The Study of Instant Pad Thai Powder Processing

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Abstract

This paper aimed to study the process of making instant Pad Thai powder by Spray Drying method. The appropriate temperature of hot gas and the quantity of Maltodextrin in processing instant Pad Thai powder by Spray Drying method were studied. Factorial in Completely Randomized Design (CRD) was used. The study found that the appropriate quantity of Maltodextrin was 20% and the appropriate temperature for in and out hot gas was 150/90 ºC. The color variation of the finishing instant Pad Thai powder was as follow: Bright colors L* 88.32 Red a* 0.99 Yellow b* 8.26. The color variation after cooking the product was: Bright colors L* 30.73 Red a* 3.08 Yellow b* 8.25. aw 0.22. The moisture of the powder was 1.24. Then, the consumer satisfaction was studied by using 3 types of Pad Thai Noodles; Pad Thai Noodles with Instant pad Thai Powder, Pad Thai Noodles with regular Pad Thai sauce, and Pad Thai Noodles sold in general market. Randomized Complete Block Design, RCBD was used. The study of the consumer satisfaction revealed that there was no difference between pad Thai Noodles made with Instant Pad Thai Powder and Pad Thai Noodles made with regular Pad Thai sauce at the statistical significance ($p>0.05$). The testers rated the overall taste of Pad Thai Noodles at 7.57. Next, the researcher studied the expiration period of Instant Pad Thai Powder by packing the product in double vacuum foil and storage the product at 4 different temperatures 30, 35, 45, and 55 degree Celsius. Then the product was studied to evaluate the physical, chemical, microorganism, and sensory property. The product kept at 55 ºC was the most different of the four storage products at $p \leq 0.05$ with the highest level of consumer satisfaction at color = 7.33, smell = 7.30, taste = 7.90, texture = 7.57 and total = 7.40. The amount of microorganism, yeast, and fungus were at the safe level to comsume.

Key words : Instant Pad Thai Powder Spray Drying Pad Thai Noodle

Introduction

Thai Food has been known as one of the Thai identities and well accepted all around the world. This also indicates to long history of collected attainment of Thai people. The subject of cooking would be the best way to conserve the quality and nutrition value of the food. And the subject of preparation is tended to focus on harmonious of tastes and aroma . The punctiliousness on choices of ingredients of the food is very attractive , and the flavor is excellent . The government supports Thai Food export, opening of Thai restaurants abroad and Thai Food materials export. Various kinds of Thai Food are popular around the world such as Green Curry, Tom Yum Koong (Shrimp spicy soup), Hot dishes, Pad Thai noodle, etc. Pad Thai noodle, or Pad Thai in panatelas, has been selected as one of the best dishes by Thai people. Later, it became the national food that is well known by foreigners worldwide, indicated by survey result of the best international Thai dishes in 1999 by the office of the National Culture Commission (the journal of the national research council of Thailand, 2003).

Pad Thai noodle has a unique taste as different from other kind of noodle meals internationally. The mellow taste of Pad Thai comes from major ingredients such as Thai noodles, thick tofu, fermented turnip (Chai Powe), red onion, dried salted prawn, egg and seasonings compounded of tamarind juice, fish sauce, coconut sugar, vinegar and salt. To cook Pad Thai, melt and mix all seasonings together to make Pad Thai sauce. Then, fry red onion and follow with salted turnip in a pan. Stir Thai noodles and add a little bit of water to soften the noodle. Then add the prepared Pad Thai sauce together with thick tofu, dried salted prawn, egg and bean sprouts. Now, Pad Thai cooking is finished. In foreign countries, it is quite inconvenient to find fresh ingredients and materials to make original Pad Thai.

Aforementioned, the author of this research is interested to study methods of producing Pad Thai noodle sauce in the form of instant powder, which is convenient for everyone's usage including Thai restaurants in foreign countries.

The purpose of this research was to: (1) To study temperature of hot wind and the proper quantity of Molto dextrin used in spray drying the Pad Thai sauce. (2) To study and compare Pad Thai powder to the original Pad Thai sauce and the locally sold Pad Thai. (3) To study shelf life of Pad Thai powder.

Experiment process

Study Temperature of Hot Wind and the Proper Quantity of Molto dextrin to Spray Drying the Pad Thai Powder.

Base on the Pad Thai noodle sauce which is accepted from the experiment in Germany and United Kingdom as the formula basis. The composition in Pad Thai noodle sauce are tamarind juice, coconut sugar, sugar, vinegar, fish sauce and salt. There has been an adjustment to use natural color sugar instead of granulated bleached sugar. The was of Molto dextrin in this formula is to crystallize the product. Then, prepare the composition of the basic formula Pad Thai noodle sauce which are tamarind juice, fish sauce, vinegar, salt and Molto dextrin except the natural color sugar. Fiber-dry the natural color sugar under the experimental design of "Factorial in Completely Randomized Design (CRD)" method. The first factor to study in Spray drying by using Molto dextrin is studying to the 3 levels of proper quantity of Molto dextrin which are the percentages of 15, 20 and 25. The second factor is studying the proper temperature in Spray drying process. There are 2 levels of temperature which are the beginning hot wind temperature 130 ±10 Celsius degrees, the terminated hot wind temperature 80 ±5 Celsius degrees and the beginning hot wind temperature 150 ±10 Celsius degrees, the terminated hot wind temperature 90 ±5 Celsius degrees. Then, mix the Spray drying Pad Thai flavoring powder with natural color sugar. And restore to former form by thawing in boiled water in the calculated ratio. After that, analyze physical quality which are color, water activity (a_w), and calculate percentage of yield, and analyze chemical of which are humidity (%) and the amount quantity total soluble solid (° Brix)

The Study of Consumer's Acceptance, Comparing All 3 Products which are Instant Pad Thai Powder, the Original Pad Thai Sauce and the Accepted Locally Sale Pad Thai Sauce.

After the Spray drying of basic formula of Pad Thai noodle composition and the studying of sensory evaluation, Pad Thai powder, the original Pad Thai sauce and the accepted locally sold Pad Thai flavoring product was compared. The ratio of Pad Thai powder after restore the form was 92 grams and Pad Thai noodle 80 grams, stirred into 3 kinds of Pad Thai. Then, plan the Randomized Complete Block Design, (RCBD). The usage of 3 kinds of Pad Thai noodle which had been analyzed the attributer in color, flavor, taste, texture and overall liking by tasting the meal and rate to 9-point Hedonic scale. 30 evaluators tasted samples trice. The result was analyzed for varying facts (Analysis of Variance, ANOVA) and analyze the difference of the varying facts by Duncan's New Multiple Range Test (DMRT) theory.

Study Shelf Life of Instant Pad Thai Powder.

Study the Shelf life of Instant Pad Thai Powder that has been accepted by testers for Shelf life Study by packing in a vacuum bag and pack again inside a foil bag. 4 different levels of temperature of storage are 30, 35, 45 and 55 Celsius degrees. Then, analyze the physical quality which are color and examine the changing of a_w. Chemical analysis consists of examination of the change of humidity and the amount of total soluble solid (º Brix). Microbiological quality analysis examine the amount of the total plate count, yeast and Molds. The sensory evaluation was conducted by stiring Instant Pad Thai Powder together after restoring the form with Pad Thai noodles. This experiment used 30 evaluators who are the food expertise teachers to evaluation in color, flavors, taste, texture and overall liking. The test is also divided into 9-point Hedonic scale. And analyze the vary facts from the result (Analysis of Variance, ANOVA). And analyze the difference of average facts by Duncan's New Multiple Range Test method. These were tested every 2 weeks for 12 weeks.

Data Analysis Result and Result Discussion.

Temperature Study of Hot Wind and the Proper Quantity of Molto dextrin to Spray Drying the Instant Pad Thai Powder, indicate that when hot wind by incoming and outgoing increased from 130/80 to 150/90 degrees Celsius, and the quantity of Molto dextrin increased from 15, 20 and 25% respectively, effected to a_w and humidity decrease (%). The rates of a_w decreased from 0.265 to 0.240, 0.230 to 0.202 and 0.249 to 0.233 consecutively. Meanwhile, the rates of humidity (%) decreased from 1.71 to 1.11, 1.50 to 1.40 and 1.35 to 1.24 respectively. Anyhow, the rate of Yield percentage was increasing when the level of Moltodextrin and the temperature during the drying was higher. The high temperature caused the Instant Pad Thai Powder to good conditioning level and there was no powder left in the spray drying machine. And this used a short time to make. As for the color of the original formula of Pad Instant Pad Thai Powder restore to former form, the study of hot wind and the proper quantity of Molto dextrin to Spray drying the the Instant Pad Thai Powder, founded the quantity of Molto dextrin at 20% and the incoming and outgoing hot wind temperature at 150/90 Celsius degrees. a_w rate and humidity were in low level. The results were appropriated for producing the Instant Pad Thai Powder. Moreover, the observation of the Spray drying indicates that the incoming and outgoing hot wind temperature at 150/90 Celsius degrees in 1 hour, produce Instant Pad Thai Powder constantly and less leftover in the machine which caused only a small loss of the product. Thereby, the level of Molto dextrin at 20% and the incoming and outgoing hot wind

temperature at 150/90 Celsius degrees were selected . In order to spray drying the Instant Pad Thai Powder which gives the best physical and chemical quality including Yield percentage.

Results of the Study of Consumer Acceptance by Comparing 3 Products which are the Developed Instant Pad Thai Powder, the Basic Formula Pad Thai Noodle Sauce and the Accepted Locally Sold Pad Thai Sauce.

Table 1 The mean scores of satisfaction in general qualification of cooked Pad Thai noodle by 3 kinds of products.

Qualification	Pad Thai noodle cooked by 3 kinds of products.		
	Developed formula	Basic formula	Local formula
Color	6.87 ± 1.07 [b]	6.60 ± 0.94 [b]	**7.50** ± 1.04 [a]
Flavour	7.53 ± 0.95 [a]	**7.70** ± 0.86 [a]	7.00 ± 0.84 [b]
Taste	**7.63** ± 1.05 [a]	7.57 ± 0.93 [a]	6.70 ± 1.16 [b]
Texture	7.57 ± 0.83 [a]	**7.67** ± 0.82 [a]	7.17 ± 1.09 [b]
Overall liking	**7.63** ±1.08 [a]	**7.63** ± 1.03 [a]	7.27 ± 1.16 [a]

*Values within rows followed by a different letter are signify cant ($p \leq 0.05$).

After the research indicates that the mean scores of Overall liking of the kinds of products have no difference in statistically significance ($p \leq 0.05$). As for the mean scores of satisfaction in color, flavour, taste and texture of the developed Instant Pad Thai Powder and the basic formula Pad Thai noodle sauce have no difference statistically ($p \leq 0.05$). These also indicate that the evaluators accepted the developed Instant Pad Thai Powder as being the same as the basic formula Pad Thai sauce. Because the consumers concur Pad Thai that is cooked by the developed Instant Pad Thai Powder as the same as the basic formula Pad Thai noodle sauce. Therefore, the researcher kept the developed Instant Pad Thai Powder for furthermore study in shelf life.

Results of the Study of Shelf Life of Instant Pad Thai Powder.

Table 2 Results of the study of chemical quality factor in humidity (%) of Instant Pad Thai Powder, when kept in 4 different levels of temperature for 12 weeks.

Shelf life duration (Weeks)	Humidity (%)			
	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
0	1.40 ± 0.00	1.40 ± 0.00	1.40 ± 0.00	1.40 ± 0.00
2	0.71 ± 0.01	0.64 ± 0.03	0.54 ± 0.03	0.54 ± 0.02
4	0.77 ± 0.02	0.69 ± 0.01	0.60 ± 0.01	0.58 ± 0.01
6	0.80 ± 0.02	0.75 ± 0.04	0.67 ± 0.02	0.62 ± 0.03
8	0.87 ± 0.03	0.81 ± 0.01	0.69 ± 0.01	0.68 ± 0.01
10	0.89 ± 0.01	0.87 ± 0.02	0.71 ± 0.01	0.70 ± 0.01
12	0.92 ± 0.02	0.90 ± 0.01	0.77 ± 0.02	0.83 ± 0.01

The numbers indicated that there were humidity (%) changes of Instant Pad Thai Powder which had been kept in 4 different levels of temperature. When the Shelf life duration of 12 weeks, the humidity in Instant Pad Thai Powder had increased each week. But the humidity (%) of the Pad Thai noodle flavoring powder quantity was less than the criterion which was under the percentage of 13 of the weight at the standard of community instant Kanom Jin (Thai rice noodle) sauce product.

Table 3 Results of the Study of Chemical Quality Factor in Total Soluble Solid Quantity (ºBrix) of the Instant Pad Thai Powder, when Kept in 4 Different Levels of Temperature for 12 Weeks.

Shelf life duration (Weeks)	The amount total soluble solid (º Brix)			
	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
0	47.2 ± 0.25	47.2 ± 0.25	47.2 ± 0.25	47.2 ± 0.25
2	48.2 ± 0.25	48.3 ± 0.25	48.2 ± 0.26	48.3 ± 0.26
4	48.3 ± 0.29	48.3 ± 0.15	48.5 ± 0.32	48.1 ± 0.10
6	49.3 ± 0.15	49.10 ± 0.10	49.50 ± 0.20	49.27 ± 0.21
8	49.1 ± 0.17	49.2 ± 0.15	50.3 ± 0.20	51.6 ± 0.12
10	49.7 ± 0.15	50.3 ± 0.20	51.7 ± 0.15	51.9 ± 0.10
12	50.5 ± 0.15	50.9 ± 0.15	51.9 ± 0.10	52.3 ± 0.21

The numbers indicated that there were amount of total soluble solid (º Brix) changed of the Instant Pad Thai Powder which had been kept in 4 different levels of temperature. The amount of total soluble solid was increasing in each week.

Table 4 Results of the study of physical quality factor in free water activity (a_w) of the Instant Pad Thai Powder, when kept in 4 different levels of temperature for 12 weeks.

Shelf life duration (Weeks)	water activity (a_w)			
	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
0	0.19 ± 0.00	0.19 ± 0.00	0.19 ± 0.00	0.19 ± 0.00
2	0.27 ± 0.02	0.26 ± 0.01	0.21 ± 0.01	0.22 ± 0.01
4	0.29 ± 0.01	0.28 ± 0.01	0.26 ± 0.02	0.26 ± 0.02
6	0.30 ± 0.01	0.31 ± 0.01	0.28 ± 0.01	0.29 ± 0.01
8	0.32 ± 0.02	0.32 ± 0.01	0.29 ± 0.01	0.30 ± 0.10
10	0.32 ± 0.01	0.34 ± 0.01	0.31 ± 0.01	0.32 ± 0.02
12	0.32 ± 0.01	0.34 ± 0.01	0.33 ± 0.01	0.34 ± 0.02

The numbers indicated that when keeping the Instant Pad Thai Powder in 4 different levels of temperature for 12 weeks, the free water quantity (a_w) was increasing each week. Therefore, the Instant Pad Thai Powder had lower than the criterion of 0.6 at the standard of community instant Kanom Jin (Thai rice noodle) sauce product.

From the study of microbiological quality factor indicated that the longer of shelf life duration, more of yeast amount would increase from the 12 weeks of shelf life. The estimated quantity was less than 10 CFU/g which was not over the standard of the community dried chili paste product had fixed as maximum 100 CFU/g. Synopsis, the developed Instant Pad Thai Powder that had been kept for 12 weeks was safe and harmless to consumers.

And from the study of microbiological quality factor indicated that the changing in amount of microorganism of the Instant Pad Thai Powder in 4 levels of temperature, the longer of shelf life duration quantity was increasing in each week. But the level was under the standard of the community dried chili paste product had fixed as maximum $1x10^3$ Colonies per 1 gram of example. Synopsis, the developed Instant Pad Thai Powder that had been kept for 12 weeks is safe and harmless to consumers.

Table 5 The Mean Scores of Satisfaction in the Instant Pad Thai Powder Product Acceptance after the beginning of Shelf life Duration.

Qualification	Instant Pad Thai Powder				
	Controlled Example Set	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
Color	7.67 ± 0.48 [a]	6.23 ± 0.68 [c]	6.40 ± 0.72 [c]	7.00 ± 0.64 [b]	7.50 ± 0.52 [a]
Flavor	7.27 ± 0.64 [a]	6.47 ± 0.68 [b]	6.17 ± 0.91 [b]	6.30 ± 0.84 [b]	6.57 ± 0.57 [b]
Taste	7.33 ± 0.61 [a]	6.33 ± 0.76 [b]	6.30 ± 0.95 [b]	6.47 ± 0.63 [b]	6.97 ± 0.85 [a]
Texture	7.03 ± 0.85 [a]	6.43 ± 0.90 [b]	6.47 ± 0.78 [b]	6.33 ± 0.88 [b]	6.50 ± 0.63 [b]
Overall liking	7.63 ±0.61 [a]	6.53 ± 0.63 [cd]	6.40 ± 0.67 [d]	6.83 ± 0.59 [bc]	7.13 ± 0.51 [b]

*Values within rows followed by a different letter are signify cant ($p \leq 0.05$).

The numbers indicated that the consumers accepted the controlled Instant Pad Thai Powder example set and that had been kept in 55 Celsius degrees the most. Because when it was kept under high temperature, the product would turn up more brown color. And the scent of the flavor would be more obvious similar to the cooked Pad Thai noodle sauce.

Table 6 The Mean Scores of Satisfaction in the Instant Pad Thai Powder Product Acceptance after 4 Weeks of Shelf Life Duration Study.

Qualification	Instant Pad Thai Powder				
	Controlled Example Set	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
Color	7.47 ± 0.78 [a]	6.03 ± 0.89 [b]	5.97 ± 0.89 [b]	6.00 ± 0.98 [b]	7.17 ± 0.65 [a]
Flavor	7.27 ± 0.61 [a]	6.47 ± 0.63 [b]	6.53 ± 0.78 [b]	6.63 ± 0.61 [b]	7.57 ± 0.63 [a]
Taste	7.47 ± 0.51 [a]	6.23 ± 0.68 [c]	6.40 ± 0.72 [c]	6.77 ± 0.43 [b]	7.43 ± 0.50 [a]
Texture	7.47 ± 0.63 [a]	5.90 ± 0.71 [c]	6.03 ± 0.56 [c]	6.13 ± 0.63 [c]	6.97 ± 0.32 [b]
Overall liking	8.10 ±0.66 [a]	6.73 ± 0.45 [c]	6.80 ± 0.41 [c]	6.87 ± 0.51 [c]	7.53 ± 0.57 [b]

*Values within rows followed by a different letter are signify cant ($p \leq 0.05$).

The numbers indicate that the consumers accepted the controlled Instant Pad Thai Powder example set and that has been kept in 55 Celsius degrees the most. Because when the Instant Pad Thai Powder was kept at 55 Celsius degrees, hence to high temperature, the product would turn up

more brown color than the first week of the shelf life duration. And the flavour of the sugar would be more obvious similar to the cooked Pad Thai noodle sauce.

Table 7 The Mean Scores of Satisfaction in the Instant Pad Thai Powder Product Acceptance after 8 Weeks of Shelf Life Duration Study.

Qualification	Instant Pad Thai Powder				
	Controlled Example Set	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
Color	7.20 ± 0.96 [b]	6.33 ± 0.88 [cd]	6.07 ± 0.78 [d]	6.73 ± 0.83 [c]	7.70 ± 1.14 [a]
Flavor	7.13 ± 1.17 [a]	6.73 ± 0.58 [ab]	6.33 ± 0.76 [b]	6.50 ± 0.94 [b]	7.00 ± 0.98 [a]
Taste	7.80 ± 0.92 [a]	6.47 ± 0.68 [c]	6.43 ± 0.68 [c]	6.63 ± 0.67 [c]	7.17 ± 0.70 [b]
Texture	7.47 ± 0.82 [a]	6.27 ± 0.74 [c]	6.20 ± 0.61 [c]	6.87 ± 0.78 [b]	7.03 ± 0.49 [b]
Overall liking	7.40 ± 0.56 [a]	6.40 ± 0.86 [c]	6.33 ± 0.71 [c]	6.90 ±0.71 [b]	7.27 ± 0.83 [ab]

*Values within rows followed by a different letter are signify cant ($p \leq 0.05$).

The numbers indicated that the consumers accepted the controlled Instant Pad Thai Powder example set and that has been kept in 55 Celsius degrees the most. Because when the Instant Pad Thai Powder was kept at 55 Celsius degrees, hence to high temperature, the product would turn up more brown color than the 4th week of the shelf life duration. And the flavour of the sugar would be more obvious similar to the cooked Pad Thai noodle sauce.

Table 8 The Mean Scores of Satisfaction in the Instant Pad Thai Powder Product Acceptance after 12 Weeks of Shelf Life Duration Study.

Qualification	Instant Pad Thai Powder				
	Controlled Example Set	30 Celsius degrees	35Celsius degrees	45 Celsius degrees	55 Celsius degrees
Color	6.93 ± 1.11 [ab]	6.47 ± 0.51 [c]	6.53 ± 0.57 [c]	7.23 ± 0.83 [a]	7.33 ± 0.71 [a]
Flavor	6.83 ± 0.99 [b]	6.67 ± 0.66 [b]	6.67 ± 0.48 [b]	6.93 ± 1.05 [ab]	7.30 ± 0.84 [a]
Taste	7.07 ± 1.01 [b]	6.83 ± 0.53 [b]	6.73 ± 0.45 [b]	7.57 ± 0.73 [a]	7.90 ± 0.61 [a]
Texture	7.00 ± 1.08 [bc]	6.57 ± 0.68 [d]	6.80 ± 0.55 [cd]	7.37 ± 0.72 [ab]	7.57 ± 0.50 [a]
Overall liking	6.87 ± 1.17 [bc]	6.73 ± 0.58 [c]	6.63 ± 0.56 [c]	7.23 ± 0.73 [ab]	7.40 ± 0.56 [a]

*Values within rows followed by a different letter are signify cant ($p \leq 0.05$).

The numbers indicated that the consumers accepted the most the controlled Instant Pad Thai Powder example set which had been kept in 55 Celsius degrees. Because when the Instant Pad Thai Powder was kept at 55 Celsius degrees, hence to high temperature, the product would turn up more brown color than the 8th week of the shelf life duration. And the flavour of the sugar would be more obvious similar to the cooked Pad Thai noodle sauce.

Experiment conclusion

Results of the study about temperature and the proper quantity of Molto Dextrin for the Instant Pad Thai Powder by Spray Drying method were 20% of Molto Dextrin, and the incoming and outgoing of hot wind temperature at 150/90 degree Celsius. The results of consumer acceptance research by comparing among 3 kinds of products indicated that the Pad Thai noodle flavoring powder could be substituted for the basic formula of Pad Thai noodle sauce. The consumers could hardly distinguish the difference except for little less flavor. The result of chemical quality changing which were humidity (%) and the amount of total soluble solid (º Brix), the conserved Instant Pad Thai Powder within 4 different levels of temperature which were 30, 35, 45 and 55 degree Celsius for 12 weeks, were lower than the standard rate and safe for consumption. The study of physical quality changing which were color of the Instant Pad Thai Powder before restore to form, color of the Pad Thai noodle flavoring powder and after restore to form color and the amount of water activity (a_w) that has been kept in 4 different levels of temperature which were 30, 35, 45 and 55 degree Celsius for 12 weeks, were lower than the standard rate referred to community instant Kanom Jin (Thai rice noodle) sauce product. The study in microorganism quality changing of Instant Pad Thai Powder that has been kept in 4 different levels of temperature which were 30, 35, 45 and 55 Celsius degrees for 12 weeks, indicated that the amount of microbe was lower than the criterion, referred to instant Kanom Jin (Thai rice noodle) sauce product. Therefore, Instant Pad Thai Powder stored in 4 different levels of temperature which were 30, 35, 45 and 55 degree Celsius could be kept up to 12 weeks.

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