

## Introduction

*Ganoderma* solid-state fermented product has high crude polysaccharide and it is very popular in functional food industry. Radio frequency (RF) can cause polar water molecule rotation and ionic components vibration to immediately increase temperature. Therefore, the downstream process such as pasteurization and drying by RF can overcome heat transfer resistance to reduce the process time.

## Objective

The objectives of this study were to establish RF pasteurization and RF drying processing of *Ganoderma* solid-state fermented product.

## Experimental design

*Ganoderma lucidum* (BCRC36123) 14-days solid-state fermented adlay product



↓ 1 kg  
RF power output at different gaps (11-20 cm)

RF pasteurization → Validation

↓  
RF drying

↓  
Temperature profile & drying curve

↓  
Grinding (60 mesh)

↓  
*Ganoderma lucidum* solid-state fermented product powder



## Results and discussion

Table 1 was showed that *Ganoderma lucidum* required 60, 50 and 30 s to inactive at 70, 80 and 90°C heating. The temperature of 1 kg *Ganoderma* solid-state fermented product by 60 s RF heating with 11 cm gap was higher than 70 °C to accomplish pasteurization (Fig. 1 & Fig. 2). The temperature and drying curves of 1 kg *Ganoderma lucidum* solid-state fermented adlay product by RF at gap of 11 cm drying were shown in Fig. 3. *Ganoderma* fermented product of 1 kg required 8, 10 and 13 min to reduce moisture content from 60% to 8% and obtain drying rate of 48, 37 and 29 g water/ min by RF air drying with 11, 13 and 15 cm gap, respectively. (Table 2)

## Conclusions

RF heating at narrower gap significantly reduced pasteurization and drying time; therefore it improved downstream processing of *Ganoderma* solid-state fermented products.

Table 1. The survival condition of *Ganoderma lucidum* in heating 1 mL PDB at 60~90°C water bath after 14-day cultivation

Temperature (°C)	Time (s)				
60°C	0	60	120	180	240
	Y	Y	N	N	N
70°C	0	30	60	90	120
	Y	Y	N	N	N
80°C	0	25	50	75	100
	Y	Y	N	N	N
90°C	0	15	30	45	60
	Y	Y	N	N	N

\* Y: growth, N: death

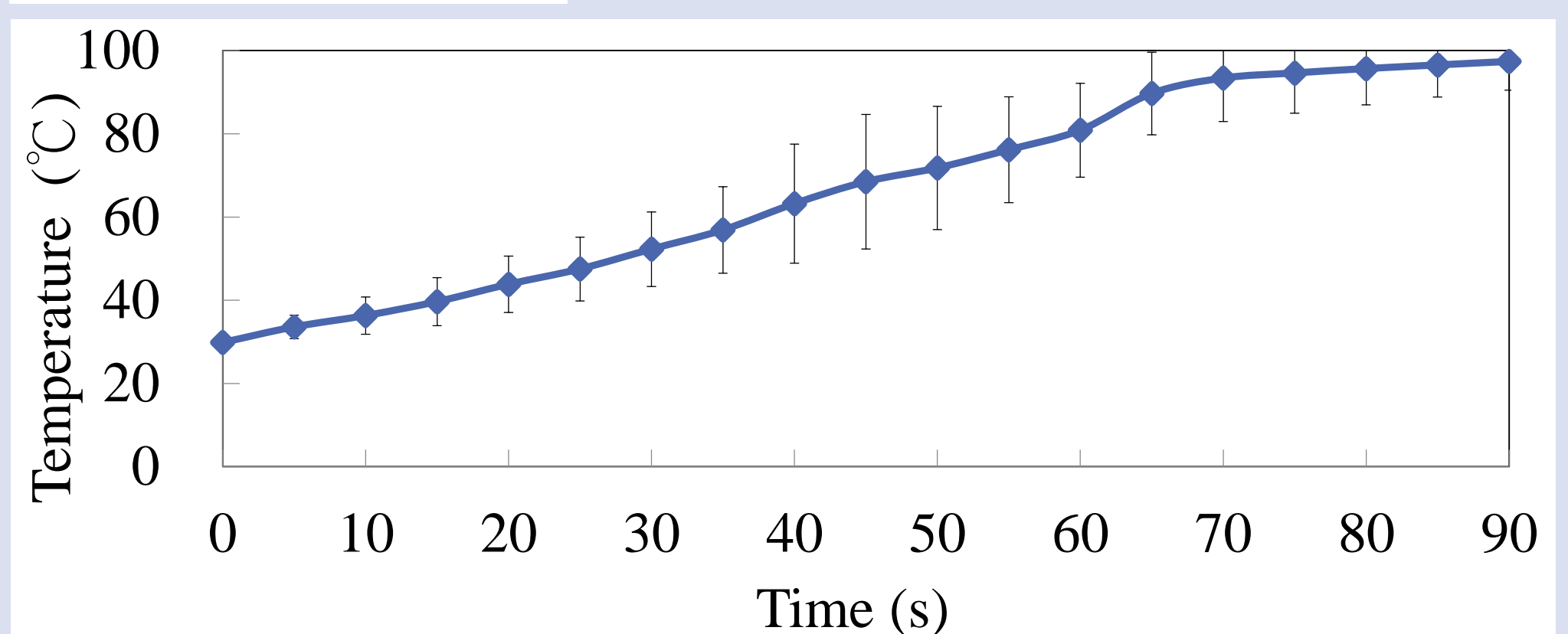


Fig. 1. The temperature profile of 1 kg *Ganoderma lucidum* solid-state fermented adlay product during RF heating at 11 cm electrode gap.

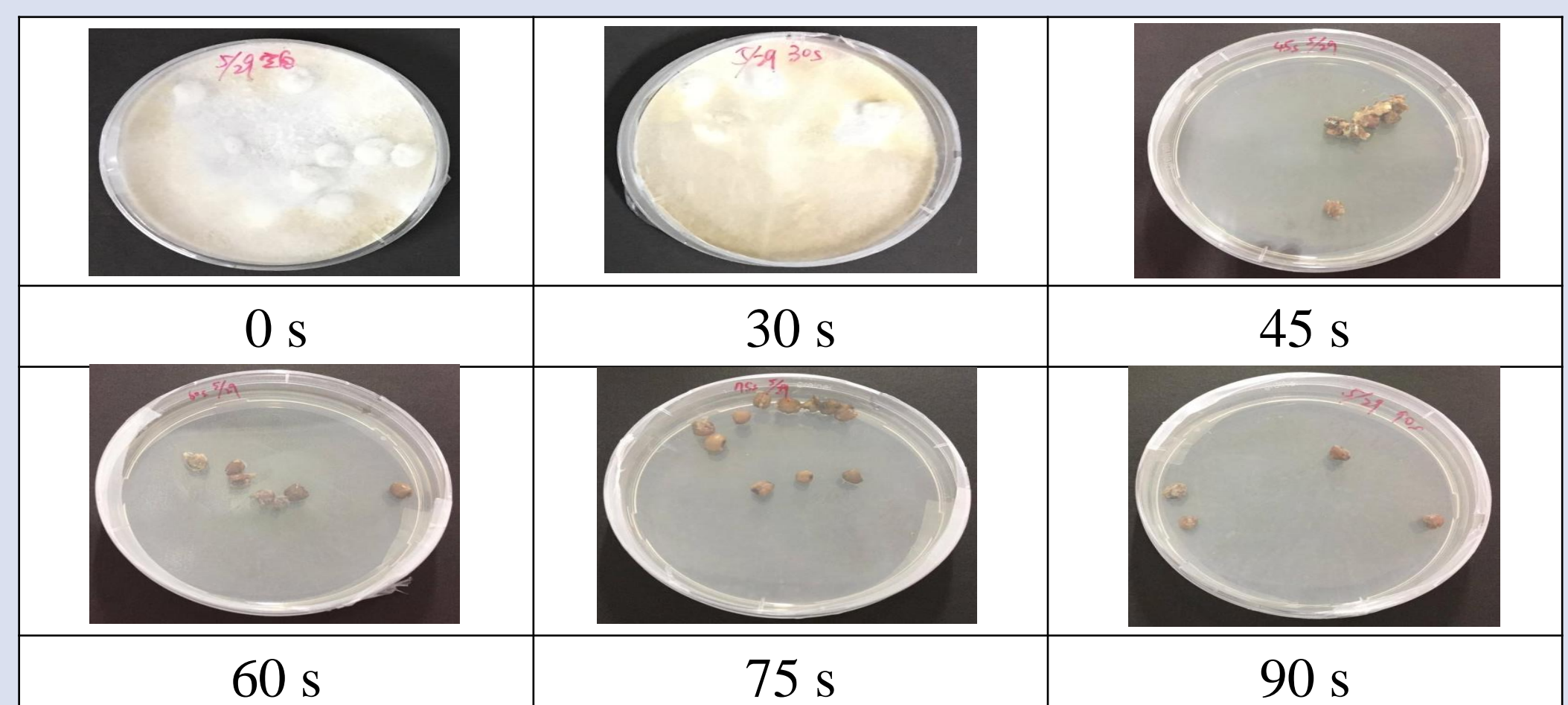


Fig. 2. The survival condition of *Ganoderma lucidum* by RF at gap of 11 cm heating 1 kg *Ganoderma* fermented adlay product at after 14-day cultivation.

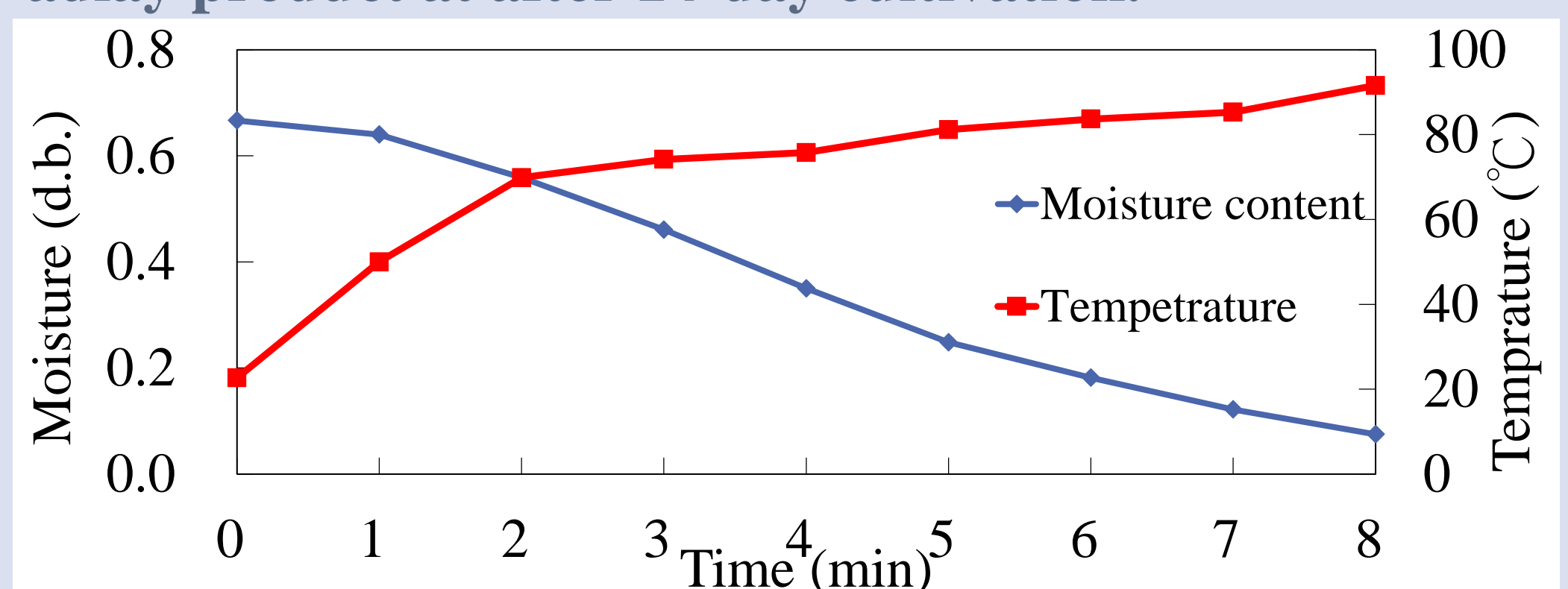


Fig. 3. The temperature profile and drying curve of 1 kg *Ganoderma lucidum* solid-state fermented adlay product by RF at gap of 11 cm drying.

Table 2. Effect of RF with different gap on drying time and drying rate of 1 kg *Ganoderma lucidum* solid-state fermented adlay product

RF gap (cm)	Drying rate (g H <sub>2</sub> O/min)	Drying time (min)
11	48	8
13	37	10
15	29	13