Department for Environment Food & Rural Affairs

ADAS





Integrated Pest Management: Science and Practice
Disease control in cereals

Neil Paveley and Frank van den Bosch

A video series funded by Defra and produced by ADAS

www.adas.co.uk

How much fungicide is needed?

IMPORTANT INFORMATION

FOR USE ONLY AS A PROFESSIONAL FUNGICIDE

Crops/situations	Maximum individual dose (Litres product/ha)	Maximum total dose (Litres product/ season)	Maximum number of treatments	Latest time of application
Durum wheat, rye (winter), wheat	0.8	2.4	–	Before grain milky ripe stage (GS 71)
Barley, oats	0.8	1.6	–	Before beginning of flowering (GS 61)

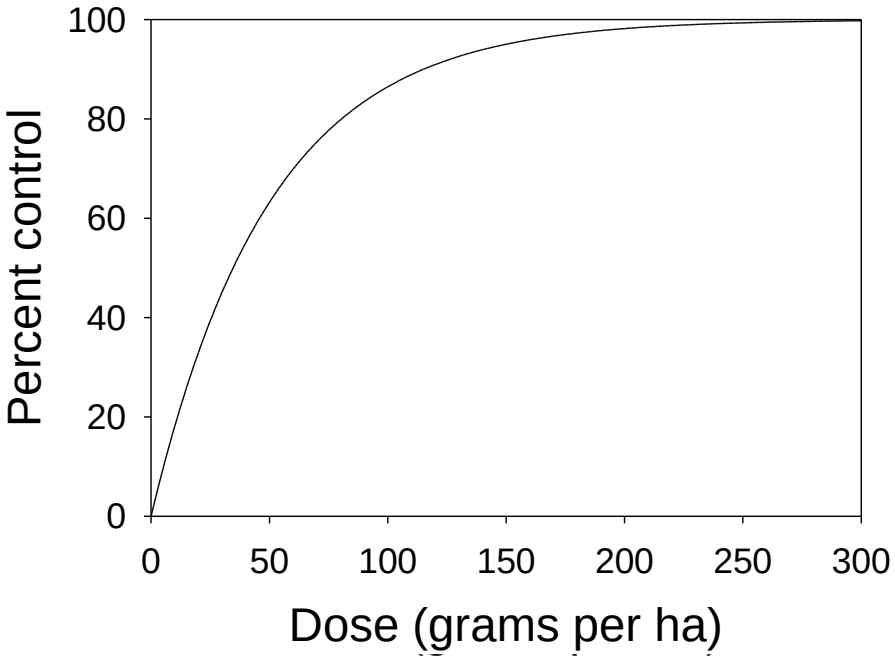
Crops/situations	Aquatic buffer zone distance (metres)	Comment
Barley, durum wheat, oats, oilseed rape (winter), rye (winter), wheat	5	see Environmental Protection Phrase 1

Other specific restrictions:

This product must not be applied via hand-held equipment.

READ THE LABEL BEFORE USE. USING THIS PRODUCT IN A MANNER THAT IS INCONSISTENT WITH THE LABEL. MAY BE AN OFFENCE. FOLLOW THE CODE OF PRACTICE FOR USING PLANT PROTECTION PRODUCTS.

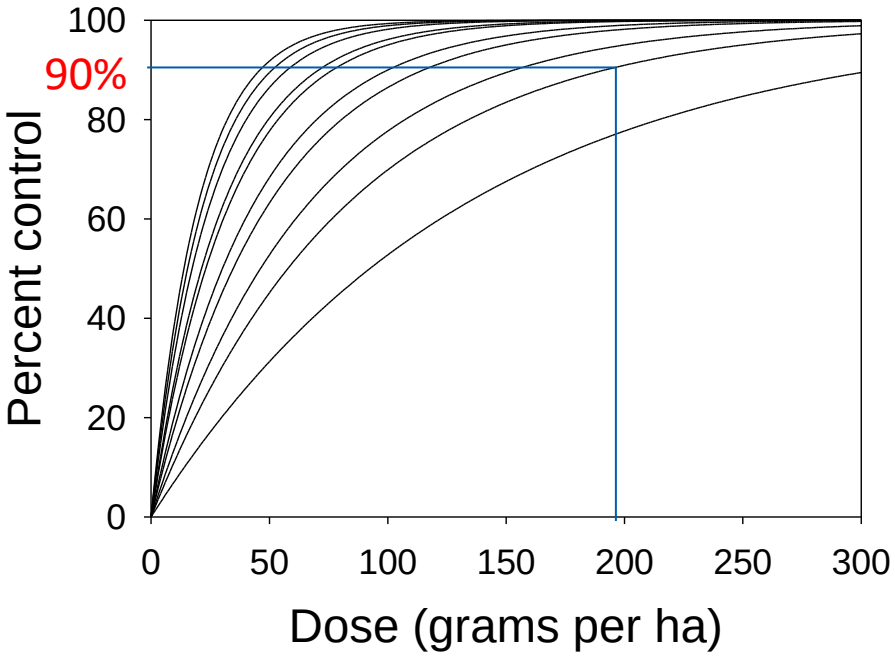
How is the maximum individual dose decided?



Dose response curve from one field trial

Source: Finney 1993, HGCA conference on cereals R&D

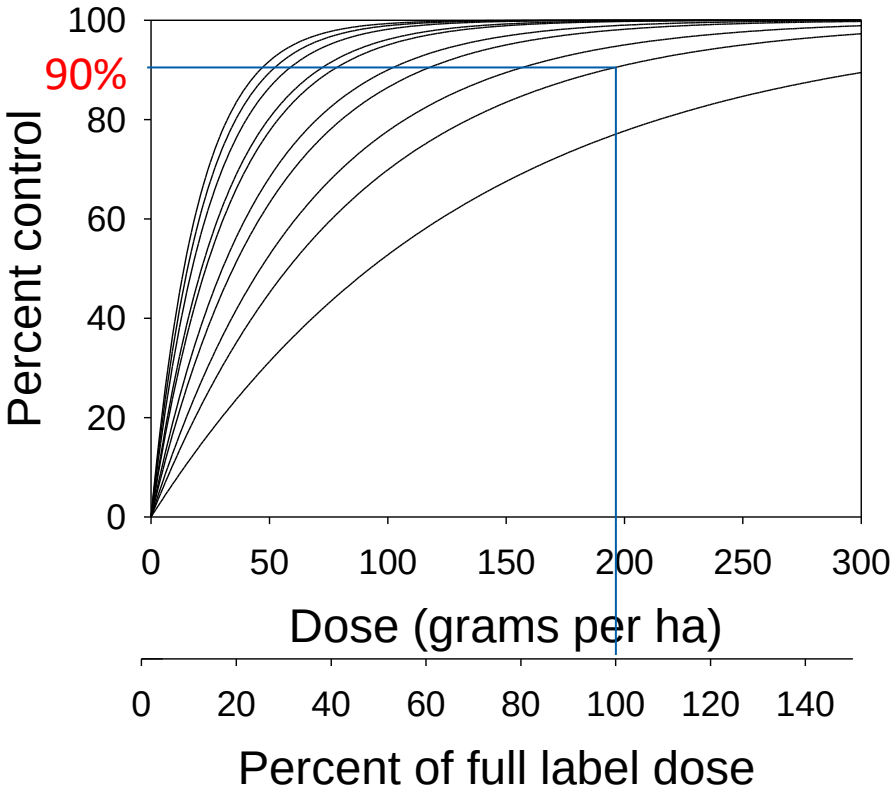
How is the maximum individual dose decided?



Dose response curves from many field trials

Source: Finney 1993, HGCA conference on cereals R&D

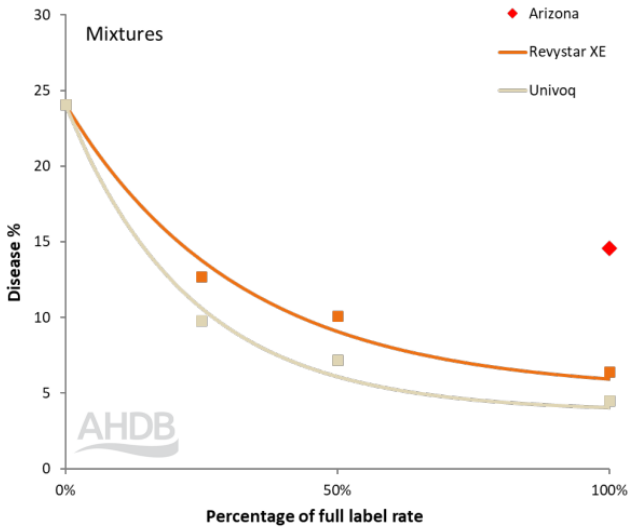
How is the maximum individual dose decided?

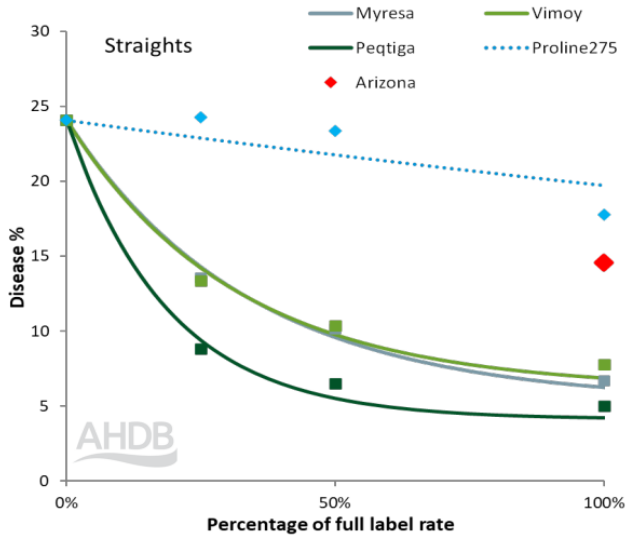


Paveley & Lockley 1993, HGCA conference on cereals R&D

Fungicide dose response curves - septoria

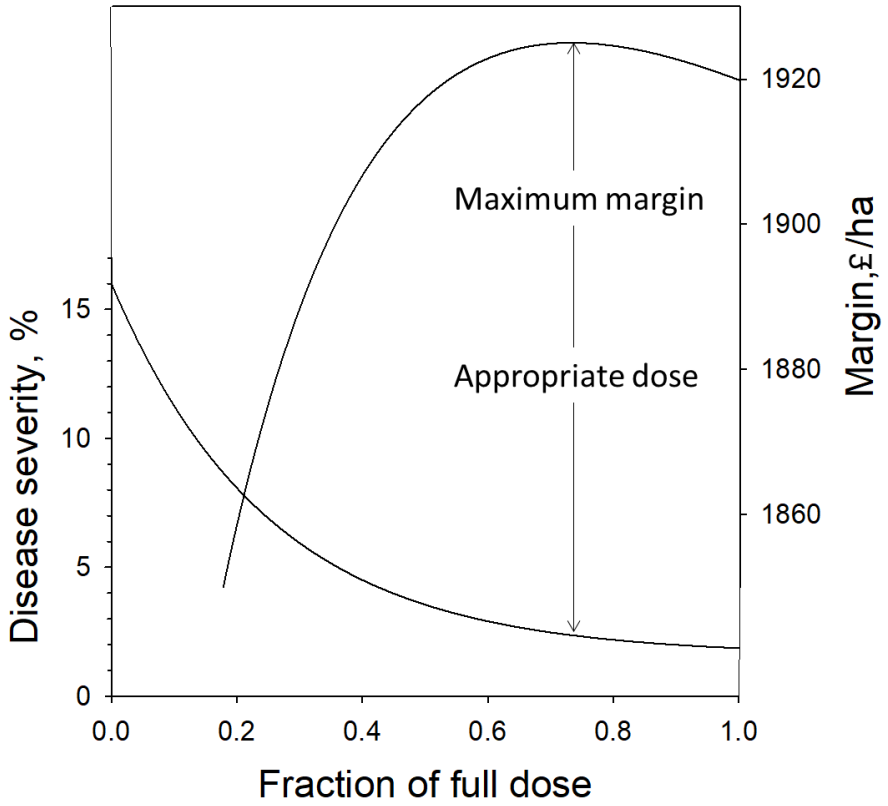
Protectant 2021-23 (17 trials)





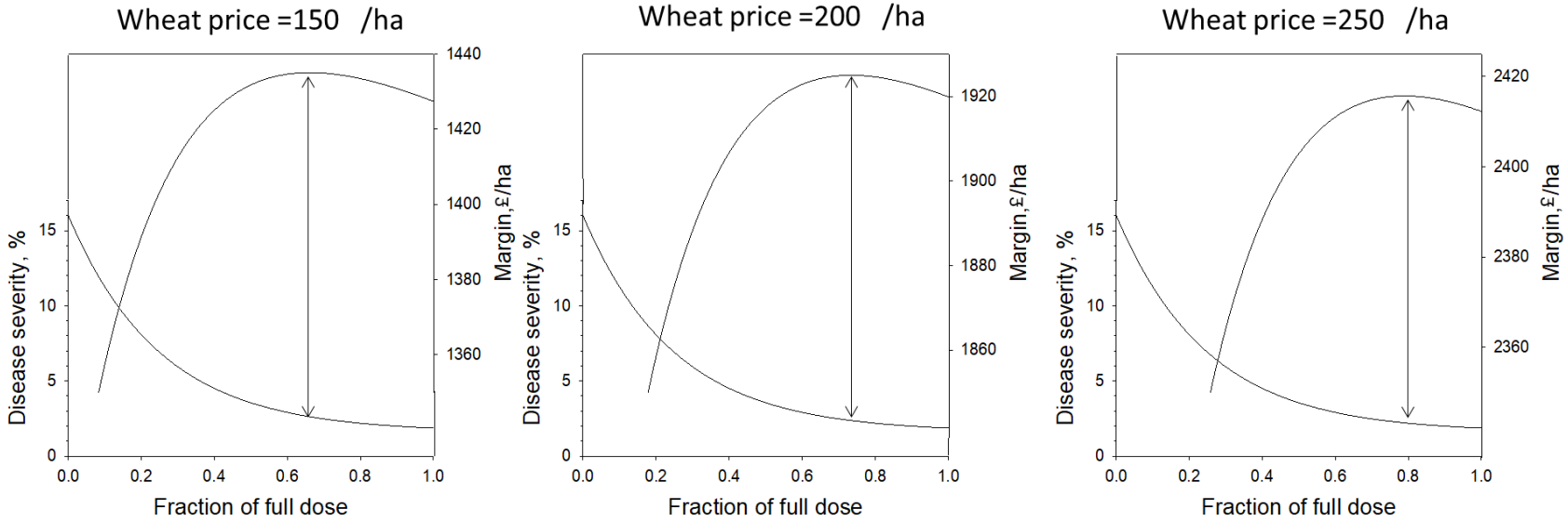
Source: AHDB Fungicide Performance

Appropriate (optimum) dose

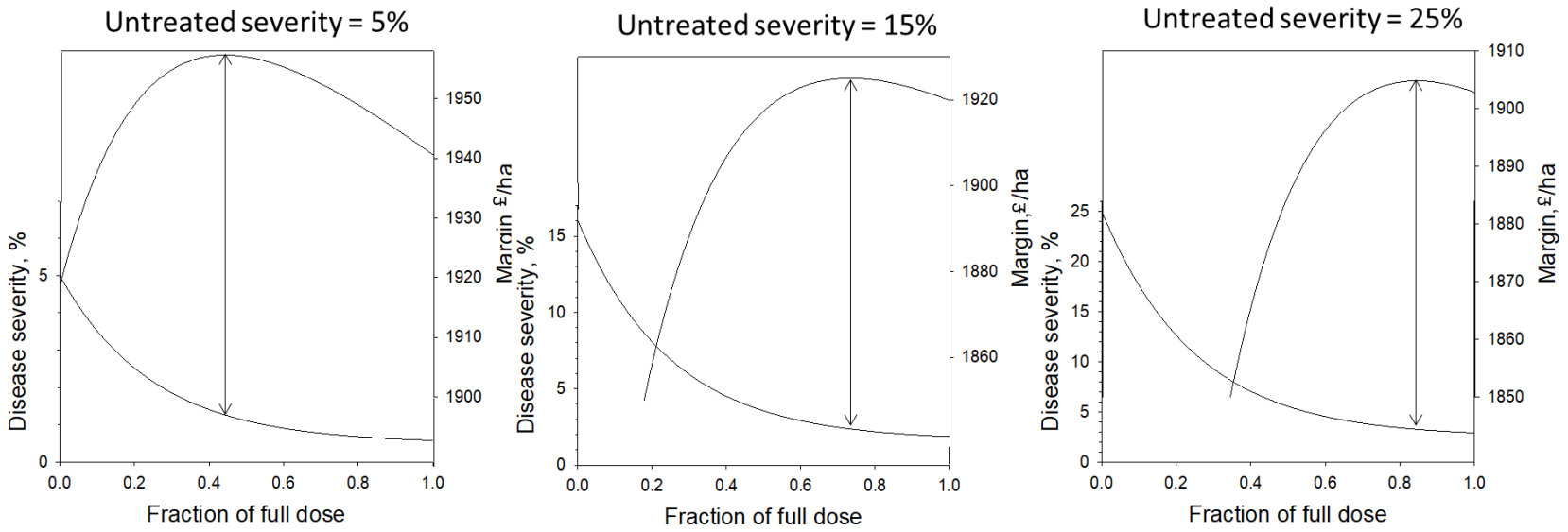


The dose response curves, margins and appropriate doses shown are for illustration

Appropriate dose: wheat price.

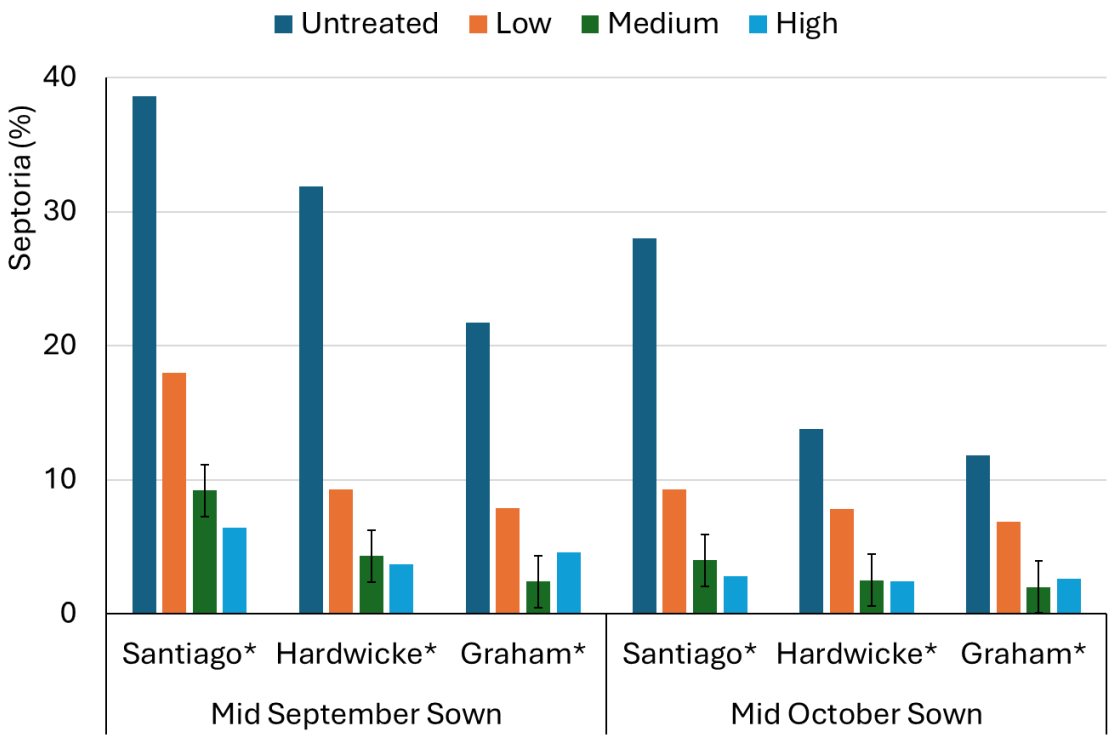


Appropriate dose: untreated severity.



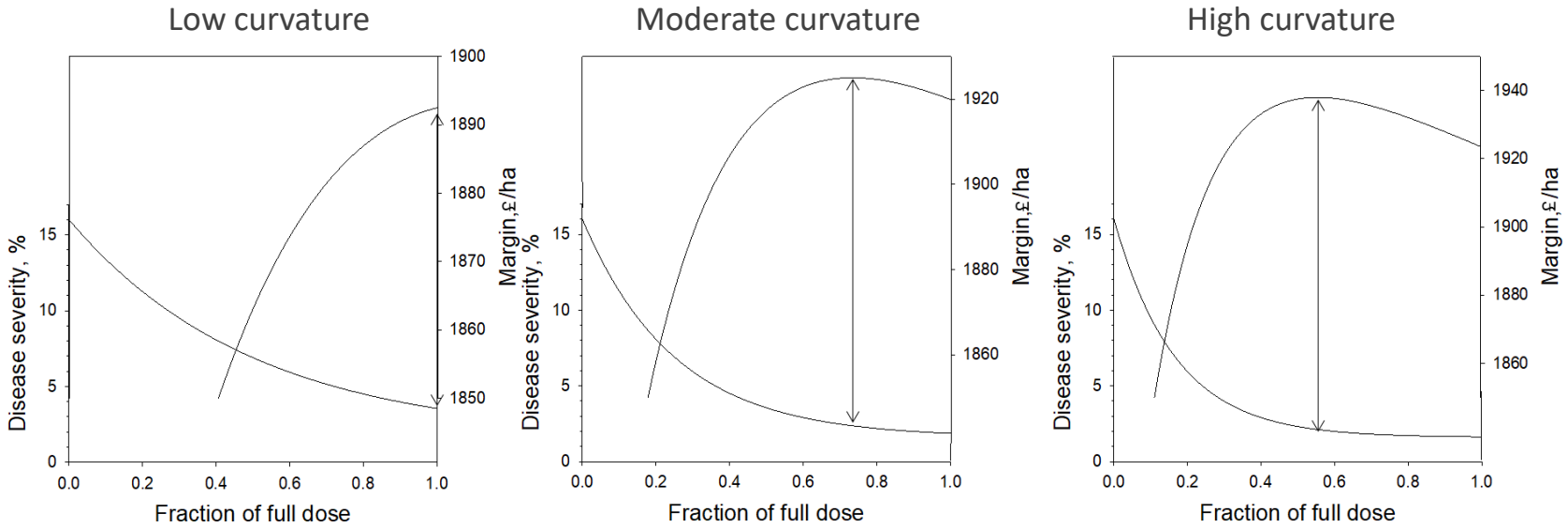
What does the future hold?

Non-chemical control methods and fungicide input

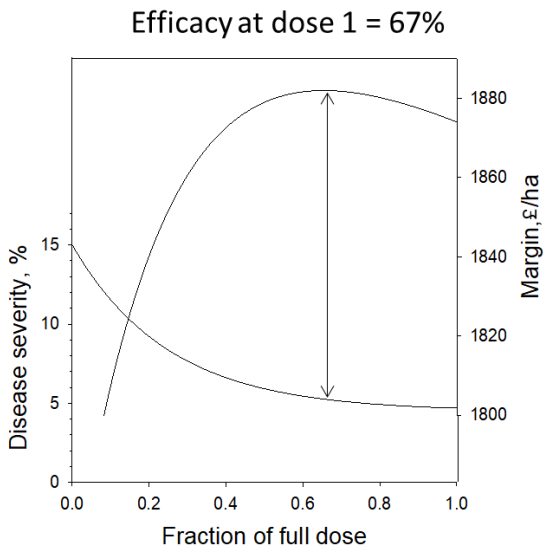


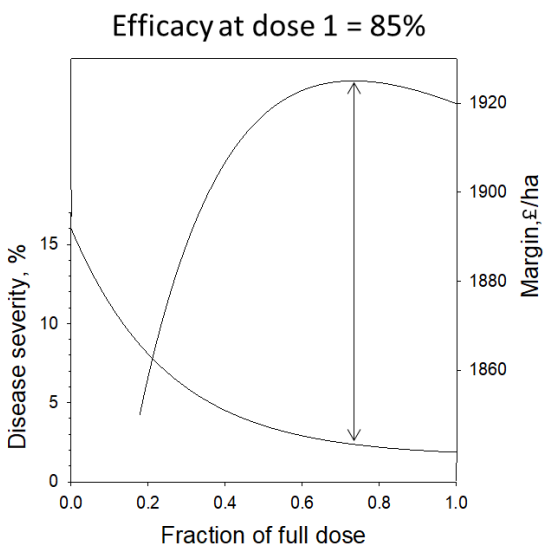
Source: Morgan et al. (2021) AHDB Research Report PR634

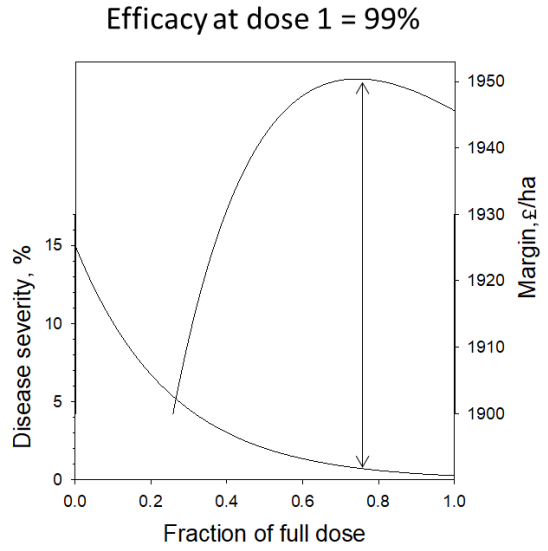
Appropriate dose: dose response curvature



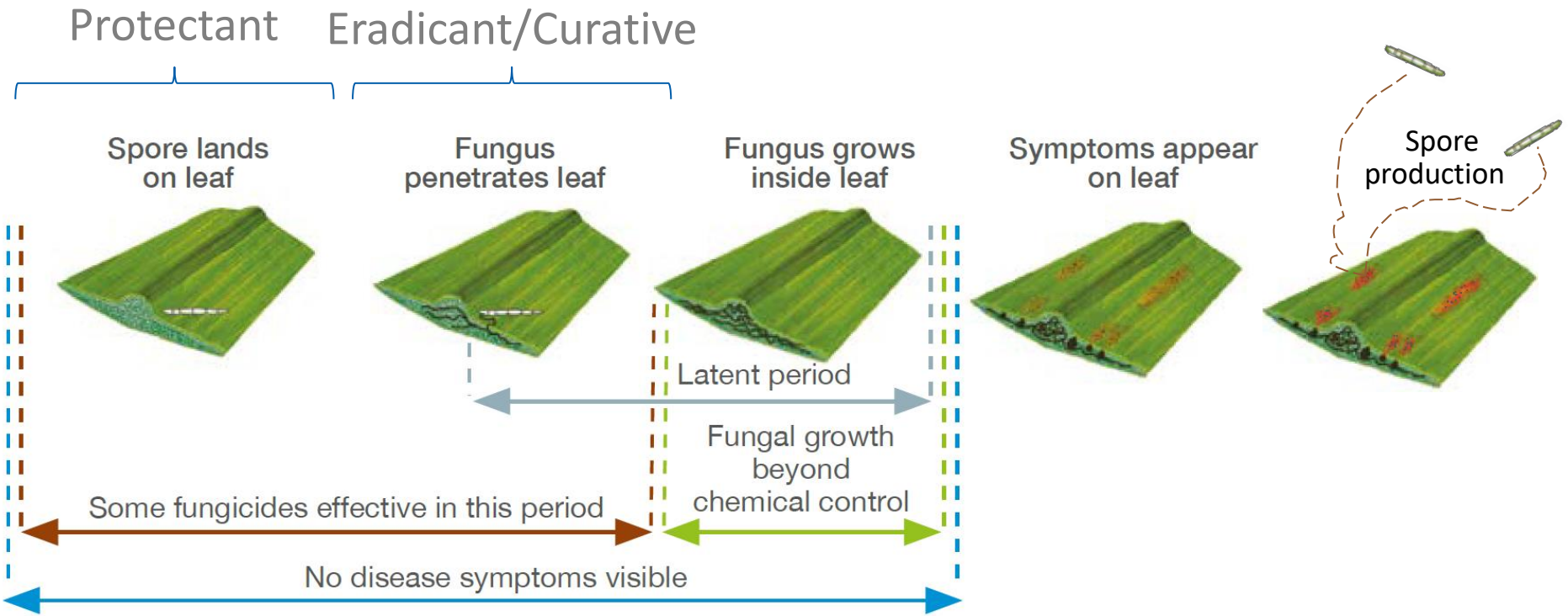
Appropriate dose: uncontrollable disease







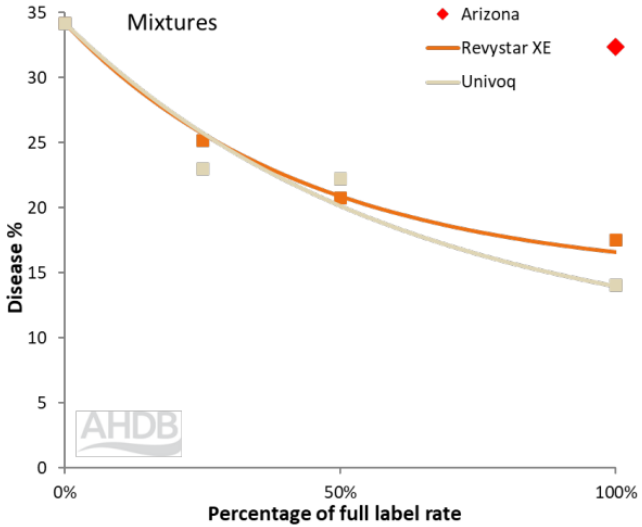
Protectant and eradicant control

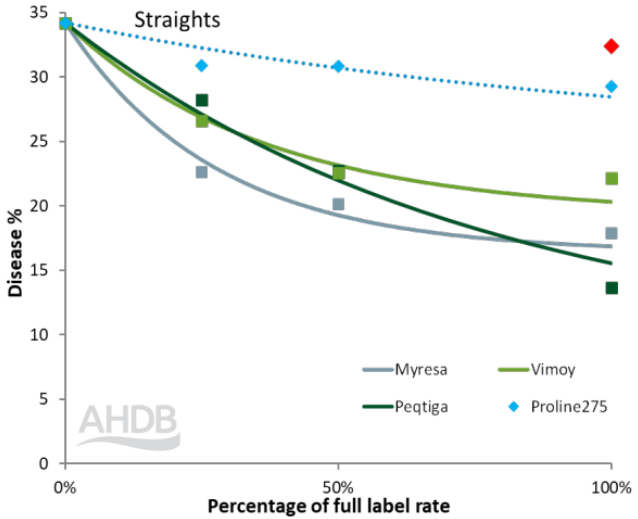


Source: AHDB, Wheat and barley disease management guide.

Fungicide dose response curves - septoria

Eradicant 2021-23 (7 trials)





Source: AHDB Fungicide Performance

How much fungicide is needed?

- Fungicide treatment should be ‘according to need’
- Maximum individual dose is set by the manufacturer and the regulator, to provide robust disease control even with high disease pressure and a susceptible variety
- A lower dose optimises margin under lower disease pressure or on disease resistant varieties
- Responsibility for using doses below the label dose lies with the farmer/adviser
- Using appropriate fungicide doses does not increase the risk of fungicide resistance
- Uncertainty about future disease pressure may justify using a higher dose
- The need for fungicide is reduced by non-chemical disease control methods
- The risk of substantial crop losses is reduced by non-chemical control methods
- Disease forecasting can help reduce uncertainty
- Do not increase dose if spray timing is too early or too late
- If the optimum dose is zero, don’t treat

Further reading

Guides

Wheat and barley disease management guide. https://ahdb.org.uk/knowledge-library/integrated-pest-management-ipm-of-cereal-diseases

Fungicide performance in cereals. https://ahdb.org.uk/knowledge-library/a-guide-to-fungicide-performance-in-wheat-barley-and-oilseed-rape

Research papers

Blake J, Gosling P, Fraaije B, Burnett F, Knight S, Kildea S, Paveley N (2018). Changes in field dose-response curves for DMI and QoI fungicides against *Zymoseptoria tritici*. Pest Management Science 74:302-313

Finney J (1993) Risk and reward from lower chemical inputs into agriculture. Home-Grown Cereals Authority 1993 Conference on Cereals R&D. Pages 144-158

Jørgensen L, van den Bosch F, Oliver R, Heick T, Paveley N (2017). Targeting fungicide inputs according to need. Annual Review of Phytopathology 55:8.1-8.23

Paveley ND, Lockley D (1993) Appropriate fungicide doses for winter wheat – balancing inputs against the risk of disease induced yield loss. Home-Grown Cereals Authority 1993 Conference on Cereals R&D. Pages 177-197.

Paveley ND, Lockley D, Vaughan TB, Thomas J, Schmidt K (2000) Predicting effective fungicide doses through observation of leaf emergence. Plant Pathology 49: 748-766. https://doi.org/10.1046/j.1365-3059.2000.00518.x

Paveley ND, Thomas JM, Vaughan TB, Havis ND, Jones DR (2003) Predicting effective doses for the joint action of two fungicide applications. Plant Pathology 52: 638-647. https://doi.org/10.1046/j.1365-3059.2003.00881.x

van den Bosch, F, Paveley, N D, Shaw, M, Hobbelen, P, Oliver, R (2011). The dose rate debate: Does the risk of fungicide resistance increase or decrease with dose? *Plant Pathology* **60**, 597-606.

van den Bosch F, Lopez-Ruiz F, Oliver R, Paveley N, Helps J, van den Berg F (2018). Identifying when it is financially beneficial to increase or decrease fungicide dose as resistance develops. Plant Pathology 67:549-560.

van den Bosch F, Blake J, Gosling P, Helps J C, Paveley N D (2019). Identifying when it is financially beneficial to increase or decrease fungicide dose as resistance develops: An evaluation from long-term field experiments. Plant Pathology Doi: 10.1111/ppa.13155

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