A review on the effect of climate change on cacao pests and diseases

Dr Julie Flood, Global Director, Trade & Commodities, CABI

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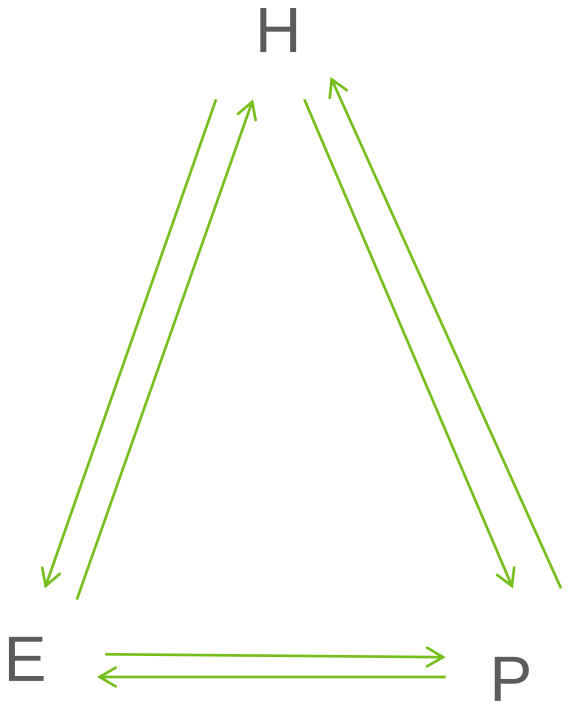
Outline of presentation

- Introduction
- What is known about climate change and cacao production
- Effect of climate change on insect pests (in general)
- Effect of climate change on insect pests of cacao
- Likely effects of climate change on disease spread
- Effects of shade
- General Recommendations and Conclusions
- Acknowledgements

Introduction

- "**Disease triangle**" (Gaumann, 1950)
- A dynamic process between a host , a pest and the environment (mutually influencing), resulting in level of disease observed
- Changes in the environment will impact the pest directly but also affects the host eg host resistance
- Stressed plants are often more susceptible to attack



Climate change and cacao production

- Various climatic models produced to examine projected effects of climate change on cocoa production in West Africa
- **Maximum dry season temperatures** projected to become **as, or more limiting**, for cocoa as **dry season water availability**
- Areas of **low climatic suitability** will **increase** ; areas of **high climatic suitability** will **decrease.**
- Differences in **climate vulnerability will lead to future shifts** in cocoa production within the region
- **Risk of new deforestation** (new areas more suitable for cocoa growing)

Climate change and insect pests (in general)

- Insects are cold-blooded so developmental rates of their life stages are **strongly dependent on temperature** (biggest influence)
- With **every degree rise** in global temperature, the insect **life cycle will be shorter**
- Other temperature effects incl **extension of geographical range**; changes in **gender ratios** ; introduction **of alternative hosts** and **over-wintering hosts**

Climate Change and Insect Pests of Cacao

- **Very little published** effects of environmental factors on **CPB**
- **Temperature and RH** play a **major part in the population fluctuations** of *Sahlbergella singularis*
- Second instar nymphs **thrive more at very high humidity but desiccated at low humidity** (linked to decline in December) due to a drop in the RH.

Mealy bugs

- **6-10 generations/year on cocoa (Ghana**)
- Present in field throughout the year but **more common in dry season** (a rainfall / RH effect)
- **Complex interaction of temperature and the life cycle eg** egg laying, hatching, proportion of females to males etc
- Effect of **temperature** was stronger than that of the **elevated CO_2** concentration
- Need similar studies on cocoa mealybugs

Climate Change and disease spread

- Changing distribution of cocoa growing - some re- distribution of diseases
- “Minor” pathogens may be more problematic eg *Verticillium* wilt
- Most likely factor in the spread of major cocoa diseases (outside their current regional distribution) **is human mediated spread**
- **Raising awareness** within the sector and public needed to prevent accidental introductions
- **Biosecurity planning-** pathways of introduction and planned responsibilities

Effects of Shade

- Many **advantages to shade** (carbon storage , biodiversity)
- **Reduces temperature** in the cocoa canopy**- reduce vulnerability**
- Role of **shade in disease suppression very complex**
- Investigation in Costa Rica examined if FP was suppressed or encouraged in the farming systems there
- **Suggested moderate and uniform shade is beneficial for FP suppression**
- ***P megakarya*** in Cameroun **made worse by heavy shade**
- *P. megakarya* and for CSSV -shade trees could potentially **act as alternative hosts**

General Conclusions and Recommendations

- **Climate uncertainty** is another threat for producers and whole cocoa industry
- **Integrate biological data** into existing climate data sets to help build **more robust models and to help predict effects** of **changing weather patterns on cocoa pests/diseases**
- M**ore fundamental information on the effects of environmental factors on major pests and host**. Major knowledge gaps
- **Funding** of basic research to allow improved modelling

General Conclusions and Recommendations

- Most likely factor in the global spread of major cocoa diseases remains **human mediated spread**
- Raising awareness of **biosecurity planning**
- A **more co-ordinated approach** is needed to plan a **global strategy** for dealing with likely climatic changes over the short term (10-15 years) and further ahead (up to 30 years)
- Multidisciplinary approaches to **plan strategy, devise actions and avoid duplication**

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merci
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zikomo
xie-xie
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efharistó
ありがとう
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thank you
gracias
zikomo
tak
asante
urakoze
ke itumetse
danke
terima kasih
dhanyawaad

Julie Flood, UK Centre

j.flood@cabi.org