

Best Use Guidance – Water Quality

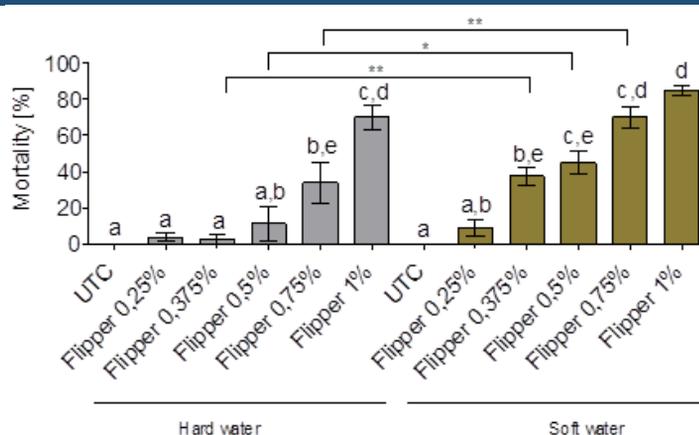
June 2020

FLIPPER®

The efficacy of FLIPPER® can be affected by hard water

- ✓ Ideally use non-hard water or collected rainwater to prepare the FLIPPER spray solution for full efficacy
- ✓ If water hardness is unknown it should be tested before use. Rapid test strips are readily available for this purpose e.g. Aquadur® or MQuant® Total Hardness test strips
- ✓ If once tested, water is shown to be hard with total dissolved solids (TDS) greater than 300 ppm this may result in reduced efficacy and a water softener should be used

Efficacy comparison of Hard vs Soft water on aphids

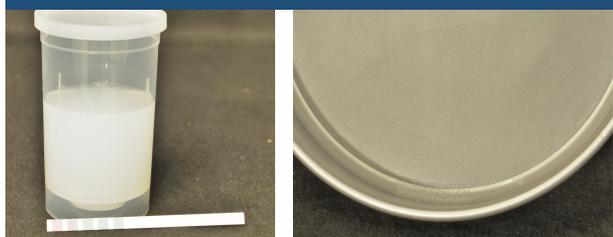


pH

Hard water with total dissolved solids >300 ppm should be softened

- Hard water contains soluble salts of calcium, magnesium and iron
- When FLIPPER (potassium salts of unsaturated carboxylic acids) is mixed with hard water a chemical reaction takes place that forms largely insoluble calcium, magnesium and iron salts
- This may lead to **flocculation, precipitation or separation** (see photos below)
- **Cloudiness** is not necessarily an indication of problem water

FLIPPER 1% in 89-178 ppm water



FLIPPER 1% in very hard water >445 ppm



- In the **very hard water >445 ppm situation** Calcium / Magnesium / Iron salts are formed which are less soluble and less efficacious as insecticides. In extreme cases (particularly high concentration spray solutions) a wax-like deposit may form

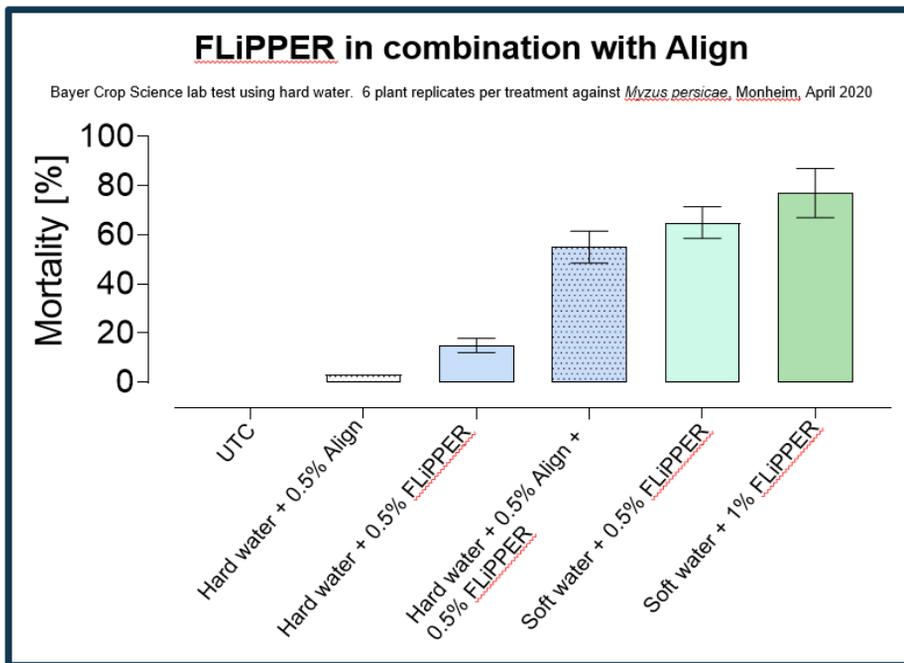
A non-acidifying water conditioner should be used (if required)

- ✓ When FLIPPER is added to a spray tank containing soft water a true solution will be formed and it can be applied as a foliar spray without any further considerations
- ✓ We recommend using a non-acidifying water conditioner where hard water is >300 ppm
- ✓ After evaluating a number of commercially available water conditioners, Bayer Crop Science recommends using **Align®** from IntraCrop
- ✗ The addition of acidifiers that lower the pH should be avoided, as these are likely to impair product solubility, efficacy and plant safety
- ✗ We do not recommend X-Change® water softener as it is also a pH adjustor



Align® water conditioner is physically and chemically compatible with FLIPPER

- ✓ Bayer Crop Science has conducted limited efficacy testing and found Align is physically and chemically compatible with FLIPPER
- ✓ Align is a complex blend of water softeners which are multidentate chelating agents. Unlike Ammonium Sulphate which works by displacing ions, these agents chelate and sequester the hard water cations more closely and securely than standard acids
- ✓ Lab tests has shown the use of Align to have a positive impact on the efficacy of FLIPPER in hard water (450ppm, 3 Ca:1 Mg), with no impact on selectivity
- ✓ Testing of other water conditioners compatible with FLIPPER is ongoing



Align, IntraCrop Dose Rate: 0.1% v/v per 100ppm water hardness

Where water hardness is in excess of max test strip result, add 0.4% v/v Align to water sample, re-test and re-calculate dose accordingly

Always follow the label instructions for water conditioners

Align increases the efficacy of FLIPPER in hard water similar to soft water levels

- ✓ *The efficacy of FLIPPER® can be affected by hard water*
- ✓ *Hard water with total dissolved solids >300 ppm should be softened*
- ✓ *A non-acidifying water conditioner should be used*
- ✓ *Align water conditioner is physically and chemically compatible with FLIPPER*
- ✓ *Align increases the efficacy of FLIPPER in hard water similar to soft water levels*

Please note that physical compatibilities may not be approved tank-mixes. The tests do not check for any adverse crop phytotoxicity or for the biological efficacy of the individual components when applied in a tank-mix. Bayer Crop Science gives no warranty and accepts no liability in respect of physical compatibilities; therefore, use is at grower's own risk.

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