

# Plant Pathogenic Bacteria A Basic Guide to Taxonomy and Nomenclature

#### Fen Beed Regional Director for East and Southeast Asia and Oceania



29<sup>th</sup> September, 34<sup>th</sup> IVTC Module 1



## The domains of life



[Embley et al., 1995]

## **Prokaryotes**

### Three invariant characteristics



- Cell membrane
- Cytoplasmic 70S ribosome
- Non-membranebound nucleoid

# **Bacterial colony morphology**



- Prokaryotes are ubiquitous and physiologically diverse
- Occupy a wide range of ecological niches, active
  as autotrophs, obtaining energy from inorganic sources or light
  - as saprophytes, obtaining energy from the breakdown of complex organic material
  - as symbionts, living co-operatively with other organisms
  - as parasites, attacking and often killing other living things. The parasites are relatively few in both kinds and numbers.



## **Taxonomy & nomenclature**

- Taxonomic levels:
- Species: Pantoea stewartii
- Domain: Bacteria
- Phylum: Proteobacteria
- Class: Gammaproteobacteria
- Order: *Enterobacteriales*
- Family: *Enterobacteriaceae*

### **Taxonomic ranks**

- **Genus:** A discrete related group of species. Strains usually have >30% DNA homology
- Species: A discrete taxonomic unit; several well defined phenotypic differences from related species. Strains usually have >70% DNA homology
- **Subspecies:** One or two well defined phenotypic differences from other subspecies
- **Biovar:** One or two minor phenotypic differences from other biovars
- Pathovar: Pathological varieties. Have distinct host specificity range for a plant species or genus, or distinct symptoms on the same host
- Race: Specificity / virulence for some, but not all, cultivars of a plant species. Based on host resistance genes and avirulence genes in the pathogen

## **Plant Bacterial Pathogens**

- All within the domain Bacteria
- Occur worldwide
- Exploit all environments and affect all major plant groups, but favour warm, moist environments
- Fall within 3 major groups
  - Gram negative
  - Gram positive
  - Non-culturables

## The main plant pathogenic genera

- Gram -ve
  - Acidovorax
  - Agrobacterium
  - Brenneria
  - Burkholderia
  - Dickeya
  - Enterobacter
  - Erwinia
  - Pantoea
  - Pseudomonas

- Pectobacterium
- Pseudomonas
- Ralstonia
- Xanthomonas

## The main plant pathogenic genera

- Gram +ve
  - Arthrobacter
  - Bacillus
  - Clavibacter
  - Curtobacterium
  - Leifsonia
  - Nocardia
  - Rathayibacter
  - Rhodococcus
  - Streptomyces

- Non-culturables [Candidatus]
  - Liberobacters
  - Phytoplasmas
  - Spiroplasma

#### **Characterisation and identification of bacteria**

- Various methods exist
  - Host range
  - Phenotypic [biochemical] properties
  - Protein profiles
  - Fatty acid profiles
  - DNA homology and sequence data
  - DNA fingerprints
  - [A polyphasic approach to study]

## **Rules of nomenclature**

- Names are governed by the International Code of Nomenclature of Bacteria
  - Approved lists of Bacteria Names
    - International Society for Plant Pathology
    - http://www.isppweb.org/....