

## Study of Cross-crack Type of Oil-tea Camellia Heated by Microwave

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**Abstract:** For obtaining the oil-tea camellia fruit physical properties, the study points out one crack type of oil-tea camellia fruit which heated by microwave. The fruit's diameters, quality, crack lengths are measured and fruit crack pictures in different time are taken in the whole process, the results show that about 40% crack type is cross and the crack is produced almost at the time while it is heated about 30 sec. So the microwave heating method is rapid to separate the oil-tea camellia fruit and seeds.

**Keywords:** Cross-crack type, microwave, oil-tea camellia fruit

### INTRODUCTION

Oil-tea camellia fruit is combined with camellia shell and camellia seeds, it's usually separated by sunshine on the sunny days in china, so it is a new kind method separating camellia shell from camellia seeds by microwave (Xiao *et al.*, 2006). The theory relief graph is as Fig. 1. In the study (Dai and li, 2000), the authors established the constant material consumption emergency model using the research results of single resource material scheduling. Malone and Crowston (1994) established multi-resources emergency system scheduling model. Xiong and Sin (2006) built a multi-emergency point scheduling model of city emergency materials and gave the solution. After that, (Hu, 2010) built a multi-objective optimization model for emergency logistics distribution with multiple supply points and multiple resource categories.

The microwave drying system is composed of microwave generator, waveguide assembly, microwave dryer, cooling device, drive system, control system, security system, shown as Fig. 2. Microwave generator is the key part of drying device, it is formed by magnetron and micro-wave battery, its' main function is producing the needed microwave energy; the microwave produced by the microwave tube is transmitted to the microwave dryer through waveguide assembly almost no lost. The microwave dryer is the interaction space enforcing camellia fruit and microwave, microwave energy is the drying energy of camellia fruits, it makes the camellia's water gasify; Then the cooling system can pump out the water and cool the camellia fruits. Control system is used to adjust devices' all parameters. It can be installed on the microwave generator, also can be separated with the main frame.

In this study, we point out one crack type of oil-tea camellia fruit which heated by microwave. The fruit's

diameters, quality, crack lengths are measured and fruit crack pictures in different time are taken in the whole process, the results show that about 40% crack type is cross and the crack is produced almost at the time while it is heated about 30 sec. So the microwave heating method is rapid to separate the oil-tea camellia fruit and seeds.

### RESULTS ANALYSIS

**Observation of the crack forming process while microwave heating camellia oleifera:** 2011 fall's camellia fruit sizes, qualities, crack lengths are shown as Table 1.

2010 fall's camellia fruit sizes, qualities, crack lengths are shown as Table 2.

Relation of time and quality of No1 camellia fruit shown as Fig. 3, its' crack changing shown as Fig. 4 a to c.

Sample No2 cross diameter are 32.96 and 37.06 mm, the longitudinal diameter is 31.88 mm, its' quality, related crack lengths are shown as Table 3. Relation of time and quality of No2 camellia fruit shown as Fig. 5, No2 camellia fruit cracks'changing are shown as Fig. 6 a to b.

### CONCLUSION

Whether camellia fruit is dried by natural sunshine or microwave, camellia fruit's inner construction is shown as Fig. 7.

From Fig. 7, camellia fruit cracking theory can be explained as follows while it is heated by microwave: Firstly, in the process of camellia growing, for its' own gravity causes more water content of its' bottom, fibrous tissue is more loosen, so this point will crack easily;

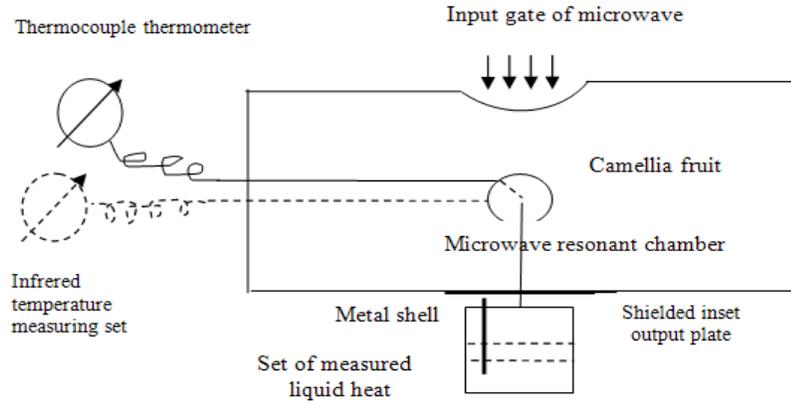


Fig. 1: Experiment equipment construction and theory relief graph

Table 1: Relation of camellia fruit sizes, qualities, crack lengths

No	Diameter 1 (mm)	Diameter 2 (mm)	Diameter 3 (mm)	Quality (g)	Heating time (30S)		Heating time (60S)	
					Crack length (mm)	Quality (g)	Crack length (mm)	Quality (g)
1	34	30.38	33.86	19.8	19.5		18.7	
2	31.18	37.46	39.22	25.5	25.1	73.36	24.5	

Table 2: Relation of camellia fruit qualities, crack lengths and types

Time (s)	Quality (g)	Crack length (mm)	Crack type
0	30.95	0	
10	30.88	0	
20	30.66	0	
30	30.34	4.86/13.48 = 18.34	⊥
40	30.17	16.18/49.42 = 65.6	+
50	29.64	23.54/66 = 89.54	+
60	29.33	25.1/71.98 = 97.08	+
70	29.2	31.58/73.14 = 104.72	+
80	28.76	32.18/74.32 = 106.5	+
90	28.11	44.4/82.98 = 127.38	+
100	27.11	47.36/88.54 = 135.9	+
110	26.44	48.9/89.64 = 138.54	+
120	25.68	49.5/90.78 = 140.28	+
150			

Table 3: Relation of No2 camellia fruit qualities, crack lengths and types

Time (s)	Quality (g)	Crack length (mm)	Crack type
0	21.47	0	
10	21.44	0	
20	21.01	5.44/14.42 = 19.86	⊥
30	20.62	11.96/20.18 = 32.14	+
40	19.99	33.68/51.26 = 84.94	+
50	19.32	38.12/56.06 = 94.18	+
60	18.82	42.26/62.28 = 104.54	+
70	18.26	43.86/62.94 = 106.8	+
80	17.73	43.92/63.78 = 107.7	+
90	17.03	44.96/71.64 = 116.6	+
100	16.58	46.96/65.4 = 112.36	+
110	16.22	47.12/64.82 = 111.94	+
120	15.79	47.8/67.32 = 115.12	+

Secondly, in the process of heating, water gas will transmit from inner to out, the centre gap of camellia fruit is biggest, the most the water gas gathers, on the affection of water gas, the camellia fruit shell is crushed and sheared by camellia seeds, the most raised point of

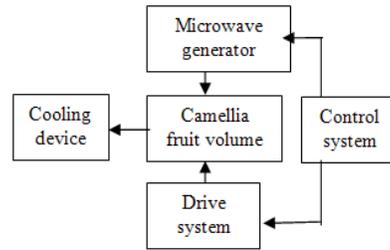


Fig. 2: Microwave device of camellia fruit shell bursting

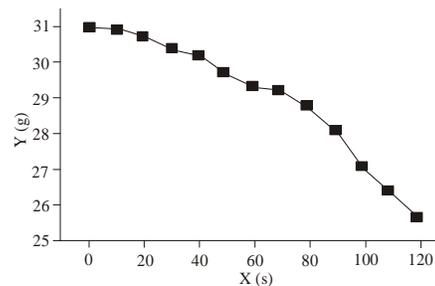


Fig. 3: Relation of time and quality of No1 camellia fruit

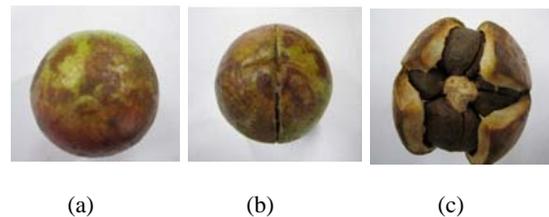


Fig. 4: No1 camellia fruit cracks' changing

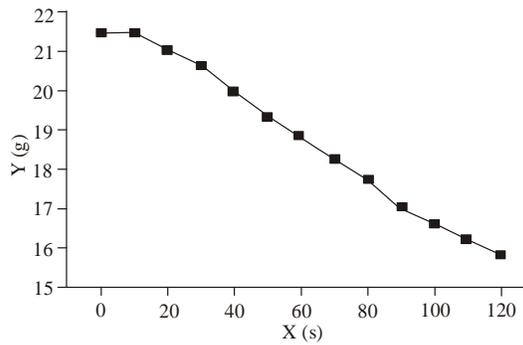


Fig. 5: Relation of time and quality of No2 camellia fruit

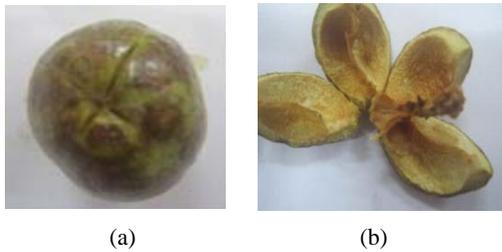


Fig. 6: No2 camellia fruit cracks' changing



Fig. 7: Camellia fruit's inner construction

camellia seeds will crack. Of course, there is an important factor, while heated by microwave, camellia seeds will be more inflation than camellia shell obviously, affected by

the microwave, camellia seeds will crush camellia shell, thus result in the shell burst of camellia fruit (Li *et al.*, 2011).

The results show that about 40% crack type is cross and the crack is produced almost at the time while it is heated about 30 sec. So the microwave heating method is rapid to separate the oil-tea camellia fruit and seeds.

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