

## **Qil Fungicides**

Qil fungicides act at the Quinone “inside” (Qi) binding site of the same complex. The only fungicide commercially available is cyazofamid.

Extensive studies have shown that although QoI and Qil fungicides act at the same enzyme, there has been no cross resistance detected in target pathogens, probably because the binding sites are sufficiently distinct.

Research has been carried out indicating that these two fungicide groups can both activate alternative oxidase (AOX) in fungi belonging to the ascomycetes. Although it is easy to demonstrate under in vitro conditions that AOX can lower the fungicide sensitivity, it is difficult to demonstrate significant AOX effects under field conditions. Probably, the alternative respiration pathway cannot produce enough energy equivalents in order to allow the survival of plant pathogens during their pathogenic state.

Moreover, there is no evidence showing that the induction of the alternative respiration facilitates the occurrence of target site mutations under field conditions.

Oomycetes (which are not true fungi) are the only pathogen group where both QoI fungicides and cyazofamid, are active. Studies on the role of AOX in Oomycetes are not available.

Therefore, evaluating the available knowledge, the practical relevance of AOX on the resistance risk of Oomycetes pathogens is considered low by FRAC.

FRAC’s primary concern is with the risk and management of field resistance, and considers that in terms of these considerations the QoI and Qil clearly fall within two different resistance groups (i.e. 11 and 21 respectively), and may be used together in effective disease control programmes.

To ensure the long-term effectiveness of all fungicides, measures to counteract the possible occurrence of resistance should be put in place. Therefore for both groups of fungicides it is recommended that effective resistance management strategies are utilised, for example the use of effective mixtures or alternation partners.

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