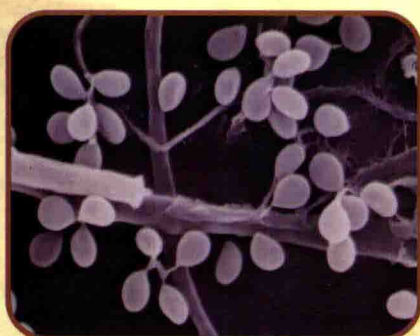


# 桃小食心虫 病原真菌的研究及应用

Entomopathogenic Fungi of  
*Carposina sasakii* and Their Application

熊 琦 谢映平 薛皎亮 范仁俊 李 捷 著

Compiled by Xiong Qi Xie Yingping Xue Jiaoliang Fan Renjun Li Jie



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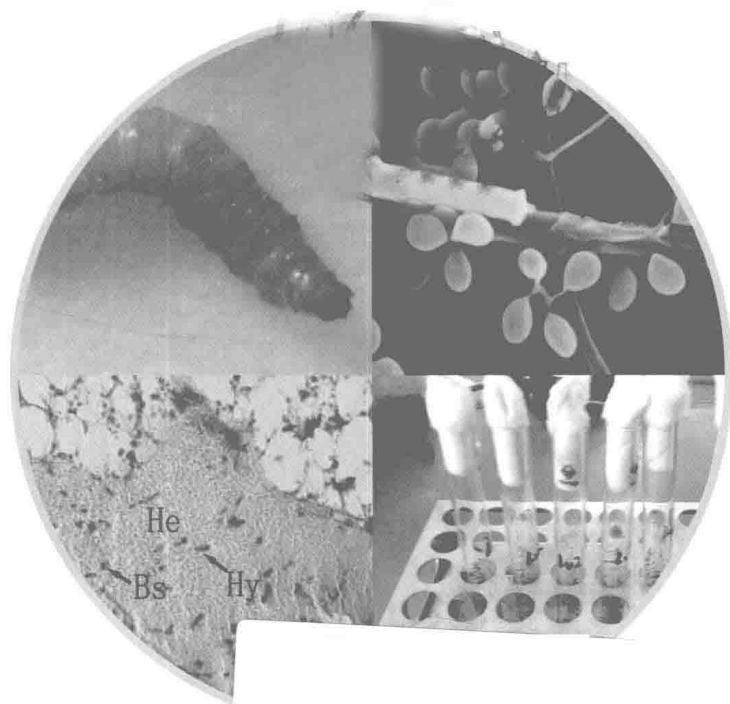
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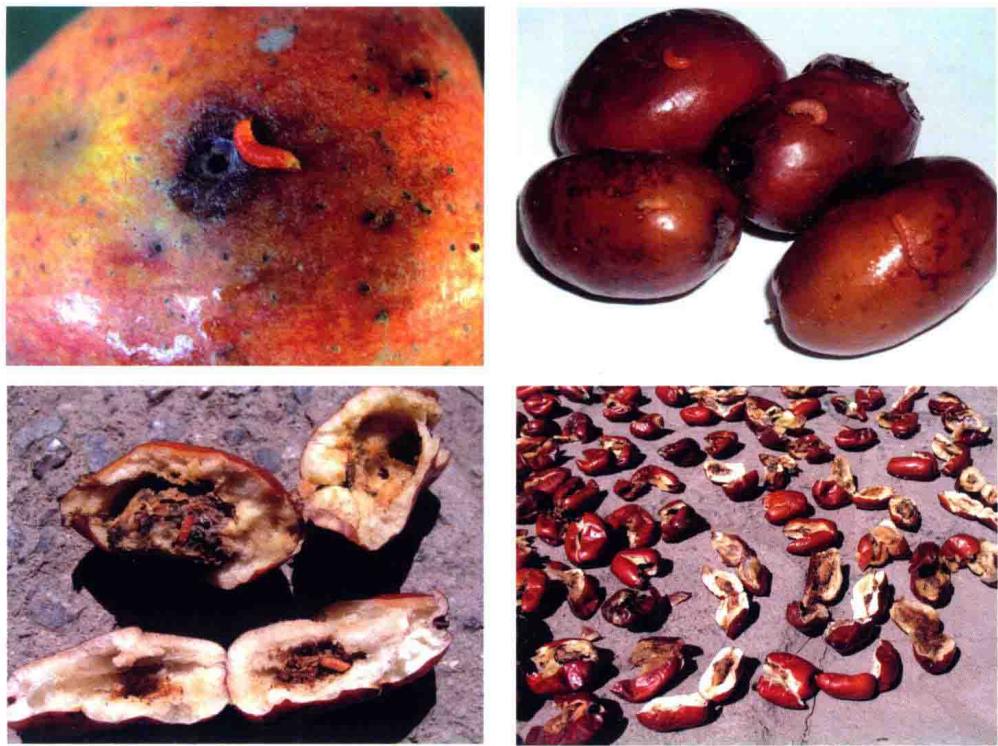


图 1.1 桃小食心虫及果实受害症状

Fig 1.1 *Carposina sasakii* and the damaged symptom of fruit



图 2.1 果园中收集桃小食心虫越冬茧

Fig. 2.1 The collection of overwintering cocoons of *Carposina sasakii* in the orchard



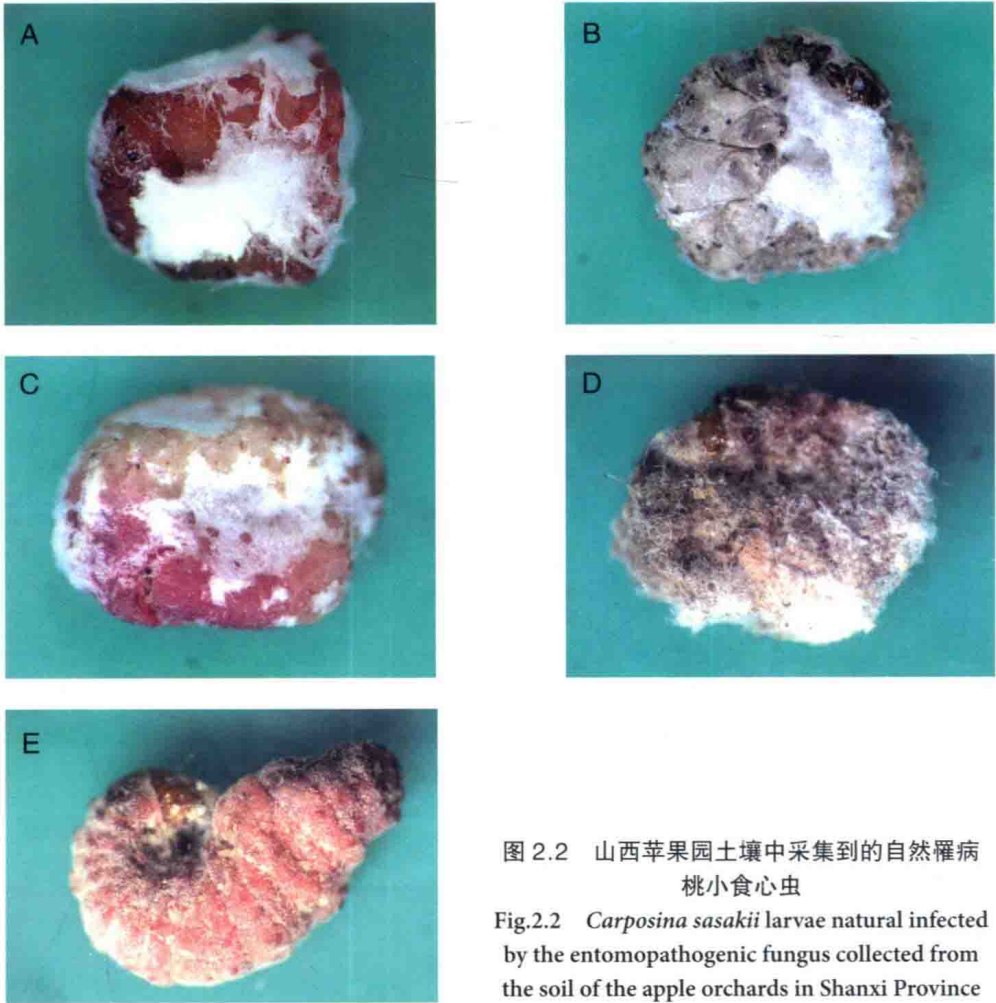


图 2.2 山西苹果园土壤中采集到的自然罹病桃小食心虫

Fig.2.2 *Carposina sasakii* larvae natural infected by the entomopathogenic fungus collected from the soil of the apple orchards in Shanxi Province

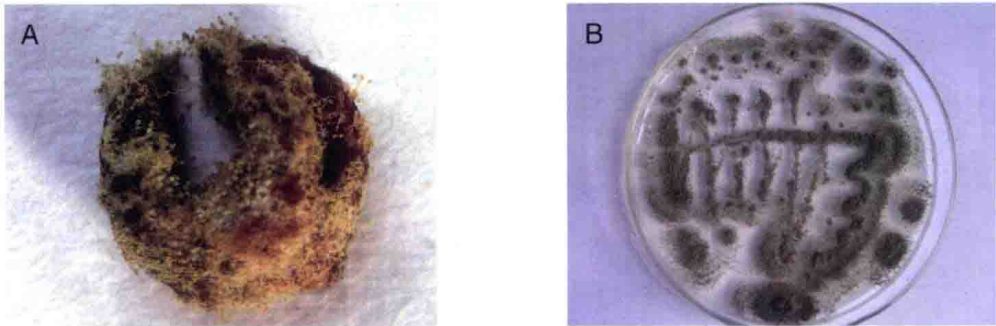


图 2.3 染菌的桃小食心虫幼虫和虫尸上分离纯化的菌株

A: 染菌幼虫 B: 纯化的菌株

Fig. 2.3 The diseased *C. sasakii* and the strain separated and purified from *C. sasakii*

A: The diseased *C. Sasakii* B: Purified strains

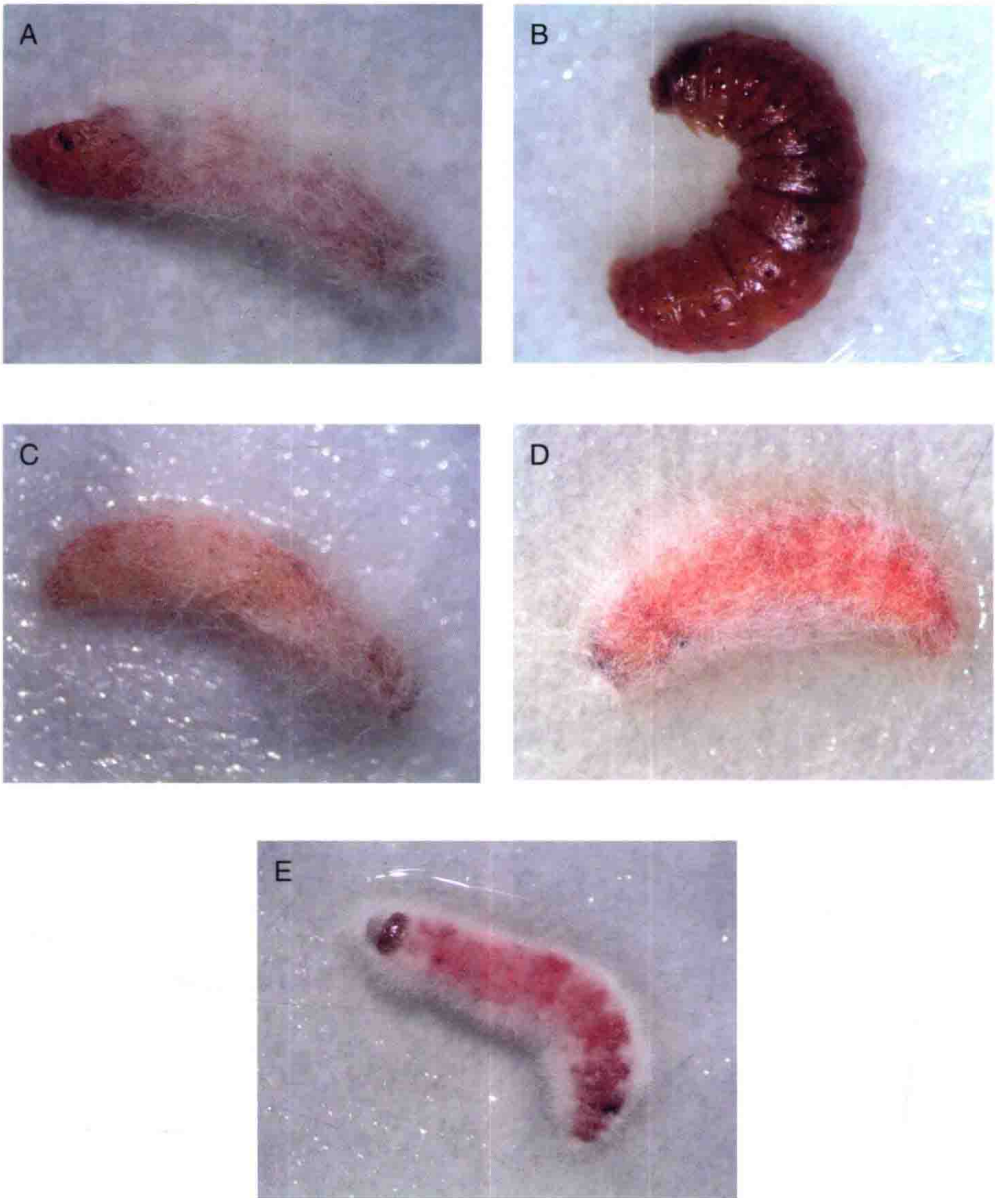


图 2.4 桃小食心虫幼虫被分离菌株感染的症状

A: 被菌株 TSL01 感染症状 B: 被菌株 TSL02 感染症状 C: 被菌株 TSL03 感染症状 D: 被菌株 TSL04 感染症状 E: 被菌株 TST05 感染症状

Fig.2.4 Symptom of *Carposina sasakii* larvae infected by the isolated strains of fungi

A: infected by the strain TSL01 B: infected by the strain TSL02 C: infected by the strain TSL03  
D: infected by the strain TSL04 and E: infected by the strain TST05

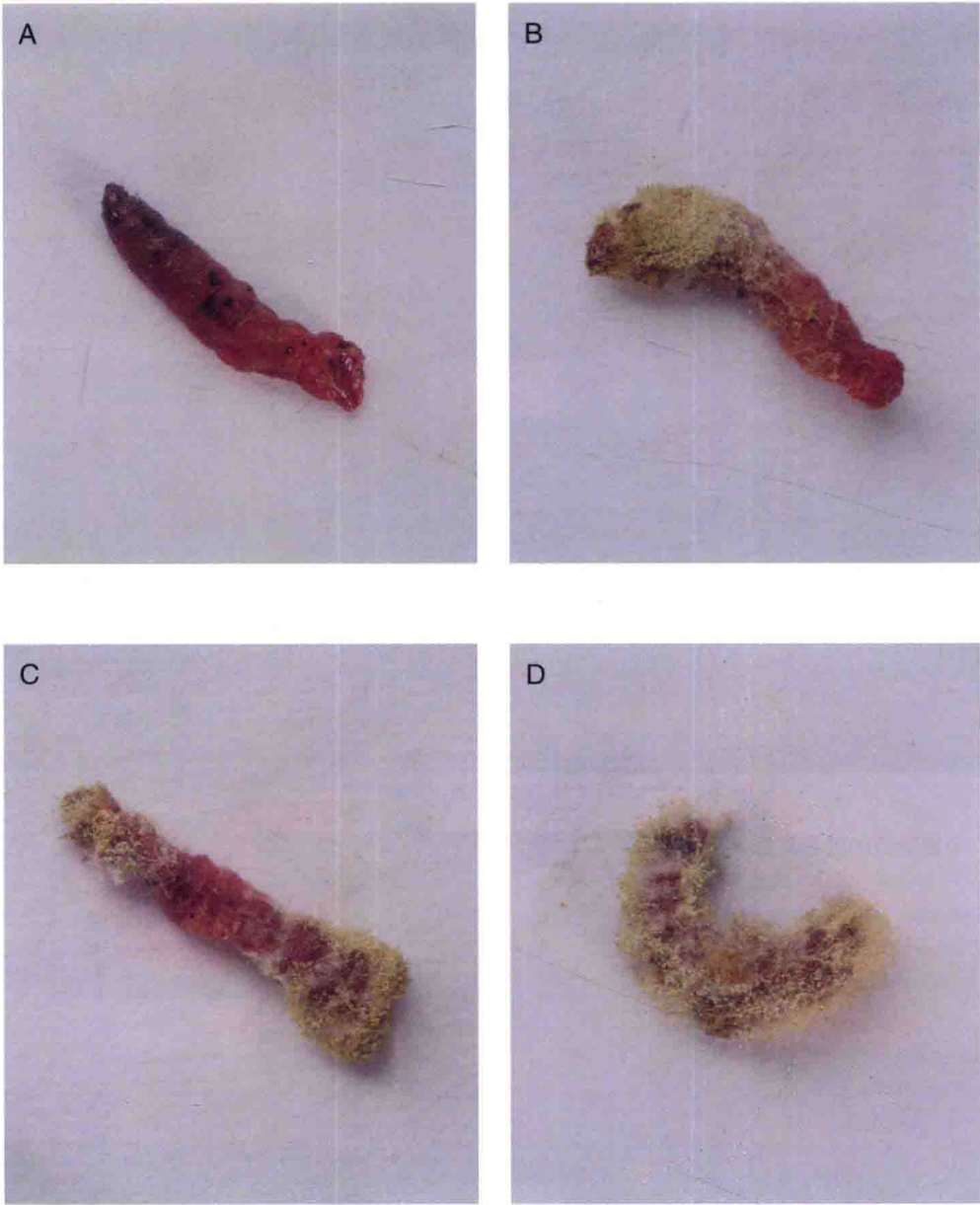


图 2.5 染菌桃小食心虫幼虫

A: 染菌 3 天虫体 B: 染菌 4 天虫体 C: 染菌 5 天虫体 D: 染菌 8 天虫体

Fig. 2.5 The diseased larvae of *C. sasakii*

A: The diseased *C. sasakii* for 3 days B: The diseased *C. sasakii* for 4 days

C: The diseased *C. sasakii* for 5 days D: The diseased *C. sasakii* for 8 days

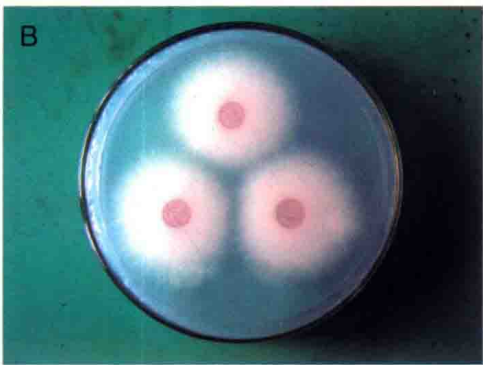
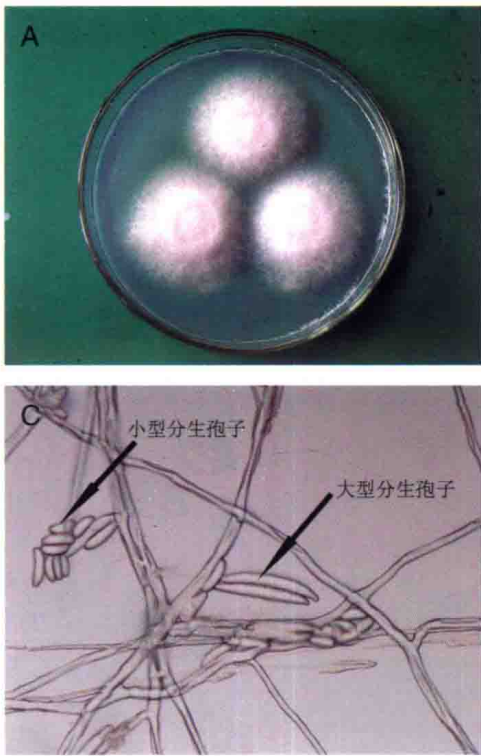


图 2.6 TSL01 菌株培养性状与形态特征

A: 菌落正面观 B: 菌落背面观

C: 菌株显微结构

Fig.2.6 Cultural and morphological characteristics of the strain TSL01

A: The front view of colony B: The back view of colony C: Micro-structure of the strain

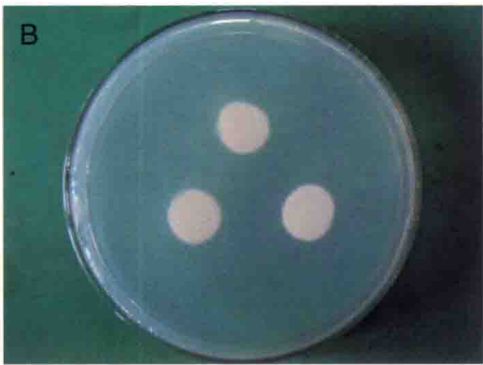
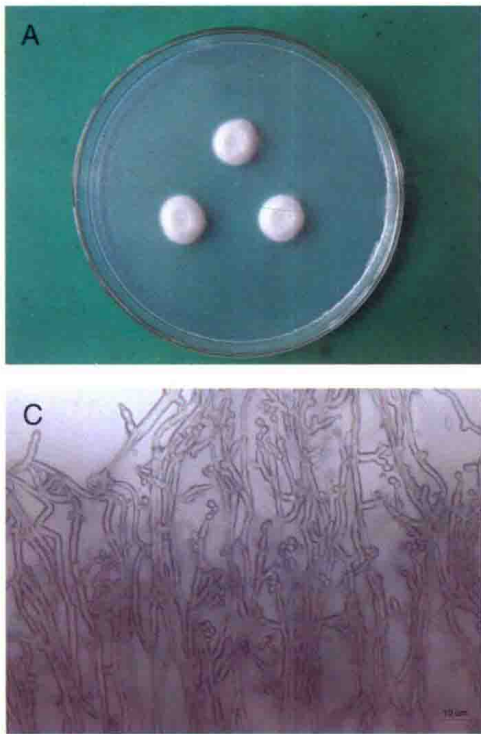


图 2.7 菌株 TSL02 培养性状与形态特征

A: 菌落正面观 B: 菌落背面观

C: 菌株显微结构

Fig.2.7 Cultural and morphological characteristics of the strain TSL02

A: The front view of colony B: The back view of colony C: Micro-structure of the strain



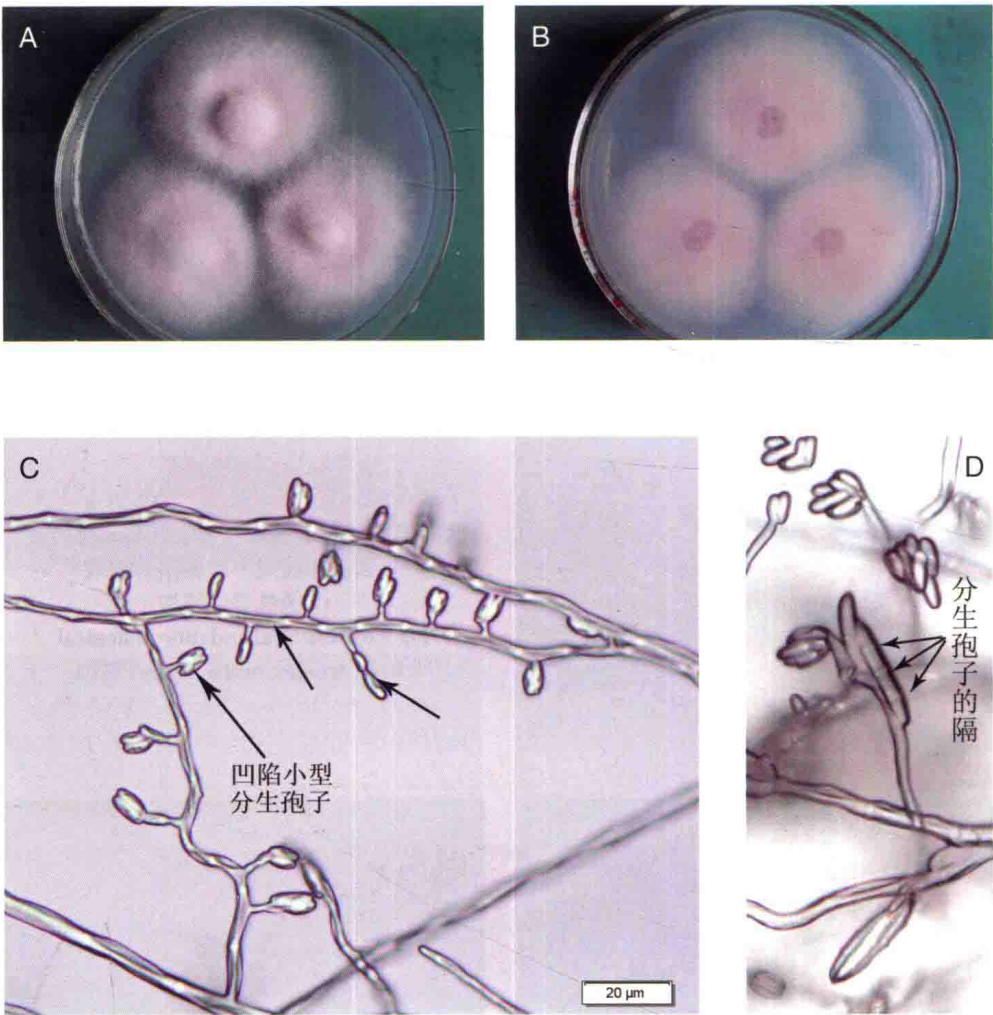


图 2.8 菌株 TSL03 培养性状与形态特征

A: 菌落正面观 B: 菌落背面观 C: 菌株显微结构显示小型分生孢子  
D: 菌株显微结构显示大型分生孢子

Fig.2.8 Cultural and morphological characteristics of the strain TSL03

A: The front view of colony B: The back view of colony C: Micro-structure of the strain showing the small conidia D: Micro-structure of the strain showing the big conidia

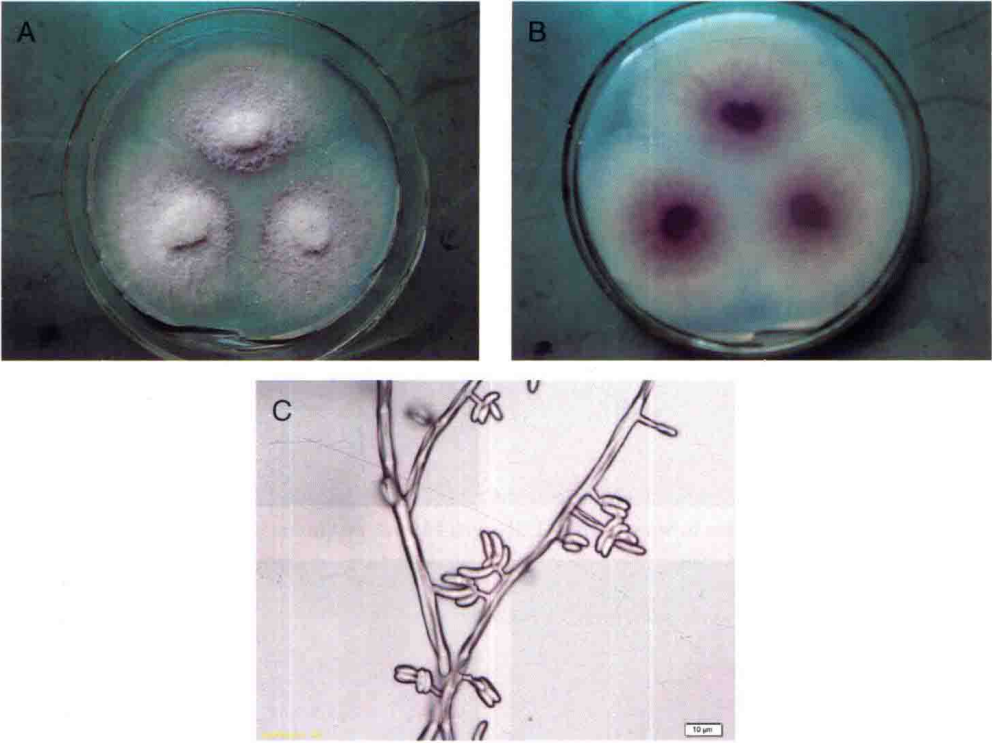


图 2.9 TSL04 菌株培养性状与形态特征

A: 菌落正面观 B: 菌落背面观 C: 菌株显微结构

Fig.2.9 Cultural and morphological characteristics of the strain TSL04

A: The front view of colony B: The back view of colony C: Micro-structure of the strain

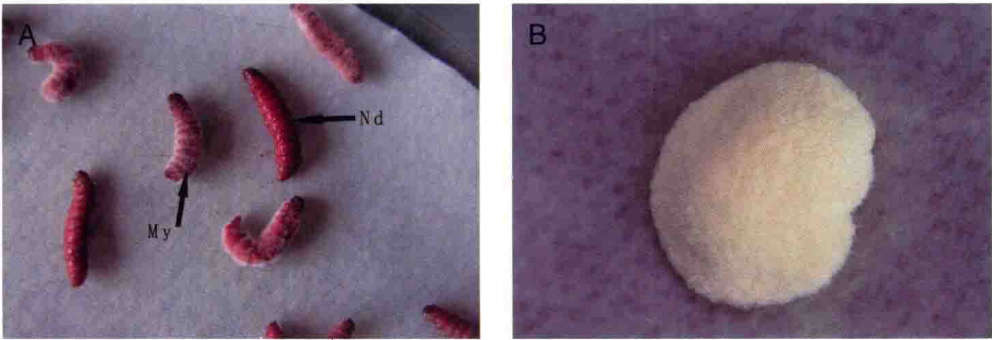


图 2.10 染菌后死亡的桃小食心虫幼虫

A: 刚死亡的幼虫 (Nd) 和死亡 24 h 后长出白色菌丝的虫尸, My: 菌丝

B: 72 h 后完全覆盖虫尸的菌丝已产生黄色孢子

Fig. 2.10 The dead larvae of *C. sasakii* infected with *B. bassiana* TST05

A: The newly dead larvae (Nd) and the larvae had died for 24 h, the white mycelia emerged on the cadaver surface B: At 72 h after death, the thicker mycelia covered on the cadaver produced many yellow conidia

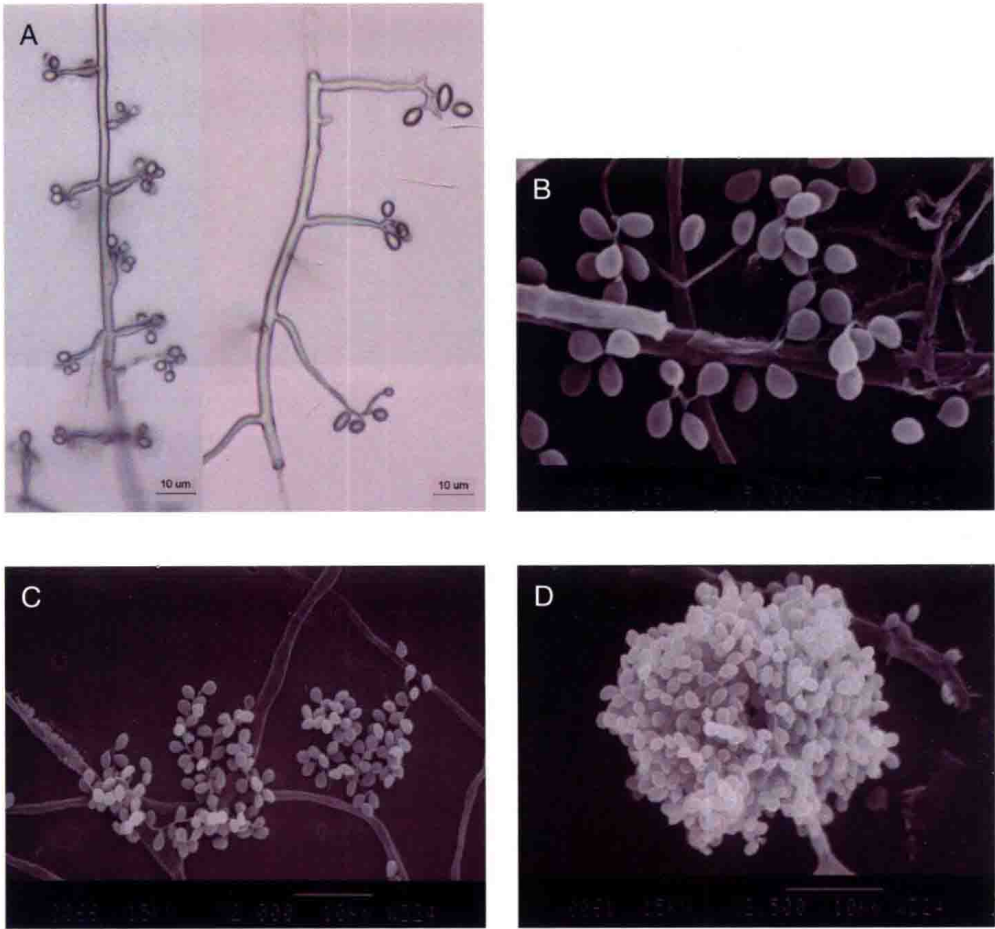
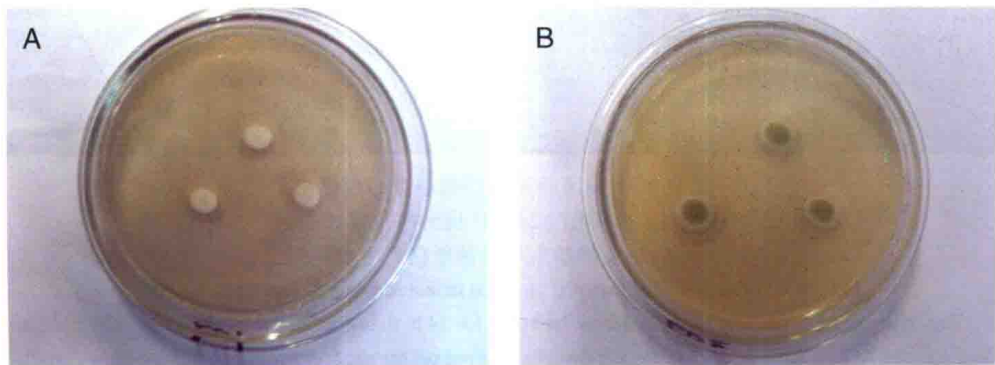


图 2.12 TST05 菌株的形态特征

A: 光学显微照片 B~D: 扫描电镜照片

Fig.2.12 Morphological characteristics of the strain TST05

A: light micrographs B~D: scanning electron micrographs



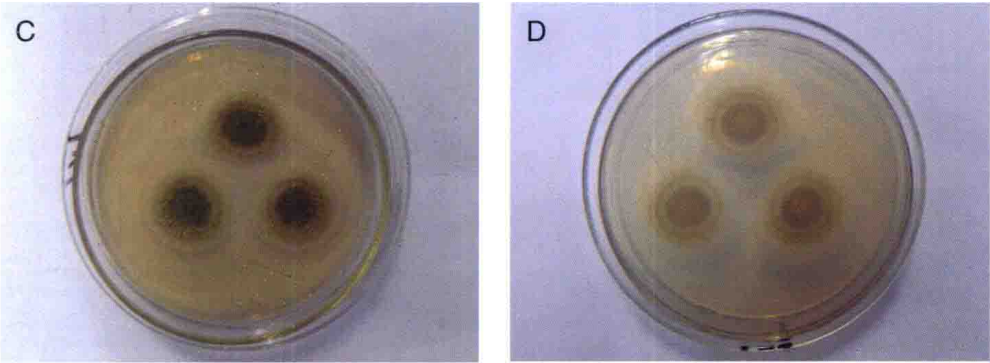


图 2.14 菌株培养性状

A: 第 3 天菌落正面观 B: 第 4 天菌落正面观  
C: 第 7 天菌落正面观 D: 第 7 天菌落背面观

Fig. 2.14 Cultural characters of the strain

A: The front view of colony on the 3rd day B: The front view of colony on the 4th day  
C: The front view of colony on the 7th day D: The back view of colony on the 7th day

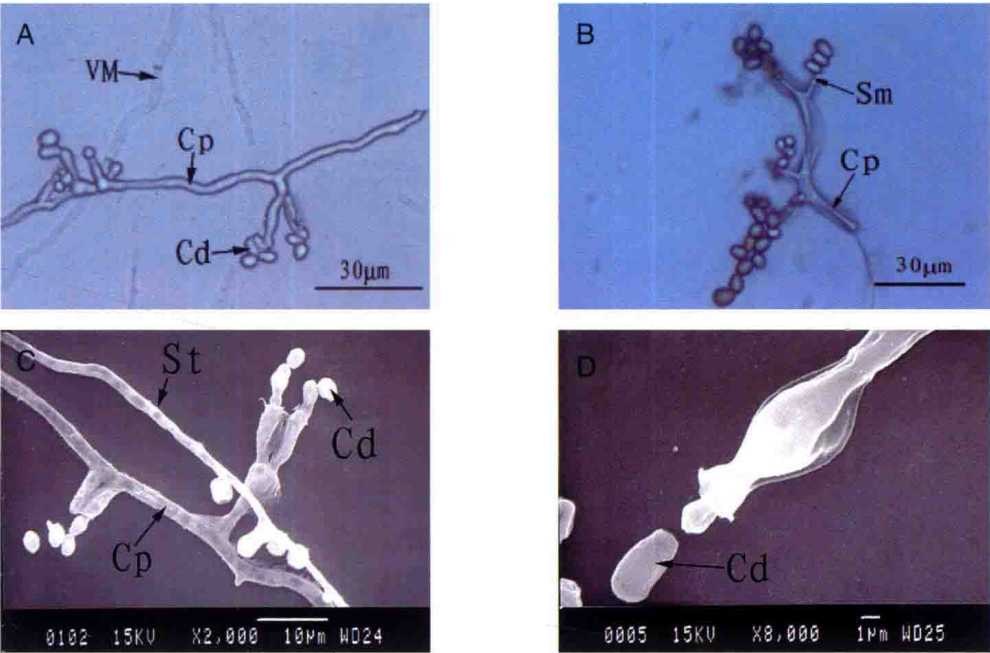


图 2.15 菌株形态特征

A~B: 光学显微形态结构 C~D: 扫描电镜超微结构 (Cp 为分生孢子梗, Cd 为分生孢子, VM 为营养菌丝, Sm 为小梗, St 为隔)

Fig. 2.15 Morphological characteristics of the strain

A~B: Optical microscopic morphology C~D: Scanning electron ultrastructure (Cp = conidiophores, Cd = conidium, VM = vegetative mycelium, Sm = sterigma, St = septa)





图 3.2 病原真菌感染桃小食心虫实验照片  
Fig. 3.2 Photos of *Carposina sasakii* larvae infected by the entomopathogenic fungi

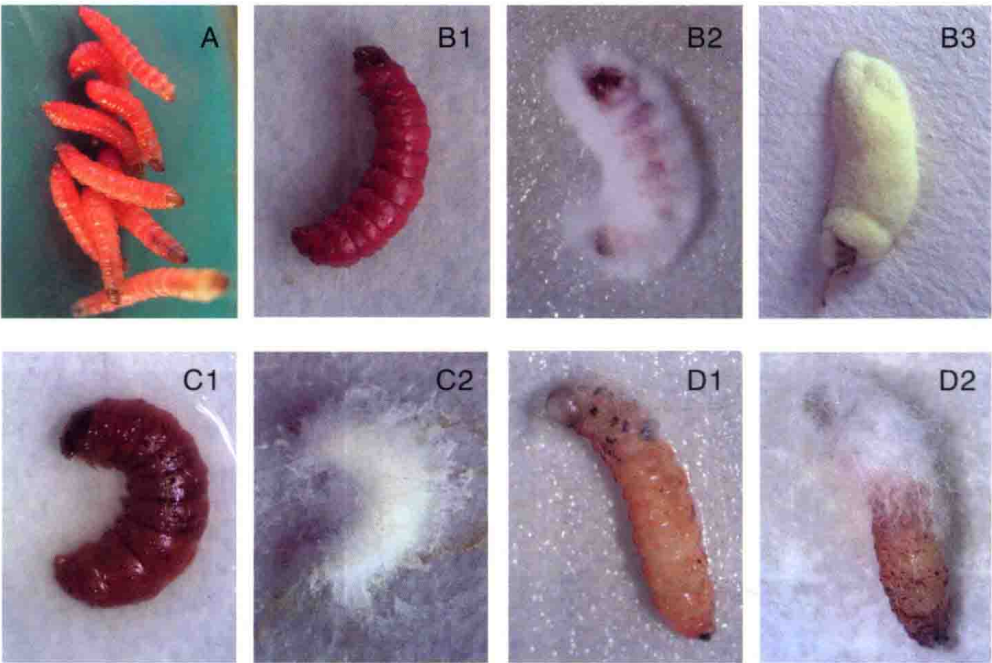


图 3.3 桃小食心虫幼虫感染病原真菌的症状  
A: 健康的幼虫 B1~B3: 被球孢白僵菌 TST05 感染的症状  
C1~C2: 被粉质拟青霉 TSL02 感染的症状 D1~D2: 被尖孢镰孢菌 TSL01 感染的症状  
Fig. 3.3 Symptom of *Carposina sasakii* larvae infected by the entomopathogenic fungi  
A: the healthy larvae B1~B3: the disease larvae infected by the *Beauveria bassiana* TST05  
C1~C2: the disease larvae infected by the *Paecilomyces farinosus* TSL02  
D1~D2: the disease larvae infected by the *Fusarium oxysporum* TSL01

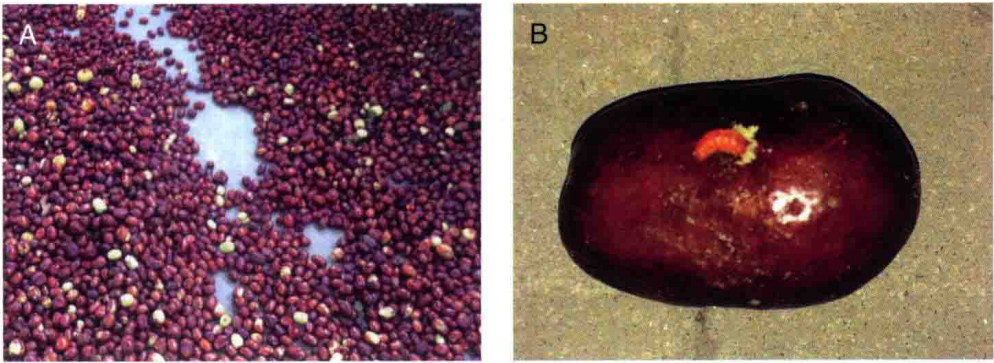


图 4.1 枣果中收集健康的桃小食心虫

A: 大量的虫枣 B: 枣中的桃小食心虫

Fig. 4.1 Collected healthful *C. sasakii* from fallen fruit

A: A large number of diseased date by *C. sasakii* B: *C. sasakii* in date



图 4.3 不同浓度 TSL06 孢子悬液侵染桃小食心虫的实验

Fig. 4.3 The infection experiment of the *C. sasakii* larvae infected with the conidial suspensions of TSL06 in five concentrations

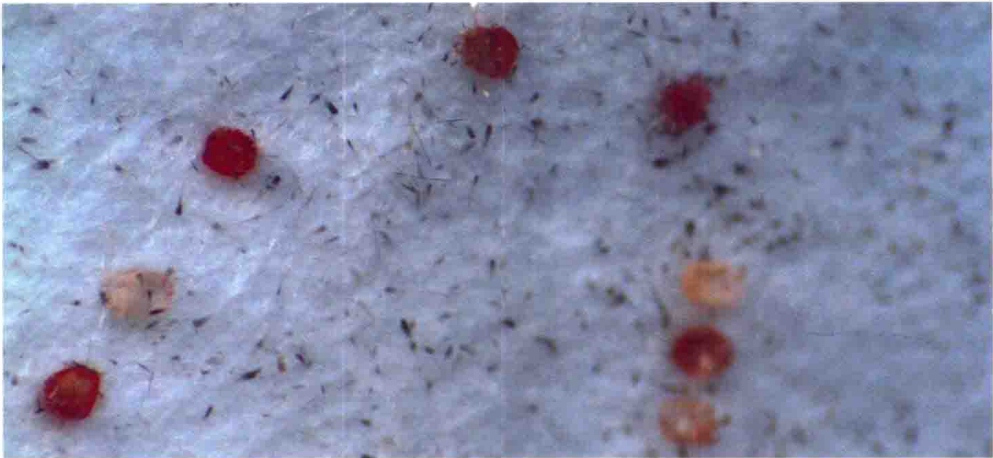


图 4.5 染菌的虫卵  
Fig. 4.5 eggs infected by the conidial suspension

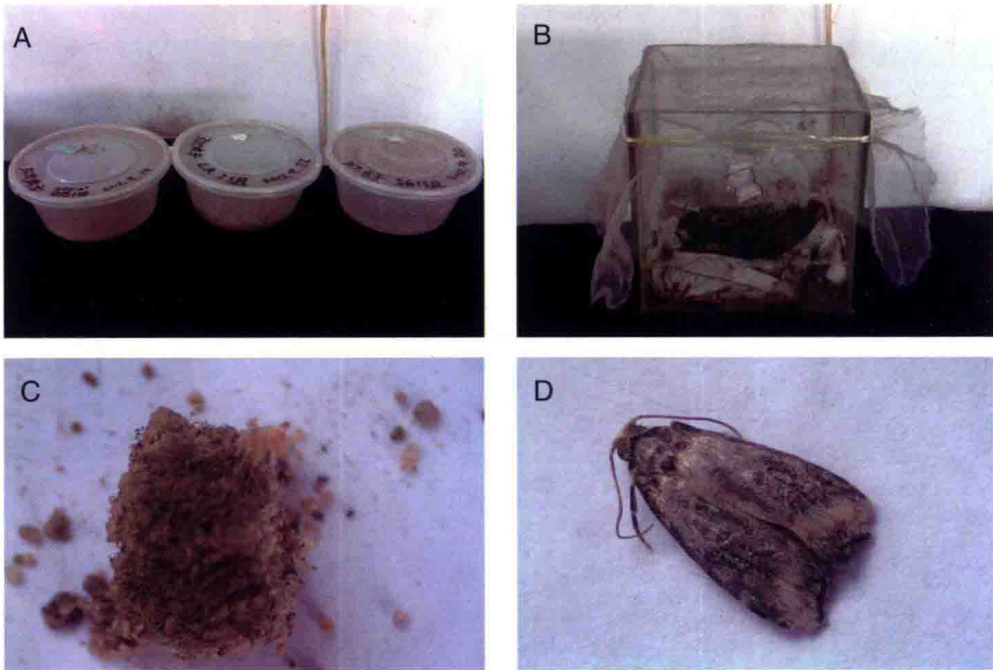


图 4.6 TSL06 菌株对结夏茧桃小食心虫的感染实验  
A: 培养染菌桃小食心虫 B: 羽化后成虫在培养缸中交尾  
C: 幼虫结茧后染菌死亡 D: 雌蛾产卵后死亡  
Fig. 4.6 The infection experiment of *C. sasakii* of knotted summer cocoon infected by conidial suspension

A: Cultured *C. sasakii* infected by conidial suspension B: Moths mating in the culture tank after emergence C: The larvae death in cocoon D: The female moths died after laid eggs





图 4.7 TSL06 菌株致死准备结冬茧的桃小食心虫

Fig. 4.7 *C. sasakii* of knotted winter cocoon infected by conidial suspension

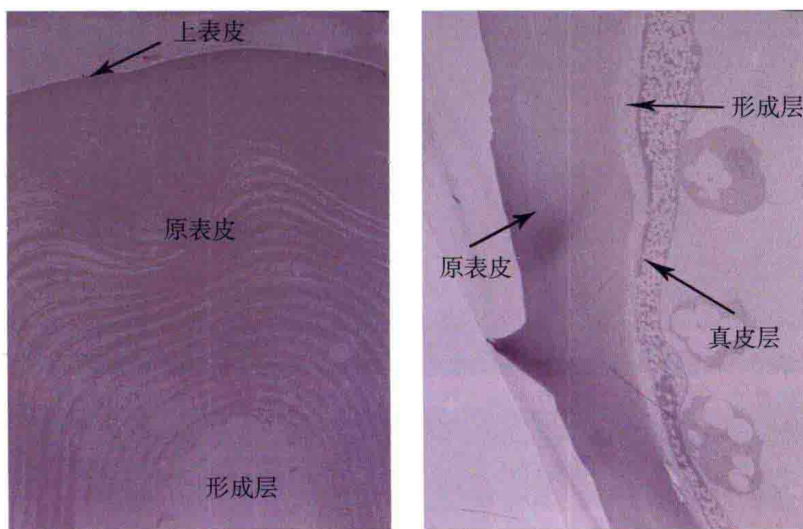


图 5.1 桃小食心虫体壁结构透射电镜图片

Fig. 5.1 Transmission electron micrographs of the cuticular structure of *Carposina sasakii*



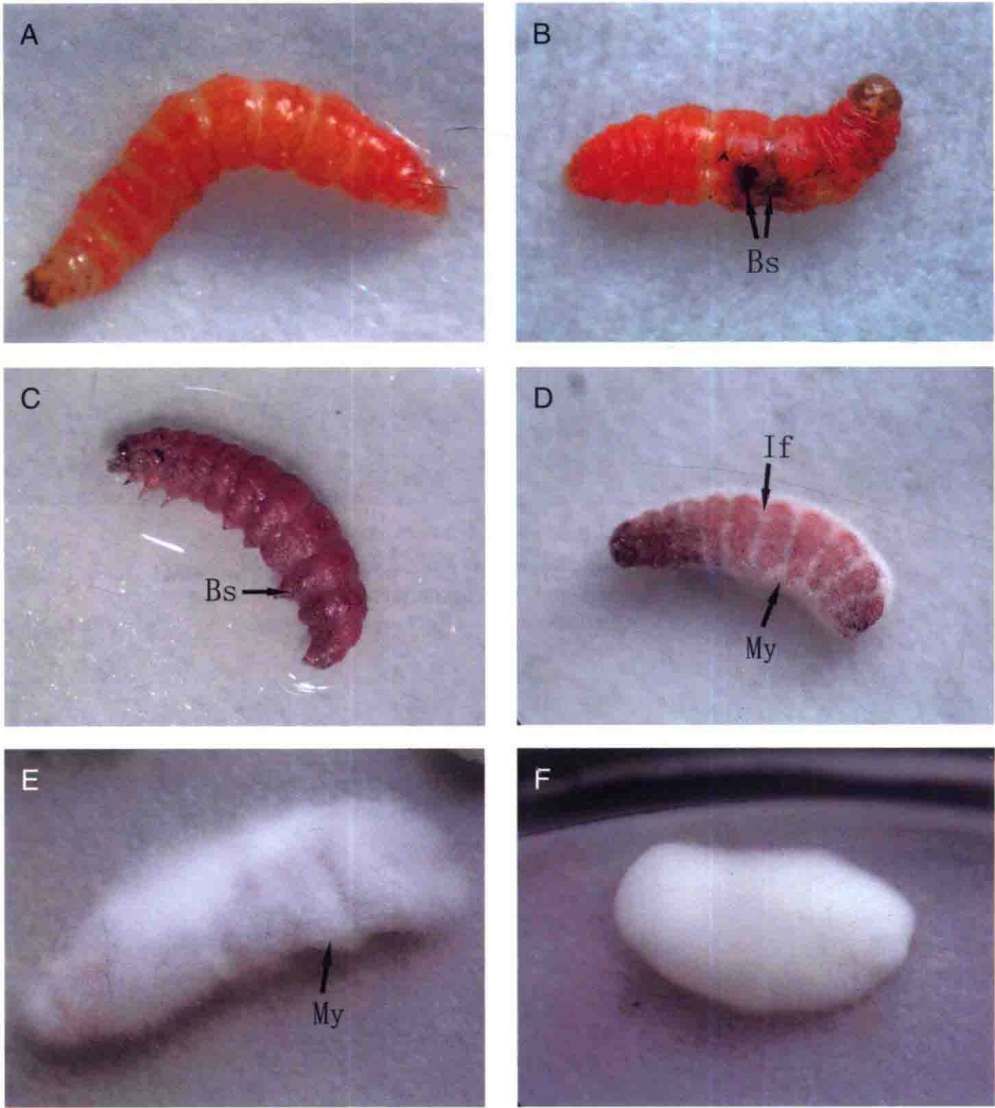


图 6.1 桃小食心虫幼虫感染 TST05 菌株后的外部症状

A: 健康幼虫 B: 感染 24 h 后，幼虫体表出现黑斑 (Bs) C: 感染 120 h 后，幼虫死亡，虫体颜色已由正常的橘红色变为黑红色，体表布满黑斑 1D: 感染 144 h 后，虫尸表面长出菌丝 (My)，在节间褶 (If) 处尤为密集 E: 感染 156 h 后，菌丝覆盖了虫尸体表 F: 感染 168 h 后，菌丝完全包裹了虫尸，并开始产生孢子

Fig. 6.1 The external symptoms of *Carposina sasakii* larvae infected by *Beauveria bassiana* TST05.

A: Healthy larvae B: The infected larvae. At 24 h after inoculation, black spots (Bs) appeared in the cuticle C: At 120 h after inoculation, the dark spots increased on body surface. And the larvae died with the body color changed to dark red D: At 144 h after inoculation, mycelia (My) grew out the dead larvae's body, occurring more thickly in the intersegmental folds (If) E: At 156 h after inoculation, the insect cadaver was covered by mycelia F: At 168 h after inoculation, mycelia covered over the insect cadaver and began to produce conidium