Study on microwave drying effect of instant noodle

Abstract: Microwave drying instant noodles is a kind of non-fried instant noodles, which avoids the harm of high fat in the fried instant noodles to human health. The taste, color, toughness, smoothness, palatability and rehydration of the products are superior to other non-fried drying methods. Based on the moisture content, rehydration time and sensory evaluation of instant noodles, the factors affecting the drying effect of microwave drying were studied. Results: Boiling time, microwave drying time and microwave power all affected the drying effect. The orthogonal experiment showed that the best drying effect was obtained when the boiling time was 3 minutes, the microwave drying time was 3.5 minutes and the microwave power was 600W.

With the rapid development of economy and people's favor for three low-fat, low-sugar and low-salt foods, fried-free instant noodles have attracted more and more attention. Free-frying instant noodles is a kind of noodles which are made by hot air, freeze-drying or Microwave drying equipment and other drying methods without frying. The noodles are characterized by smooth, good rehydration, rich taste and long shelf life. The cost of freeze-drying instant noodles is too high for large-scale production because of its high production cost; the structure of products obtained by hot-air drying is compact due to its long drying time; the gelatinization degree in the surface of products by Microwave drying instant noodle equipment is high, and its toughness, smoothness, palatability and rehydration are superior to other non-drying instant noodles. Frying and drying methods.

Microwave drying can greatly prolong the shelf life of instant noodles because of its sterilization. However, the technology of microwave drying instant noodles is not very mature, and the drying effect of instant noodles is not stable. In this paper, the factors affecting microwave drying of instant noodles were studied and analyzed in order to find the reasonable parameters of microwave drying of instant noodles.

Glassware and others: beaker, glass rod, weighing bottle, dryer, Petri dish. Pot; electric furnace; gauze; tweezers.

The technological process of frozen fresh noodles thawing cooking cooling microwave drying cooling finished product inspection, natural thawing at room temperature for about half an hour, such as noodles to restore the original state of nature.

Cooking: the temperature is 100 C, and the time is determined by different single factors and orthogonal experiments. Cooling: put noodles on gauze and drain. Microwave drying: The cooled noodles are folded and placed in a Petri dish, keeping the spacing consistent, then put into a microwave oven, heating according to the set time and power. Cooling: after drying, the instant noodles are cooled to room temperature at room temperature. Determination of moisture: Determination of moisture content with reference to GB/T5009.3- 2003 direct drying method. Rehydration time was measured by placing the dough in a beaker and adding boiling water about three times the mass of the dough. Take out a noodle and squeeze it with two pieces of transparent glass. Observe whether there is a white core in the middle of the noodle.

The disappearance time of the white core is the rehydration time of the noodle.

Sensory evaluation: According to the quality standards, instant noodles should have sensory standards: normal appearance of instant noodles should be uniform milky white or light yellow, no burning phenomenon, positive and negative sides can be slightly different. It has normal odor, no mildew, rancid taste and other peculiar smell. The appearance is neat and the pattern is even. After the noodles were retreated, there was no obvious breakage, the taste was not too thick, the teeth were not sticky, and there was no visible impurity. Accordingly, three professionals with rich experience in sensory evaluation were asked to evaluate the sensory organs according to the scoring criteria shown in Table 2-1. The drying effect of microwave drying instant noodles was influenced by the cooking time, microwave drying time and microwave power. Based on this, the above three factors were determined to carry out a single factor study to investigate the changes of water content and rehydration time at different levels.

Effect of boiling time on drying efficiency of microwave instant noodles The effect of microwave drying time on instant noodles drying effect The fixed boiling time is 3 minutes, the microwave power is 600W, and then the microwave drying time is changed as shown in Table 3. The influence of microwave power on the drying effect of microwave instant noodles According to the result of single factor test, the level of each factor was selected, then orthogonal test was arranged. Orthogonal table L9 (34) was selected to determine the moisture content and rehydration time under different combinations, and sensory evaluation was carried out.

RESULTS AND ANALYSIS: According to single factor test results, the effects of boiling time on rehydration time and water content are shown in Fig. 1 and 2. Fig. 1 Relationship between boiling time and rehydration time No. 1 2345 Boiling time/min 1 2345 Item Full Score Apparent State 20 Color 10 Hardness 10 Elasticity 20 Viscosity 10 Smoothness 10 Taste 10 Bubble resistance 10 Total Score 100 Sequence 1 2345 Drying time/min 0.51 45 Sequence No. 1 2345 Microwave power/W 120 250 4506 00 700 shows the effect of different cooking time on the rehydration time and moisture content of instant noodles when the microwave drying time is 2.5min and the microwave power is 600W. As can be seen from Fig. 1, the longer the boiling time is, the shorter the rehydration time is. But when the boiling time is longer than 4 minutes, the longer the rehydration time begins. This is mainly due to the excessive gelatinization of starch and excessive water absorption, which makes the unit drying power required for drying increase. As shown in Fig. 2, the longer the boiling time, the lower the moisture content of instant noodles. The long boiling time can improve the alpha degree of noodles. The higher the alpha degree, the lower the viscoelasticity of noodles, the faster the rehydration.

The color and transparency of the noodles are ideal, and are easy for human digestion and absorption. According to the experimental results, the boiling time of the process is 3min.

The results showed that the longer the microwave drying time, the shorter the rehydration time, the better the rehydration, and the lower the moisture content. However, when the drying time was 5.5 minutes, the noodles appeared scorching phenomenon, which was mainly due to excessive loss of moisture in noodles. Some of the bound water emitted, resulting in the destruction of the original state of noodles, loss of proper food properties, so the No. 5 test did not determine its rehydration time and moisture content. As time goes on, when 2.5min reaches,

the rehydration time tends to be stable, generally around 225s. Therefore, choosing drying time 2.5min is the best.

The relationship between microwave power and rehydration time: The relationship between microwave power and moisture content can be seen from Figure 5. With the increase of microwave power, the rehydration time of instant noodles is gradually shortened. This may be due to short-term drying at high temperature, rapid evaporation of moisture, slight expansion of noodles, internal porosity, and improved rehydration. Some scholars have recognized that The higher the microwave power, the faster the drying rate, the shorter the drying time, and the higher the rehydration rate, but it has a greater impact on the color. This is due to the rapid microwave heating speed and the spatial distribution of electromagnetic field. With the increase of microwave power, the moisture content tends to balance gradually. When the power reaches 450W, the moisture content is maintained below 10%, which conforms to the national standard for non-fried instant noodles. When 700W microwave drying, some noodles turn yellow, 120W noodles do not change color, rehydration is poor. Therefore, the quality of 600W microwave drying is better.

According to the single factor test results, in line with the principle of energy conservation, each factor selected three levels, factor level selection as shown in Table 5. Table 5 Factor Horizontal Table Level 123 Boiling Time (A) / min 234 Drying Time (B) / min 12.53.5 Microwave Power (C) / W 250 400 600 66 The most important indicator should be water content, because excessive water content will accelerate the growth and reproduction of microorganisms, shorten product shelf life. The range R of each factor corresponding to the water content index is greater than that of the empty row, so it can be determined that all the factors listed (boiling time, drying time, microwave power) have an impact on the water content.

According to the value of R, it can be seen that factor B, that is, drying time is the most important factor affecting moisture content, followed by microwave power, and finally boiling time. According to table 7, the effect of microwave drying time on moisture content is obvious. The results of range analysis showed that microwave drying instant noodles made the lowest moisture content of the combination B3C3A3. The shorter the rehydration time, the shorter the better. According to the value of R', the most important factor is drying time, followed by boiling time, and finally microwave power. According to table 8, the effect of microwave drying time on rehydration time is obvious. The result of range analysis shows that the best combination is B3C3A3. According to the data in the table, the drying time is the most important factor affecting the sensory quality. When the drying time is 3.5 minutes, the comprehensive score is the best, followed by microwave power, and the boiling time is the weakest. According to table 9, the effect of microwave drying time on sensory score is obvious. Microwave drying equipment has a certain expansion effect when it is dry, making the taste better. According to the result of range analysis, the best combination of B3C3A3 is selected. According to the test results, the best combination of B3C3A3 was selected, that is, the boiling time was 3 minutes, the drying time was 3.5S and the microwave power was 600W.

The combinations selected in the validation experiment were not validated in the nine experiments of orthogonal table according to the selected combinations. When the boiling time was 3 minutes, the drying time was 3.5 minutes and the microwave power was 600 W, the

moisture content of instant noodles was 5.0%, the rehydration time was 200 seconds, and the sensory score was 88 points.

In the single factor experiment, as far as the boiling time is concerned, because the rehydration time decreases with the prolongation of boiling time, the change of water content is small, the boiling time is 3 minutes. In the study of microwave drying time, it was found that the rehydration time and moisture content decreased with the increase of drying time, and eventually tended to balance; the best rehydration time and moisture content was 2.5min. 600W is the best.