

# 殺菌溫度對蛹蟲草菌絲生長之影響

## Effect of sterilization temperature on *Cordyceps militaris* survival

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### Abstract

*Cordyceps militaris* is also called north *Cordyceps*., and it is a traditional Chinese medicine with expensive price. The active compounds of *C. militaris* such as polysaccharide, cordycepin, adenosine, have various pharmacology functions. The metabolites can be fast produced by fermentation technology. However, the final *C. militaris* products required to be sterilized and dried. The high temperature sterilization and drying may influence the retention of the active substance; therefore, the purpose of this research was to study the relationship between heating temperature and time on *C. militaris* survival and bioactive compounds retention. At first, 1mL PDB medium and 10 grams of wheat substrate (the moisture content is 50%) were packed into a little vial and tube, respectively, and they were heated at different temperature in a water bath and recorded the temperature time history. In addition, 1 mL pre-activated *C. militaris* was added into a vial or 10 g wheat medium, then they were heated at 60–90°C, and observed the growth of *C. militaris* after 7-days cultivation. After sterilization, *C. militaris* in PDB required 480, 180,150 and 90 sec heating at 60°C, 70°C, 80°C, and 90°C to kill. The mycelial growths of *C. militaris* in solid-state wheat required 600, 600 and 390 sec heating at 70°C, 80°C, and 90°C to kill. There were no significantly changes on adenosine and cordycepin during heating at 80°C and 90°C for 10 min.

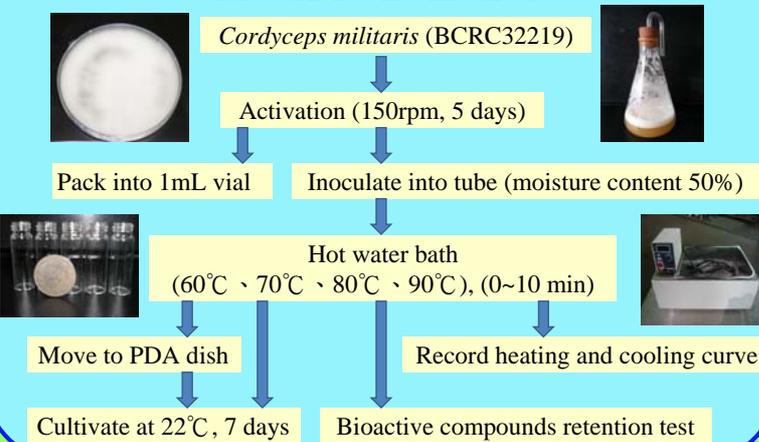
### Introduction

It is hot almost has fatal effect on all microorganism, but some heat resistance microorganism at particular temperature still survive. The temperature - time histories during heating liquid medium and solid-state medium are related to microorganism sterilization. The bioactive compounds may be destroyed by heating processing.

### Aim

To study of *C. militaris* sterilization on *C. militaris* survival and retention of cordycepin and adenosine.

### Materials and methods



### Results and discussion

The temperature profiles of heating of liquid (PDB) and solid-state (wheat) media were shown in Fig. 1 & 2. After sterilization, *C. militaris* in PDB required 480, 180,150 and 90 sec heating at 60°C, 70°C, 80°C, and 90°C to inhibit (Table 1 and Fig. 3). However, the mycelial growths of *C. militaris* in solid-state wheat medium required 600, 600 and 390 sec heating at 70°C, 80°C, and 90°C to inhibit (Table 2 and Fig. 4). There were no significantly changes on adenosine and cordycepin during heating at 80°C and 90°C 10 min (Fig. 5 & 6).

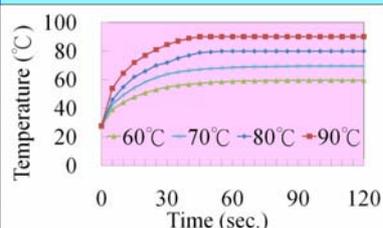


Fig. 1. The heating curve of PDB at different temperature.

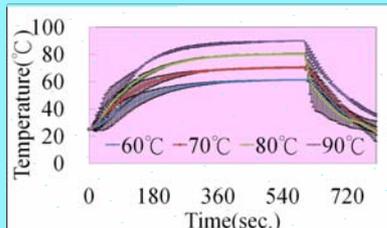


Fig. 2. Heating and cooling curves of solid-state wheat medium at different temperature.

Table 1. The sterilization of *C. militaris* in PDB at 60–90°C after 7-days cultivation.

60°C	0s	240s	360s	420s	480s	600s
60°C	○	○	○	○	X	X
70°C	0s	60s	120s	150s	180s	600s
70°C	○	○	○	○	X	X
80°C	0s	60s	90s	120s	150s	600s
80°C	○	○	○	○	X	X
90°C	0s	30s	60s	90s	120s	600s
90°C	○	○	○	X	X	X

○: Growth, X: Death

Table 2. The sterilization of *C. militaris* in wheat medium at 60–90°C after 7-days cultivation.

60°C	120s	240s	360s	480s	600s
60°C	○	○	○	○	○
70°C	90s	210s	330s	450s	600s
70°C	○	○	○	○	X
80°C	60s	180s	300s	420s	600s
80°C	○	○	○	○	X
90°C	30s	150s	270s	390s	600s
90°C	○	○	○	X	X



Fig. 3. The picture of 60–90°C sterilization on *C. militaris* in PDB after 7 days cultivation.

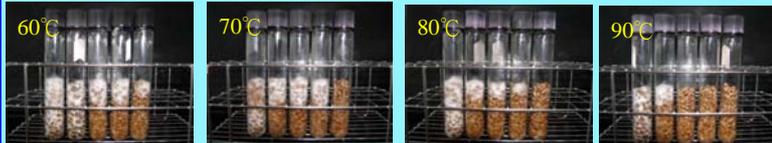


Fig. 4. The picture of 60–90°C sterilization on *C. militaris* in wheat after 7 days cultivation.

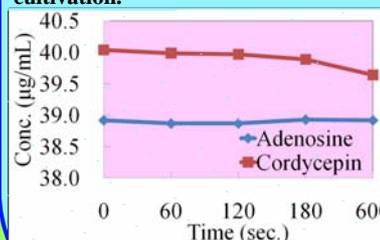


Fig. 5. The retention of adenosine and cordycepin at 80°C heating.

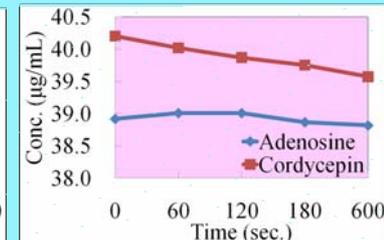


Fig. 6. The retention of adenosine and cordycepin at 90°C heating.

### Conclusion

The liquid medium had better heat-transfer than solid-state medium; therefore, the shorter sterilization time for *C. militaris* was taken place at liquid medium. The sterilization condition had not obviously influence on adenosine and cordycepin retention.