

Avoiding trade restrictions due to questionable assertions about taxonomy, hosts, and geographic distribution of regulated pests

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1957–2017



Objectives:

Illustrate how equitable trade can be negatively affected by questionable assertions about regulated pests.

Discuss ways to prevent this.



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Although regulatory plant protection organizations are relatively young, trade & pests have an ancient regulatory history.





Hammurabi Code (1754 BCE); Law 120:

If someone stores grain in another's granary and that grain is lost, the owner of the grain shall swear an oath and the owner of the granary must compensate the owner of the grain.



Ancient grain stores

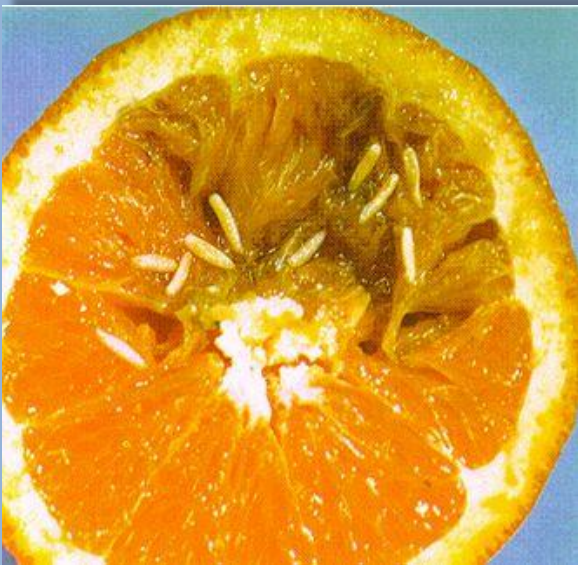


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Today detailed, complex phytosanitary regulations govern trade in a such a way that regulated pests are among the main ways that trade can be restricted. These restrictions must be based on “*scientifically sound rationale*”.

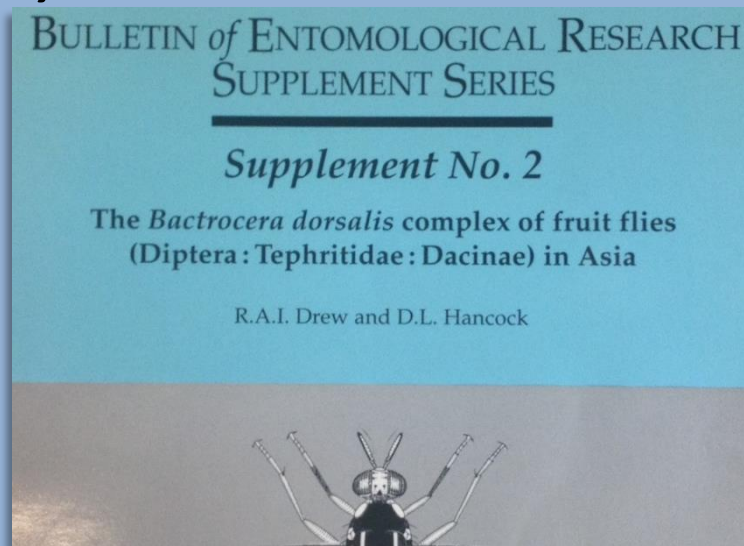


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Trade in agricultural commodities is susceptible to assertions about regulated pests. For example, when new economic species of *Bactrocera*, such as *philippinensis* and *papayae*, were named > 20 yr ago trade barriers resulted.



By the time it became widely accepted 20 yr later that some of the new species were the same as *B. dorsalis* the economic damage had been suffered.



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Then *Bactrocera* “syn. *invadens*” in 2005, causing loss in Africa, as no phytosanitary options (except the generic PI dose of 150 Gy) were available. If it was accepted then that it was *B. dorsalis* perhaps treatments developed for *B. dorsalis* elsewhere could have been used. Hundreds of millions \$\$ lost from fruit export.



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Lost markets are not the only problem with dubious names.

The US did not regulate import of banana from Africa for 5 yr after *B. "syn. invadens"* found there, risking invasion. If it was known to be *B. dorsalis*, bananas would have been regulated immediately.



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The lack of voucher specimens from previous research into phytosanitary measures hampered the ability to retroactively apply these measures to the new species.



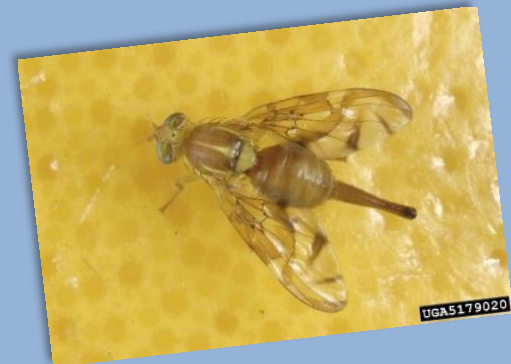
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Unintended positive consequence of the naming of *B. "syn. invadens"* was the creation of the Seibersdorf phytosanitary treatment project which aims to develop broadly applicable phytosanitary treatments against fruit flies.



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Also shows value of routine visits to Seibersdorf labs



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“Comparison of *in vitro* heat and cold tolerance of *B. invadens* 3rd instars with 3 known tephritids” (Hallman et al. 2011)

species	LD _{99.9} cold (d)	LD _{99.9} heat (min)
“ <i>invadens</i> ”	7.7 (6.2-9.6)	70 (47-81)
<i>dorsalis</i>	7.7 (6.2-10.3)	62 (41-98)



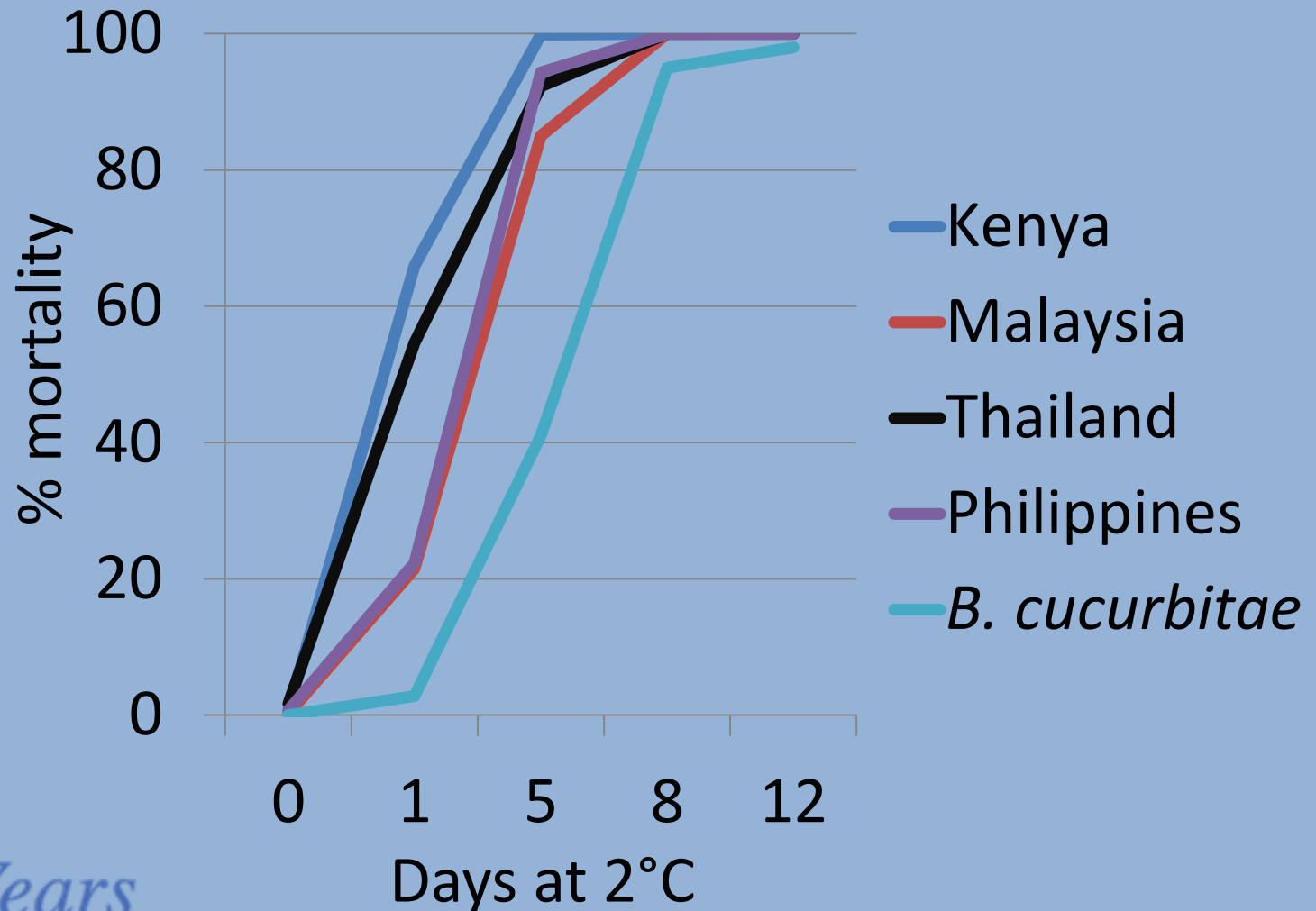
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3rd instar mortality at 2°C of 4 populations of *Bactrocera dorsalis* and 1 of *B. cucurbitae* infesting orange

(Myers et al. 2016)



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Cold treatment ($1.1 \pm 0.1^{\circ}\text{C}$) against *Anastrepha grandis*
in zucchini squash (Hallman et al. 2017)

Stage	LD ₉₉ (days)
Egg	9.5 (9.0-11.5)
1 st instar	10.6 (9.7-14.1)
2 nd instar	10.1 (9.4-12.3)
3 rd instar	13.4 (11.9-23.6)



Survival of 3rd instar *Ceratitis capitata* in mandarin after 9 d at 1°C

Age (d)	Mean \pm SEM % survival population from		
	Australia	Argentina	Spain
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0.5 \pm 0.4	0.4 \pm 0.3
4	1.3 \pm 1.6	1.6 \pm 1.39	2.1 \pm 1.8
5	0	0.4 \pm 0.5	0
6	0	0.4 \pm 0.4	0
7	1.9 \pm 2.1	2.8 \pm 2.5	0.4 \pm 0.5
8	2.2 \pm 1.4	3.1 \pm 2.8	0.3 \pm 0.4
9	5.0 \pm 3.4	3.8 \pm 3.0	3.1 \pm 3.8
10	4.7 \pm 2.0	4.4 \pm 3.1	4.3 \pm 4.3

Tolerance of eggs (most heat-tolerant stage) of 3 populations of *Bactrocera dorsalis* in mangoes to 47°C vapour heat treatment



Population	Mean % survival after 3 h	Seed surface temp. for efficacy (°C)
Thailand	7.4 ± 4.0	45.4
Kenya	0.8 ± 0.6	45.3
Fujian (China)	1.3 ± 0.8	45.4



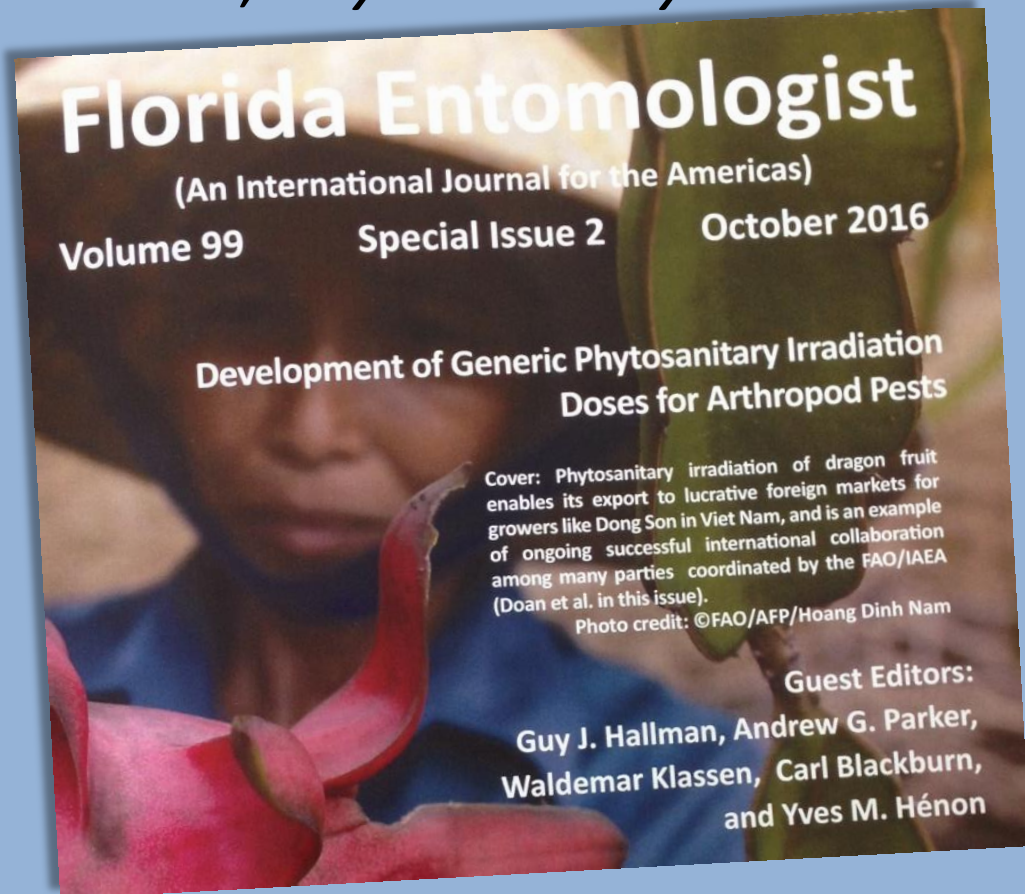
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36 Gy prevented adult emergence when late 3rd instar *A. grandis* irradiated in zucchini; supports generic dose of 70 Gy for all *Anastrepha*, reducing dose from the current 150 Gy.

Submitted to IPPC ISPM #28, *Phytosanitary Treatments for Regulated Pests*.



Cold treatment ($1.1 \pm 0.1^{\circ}\text{C}$) against *Bactrocera* (*Zeugodacus*) *tau* in zucchini squash and mandarin;
3rd instar most tolerant stage

Host fruit	Days to 3 rd instar	Days for control
Zucchini squash	4	11
Mandarin	8	20



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In contrast to *B. dorsalis*, the existence of multiple species among populations considered *Anastrepha fraterculus* is defensible as it is based on multi-faceted, science. The imminent description of new species in this case may also lead to new trade barriers. Again, voucher specimens could have helped avoid some of this potential disruption. Postharvest project at Seibersdorf has begun to address this.

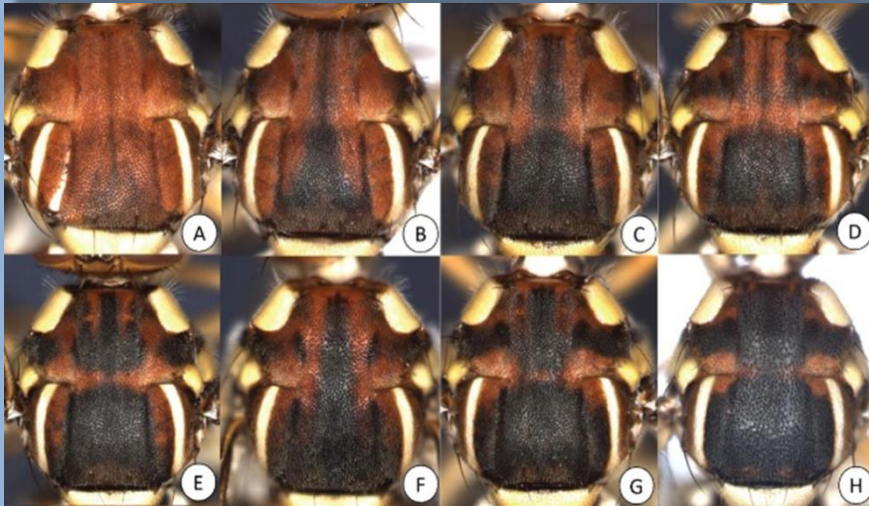


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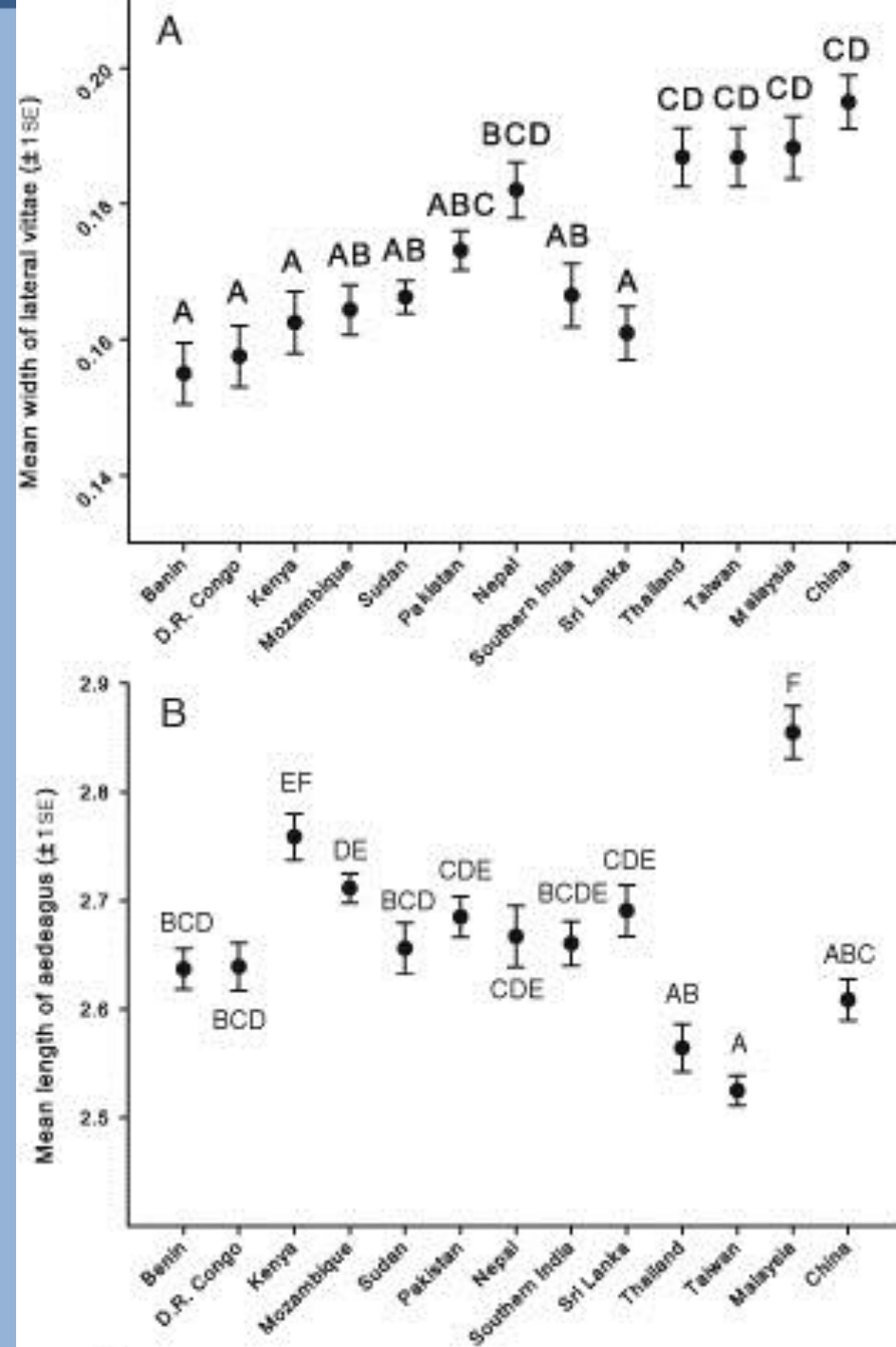
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Plasticity in morphology



Leblanc et al. 2013 as modified by Schutze et al. 2014



Schutze et al. 2014

Similar situations exist with **host lists** and **geographical distributions**, and these are expected to increase and become more difficult to interpret as changes in climate develop.

Avocado from Hawaii to the US

Avocado from Michoacán to the US >US\$1.5 billion

Assertions that California infested with several fruit flies



Plasticity in host range:

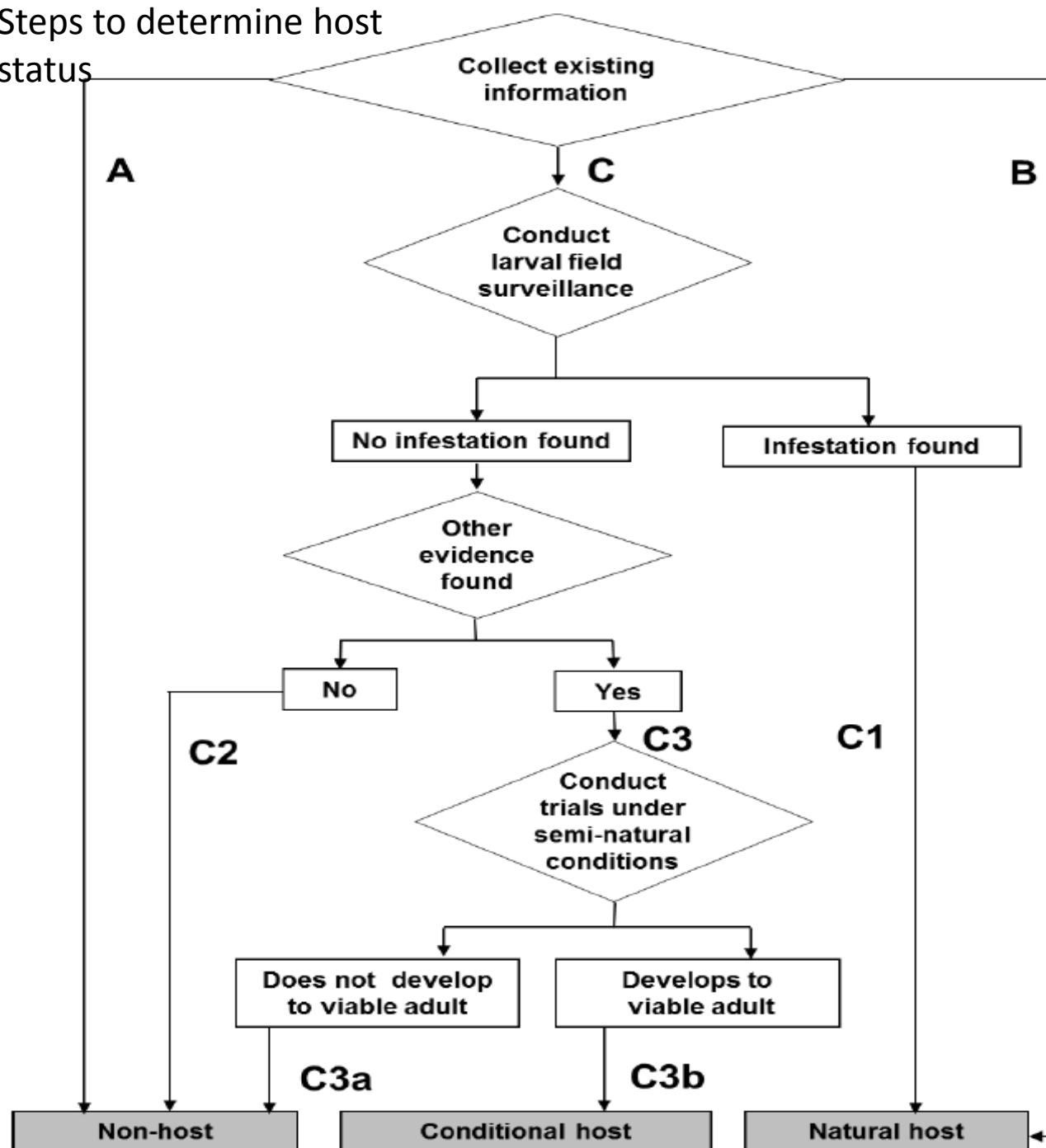
Tobacco budworm, *Heliothis virescens* (Lep: Noctuidae) does not attack tobacco in S. America and much of the Caribbean. Should products at risk of being infested by populations from N. America be quarantined or is this only a phenotypical response? I.e., a monophagous pest of tobacco, *H. tergeminus*, exists where *H. virescens* does not attack tobacco.

Guidelines for assertions about regulated pests help avoid needless economic damage. A primary source is the International Plant Protection Convention's International Standards for Phytosanitary Measures, available on-line in 6 languages.



ISPM 37 (2016) Determination of host status of fruit to fruit flies (Tephritidae)

Steps to determine host status



Another means to avoid needless economic damage is to resist the urge to get novel information quickly into the literature.

"I don't mind your thinking slowly; I mind your publishing faster than you think."

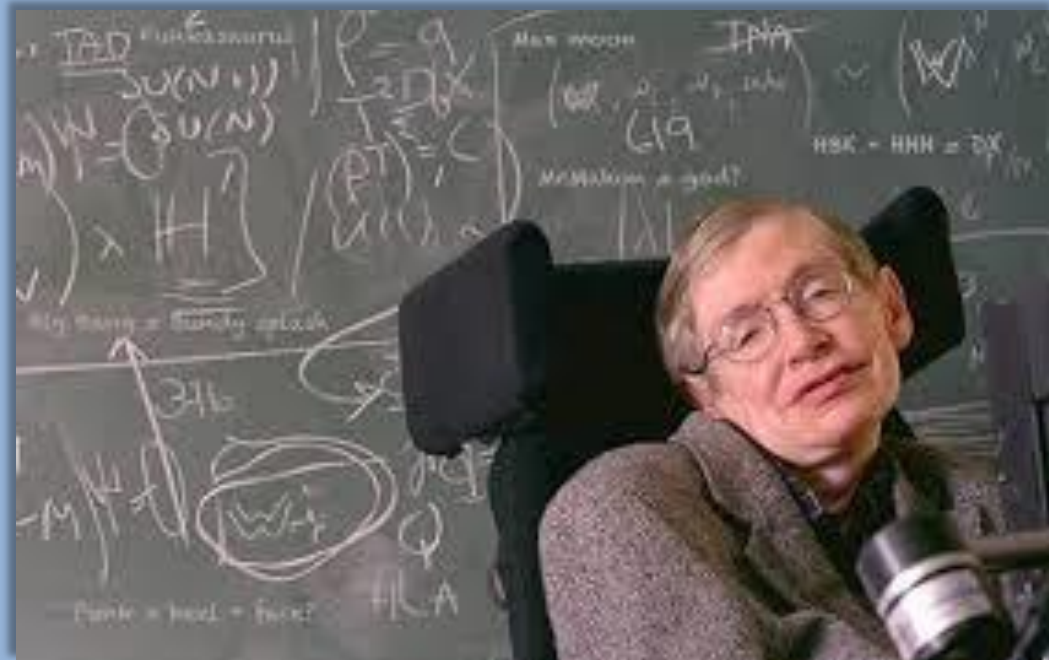
—Wolfgang Pauli



Contemporary Economics and Management (EJCEM, EJEM)	Journal of E-Computer Science Evolution	Recent Trends in Electrical & Electronics Engineering (IJRTE)	Plant Digest
European Journal of Educational Research (EUJER)	International Journal of Economics and Finance (IJEFin)	International Journal of Research and Innovation in Computer Engineering (IJRICE)	Pure and Applied Biology (PAB)
European Journal of Educational Sciences (EJES)	International Journal of Economics and Research	International Journal of Research Development (IJORD)	Reef Resources Assessment and Management Technical Paper
European Journal of Natural History (EJNH)	International Journal of Economics, Commerce and Management (IJECON)	International Journal of Research in Aeronautical and Mechanical Engineering (IJRAME)	Research
European Journal of Scientific Research	The International Journal of Educational and Psychological Assessment	International Journal of Research in Agricultural Sciences (IJRAS)	Research Directions: International Multidisciplinary Research Journal (Research Directions Journal)
European Journal of Sustainable Development	International Journal of Electrochemical Science	International Journal of Research in Ayurveda and Pharmacy	Research in Biotechnology
European Law and Politics Journal (ELPJ)	International Journal of Electronics and Computer Research (IJECON)	International Journal of Research in Computer and Communication Technology	Research Inventory: International Journal of Engineering and Science
European Scientific Journal	International Journal of Electronics Communication and Computer Engineering	International Journal of Research in Computer Science	Research Journal of Pharmaceutical, Biological and Chemical Sciences (RJPBACS)

Beall's List of Predatory Journals & Publishers

Does philosophy matter any more? Famous science populists have concluded not.



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Philosophy does have consequences:

Is *postmodernism* (anyone's opinion could be as good as anyone else's) in power today?

Factual relativism – evidence depends on the perspective of the observer

a.k.a. “alternative facts” or “fake news”



Ceci n'est pas une pipe.

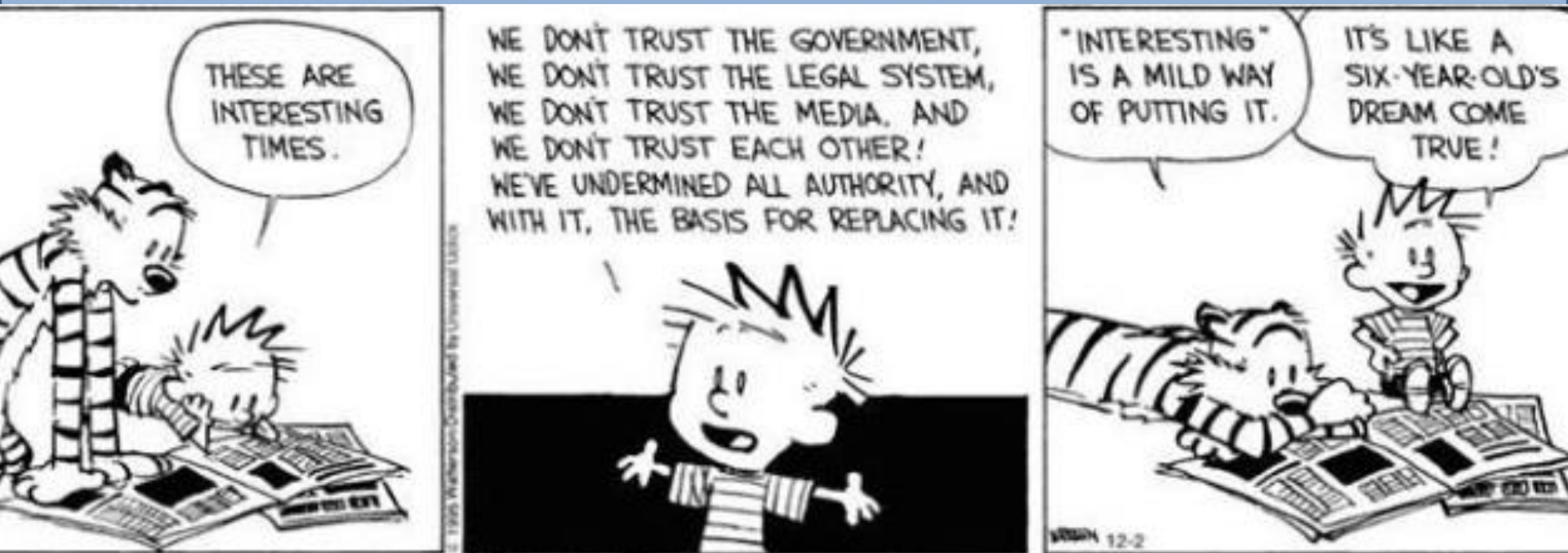


Ceci n'est pas la
Bactrocera dorsalis Hendel

The apparent ascent of some postmodernist ideas into some positions of power coupled with the ability to publish virtually anything these days provides brick and mortar for trade barriers.



“May you live in interesting times”
(a curse disguised as a blessing)



Now that postmodernism seems to be in power,
are its days defining culture numbered?

What is *Post*-postmodernism?

Themes seem to be trust, dialogue, good performance, and sincerity to transcend postmodern irony and distrust.

Sounds like Area-Wide Pest Management!
It is what we make it.



Phytosanitary Measures Research Group (since 2013)

Mission: harmonize research on phytosanitary measures with application to trade of horticultural commodities in support of IPPC Technical Panels, plant protection organizations, and researchers.

Meet every ~1 ½ yr (10-13 July 2017 in Wageningen); working groups address issues between meetings.

You here!



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Take away conclusions:

- Keep voucher specimens
- Follow accepted norms but challenge them when necessary
- Think of consequences for trade, economy, society when publishing
- Avoid dubious publications
- Work with groups like the PMRG