Study on the Formula of Moringa Noodles

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Abstract. In order to improve the nutritional value of the noodles products, we added some ingredients in noodles and *Moringa* noodles were made. In this paper, the wheat flour was used as the raw material, adding appropriate amount of *Moringa* powder, and study on the formula of *Moringa* noodles. The experiment took the optimization of the orthogonal experimental design and analysis. The optimum conditions for wheat flour: distilled water: *Moringa* powder were mixed with the ratio of 200:90:10. According to the optimal scheme for the sensory evaluation of *Moringa* noodles was Grain powder 2.5%, CNC 0.3%, edible alkali 0.2%, salt 2.0%, and the noodles display good quality and the sensory score was 81.

1. Introduction

Moringa oleifera, also known as drumstick tree, white cauliflower, is a species belonging to the Moringaceae family. Originating in India and its name owing to roots with spicy. The whole plant has edible value, roots and bark is traditional medicine raw materials, oil is rich in its seeds and can be used as a storage of edible vegetable oil. *Moringa* leaves are vegetables which it has a large amount of nutrition, such as protein, minerals, vitamins and calcium, potassium, iron and other mineral elements, is a comprehensive nutritional supplement. *Moringa* have the effect of improving immunity, anti-inflammatory, analgesic, preventing and treating diabetes, hypertension and other effects, therefore *Moringa* is widely applied in medical and health care, etc [1-6]. It was reported that *Moringa* is recognized for its nutritional properties. *Moringa* leaves can be fresh to eat, eat cooked or made into powder storage, it can even preserve a few months without the loss of nutrients at room temperature. It is reported that daily consumption of 25 g *Moringa* leaves dry powder, the body can get the 42% protein, 125% calcium, 61% magnesium, 41% potassium, 7l% iron, 272% vitamin A and others of the recommended standard.

At present in Chinese, the nutritional value of *Moringa* has been recognized by people, but there still exist some limits in the development of products. The visible products in market is mostly the substitute tea with other compounds of *Moringa* leaves, the use of nutritional food additives just have *Moringa* flour products. The research of its active ingredient and the product development has become a hot spot. So the depth development and utilization of Moringa has important economic value and social significance [7-9].

2. Materials and Methods

2.1 Material
Moringa powder, Plain flour purchased from the market.

2.2 Process Flow

First take the appropriate amount of raw material (the salt dissolved in water in advance), then stir them to make it mixed evenly, next knead the dough to place the dough fluffy, and forming by pressing. Final cut into strips to dry naturally and can put into the bag to wait be tested.

2.3 Determine the Basic Formula of the Product

Based on the exploratory experiment pre-period, decided to select 4 important factors for this experiment: grain powder, CNC, dietary alkali and salt respectively. And design the experiment of four factors and three levels orthogonal test [10]. The sensory score was taken as the investigation index in order to determine the best product formula. Factors and levels were shown in Table 1.

Table 1 Factors and levels of the orthogonal experiment

level	Grain powder (A)/%	CNC (B)/%	Dietary alkali (C)/%	Salt (D) /%
1	2.0	0.25	0.15	1.5
2	2.5	0.30	0.20	2.0
3	3.0	0.35	0.25	2.5

2.4 Sensory Evaluation Methods

The comment group was composed of 10 students, and mainly focused on the color, appearance, palatability, toughness, viscosity, smoothness and taste evaluation. In order to improve the credibility of the evaluation, for the member of the comment group should not drink alcohol, not smoking and not eat spicy food before tasting. And after evaluating a sample, remember to gargle with water and then evaluate the next sample and develop the evaluation criteria. (Table 2)

Table 2 Sensory evaluation standard of *Moringa* noodles

Sensory index	Grading standard		
The index of Color 10 score	Refers to the color and brightness of noodles, noodles with natural pale red or dark red, bright 8.5~10 score	The brightness is commonly 6~8.4 score	Brown, gray, the score of brightness is 1~6 score
Apparent state 10 score	Refers to the surface is smooth 8.5~10 score	The surface of the noodles is slightly rough 6.0~8.4 score	The surface of the noodles is terrible 1~6 score
Palatability 20 score	The power of biting the noodles is moderate 17~20 score	The power of biting the noodles is stiff or soft slightly 12~17 score	The strength of biting the noodles is too hard or too soft 1~12 score
Toughness 25 score	When the noodles are chewing, the feel of chewing is full of elasticity 21~25 score	Chewing generally and elastic in general 15~21 score	Lack of flexibility 1~15 score
Viscosity 25 score	In the chewing process, the noodles are not sticky teeth 21~25 score	When chewing the noodles, the feel is slightly sticky teeth 15~21 score	In the process of chewing noodles, sticky teeth seriously 1~15 score
Smoothness 5 score	The taste is smooth when tasting the noodles 4.3~5 score	The taste of noodles is slightly rough 3~4.3 score	Poor smoothness 1~3 score
Taste 5 score	The taste of noodles are fragrant 4.3~5 score	No unpleasant taste 3~4.3 score	There is an unpleasant taste 1~3 score

2.5 The Determination of The Texture of Noodles

Weighing 50 g noodles sample, and put it in a small aluminum pot with 500 ml boiling water which heating on a 200 W electric furnace, when the white core disappeared, and gain noodles

immediately then add cold water cooling for 2min and taking 3 root noodles put on texture instrument, then determine the texture of noodles. The average value was measured by 5 groups of data. All speed of pre-measured, determination speed and after the determination speed are 0.8 m/s. The deformation rate is 75%; the type of trigger is automatic and the power of trigger is 5.0 g. The type of probe is TA3/100 and cycle number is 2 times.

3.   Results and Discussion

3.1 Determine the Basic Formula of the Product

This is a test of 4 factors and 3 levels which the indicators to be investigated is the comprehensive score of sensory evaluation. The higher the score, the better the effect. Since the interaction was not considered, the orthogonal table L9 (3^4) can be used to arrange the test and can get the results of orthogonal experiment. (Table 3)

Table 3 The results of orthogonal test

Number	Factor				score
	A	B	C	D	
1	1	1	1	1	74.40
2	1	2	2	2	75.50
3	1	3	3	3	74.60
4	2	1	2	3	76.30
5	2	2	3	1	77.10
6	2	3	1	2	77.80
7	3	1	3	2	74.70
8	3	2	1	3	76.40
9	3	3	2	1	76.10
K1	224.50	225.40	228.60	227.60	
K2	231.00	229.00	227.90	228.00	
K3	227.40	228.50	226.40	227.30	
k1	74.83	75.13	76.20	75.87	
k2	77.00	76.33	75.97	76.00	
k3	75.80	76.17	75.47	75.77	
R	2.17	1.20	0.73	0.23	
Main factors sort			A B C D		
Optimal scheme			$A_2B_2C_1D_2$		

From the table, we can get the result of maximum polarity was A, then B was second, the rank of C was third, and D was minimum. That was to say, the amount of grain powder had the greatest impact on *Moringa* noodles quality, and the amount of CNC was less. The amount of edible alkali had the minimum influence on the quality of *Moringa* noodles. According to the range analysis, the optimum process parameters were $A_2B_2C_1D_2$, so the amount of grain powder, CNC, edible alkali, and salt were 2.50%, 0.30%, 0.15%, and 2% respectively, then could get the best quality of *Moringa* noodles which the sensory indicators such as taste, toughness, texture, viscosity and et al can get the standard of excellent.

3.2 The Determination of the Texture

Table 4 The comparison of the texture between *Moringa* noodles on the market and the products from the experiment

	hardness	viscosity	elasticity	gumminess	chewiness
Market products	15.22± 4.94	1.54± 1.23	1.23± 0.18	7.37± 1.33	8.94± 1.11
Experiment products	20.22± 2.98	1.86± 0.37	1.51± 0.35	6.10± 0.95	9.4± 3.48

Through the table we could get clearly the index of the hardness, the viscosity, the elasticity and the chewiness were higher than the market, the gumminess was lower than the market, and had a better taste, it was easier to chew and did not stick to the teeth, even the repeatability of the data was better than the market.

Finally, according to the SB/T-10068 to be compared, the ratio of the measured by the index of Moringa noodles were within the range of product level, belongs to first grade product.

4. Conclusion

At present, the research about *Moringa* is more focused on the cultivation technology, but the development of products about *Moringa* in the field of food is less. Because of the nutritional value of *Moringa* noodles is higher, has broad prospects for the development. According to the optimum conditions for wheat flour: distilled water: *Moringa* powder were mixed with the ratio of 200:90:10. And the optimal scheme for the sensory evaluation of *Moringa* noodles is: Grain powder 2.5%, CNC 0.3%, edible alkali 0.2%, salt 2.0%, the noodles display good quality. The ratio of the measured by the index of Moringa noodles were within the range of product level, belongs to first grade product. With the deeper study about *Moringa*, we can believe *Moringa* noodles will occupy a larger share in the market in the near future, and will have better prospects for the development.

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