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Study on Germicidal Effect of Plant Material Fresh Bitter *Momordica charantia*

Shang-qin Hu

College of Life Science Chongqing Normal University, Chongqing , China

Abstract: For the further development and utilization of bitter gourd, this study used fresh bitter *Momordica charantia* sterilization experiment. It is mainly to study the bitter melon juice to the several common food contaminating microorganisms. Using concentration gradient dilution of ten times dilution of the tested fungi and fresh bitter *Momordica charantia*, diluted into different concentrations and the balsam pear juice respectively with different processing test bacteria. Through the dilution culture method to calculate the number of live bacteria and its sterilization rate. The experimental results show that bitter melon juice concentration, 40-80% concentration, reaction time is 60-90, the *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus* has obvious killing effect and weak inhibition on the Roux yeast and *Aspergillus niger* weak inhibition.

Key words: Bitter *Momordica charantia*, sterilization effect, application research

INTRODUCTION

Bitter gourd (*Momordica charantia* L.) belongs to cucurbitaceous *Momordica* annual trailing plants, fruits and spindle growth cylindrical, epidermal tumor protrusion, mature orange. Also known as scabies melon (Guo and Zhang, 2006). Originating in Indonesia, Europe and the Americas and was introduced into China, through land and wide plant in China, most in the southern provinces (Yan, 2004). Ancient medical books have documented, bitter gourd, bitter cold, with heat-clearing and detoxicating, wet heat removal effect on pure and clear eyes (Li *et al.*, 1999), bitter gourd can clear damp, bitter gourd can reduce eye secretion; bitter gourd has slight bitter taste and can stimulate saliva and gastric juice secretion, helps digestion and increase appetite and quinine elements contained in balsam pear also has the efficacy of Bao (2006) equivalent to malaria. As well through Clinical observation, balsam pear pulp of balsam pear is similar to the action of insulin and can drop blood sugar and has certain effect on diabetes (Wang, 2008) Pear protein components of biological activity extracted from the bitter gourd can improve the immune function of human body and a variety of bitter amino acid balsam pear contains rich vitamin C has anti-cancer effects.

But the bitter gourd as a kind of natural plant medicine food dual-use, so exploring and screening of natural resources has antimicrobial activity, it becomes a new direction of food industry research. Some Concentrate on the balsam pear leaf, root and fruit, some on the dried bitter gourd crushed into powder, some on the extraction of *Momordica charantia* but rarely directly to the bitter gourd juice for sterilization experiment

research. This experiment aims at the study from the fresh bitter melon juice sterilization effect and provides a theoretical basis for the comprehensive study of *Momordica charantia*

MATERIALS AND METHODS

Testing

Material

Balsam pear: Balsam pear fruit was bought from Chongqing city Shapingba food market.

Strain: *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus*, Roux yeast and *Aspergillus niger* were provided by the Applied Microbiology laboratory of Chongqing Normal University

Medium and drug: Beef extract peptone medium: beef extract peptone 5 g L⁻¹, peptone 10 g L⁻¹, NaCl 5 g L⁻¹, agar 18 g L⁻¹, fresh water pH 7.0 (Qian and Huang, 2008). Potato medium: Potato 200 g L⁻¹, glucose or sucrose 20 g L⁻¹ agar 20 g L⁻¹, fresh water, natural pH[7]. Malt extract medium: Malt Extract 20 g L⁻¹, agar 20 g L⁻¹, fresh water pH 6.8 (Shen and Chen, 2007). And alcohol, NaOH, HCl etc.

Equipment: Asepsis room, ultra-clean table (SW-CJ-1FD), vertical pressure steam sterilizer (YXQ-LS-100), mold incubator (SHH-250JS), biochemical incubator (SHH-250L), electronic balance (JA5003A), triangular bottle of various types (500, 250, 100 mL), Petri dish (90, 75 mm), the electromagnetic oven (IC-TW2104), Galanz microwave oven (G80W23YSL-V90), type JJ-2 Waring Blender (DS-200), test tubes, pipettes etc.

Method

Activation of strain: These five kinds of bacteria, including *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus* inoculation in beef extract peptone medium, 37 centigrade activation and cultivate 24 h. Lu's yeast in wort medium, 28 centigrade activated culture 48 h. *Aspergillus niger* seeded in the culture medium of potato, 28 centigrade activation and cultivate 96 h.

Bitter melon juice preparation: Bitter gourd were surface sterilized with alcohol and clean, cut into pieces with sterile water and put into the tissue triturator of pulp, using filter paper, get bitter solution. Then by the 10 times dilution method in solution based on 10, 20, 40, 60, 80% compound, different concentrations of bitter melon juice. put 5mL respectively into sterile tubes in the stand-by preparation of bacteria suspension liquid.

From the activation medium, respectively take the strain corresponding and put into 100 mL with sterile water (containing glass beads) triangle bottle, slightly shake10, made of bacterial suspension liquid and then 10 times dilution into 10-4, 10-5, 10-6 three concentration gradient.

Balsam pear bactericidal action: Put 10, 20, 40, 60, 80% of with 5 mL concentration of bitter melon juice, into sterile tubes and then put into respectively prepared bacterial suspension mixed 1 mL and in 30, 60, 90 min sampling 0.5 mL mixed liquid and solution cultivate, 24, 48, 96 h, count the colony (No. of colonies: "CFU"). The control group with sterile water 5 mL and mix with 1mL bacterial suspension liquid and another 0.5 mL sample solution to

the corresponding medium on plate count. According to the control medium colonies and the experimental group of medium for the growth of the number of colony growth of the difference between the calculated efficiency of sterilization.

RESULTS AND ANALYSIS

Different concentrations of the bactericidal action of bitter melon juice: When the bacteria suspension liquid concentration is 10-6, at the same time 90, bitter melon juice of different concentration of various strains of germicidal test. The results in Table 1.

From Table 1 data, seen from the table in bitter melon juice on bacterial the killing effect is obvious and with bitter melon juice in the effective increase, bactericidal effect increased. Bitter melon juice concentration more than 10% antimicrobial activity is obvious, Especially the antibacterial effect on *Staphylococcus aureus* is more obvious, in bitter melon juice concentration is 80%, the sterilization rate reached 96.7%. However, the role of *Bacillus*, yeast and *Aspergillus niger* sterilization relatively poorer, bitter melon juice concentration of 80% sterilization rate was 53 and 74%. This may be because the resistant effect of *Bacillus*, fungi (yeast and mold) cell structure is different.

Effects of different time of balsam pear: When the bacteria suspension concentration is 10-6, bitter melon juice at the same concentration and action time of tested bacteria, not at the same time, the influence of various bacteria growth, Table 2-4.

Table 1: Effects of different concentrations of various strains of bitter melon juice

Strain name	Different concentrations of bitter melon juice 90 min No. of live bacteria ($\times 10^2$ CFU mL ⁻¹)					Contrast	Different bitter melon juice concentrated sterilization percentage (%)				
	10 (%)	20 (%)	40 (%)	60 (%)	80 (%)		10 (%)	20 (%)	40 (%)	60 (%)	80 (%)
<i>Escherichia Coli</i>	117.0	110.0	33.0	30.0	14.0	145.0	19.3	24.1	72.2	79.3	90.3
<i>Bacillus Subtilis</i>	23.0	20.0	10.9	9.8	7.4	28.5	19.3	29.8	61.8	65.6	74.4
<i>Staphylococcus aureus</i>	20.2	17.0	5.2	4.2	0.9	26.9	24.9	36.8	80.6	84.4	96.7
<i>Saccharomyces rouxii</i>	12.0	9.0	8.4	7.6	6.0	12.9	6.9	30.2	34.9	41.1	53.5
<i>Aspergillus niger</i>	10.0	8.7	7.5	6.5	5.4	11.5	13.0	24.3	34.8	43.5	53.0

Table 2: Effects of different treatment of bitter melon juice time in 10⁻⁶/mL strain

Strain name	Live bacteria at different time after the bitter melon juice ($\times 10^2$ CFU mL ⁻¹)				Contrast	Bitter melon juice at different time sterilization rate (%)		
	30 (min)	60 (min)	90 (min)			30 (min)	60 (min)	90 (min)
<i>Escherichia Coli</i>	120.8	119.6	118.0		145.0	17.2	17.9	18.6
<i>Bacillus Subtilis</i>	23.5	23.3	23.0		27.5	14.5	15.3	16.4
<i>Staphylococcus aureus</i>	21.1	20.8	20.2		26.9	21.6	22.7	24.9
<i>Saccharomyces rouxii</i>	12.0	11.0	10.0		13.0	7.7	15.4	23.1
<i>Aspergillus niger</i>	11.0	10.0	9.8		12.0	8.3	16.7	18.3

Table 3: 40% Effect of bitter melon juice concentration of bacteria in different time

Strain name	40% effects of bitter melon juice concentration and different time of bacteria (10^2 CFU mL ⁻¹)				Inhibitory rate of bitter melon juice at different time (%)		
	30 (min)	60 (min)	90 (min)	Contrast	30 (min)	60 (min)	90 (min)
<i>Escherichia Coli</i>	35.8	35.1	33	145	75.3	75.8	77.2
<i>Bacillus Subtilis</i>	11.3	11.1	10.9	28.1	59.8	60.5	61.2
<i>Staphylococcus aureus</i>	5.7	5.5	5.2	26.9	78.8	79.6	80.6
<i>Saccharomyces rouxii</i>	11.43	11.4	11.4	12.0	4.8	5.0	5.0
<i>Aspergillus niger</i>	0.5	0.5	0.5	0.5	4.0	4.0	4.0

Table 4: 80% effect of bitter melon juice concentration of bacteria in different time

Strain name	80% effects of bitter melon juice concentration and different time of bacteria (10^2 CFU mL ⁻¹)				Inhibitory rate of bitter melon juice at different time (%)		
	30 (min)	60 (min)	90 (min)	Contrast	30 (min)	60 (min)	90 (min)
<i>Escherichia Coli</i>	16.80	15.90	14.00	145.0	88.4	89.0	90.3
<i>Bacillus Subtilis</i>	5.70	5.50	5.40	28.1	79.7	80.4	80.7
<i>Staphylococcus aureus</i>	1.50	1.21	0.90	26.9	94.4	95.5	96.7
<i>Saccharomyces rouxii</i>	9.70	9.64	9.60	12.0	19.2	19.7	20.0
<i>Aspergillus niger</i>	0.49	0.49	0.48	0.5	2.0	2.0	4.0

From Table 2-4 the data can be seen, under the same bitter melon juice concentration and the concentration of bacteria suspension conditions, with different time, the sterilization rate will be different. With the extension of time, the number of bacteria killed also increases, the sterilization rate is high. Bitter melon juice on *Bacillus*, yeast and *Aspergillus niger*, its bactericidal action is still weak.

CONCLUSION

This study shows that bitter melon juice on *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, molds and yeasts has certain sterilization, especially more obvious on *Staphylococcus aureus* and *Escherichia coli*, 60 min sterilization rate can reach more than 80%. And with the increase of bitter melon juice concentration, bactericidal effect is greater. At the same time, bactericidal effect of bitter melon juice with different processing time, processing time is long, the effect is better.

It can be inferred that from bitter melon juice has a good application prospect in the prevention of bacterial

food poisoning, there is research and development to contribute to the future of biological sciences and biotechnology products.

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