* and *S. aureus*. We have also noticed the presence of *Salmonella spp* in the skewers which shows an unsatisfying result of the microbiological quality.

Table 2 : The average value of the microbiological results in the grilled chicken

	Grilled chicken samples (n=5)							
	South 67ha	67 ha Center	67ha North-West	67ha North-East	Ankatso-119	Ankatso-Tsiadana	Criterias (CE n°020073/ 2005)	Quality
TAMF (CFU/g)	$7{,}1.10^5$a	$1{,}04.10^6$a	$9{,}6.10^5$a	$1{,}2.10^6$a	7.10^5a	$2{,}4.10^5$a	m= 3.10^5 M= 3.10^6	Ac
E. coli (CFU/g)	$4{,}03.10^3$a'	$5{,}3.10^3$a'	$1{,}6.10^3$a'	4.10^3a'	$1{,}3.10^3$a'	2.10^3a'	m= 1.10^2 M= 1.10^3	U
S. aureus (CFU/g)	$4{,}03.10^3$a''	$3{,}6.10^3$ a''	2.10^3 a''	$3{,}03.10^3$ a''	$3{,}3.10^3$ a''	$2{,}3.10^3$ a''	m= 1.10^2 M= 1.10^3	U
Salmonella spp (CFU/g)	0/5 (0%)	1/5 (20%)	2/5 (40%)	2/5 (40%)	3/5 (60%)	4/5 (60%)	Abs/25 g	U
C. jejuni (CFU/g)	0/5 (0%)	1/5 (20%)	2/5 (40%)	2/5 (40%)	1/5 (20%)	4/5 (80%)	Abs/25 g	U

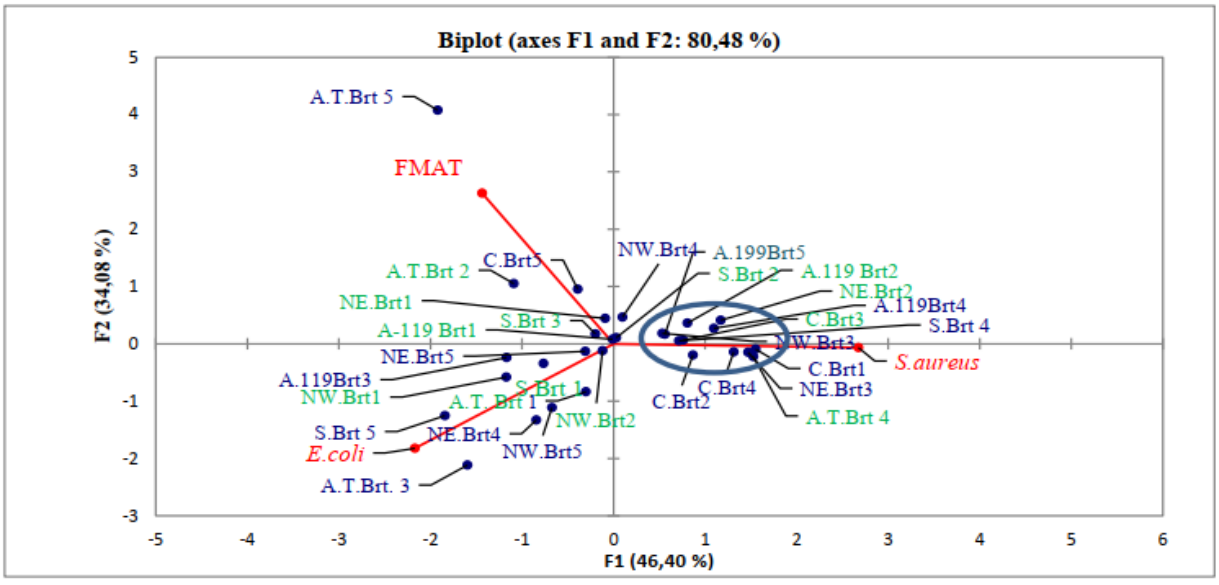
TAMF : Total Aerobic Mesophilic Flora ; *E.coli : Echerichia coli* β-D-glucuronidase positive ; *S. aureus : Staphylococcus aureus* ; AC *: acceptable* ;U *: unsatisfying* ; CFU/g : *Colony-Forming Units per gram of sample* ; n=numbers of samples ; Abs 25 g : absence in 25 g of sample.

The numbers with the same letter in one column are not significantly different (p 0.05). The table 3 indicates that the microbiological quality of the grilled chicken in the six quarters is acceptable in term of TAMF, unsatisfying in term of *E. coli* and *S. aureus*. Those results are sign of the bad quality of the products because of the lack of hygiene of the used raw materials and the personnel. Contamination from the pathogen germs: *Salmonella spp* and *Campylobacter jejuni* was noticed in five quarters among the six studied area. So, the microbiological quality of the grilled chicken is insufficient.

3.3. Results of the statistical analysis

Principal Component Analysis (PCA)

A principal component analysis is done to study the correlation between the germs, to compress information and represent the samples in the form of points in a reduced space. The PCA of the germs in the beef skewers is illustrated in figure 3.

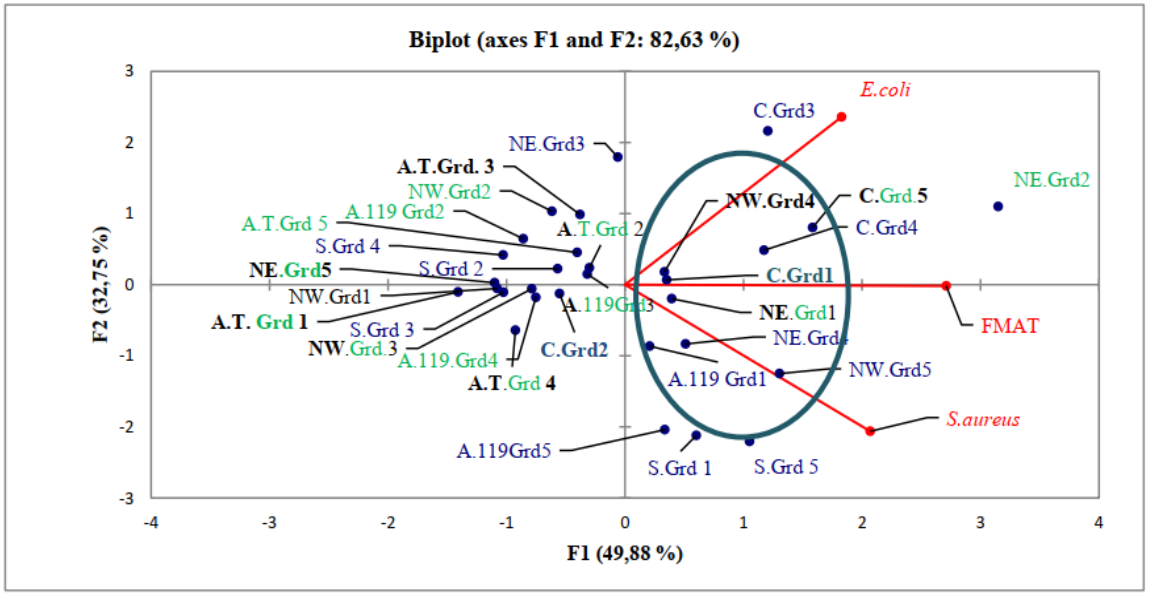


S (67ha south) ; C (67ha center) ; NW (67ha north-west) ; NE (67ha north-east) ; A(Ankatso 119) ; A.T(Ankatso-Tsiadana) ; Brt (skewers) ; the number of the sample is put in index 1, 2, 3, 4, 5 (for exemple : S.Brt.$_1$; a sample of beef skewer taken from the quarter at 67ha Sud).

Figure 3 : Germs in the beef skewers

The first factorial axis (Dm1) constitutes 46.40% of the total variance and the second factorial axis (Dm2) covers 34.06%. The variability sum represents 80.48% of the total variability of the dataset. It means the factorial axis has a right variability and respect the 75% standard variability. The first factorial axis is negatively correlated to the TAMF and *E. coli* variables while its correlation to *S. aureus* is positive. The second factorial axis implies with the TAMF. The different samples were divided into two factorial axes to evaluate the germ concentration in the skewers. The sample "A.T.Brt5" is positioned at the left of the figure. It shows a strong contamination by all the studied germs. The lot circled in blue on the factorial axis (Dm1) is the samples more contaminated by *S. aureus*: four samples from 67ha Center, three samples from Ankatso 119 and two samples from 67ha North-west. The lot circled in red are the samples more contaminated by *E. coli* but they are less contaminated by *S. aureus*: three samples from 67ha North-west, two samples from Ankatso Tsiadana, South 67ha and 67ha North-west. Each quarter represents *salmonella spp* contamination but the most contaminated were the samples from Ankatso Tsiadana and South 67ha (the samples contaminated by *Salmonella spp* are green colored).The PCA of the germs in the grilled chicken is shown in the figure 4.

Figure 4 : Germs in the germ in the grilled chicken



S (67ha south) ; C (67ha center) ; NW (67ha north-west) ; NE (67ha north-east) ; A(Ankatso 119) ; A.T(Ankatso-Tsiadana) ; Grd (Grilled chicken) ; the number of the sample is put in index 1, 2, 3, 4, 5 (for exemple : S.Grd.$_1$; a sample of grilled chicken taken from the quarter at 67ha Sud).

In the figure 4, the first factorial axis (Dm1) constitutes 49.87% of the total variance. The second axis (Dm2) explains the 32.75%. These two components can prove that 82.63% of the total variable were from the dataset. All the variables are positively correlated with the first main factor. The blue circled samples situated at the right part of the factorial axis (Dm1) are mainly contaminated by *S. aureus*, *E. coli* and TAMF. They represent four samples from 67ha Center and three samples from 67ha North-East. *Salmonella spp* is detected and *Campylobacter jejuni* (black colored) are suspected in the green colored samples. There was no sample contaminated by those two pathogen germs in the zone of South 67ha.

IV. Discussion

According to the collected data, the hygiene notion and necessary skills for the right hygiene are already known by the merchants, but it is not respected for some of them. About the disease symptoms, we could identify the presence of these following germs: *Salmonella spp, Campylobacter jejuni, E.coli and S. aureus.* The general average concentration of TAMF in the two types of samples is 1,2.106 UFC/g for the beef skewers and 8,1.105 UFC/g for the grilled chicken. So, the results are basically acceptable for a three-class plan. All the analyzed samples are not consistent with the microbiological criterias of *E. coli* and *S. aureus.* The medium charge of *E. coli* is 2,2.103 UFC/g for the beef skewers and 2,6. 103 UFC/g for the grilled chicken. A high concentration of *E. coli* is provided from fecal contamination during killing the animals and transporting the meat. As defined in the accomplished study, the contamination of fresh meat sold in the open market by the germ of *E. coli* is up to 1,13.103UFC/g [18], which means that the meat are already contaminated. The average concentration of *S. aureus* is 2,6.103 UFC/g for the beef skewers and 3,03.103 UFC/g for the grilled chicken. It is due to the inconsistency of the selling point: the meat that are ready to grill are exposed on a table without protection. *S. aureus* is a pathogen germ but also a hygiene indicator in case of handling preparation of the products [7,9]. All foods may be contaminated by *Salmonella spp.* They are some of the main bacterial infectious agent of foodborne infection [16]. The obtained result is alarming as 53.33% of the beef skewers and 36.66% of the grilled chicken are contaminated by *Salmonella spp*. Inaddition, 43.33% of the grilled chicken contains *Campylobacter jejuni*.So that, the two products are considered unsatisfying and all the results are mostly related tothe lack of hygiene during the preparation of the meat [8].

V. Conclusion

The sector of street foods has a big place in city life. It brings a lot of interest for themerchants and for the customers. According to microbiological analysis result, it has beenproved that the quality of skewers and grilled chicken around 67ha and Ankatso is insufficient.These foods have less satisfying quality of *E. coli* an *S.aureus*. The skewers are contaminatedby *Salmonella spp*. Two pathogen germs were observed in the grilled chicken (*Campylobacterjejuni* and *Salmonella spp*). So that, it is necessary to share skills to the merchants about foodhygiene by educating or training them. Experienced also should be shared to promote a rightstrategy for them to get safe food for the population.

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Dosage of Benzo(A)Pyrene in Skewers and Grilled Chicken, Sold around 67ha and ankatso, Antananarivo, Madagascar

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ABSTRACT

A study about sales and consumption of beef skewers and grilled chicken around 67ha and Ankatso showed that this small business is mainly practiced by men (57.74% men and 42.25% women). The most concerned consumer are students, 88.46% of the consumers in Ankatso and 47.88% of the consumers for 67ha. The preparation of the meet for the grilled chicken generates potentially toxic molecules like Benzo(a)pyrene that can be carcinogenic. The grilling time is one of the factors that cause this risk. Skewers and grilled chicken cooked for 10 to 20 minutes on charcoal have an amount of high benzo(a)pyrene (0.66µg/kg and 4,09 µg/kg) compared to cooked on intense fire for less than 10 minutes (0.25µg/kg and 1.34µg/kg). Grilled chicken contains a high quantity of Benzo(a)pyrene more than recommended standard (2µg/kg).

Keywords: skewers, benzo(a)pyrene, carcinogenic, grilled chicken

I. Introduction

Selling street food increased 60 years ago in the whole African countries including Madagascar. The urban population growth and the economic problems enable the development of open food market [5, 19]. Food sold in the urban commune of Antananarivo is composed of ingredients rich in carbohydrate (cereals and tubers), fat (fries and meat) and protein (sausage, skewers and barbecue) [6]. Beef skewers and grilled chicken are among the most consumed street food in Antananarivo [6,7]. Barbecuing have been used for centuries in many countries to get the food taste and characteristic appearance [4]. Recently, nutritional messages alarm the cooking of the grilled meat. Carelessness during the grilling generates toxic molecules like polycyclic aromatic hydrocarbon (PAH) particularly the Benzo(a)pyrene (BaP); it is carcinogenic, mutagenic and teratogen [14,15,16]. BaP is used to indicate the contamination of the foods by the PAH. This study will focus on the dosage of BaP during the cooking of the sold beef skewers and grilled chicken around 67ha and Ankatso in Antananrivo city. These places are chosen because of the quantity of seller and consumers there. Besides, those types of food are mostly appreciated by students who will lately lead the nation and it is important to know about the quality of the food they eat.

II. Materials and methods

2.1 Materials

- **Biological materials**

It constists by different grilled meat samples: beef skewers and grilled chicken sold around 67ha and Ankatso.

- **Reagent**

A standard solution containing 1g/l of BaP, acetonitrile, acetone, methanol, N-hexane, toluene, dichloromethane and deionized water were used for the dosage of BaP.

- **Materials and laboratory devices**

The dosage of BaP was done by high performance liquid chromatography (HPLC)/ UV Visible Spectrophotometer, with C18column.

1.2 Methods

1.2.1 Sampling method

For this study, two samples for each food were taken : the first one is braised and the other one is grilled with hot fire. Then the samples were covered with aluminum foil to protect them from dirtiness before keeping them in an amber glass jar. The samples were kept in 4°C cold and transferred to the laboratory. This precaution is necessary because of the photosensitivity of some HAP [17].

2.2.2 Survey

A survey was done according to the availability of the sellers; it was based on survey. Information about the characteristics of the sellers, the grilling practice (including the kind of fire, the cooking time and the grilling kind) were observed during the survey.

2.2.3 Dosage method of BaP

Extraction

The realization of the extraction and the analysis of the BaP followed the standard ISO 15753-2004 [8]. We have tested 2.5g sample (beef skewers/grilled chicken) in a centrifuge tube, then, 10 ml of combined acetonitrile/acetone (v/v: 60/40) were added. The solution has been homogenized in vortex for 30 s and in ultrasound for 5 min before being centrifuged for 5 min at 4 000 t/min. The supernatant has been transferred in a crucible conic tube and the solvent was evaporated with a rotavapor at 35°C. The extraction has been repeated twice with 10 ml of combined acetonitrile/acetone (v/v: 60/40). The extract has been purified on grafted cartridge phase of C18. So, 2 ml of combined acetonitrile/acetone are introduced in a conic tube containing the extract and shake with vortex for 15s then centrifuged for 30 s. The supernatan was transferred in prior conditioned C18 cartridge with 12 ml of methanol and 12 ml of acetonitrile. The elution was done with 5 ml of combined acetonitrile/acetone on atmospheric pressure. The eluent was concentrated with a rotavapor at 35°C. The purified extract as been taken in 1 ml of hexane. The tube was then closed and conserved at -4°C before the analysis.

Analysis on HPLC/UV

The analyzed extract by HPLC was equipped with fluorescence detector UV-visible due to their universal character, the relational transparency in many solvents and the simplicity of the method [13]. The C18 column (15 m*4.6 mm*5 µm), the combination solvents acetonitrile/acetone (60%/40%) and acetonitrile/water (50/50) were used as mobile phase of 0.6 ml/min flow. An extract of 20 µl was injected in the column. The product signal during the composed detection cell passage was resulted from a chromatogram peak whose surface would be proportional to the concentration. The quantification of BaP was done from the calibration curve.

2.2.4 Statistical analysis

The statistical processing was achieved with the XLSTAT 2014 software and the significancethreshold is hold at 0.05. The result of the BaP dosage is analyzed with the test Khi2 to justifythe hypotheses on the principal causes of the toxic product in the beef skewers and the grilledchicken.

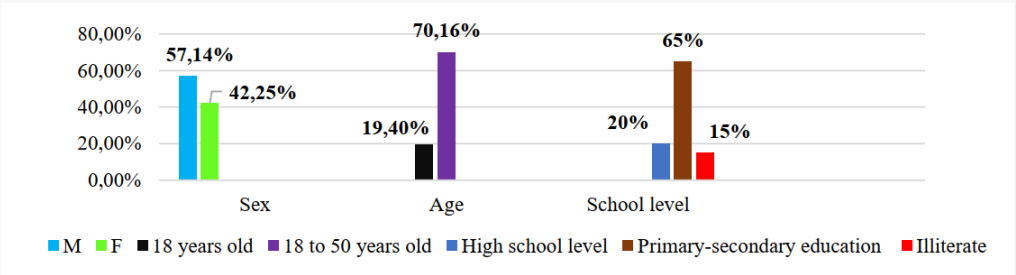
III. Results

3.1. Surveys results

3.1.1. Sellers

The age, the sex and the education level of the sellers in the two areas of study arepresented in this figure 1.

Figure 1 : Sellers profile



The survey shows that 19.40% of the sellers are younger than 18 years, 70.16% are included in the age of 18 to 50 and 10.44% are aged more than 50. The majority of the sellers are men 57.74% and 42.25% women. The sellers are less educated, only 20% of them achieved high school education, 65% have finished primary-secondary education and 15% are illiterate. Personals who does this business is varied: those who cut the meat into small pieces, those who cook, those who serve and those who manage. The main used fuel for grilling is charcoal. If the meat is braised, the cooking time is 10 to 25min. But if the meat is grilled with hot fire, the duration is only 10 min. This following table illustrates the cooking duration depending on the fire intensity for the barbecue.

Table1: Cooking timing and percentage of the skewers according to the kind of used fire

	Braise	*Hot fire grill*
Cooking timing	*10 min to 25 min*	*About 10 min*
Pourcentages of the skewers according to the kind of fire	*57,64% More carbonized meat*	*40,84% Less carbonized meat*

The cooking duration on the barbecue also depends on the customers' needs. Someconsumers prefer to eat the rare meat and some prefer it well-cooked.

The meat is well-cooked and more carbonized if it is braised and it is rare or "masak'afo" and less carbonized if the fire is intense. As we can notice in the table 1, 57.64% of the grilling is practiced with braised heat and 40.84% is practiced with intense fire.

3.1.2 Consumers

Three hundred consumers were surveyed around 67 ha and Ankatso including 68.64% men and 31.35% women. Their ages vary between 16 and 54, with 29.60% married and 70.33% single. The figure 2 shows the profile of consumers.

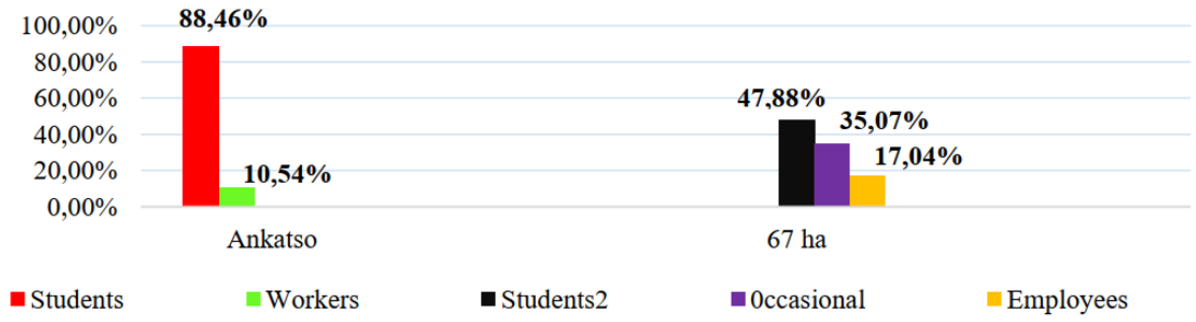


Figure 2 : Consumers profile

In Ankatso, 88.46% of the consumers are students and 10.54% are workers. In 67ha, most of the consumers are students 47.88%, occasional consumers are 35.07% and 17.04% are employees. Generally, a large number of the consumers in the two areas are students. The purchase frequency per week and the demand of the consumers s are illustrated in the figure 3.

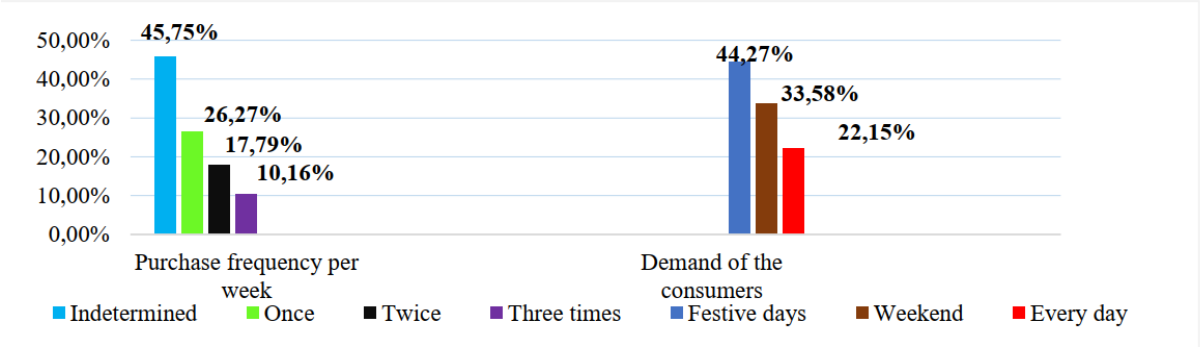


Figure 3 : Weekly supply and demand

The surveyed consumers (10.16%) eat one the products three times a week, 17.79% eat it twice a week and 26.27% once a week whereas 45.75% consume the product occasionally. Like any commercial activity, there is high season for the sale. The skewers and grilled meat are especially consumed on festive days (44.27%) and weekends (33.58%). Every day, the demand of the consumers is at 22.15%.

3.2. Results of the BaP dosage

The results of the BaP in the beef skewers and grilled chicken are shown in the table 2.

Table 2: The content of BaP.

Type of used fire and cooking duration	*BaP in beef skewers*	*BaP in grilled chicken*	*Standard CE N°835/2011*
Braise fire 10 à 25 min	*0,66 µg/kg*	*4,09 µg/kg*	*2 µg/kg*
Intense fire Fewer than 10 min	*0,25 µg/kg*	*1,34 µg/kg*	*2 µg/kg*

The quantity of BaP in beef skewers is less than BaP in grilled chicken. The quantity of formed BaP during the 10 to 25 min cooking with braised heat fire is superior to the 10 min cooking with intense fire. It reaches 0.66 µg/kg for the beef skewers and 4.09 µg/kg for the grilled chicken. With intense fire, this content decreases to 0.25 µg/kg, the grilled chicken cooked with braised heatreaches twice more of this amount.

So, the development of BaP in the two products is not related to the high temperature of the fire, but it depends on the cooking duration. A Khi2 testisrealized to check the dependence between the variables. We have two qualitativevariables: the BaP quantity in the variety of grilled meat (chicken and beef) and the heattemperature (braised heat, intense). In null hypothesis (Ho), the content of BaP is not linked to theincrease in the fire temperature while in the alternative hypothesis, the two variables depend oneach other. The p-value (0.9546) is superior to significance threshold 0.05. So that, thehypothesis Ho is agreed which means the development of BaP is not related to the intensity offire.

IV. Discussion

The difference in the rate of BaP in these foods is due to: the kind and surface of the piece of meat in contact with the charcoal fire, and the grilling for cooking the meat. The meat in contact with heat for hours provides HAP [9,12]. In addition, the grilled chicken is susceptible to contain BaP because of its amount of fat. The exudation of fat from heat increases the development of HAP [9,10,11]. Skewers are grilled with specific materials. Sometimes, the sellers use 6 cm spaced metal rod (which permits a direct contact of meat and the fire), the dug flat iron also is used to cook the skewers. Figures 4 and 5 show the types of used grill for cooking the meat.

Figure 4 : Type of grill for beefskewers Figure 5 : Type of grill for grilled chicken (Source : author)

Studies were done to limit the contact between the meat fat and the source of heat to decreasethe pyro synthesis of HAP. Using barbecue with a vertical heating system allows to avoid theexuded fat to the fame. It leads to the development of HAP at 10 times to 30 times less thanwith classical barbecue with horizontal system [3,18]. And the content of the most raised BaPis registered for the barbecue grilling (0.09 to 4.86µ/kg) even they were few (about 0.1µg/kgfor that are cooked with spoil or roast). Concerning the variability of the meat, the highestquantity of BaP were measured in the chicken and in the beef [9].

Consequently, it is important to give some suggestions to improve the practice of grilling andto limit the overexposure of the foods to the composition.

- The foods must be cooked with braised heat, not in a direct contact with the fire[12].
- The cooking temperature should not exceed 22O°C and the grill ought to be put at least10 cm from the braised heatin case of horizontal grill or even choose the vertical grill [1, 18].
- It is crucial to avoid the fat to fall in the fire. The leaner is the meat, the lower is the riskof BaP [2].

However, HAP contamination risk increases if the way of cooking is not wellcontrolled. In fact, the failing fat in the fire provokes fumes and flame which creates HAPwhen it is in contact with the meat. Then, it has to be covered with thin ash or to take offthe fat of the meat.For hygienic and security reason, permanent cleaning of all the grilling materials isrequired.

V. Conclusion

The grilled chicken has a high quantity of BaP which is superior to the limit 2µg/kgcompared to beef skewers. Cooking with braised heat fire for 10 to 20 min presents more content ofBaP than cooking with intense fire for 10 min or less. Consuming beef skewers or grilledchicken may cause immediately notified or chronic disease, it depends on the consummationfrequency and the amount of the products. But it provides protein for the young consumers asmeat contains essence amino acid and grill can reduce chronic malnutrition (whose prevalenceis 47.3% in Madagascar). In a word, a good alimentation is a source of better economicdevelopment of a country.

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Design Personar Chatbot for Customer Service Case study : Sound Indy Shop

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ABSTRACT

The importance of maintaining customers is that the mission of maintaining the loyalty of current customers to the business is something that entrepreneurs cannot ignore at all. Nowadays, social media marketing has become to competition in the business. The objective of this paper to design the persona chatbot for conversation between the customer and business. In the case of the study was the small business for sale about headphones accessories. The design and implementation of the chatbot to provided the customer used the Chatfuel platform on Facebook. The results of this paper show that the chatbot can support communication with the customer and the chatbot at any time.

Keywords—Chatbot; Chatfuel; Small business; Artificial intelligence;

I. INTRODUCTION

Nowadays, the competition of the business marketing in the social network are highly competitive. In the of several years, A one-stop-shop has become very popular from the online trade with the rapidly expanding modern online shopping. The intense online competition is putting pressure on e-commerce businesses around the world to urgently adjust their trading strategies. Especially for product delivery to meet the needs of most online customers who want the product the next day after placing an order. In Thailand, although the e-commerce business is worth over 2 trillion baht, the purchasing habits have changed to social media purchases such as Facebook, Line and Instagram.

Headphones or earphones are inseparable companions of multimedia devices such as a computer, laptop, smartphone, mp3 player, or other devices to privately listen to audio without disturbing anyone in the vicinity. The sound indy shop is a small business for sale the headphone to the customer or the people in the social network. Currently, the sound indy shop has more than 15 bands selected from leading brands covering a wide range of products that are involved in listening to music. The main products are portable music players, headphones, headphone upgrade cables, and accessories, etc. Sound indy shop business is purchased and sold, which imports products from the partner store to be sold to the customer from the social media and also, sold at the point of sale.

Online shopping through social media One of the main factors that affect each purchase decision that is a conversation between buyers and sellers. Social media power has shifted the actions of online shopping. Businesses now create social media fan pages for their brands through Facebook, Instagram, and Twitter to reach many customers which have led to new types of marketing plans, called social media marketing (SMM). SMM is described as the method of using social media networks to create, interactively deliver, and turn corporate contributions beneficial to corporate stakeholders [2]. Besides, the communication of SMM is effective communication through social media reduces the risk of product misunderstandings. If a business can present accurately, fast, to the point, it will build confidence and enhance the good image of the business.

However, the issue directly or indirectly affects the cost of the business, since using individuals to answer questions with customers is a waste of labor and time, and emotions and feelings at different times can affect the standard of answers that can cause negative customer feelings. As a result of this problem, many businesses use "chatbots", customer interactions on behalf of individuals, divided into artificial intelligence (AI Chatbot) and rules-based chatbots.A chatbot is a conversational agent with a computer program that can conduct a using natural language speech conversation between the man and a computer possible [3]. Chatbots are also referred to as artificial intelligence conversation systems have been developed to aid people in managing time commitments and performing tasks [4]. The process of chatbots works intelligently by interpreting users' input before providing answers, and the basic conversation of the chatbot was the keywords that are inputted and respond with the most suitable matching keyword replies from their databases [5].

The contribution of this paper is that proposes to design a conversation system is based on real customer data conversation with the seller (sound indy shop).[informatics-06-00046.pdf]

II. MATERIAL AND METHODS

A. Data collection

1)*Data Collection*

Experiments with generative chatbots were performed using a small domain-specific manually created dataset, having QA pairs. This dataset contains real questions/answers about the company (sound indy shop) products, prices, supported languages, and used technologies (in Thai language).

B. Chatbot for customer service

A chatbot is a program that a conversational system that allows the user to interact with the machine through natural language [6]. Nowadays many chatbot systems with different purposes s such as customer support, health, and education, in addition to marketing, entertainment, and general assistance with simple tasks [7].

Recently, the importance of support in customer service of chatbots. Customer service is the one of most important for support the business and customer with support offered before and after they buy products or service. A customer service chatbot is program that playing to answer basic customer questions via a business messenger using AI and machine learning without any human intervention. Therefore, chatbots can be a great way to augment and replace human personnel in customer service, since they are also capable of answering higher value queries [8]. Chatbots in customer service should be perceived as a combination of three elements: Interface, Intelligence, and Integration [8]. Among the top three benefits of implementing chatbots, they mentioned: enhanced employee productivity, an improved ability to manage client queries by networking with other bots, as well as providing customers with a personalized and unique shopping experience access to information [9].

Chatbots, to be able to carry on a conversation with the user, must have the following components [10]:

- Conversational artificial intelligence is the engine of Chatbots. Through this tool, it is possible that the management and processing of natural language is carried out. Through conversational AI, Chatbots have the ability to analyze user entries, learn from them and generate a response as appropriate as possible in relation to the input entered.
- User experience (UX), is responsible for making the conversation between the Chatbot and the user as natural as possible and that it is intelligent and logical.
- User interface (UI), is the component through which the user interacts with the Chatbot, that is, they are the elements that the user can physically see and hear to make decisions and follow the conversation.
- Conversational design is a design language, which is based on human conversations. It is the
- conversational design and responsible for providing human logic to an artificial intelligence.

1) *AI platform creating facebook chatbot*

The following AI-powered solution to create a chatbot for the multi-platform, including Facebook messengerincluding:Chatfuel, Dialogflow, ManyChat, MobileMonkey, and etcplatefrom. In this paper used the chatfuel

(1.1) Chatfuel

Chatfuel is first and foremost a powerful chatbot builder that focuses on automation and versatility. Its main focus is building bots that can do it all, from answering questions to collecting emails.Chatfuel creates bots by using content blocks. These are sections of content that appear on the Messenger bot.Basically, each dialogue that the chatbot sends to the user is a block. Chatfuel compares blocks to pages of a website in that the user can navigate them based on his or her needs.The idea is to create a chatbot block by block. This approach allows you to customize every part of the chatbot, which makes it great for creating a personalized customer experience. A Chatfuel chatbot is made up of cards. Cards contain content in some form, and they can also contain plugins that will direct your users to the next part of the flow, export their data, or perform some other action [11].

C. Methods

This paper proposed the design persona chatbot to customer service for the small business, Case study: Sound indy shop the methodology including:

1. Define the problems and the functionalities for a chatbot;
2. Identify the conversation flow and input;
3. Design the user intent recognitionfollowing conversation flow;
4. Design user interface for the chatbot
5. Determine to develop the chatbot inchatfuel tool;
6. Test the chatbot and obtaining approval of relevant stakeholders;

III. Results and Discussion

As mentioned earlier in the paper approach and strategy, for the authors to collect as relevant data as possible for this study, primary data from interviews and secondary data from Facebookfan page company will be used. The result of the data collection to be implement to design the persona chatbot for customer service show that:

1) The results interview of Frequently Asked Question reponses (FAQs). These are normally 20 topics and answers with short text responses along with follow up links as needed which contains additional details and information.

2) The result of identify the conversation flow and input show that the dialog flow of conversation from the customer and the chatbot as shown in figure 1. In the dialog flow design, the conversation architecture to show representations of what the bot will say at each step from the FAQs. The input of conversation flow as shown in Figure 2.

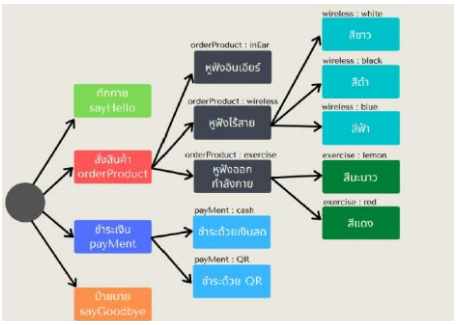

Figure 1. Example for dialog flow of conversation flow.

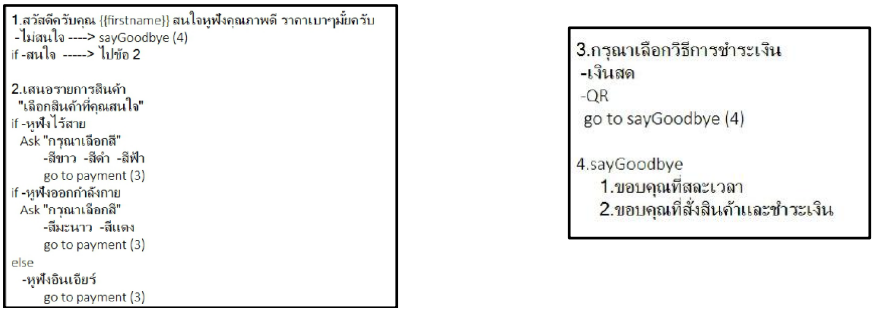

Figure 2. Example for input of conversation flow.

3) The result of intent recognition following conversation flow and user interface for the chatbot for customer service following: the context and intent recognition following conversation flow as shows in Figure 1 and 2. The design of the intent structure according to conversation flow is available key components are as follows:

- Agents: The user of the service assists in searching the information according to the requirements of user.
- Intents: Defining the role of chatbot based on the objective followed the conversation flow.

The step design of the chatbot following:

- The welcome message is the one that shows up when a potential customer interacts with your bot for the first time as shows in Figure 2

Figure 3. welcome message.

- Setup AI to customer service, which specific words canbe mapped and answered using an existing block, a predefinedtext or a randomized answer out of a predefined set of answers as shown in Figure 4

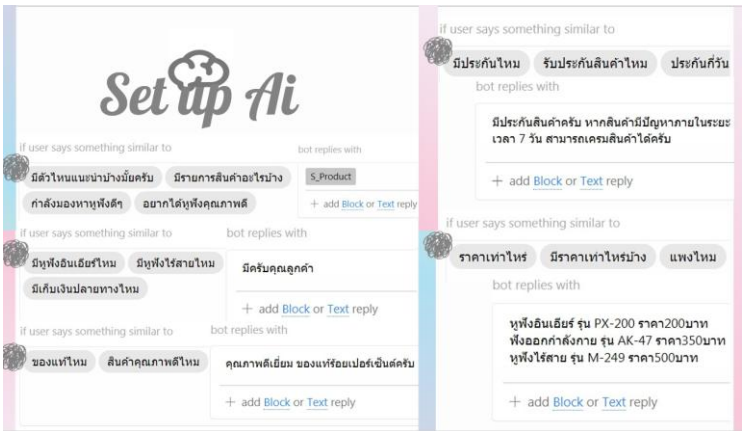

Figure 4. Setup AI for FAQs.

- Design menu for interactive with customer followed the intent recognition with conversation flow as shows in Figure 5.

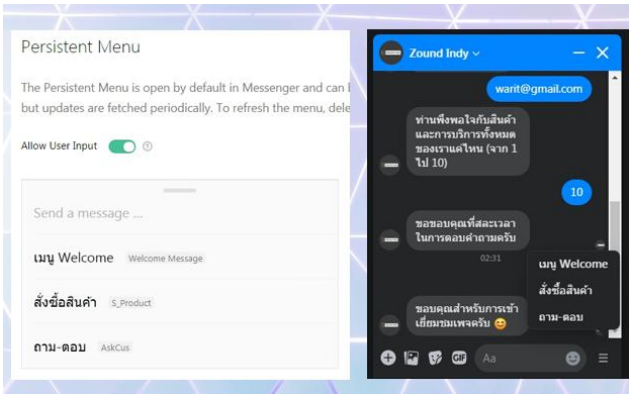

Figure 5.Menu for customer service.

4) Evaluated of the chatbot used assessment method to the satisfaction score from the customer about 10 people was good level.

IV. Conclusion

In this paper proposed the design persona chatbot the provide the customer service in the small business based on the social media. A chatbot is the new platform for communication between the customer and the small business by allowing the real time and unlimited access to some information at all time without to ask owner.

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