

- 一、請舉例說明生物技術如何應用於昆蟲學之研究(5%)？(請具體說明擬研究之關鍵問題、關鍵技術、目標害蟲之組織、蛋白或基因、與簡單作法，請避免籠統之分子生物、害蟲等模糊字眼)
- 二、桿狀病毒是一種桿狀、含有雙股 DNA 基因體的病毒，試述昆蟲桿狀病毒應用於防治蟲害之優點 (5%)？針對其缺點如何改進 (5%)？
- 三、下面摘要選自一篇文章: Systemic Spread and Propagation of a Plant-Pathogenic Virus in European Honeybees, *Apis mellifera*，請將劃底線部分翻譯成中文(10%)？並陳述此一研究之重要意義 (5%)？

Emerging and reemerging diseases that result from pathogen host shifts are a threat to the health of humans and their domesticates. RNA viruses have extremely high mutation rates and thus represent a significant source of these infectious diseases. In the present study, we showed that a plant-pathogenic RNA virus, tobacco ringspot virus (TRSV), could replicate and produce virions in honeybees, *Apis mellifera*, resulting in infections that were found throughout the entire body. Additionally, we showed that TRSV-infected individuals were continually present in some monitored colonies. While intracellular life cycle, species-level genetic variation, and pathogenesis of the virus in honeybee hosts remain to be determined, the increasing prevalence of TRSV in conjunction with other bee viruses from spring toward winter in infected colonies was associated with gradual decline of host populations and winter colony collapse, suggesting the negative impact of the virus on colony survival. Furthermore, we showed that TRSV was also found in ectoparasitic *Varroa* mites that feed on bee hemolymph, but in those instances the virus was restricted to the gastric cecum of *Varroa* mites, suggesting that *Varroa* mites may facilitate the spread of TRSV in bees but do not experience systemic invasion. Finally, our phylogenetic analysis revealed that TRSV isolates from bees, bee pollen, and *Varroa* mites clustered together, forming a monophyletic clade. The tree topology indicated that the TRSVs from arthropod hosts shared a common ancestor with those from plant hosts and subsequently evolved as a distinct lineage after transkingdom host alteration. This study represents a unique example of viruses with host ranges spanning both the plant and animal kingdoms.

見背面

四、試以仿生學(Bio-mimetics)研究為材料的昆蟲類群(種類)以及議題，請列舉5實例簡述之。(10%)

五、試以具有應用潛力的有害生物天敵(1.捕食、2.寄生、3.微生物)以及其防治的害蟲類群(種類)，請各列舉4實例。(25%)

六、配合題(單複選)：每題1分，答錯一選項倒扣0.5分至該題0分止。(5%)

請填入英文字母代號

1. (            ) the vectors for Dengue fever
2. (            ) Cruciferae pests
3. (            ) Attracted by cue lure
4. (            ) Red imported fire ant
5. (            ) Tephritidae

- |                                 |                                   |                            |                                 |
|---------------------------------|-----------------------------------|----------------------------|---------------------------------|
| A. <i>Ctenocephalides felis</i> | B. <i>Bactrocera dorsalis</i>     | C. <i>Aedes albopictus</i> | D. <i>Solenopsis geminate</i>   |
| E. <i>Bemisia argentifolii</i>  | F. <i>Anopheles gambiae</i>       | G. <i>Culex annulus</i>    | H. <i>Spodoptera litura</i>     |
| I. <i>Trichoplusia ni</i>       | J. <i>Bactrocera tau</i>          | K. <i>Aedes aegypti</i>    | L. <i>Bactrocera cucurbitae</i> |
| M. <i>Solenopsis invicta</i>    | N. <i>Culex tritaeniorhynchus</i> |                            |                                 |

七、如何說服消費大眾願意花更多的錢，購買以IPM (integrated pest management) 進行防治所生產的農產品或環境衛生之處理 (15%)?

八、為害植物的農業害蟲約有九個目，請分別列出數目最多的五個目中為害最嚴重的害蟲，並說明這五種害蟲的分類地位、為害徵狀、為害作物及防治方法 (10%)。

九、床蟲 (*Cimex lectularius*) 近幾年來大發生，請說明床蟲的分類地位、為害徵狀、如何發現它的存在及防治方法 (5%)。

試題隨卷繳回