POTENTIAL OF QUINHYDRONE AS A GROWTH INHIBITOR OF PHYTOPATHOGENIC BACTERIA

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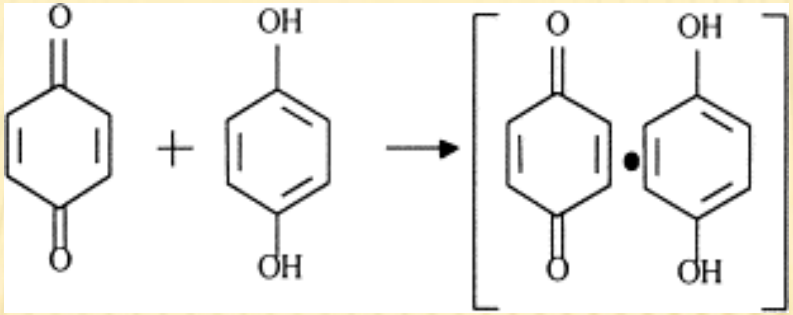
QUINHIDRONE (QH)

- Charge transfer complex commonly used as a redox standard. Its physiological function and mechanism of generation in plants have not been fully elucidated



QH charge transfer complex between benzoquinone and hydroquinone

- Can be accumulated in the cell wall as a complex of benzoquinone and hydroquinone
- Acting both as an oxidant and as a reductant, it regulates redox processes in the apoplast
- Main source of quinones is enzymatic (peroxidase, polyphenol oxidase) oxidation of cell wall flavonoids, which is linked to plant protective mechanisms against abiotic and biotic stress
- Recently, we showed that QH accumulates in response to excess Zn in phenolic rich plants such as *Verbascum thapsus* due to Zn stabilization of phenoxyl radicals and quinone formation (Morina *et al*., 2010, Physiol. Plantarum)

QH IN PLANT PROTECTION

- The peach X-disease phytoplasma may be controlled by treating the infected trees with aqueous solution of QH, without affecting the host tissue (Rangaswami and Bagyaraj, 2005)

PHYTOPATHOGENIC BACTERIA

- responsible for great losses in economically important crops (vegetables, fruits)
- protection against pathogens is mainly based on copper derivatives and antibiotics
- research on possible use of naturally occurring substances for pathogen control and for plant growth promotion is preferable with great importance in environmental protection

THE AIM

Present study reports the activity of QH as a growth inhibitor of three economically important phytopathogenic bacteria:

Erwinia amylovora (Burrill) Winslow et al.
(fire blight of apples, pears, and some other members of the family *Rosaceae*)


(Wikipedia)


(CABI)


(CABI)

Pseudomonas syringae* pv. *syringae van Hall 1902
(bacterial canker or blast of stone and pome fruit,
bacterial brown spot of beans)

Sundin G & Rothwell N

Xanthomonas campestris* pv. *campestris (Pammel) Dowson
(Black rot of crucifers)

McGrath MT

MATERIAL AND METHOD

➢ **Test strains** (cultured on Nutrient Agar for 48 h at 28 °C):
Ea: Institute for Plant Protection and Environment, Serbia (TEad1)
Pss: La Collection Française de Bactéries Phytopathogènes, France (CFBP 1582)
Xcc: National Collection of Plant Pathogenic Bacteria, United Kingdom (NCPPB 1144)

➢ **Commercial QH** (Sigma)

➢ **Agar diffusion technique**

- 100 mL of bacteria suspensions (3 x 10^6 cells/mL) mixed in 100 mL Nutrient Agar (NA) poured in sterilized Petri plates (90 mm in diameter)

- After solidification, 25 µL of different QH concentrations (0.01, 0.02, 0.03, 0.04, 0.1, 0.5, 1, 5 and 100 mM) placed on filer paper disks on the agar surface

- Incubation three days at 28ºC

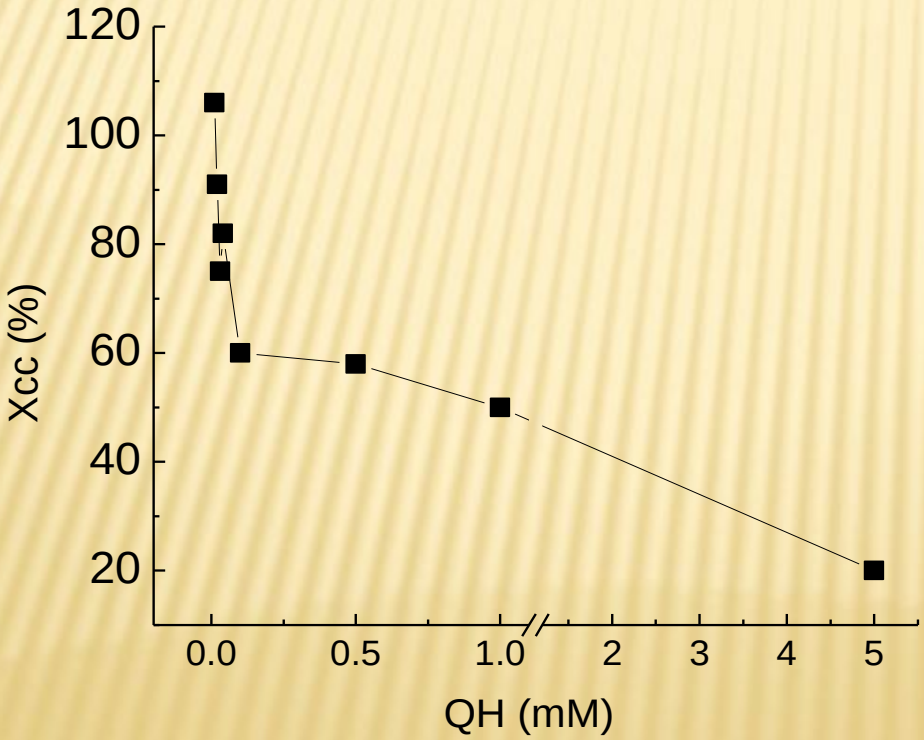
- The number of bacteria within the inhibition halos was measured according to McFarland standard units using a densitometer

RESULTS

- QH inhibited the growth of all three bacterial strains in a concentration dependant way
- Concentration of 100 mM QH completely inhibited bacterial growth
- Concentration of 0.01 mM QH had no effect on growth in any of the bacterial strains

RESULTS

- the most sensitive was Xcc strain
- 50% inhibition at 1 mM QH
- at 5 mM QH only about 20% of Xcc bacteria survived

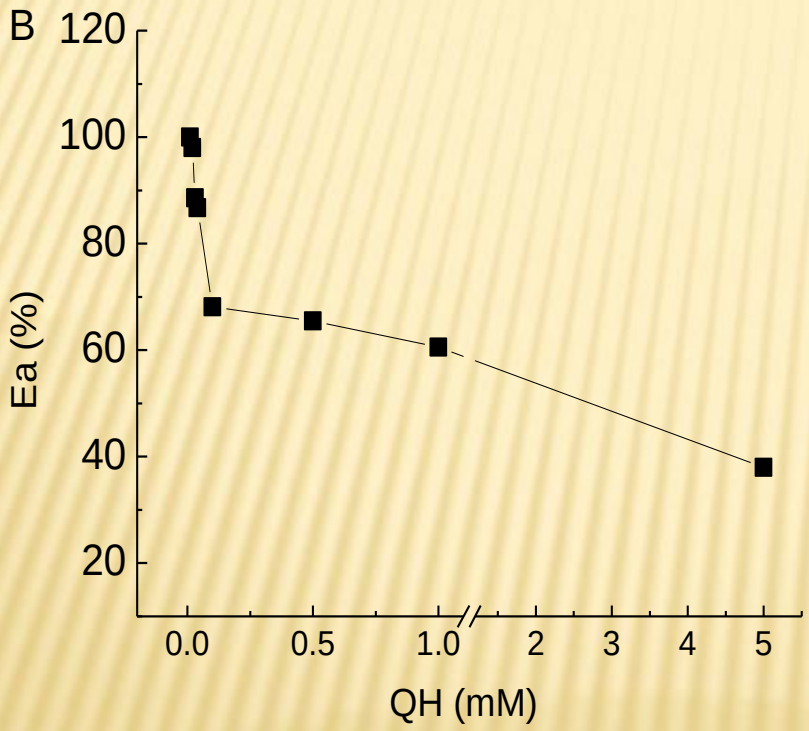


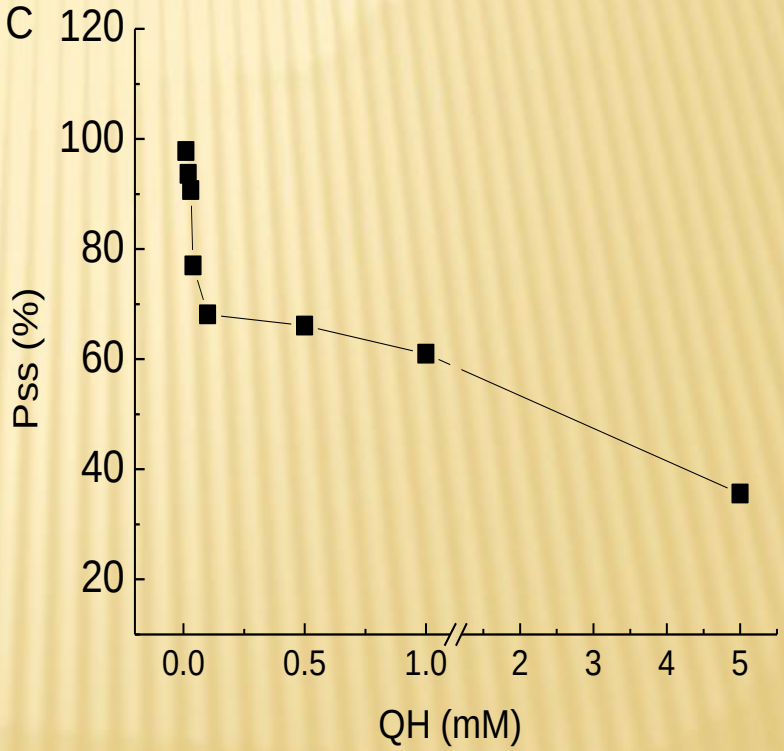
Growth inhibition of Xcc strain after addition of 0.5 mM, 1 mM and 5 mM QH and controls (K, K+)

Growth inhibition of Xcc strain after addition of 100 mM QH and control (K)

RESULTS

- The number of Pss and Ea strains decreased to 60% at 1 mM QH and 36% at 5 mM





CONCLUSION

- QH in the concentration range from 0.5 mM to 5 mM can be effective against Ea, Pss and Xcc

- this complex might be considered as a potential compound for the development of antimicrobial agents for use in plant protection either as a pesticide ingredient or as an agent expressed in transgenic plants

- further studies will investigate the effects of QH application on plants as well as mechanism of induction of QH generation in the cell wall.

THANK YOU FOR ATTENTION !