Plant Medicine, a University science and Plant Doctor, a necessary profession for the benefit of global agriculture:

Arguments and actions for their establishment

Eris Tjamos

Emeritus Professor of Plant Pathology,

Agricultural University of Athens, Greece

President of the Hellenic Society of Phytiatry

e-mail ect@aua.gr

Mycenae, 3.500 years ago
Ancient agriculture (a lady holding two sheaves of wheat)

Today Agronomy as a general science and Agriculture as its application,
are continuously evolving and adapted according to the needs of the humanity...but

AGRONOMY, AGRICULTURE and PLANT MEDICINE

- ***Regardless of the fact that continuous modernizations of University programs in Agronomy contribute to a broadening of the didactic courses with the addition of a plethora of various new scientific disciplines, these changes still do not take into account the importance of Plant Medicine (Phytiatry)***

PLANT MEDICINE (PHYTIATRY)

- *The oxymoron is that studies in Animal husbandry, in Food science, in Biotechnology in agriculture, in Agricultural engineering, in Agricultural economics and so on are gradually separated from classical Agronomy to create distinct relative professions,*
- *but real actions have not been taken so far for establishing Plant Medicine as a new University Science.*

Plant Medicine

Late Prof. George Agrios,

the founder of the PH.D. program in Plant Medicine, operating in the University of Florida, 15 years ago, has introduced the term Plant Medicine.

WHAT COULD BE PLANT MEDICINE ?

- ***Plant Medicine or Phytiatry as Medicine in Humans and Veterinary in animals could be a University science directly connected with all aspects of basic and applied topics of various related sciences.***
- ***A distinct multidisciplinary science that can deal with basic and applied research for studying taxonomy, classical and molecular biology and ecology of pests and pathogens and implementation of methods, techniques and tools for the diagnosis, prevention, therapy, dispersal or protection from plant diseases and pests, abiotic diseases, plant nutrition and generally management of plant pests and diseases.***
- ***Besides could include all measures and regulations concerning Plant Protection and Plant Health necessary to manage pests and pathogens taking into account environment, food safety, food security and costs of crop production.***

PLANT MEDICINE….

as a five-years course University science could include over 40 different scientific disciplines listed below

PLANT MEDICINE DISCIPLINES

1. Phytopathological Mycology
2. Bacteriology
3. Virology
4. Molecular Plant Pathology
5. Epidemiology
6. Agricultural Entomology
7. Agricultural Zoology
8. Nematology
9. Weed Science
10. Phytopharmacy
11. Breeding for disease and pest resistance
12. Disease and pest Diagnosis,
13. Plant Protection Strategies
14. Identification of new diseases, pests and weeds
15. Disease and Pest Monitoring
16. Molecular Biology,
17. Biotechnology
18. Ecotoxicology
19. Environmental Protection
20. Plant Physiology and Biochemistry
21. Plant Breeding
22. Select varieties for treating diseases and enemies
23. Experimentation and Biometrics

RELATED AGRONOMIC DISCIPLINES

1. Basic knowledge of general and specific Pomology,
2. Viticulture,
3. Horticulture,
4. Floriculture,
5. General and Special Agriculture,
6. Forestry
7. Farming systems
8. Soil Science,
9. Soil management /
10. Fertilizers - Nutrition
11. Multiplication of seed and plant breeding
12. Harvesting process and impacts on Plant products
13. Ecology and landscape architecture
14. Communication and information,
15. Socio-economic impact of applied plant medicine
16. Quality production
17. Consumer protection
18. Work safety
19. Production Systems
20. Stored-Product Protection,
21. Harvest Processing, etc.

PLANT MEDICINE:

- ***Our presentation enlightens the major problems related to the current situation in Plant Medicine concerning education and application around the globe.***
- ***It presents arguments along with pictures, which emphasize the fundamental particularity of all sciences related to Plant Medicine, and also***
- ***Actions and requirements for upgrading the education and specialization on basic and applied disciplines of Plant Medicine in world agriculture,***
- ***for establishing a new profession of Plant Medicine doctors.***

WHY
UNIVERSITY PLANT MEDICINE DOCTORS

- ***Because modern agriculture needs …….***

- ***Plant Medicine doctors****, who will* ***work*** *in the labs but also, when invited, to be able to* ***visit*** *the fields, the orchards and the glass houses to* ***examine*** *the plant health problems, to* ***attend*** *symptom expression, to* ***diagnose*** *the causes and* ***identify*** *pests and weeds,* ***to examine problems of plant nutrition, soil fertility*** *and* ***suggest*** *the necessary measures.*
- ***Plant Medicine doctors****, who will* ***detect*** *the new problems.*
- ***Plant Medicine doctors****, who will* ***communicate*** *with the Research Institutes.*
- ***Plant Medicine doctors****, who will* ***transfer*** *to the agricultural practice the new research results through* ***a private or state controlled extension service.***

WHY?
Aren't we satisfied from the current situation?

- ***Currently agronomists, biologists etc. usually acquire very generalized and limited University knowledge related to control of pests and plant diseases, so normally in many specialized cases operate with unjustifiable amateurism.***

- ***Besides, Plant Pathologists, Entomologists, Weed science and Plant stress specialists cover partially the needs of application since they are very specialized, thus, suitable to work in Research centres and Universities.***

- ***Then, who is going to fill the existing gap of plant medicine doctors combining these scientific disciplines in one?***

Personally I strongly believe that modern Agriculture needs Plant Medicine as a separate University science to create the distinct and independent new profession of Plant Medicine Doctors able among others to:

1. **Cover problems related to scientifically accurate Disease and Pest Diagnosis**
2. **Distinguish the causes of diseases, pest damages and plant stress effects appearing with similar symptoms on plants**
3. **Consult and help avoiding Pathogen and Pest Dispersal**
4. **Select and suggest appropriate Pest Management along with contributing to Pesticide Education and Safety Programs**
5. **Solve acute problems in Postharvest plant medicine**
6. **Deal with the impact of Mycotoxins and Chemicals Thoughtless and unnecessary use of pesticides to food safety**
7. **Suggest the appropriate Plant nutrition**
8. **Guide the farmers to produce quality products both for human consumption and animal feed.**
9. **Contribute in ameliorating the negative impact of farming on the Environment**
10. **Contribute in reducing unjustifiable expenses and high Costs in crop production**
11. **To avoid amateurism ……..**

ARGUMENT-1

New profession of
Plant Medicine Doctors

is needed to cover problems related to scientifically accurate
Plant Disease and Pest Diagnosis

Single diseased plants, leaves or fruits

LEMON OR LEMON TREE

Simply because all cases are not as simple as infections by

Penicillium digitatum, ***or*** ***Phoma tracheiphila***

APPLE AND OLIVE TREES

Apple scab - Fusicladium or Dacus fly to be easily identified …..

PEACHES

Specific cases need proper education and experience to avoid guessing or wrong diagnosis

Thrips damage? or Phytoplasma?

Simply you guess

Single diseased plants, leaves or fruits

QUINCES

Virus?

Simply you remain silent or just guess

Single diseased plants, leaves or fruits

CHERRIES virus?

Simply you suspect the cause or just guess

Single diseased plants, leaves or fruits

LETTUCE

Herbicide toxicity or a pathogen Simply you guess

Single diseased plants, leaves or fruits

APRICOTS var. orange red

Is it a fungal diseases e.g. Coryneum beijerinckii ?

Wrong diagnosis

TOXIC combination of fungicides (benomyl) and leaf fertilizers

Single diseased plants, leaves or fruits

ARGUMENT-2

Obviously Lack of Plant Medicine Doctors

allows

amateurism to prevail with unqualified scientists who are unable to distinguish the causes of diseases, pest infections and plant stress effects, appearing with similar symptomatology.

OLIVES

Similar symptomatology

Eriophyes or Leveillula

You can check it, but you need microscope

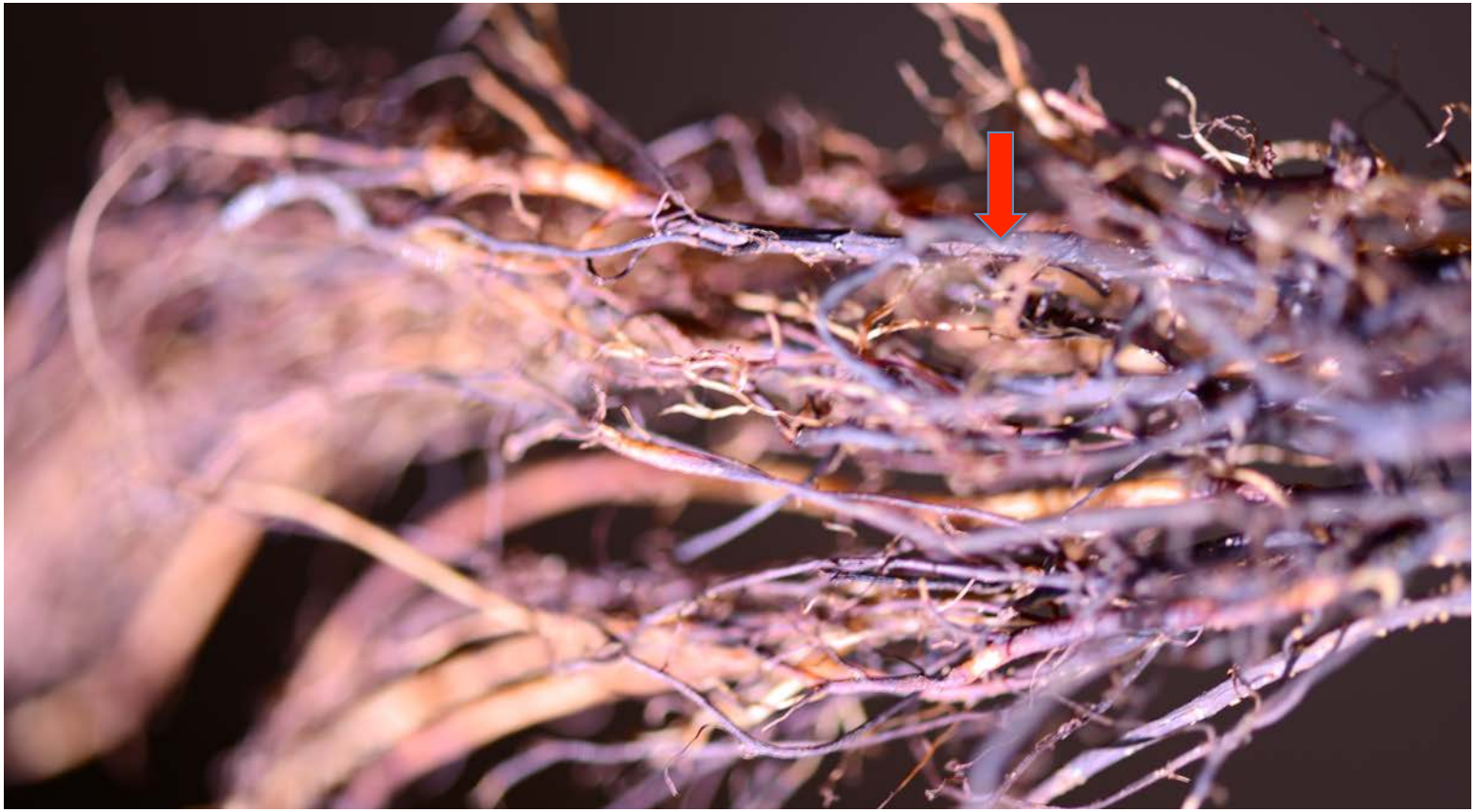
Single diseased plants, leaves

STRAWBERRY

Similar symptomatology

Roots infected by

Rhizoctonia solani, Pythium sp., Idriella, or Fusarium solani ?



Single diseased plants, or roots

POMEGRANATES

Similar symptomatology

Spray toxicity ?

No High humidity in storing

Single diseased plants, leaves or fruits

POTATO LEAVES

Similar symptomatology

Chemical toxicity, fungal infection?

None of them but Necrosis caused by big differences between day and night temperatures

Single diseased plants, leaves or fruits

CARROTS

Similar symptomatology

Wireworms or Pythium?

None of them but Psila rosae

Single diseased plants, leaves, rhizomes or fruits

CARROTS

Similar symptomatology

Waterlogging or herbicide toxicity?

None of them but Boron deficiency

Single diseased plants, leaves, rhizomes or fruits

GRAPEVINE cane

Similar symptomatology

Agrobacterium vitis?

No Hormonal herbicide toxicity

Single diseased plants, leaves or fruits

CHERRY TREE

Gummosis caused by Phytophthora, Armillaria, or…..

Single diseased or damaged tree

ALMOND TREES

Similar symptomatology

Verticillium, Armillaria, Rosellinia,

Capnodis (syn. Bupestris)? or waterlogging?

None of them but Phytophthora sp.

Orchard diseased plants

ORANGE TREE

Similar symptomatology

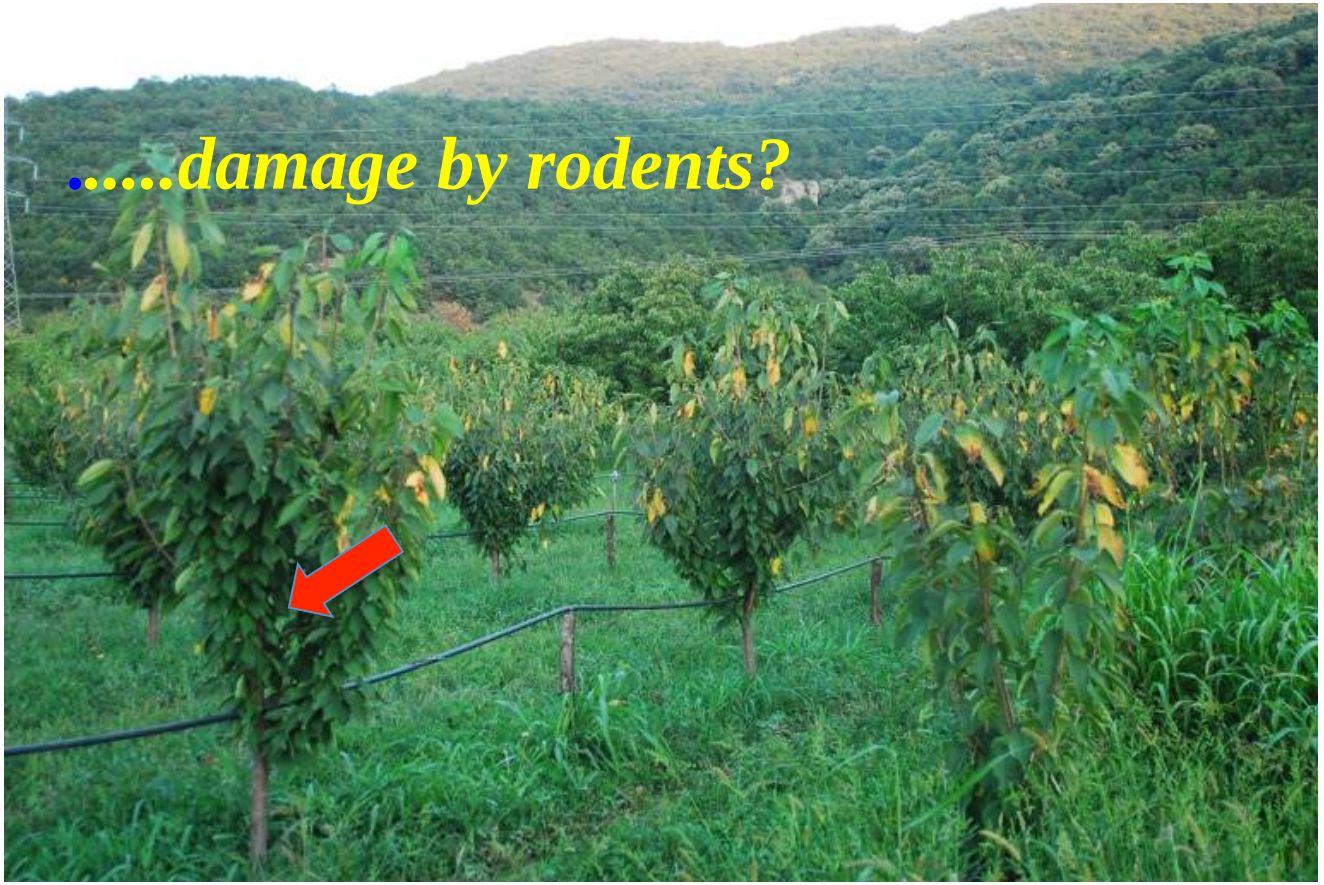
Phytophthora or waterlogging

None of them but rodents

Orchard diseased or damaged plants

CHERRY TREES

Phytophthora, Verticillium, Armillaria, Capnodis (syn. Bupestris), waterlogging or.....



Orchard diseased or damaged plants

MANDARIN TREES

Fusarium solani or waterlogging

None of them but nematodes

Orchard diseased or damaged plants

CHESTNUT and ABIES forest

Endothia or Cerambicidae ?

Forest diseased or damaged trees

POTATOES

Phytophthora infestans or
Dickeya solani……?
None of them but Verticillium dahliae

Field diseased or damaged plants

MELONS

Fusarium oxysporum f. sp. melonis (and what race), Monosporascus cannonballus or Olpidium bornovanus? None of them but Verticillium dahliae

Field diseased or damaged plants

LETTUCE

Pythium or Verticillium dahliae?

None of them but Sclerotinia minor

Field diseased or damaged plants

ARGUMENT-3

Plant Medicine Doctors,

who can consult the agronomists or the farmers on quarantine pathogens and pests and help avoiding Pathogen and Pest Dispersal

- *Just to mention few of the most recent cases of International threats*

- *TOMATOES/POTATOES*

- *Ralstonia solanacearum*

WHEAT

Karnal (Partial) Bunt Tilletia indica

WHEAT rust:

Puccinia graminis f.sp. *tritici*

The virulent stem rust race Ug99

of wheat rust, a devastating disease known as the "polio of agriculture…threatens to destroy the world crop

CITRUS greening
Liberibacter asiaticus / Asian citrus psyllid

POTATOES/TOMATOES

Candidatus Liberibacter sp.

- *A new bacterial species 'Candidatus Liberibacter psyllaurous' has been found in association with serious diseases of tomatoes, potatoes*
- *In some potato and tomato production areas of North America* .

OLIVES

Verticillium dahliae

OLIVE in Italy

is it also Verticillium wilt ?

Unfortunately it is XYLELLA FASTIDIOSA

ORANGE TREES

Smuggling of even certified?? plant material can not be excluded

TRISTEZA in Greece

PALM

Rhynchophorus ferrugineus

or the current palm pest menace

Paysandisia archon

ARGUMENT-4

Plant Medicine Doctors

able to

- ***suggest suitable Pest Management***

- ***introduce disease and pest forecasting/risk assessment models, which will allow growers to more accurately schedule sprays and reduce chemical use and***

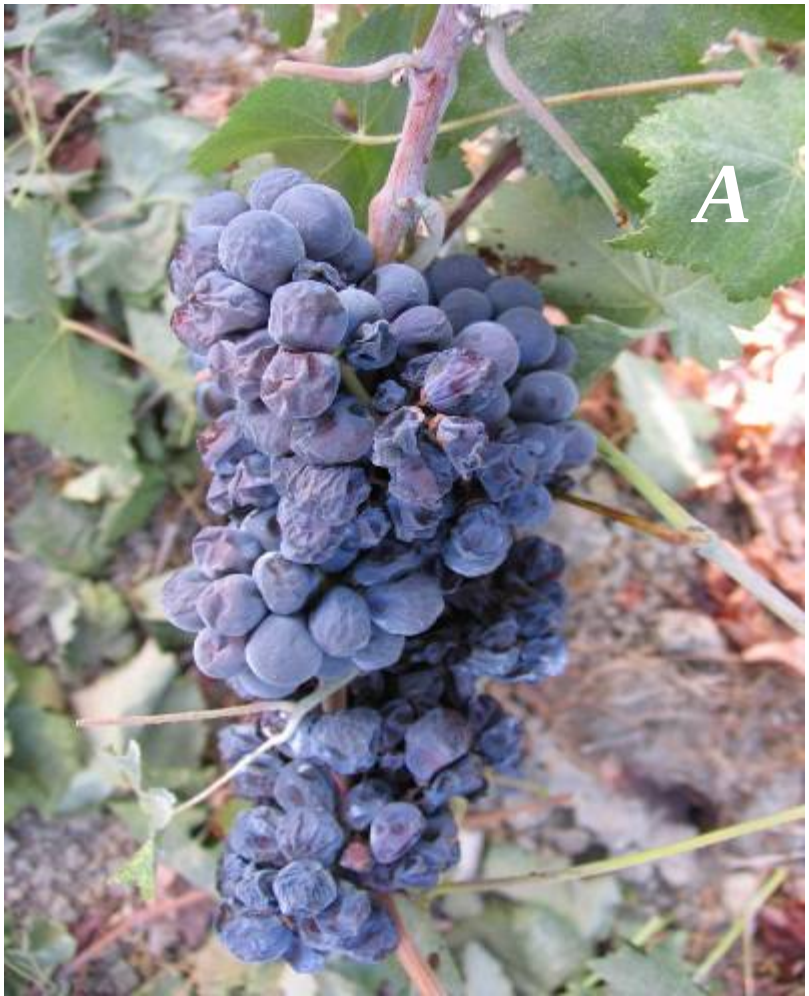
- ***contribute to best Pesticide Selection for securing effectiveness and food safety.***

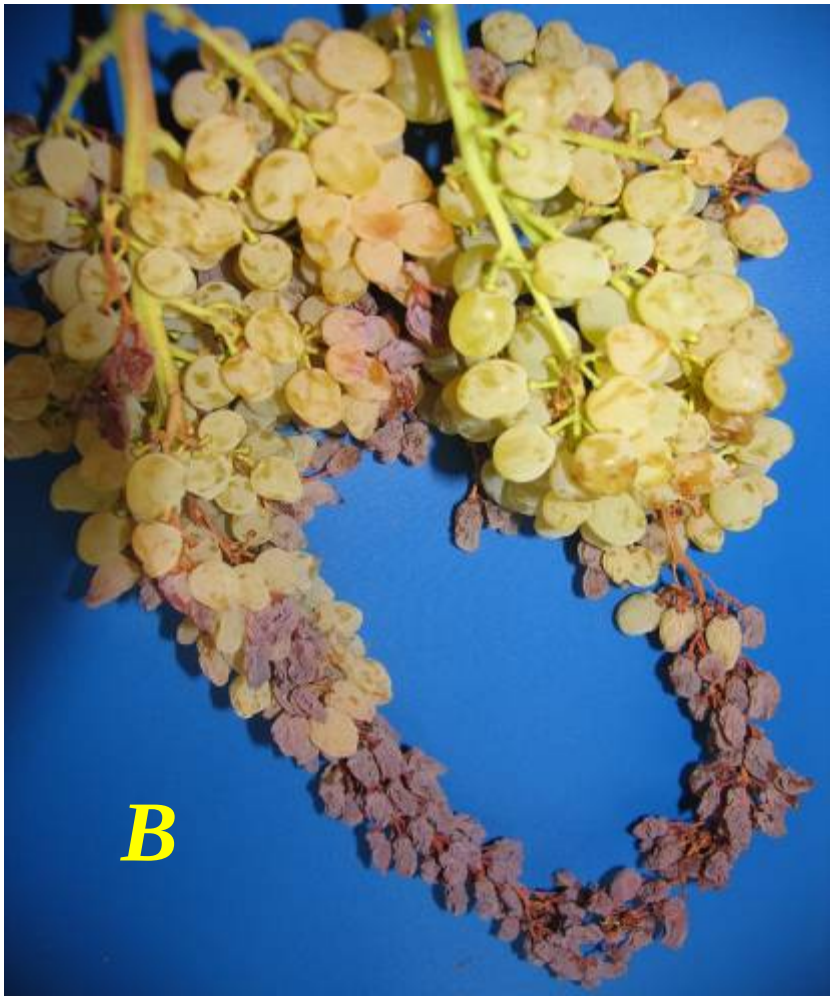
PEPPER

Downy mildew or powdery mildew?
Correct diagnosis since
different chemicals are needed to be controlled

GRAPES

Botrytis bunch rot or Sour rot (Aspergillus) and Grape berry moth (Eudemis) –A or Stem and bunch breakdown (Ca Deficiency)-B





ARGUMENT-5

Plant Medicine Doctors
able to
deal with complicated problems of
Postharvest Plant Medicine

PLUMS

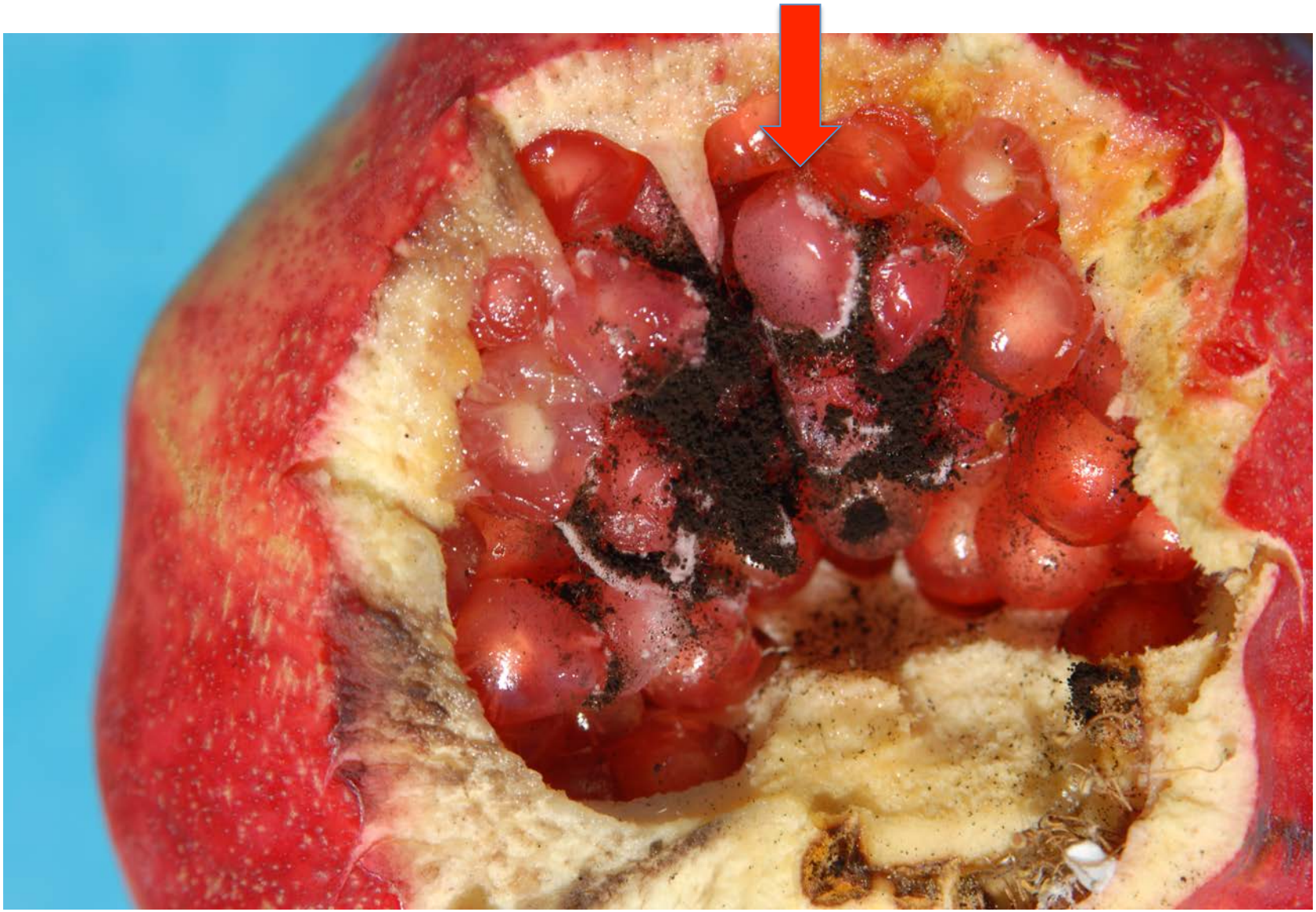
Monilia laxa

STRAWBERRIES

Botrytis cinerea

POMEGRANATE

Aspergillus niger



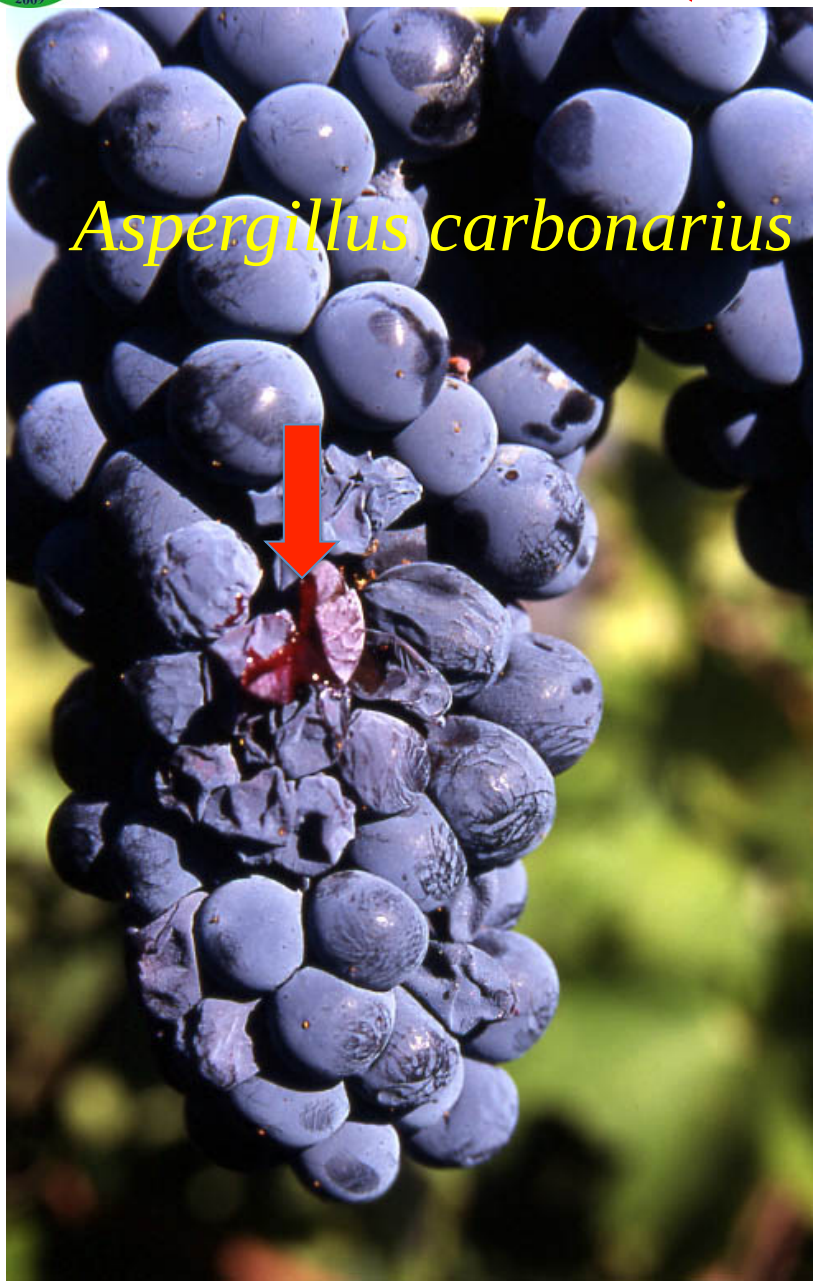
ARGUMENT-6

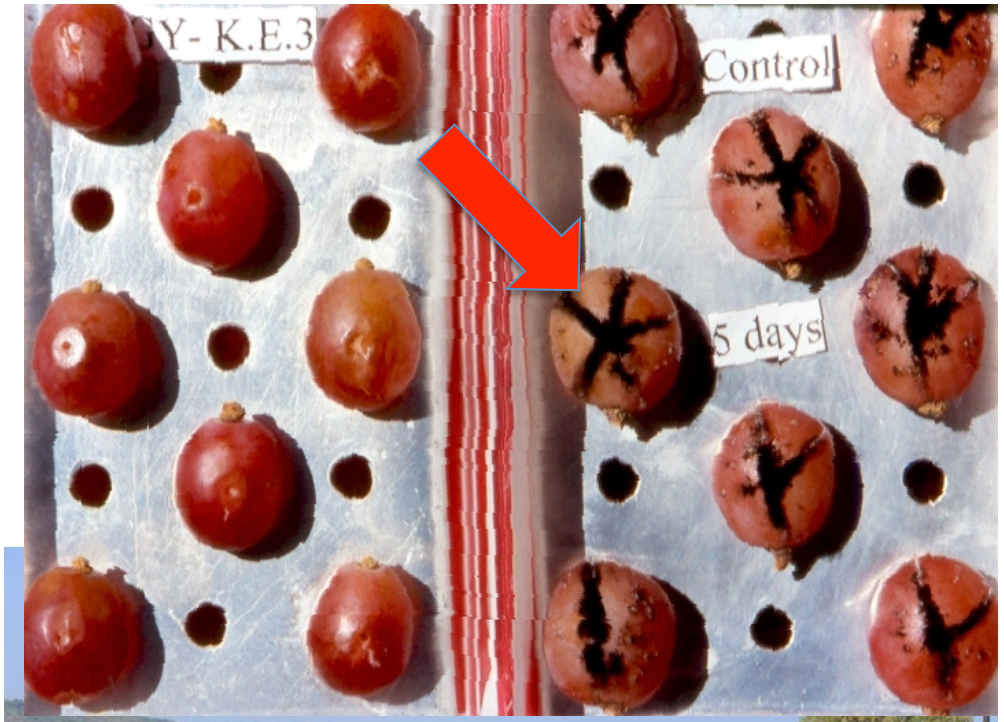
Plant Medicine Doctors

able to

deal with the impact of mycotoxins on food safety and suggest measures for management of relative pathogens

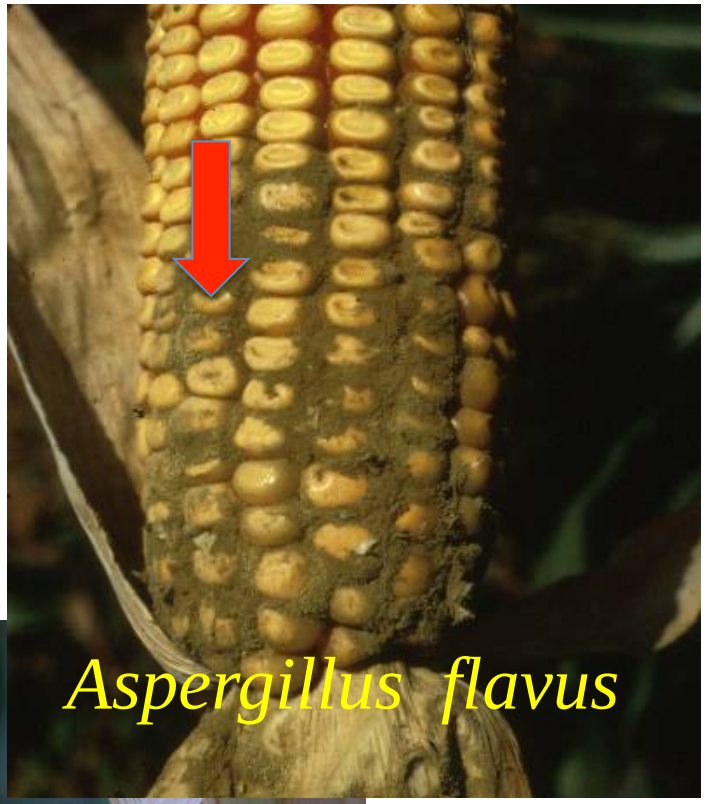
GRAPES (OTA WINE AND RAISINS)





MAIZE

Fusarium verticillioides



Aspergillus flavus

FIGS

PISTACHIOS

Aspergillus and Penicillium

ARGUMENT-7

Plant Medicine Doctors

able to

provide with the appropriate

Plant nutrition instructions

to secure best plant growth related to crop health

ARGUMENT-8

Plant Medicine Doctors

able to

guide the farmers to produce quality products both for human consumption and animal feed


GEOPLANT
GEOPLANT A.E.E.Γ.Ε.
GEOPLANT
GEOPLANT A.E.E.Γ.Ε.


ΦΥΤΙΑΤΡΙΚΗ ΕΤΑΙΡΕΙΑ ΕΛΛΑΔΟΣ
2009

ARGUMENT-9

Plant Medicine Doctors

able to

contribute in ameliorating the negative impact of farming on the Agricultural Environment and

instructing farmers to be in vigilance in protecting both their farms, the agricultural environment and their health.


ΦΥΤΙΑΤΡΙΚΗ ΕΤΑΙΡΕΙΑ ΕΛΛΑΔΟΣ
2009

ARGUMENT-10

Plant Medicine Doctors

able to

contribute in reducing Unjustifiable expenses and high Costs in crop production

through accurate diagnosis, best selection of measures and appropriate timing in application.

ARGUMENT-11

- *Plant Medicine Doctors*
- *able to*
- *eliminate the problem of amateurism in disease and pest diagnosis and management*

Empirical plant Medicine doctors..... in the 21st century ?

- ***Several people in the private sector consider that services in applied Plant Medicine could still be based on a general crop production knowledge, simply accumulated through everyday practice.***
- ***But this service is occasionally based on inadequate superficial knowledge, on empirical information or on unethical attitude of practitioners,***
- ***unfortunately leading to wrong diagnoses and tragic proposals for management with negative financial and environmental impacts.***

Several also believe that they can identify the cause of diseases by sending e-mail pictures to specialists

Mission impossible for soilborne pathogens, toxicities etc.

Kiwi fruit

Pseudomonas syringae pv actinidiae ?

Pistachio nut

Walnut

ACTIONS

CURRENT AND FUTURE RELATED INTERNATIONAL ACTIONS IN VARIOUS FIELDS

1. *Extension plant clinics*
2. *Education at Universities*
3. *Cooperation in international training*
4. *Alarming cases for urgent steps (APS, BSPP)*
5. *International joint congresses*
6. *Applied Plant medicine actions*
7. *International Societies*
8. *Time for common Action*

ACTION-1
Extension plant clinics

Of course there are Extension plant clinics

- ***Plant Health Clinics around the globe***

operating by groups of specialists

- ***University Plant Clinics-USA***

Plant diagnostic labs are operating in USA mainly through their relative departments in State Universities

- ***Private Plant Diagnostic Clinics***

promoting a "Test and Don't Guess" attitude

ACTION-2
EDUCATION AT UNIVERSITIES

- ***Undergraduate***
- ***and Postgraduate studies***

UNDERGRADUATE STUDIES

Specific University studies in Plant Medicine

- *Today there is a scientific gap in Plant medicine sciences at an undergraduate level*
- *There are very few Universities offering first University degree, such as Bachelor in Plant Protection and Integrated Pest Management in*
- *California State University – Fresno*
- *Belgrade, Serbia*
- *Plovdiv, Bulgaria*
- *National Pingtung University of Science and Technology (Department of Plant Medicine), South Korea*
- *Chungbuk National University (Department of Plant Medicine), Taiwan*

POSTGRADUATE STUDIES

PLANT MEDICINE today

- ***Ph.D. in USA or elsewhere***

- ***Plant medicine at post graduate level is a growing field that started in the University of Florida.***

Plant Medicine Doctor

University of Florida

- ***Program***
- ***in crop and plant health education focused mainly on***
- ***Entomology and Nematology***
- ***Plant Pathology,***
- ***Plant Soil and Weed Science***

The Multidisciplinary Doctor of Plant Medicine program at the University of Florida was perfectly fit to Intensive course works and internships within various agricultural fields, such as agronomy, horticulture, entomology and nematology, soil and water sciences, and plant pathology.

- ***Mission and Profession***

- ***The mission of the University of Florida, Doctor of Plant Medicine program is to provide premier professional doctoral training for plant scientists.***

- ***The graduates are important team members and leaders in industry, the private sector, government, and academia.***

Plant Health Doctor
University of Nebraska

- ***The Professional Program in Plant Health has started five years ago.***

- ***The program is designed to train practitioners rather than researchers in entomology, agronomy, plant pathology and soil science.***

ACTION-3

- ***COOPERATION IN INTERNATIONAL TRAINING***

Post graduate programs organized in cooperation with Florida:

- •*Japan, Hosei University/University of Tokyo*
- • ***South Korea,*** *Chungbuk National University (Department of Plant Medicine)*
- • ***Taiwan,*** *National Taiwan University*
- *National Chiayi University;*
- *National Pingtung University of Science and Technology (Department of Plant Medicine)*
- • ***USA****, University of Nebraska*
- • ***Thailand****, Maejo University (cooperative agreement completed)*
- • ***Egypt****, Mansoura University (cooperative agreement in progress)*

IN MEDITERRANEAN COUNTRIES

Italy

Masters' degree in Plant Medicine

- **Corso di Laurea Specialistica in Medicina delle Piante**

(Facoltà di Agraria Universita di Bari)

UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

International joint Master degree in Plant Medicine (acronym: IPM)

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In Greece

University of Thessaly

Postgraduate program on

Plant Medicine and Environment

- ***Although Plant Medicine programs at a postgraduate level in the USA and Europe are a breakthrough, the differences in the undergraduate scientific backgrounds among students entering the programs is still a problem.***

- ***I personally believe that postgraduate studies should come as a step next to undergraduate studies in Plant Medicine.***

ACTION-4

- ***Alarming cases need urgent steps to be taken (APS, BSSP)***

- ***TOWARDS ALLERTING STATES, UNIVERSITIES AND THE PUBLIC SECTOR***

ALLERTS IN BRITAIN

Alarming reaction by British Society for Plant Pathology

stating that

- *Plant pathology has been lost completely or greatly reduced at 11 UK Universities, threatening Britain's ability to combat new diseases.*

- *Plant pathology education in Britain needs to be revived, to reverse the decline in expertise and to give farmers and foresters better ways of controlling these diseases.*

Campaign of British Society for Plant Pathology

Become a plant doctor

but they mean plant pathologist

APS YOUTUBE PLANT DOCTORS

APS produced and provides alarming you tube videos to emphasize the emerging need for plant doctors.

But both the British and the Americans are wrongly considering plant doctors as plant pathologists only.

But they must move along with other relative societies such as Entomological and Weed Science Societies to initiate a campaign on how we should proceed and be coordinated to obtain the real Plant medicine doctors

ACTION -5

- ***Jointed international congresses of related plant medicine sciences are organized.***

- ***Just to prove that we can not separate the related disciplines particularly for Applied Plant Medicine reasons.***



EXAMPLES

1. 2011 American Phytopathological Society-International Plant Protection Congress (APS-IPPC) Joint Meeting in Honolulu, Hawaii

2. 2011 Entomological Society of America-American Phytopathological Society, San Huan Puerto Rico

ENTOMOLOGICAL SOCIETY OF AMERICA
APS
Exotic Species:
A Shared Experience
2011
ESA-SEB & APS-CD
Joint Annual Meeting
March 19-22, Caribe Hilton Hotel, San Juan, Puerto Rico

ACTION-6
Current Applied Plant Medicine actions

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Andrew Maloy

Currently Plant doctors covering all disciplines although operating without having obtained appropriate University education, are showing the proper route for the future of the profession of Plant Medicine Doctors

ACTION-7
Beyond APS and BSPP

- ***Plant Medicine Scientific Societies***

world-wide could play a substantial role with international cooperation

Swiss Society for Phytiatry (SSP)

Schweizerische Gesellschaft für Phytomedizin
Società svizzera di fitoiatria
Swiss society for phytiatry

The German Phytomedical Society (DPG)

- *The German Phytomedical Society (DPG) is the largest scientific association in plant production in Germany*
- *The Society is membership-based 1200 members, are professionals within the entire field of phytomedicine Science for Practice*
- *Phytomedicine* ***is*** *the science of plant disorders (whether biotic or abiotic), their diagnosis, management and control*

The Spanish Association of Plant Health (AESaVe)

aesave
ASOCIACIÓN ESPAÑOLA DE SANIDAD VEGETAL

AESaVe is a nonprofit, open society committed to promote plant health as a specialized profession in Spain through enhancing the need for specific training at Spanish universities on plant health disciplines, while at the same time enhancing the perception by society of the critical role played by plant health on agro-forestry sustainability and food security.

Hellenic Society of Phytiatry

- ***The Hellenic Society of Phytiatry was established in Greece in 2009***

In a Letter to the Editor of Phytopathology News in May 2010

I have suggested Establishment of Plant Medicine as a New distinct and independent University Science to create a new very attractive Profession of general or specialized Plant Medicine Doctors

ACTION-8
Time for common Action

- ***Universities, Academia, Politicians, along with related Scientific Societies, the Private sector and Farmer unions must exercise their pioneered role and cooperate to go ahead with the establishment of Plant Medicine as a new University science at an undergraduate level.***
- ***For the benefit of Agriculture, for the farmers, for the consumers, for the environment, for the humanity.***


THANK YOU VERY MUCH