Biofilter & Fytobac in the Netherlands

Testing, demonstration & implementation

March 20th 2013, Rik de Werd
Outline presentation

- Goal & setup on farm tests
- Measuring results 2008 – 2012
- Practical implications
- Communication for implementation
- Implementation in regulation: update
Goal of our on farm tests

- Develop practical advise for bioremediation

- Demonstrate the possibilities to farmers and other stakeholders (farmers advisors, policy advisors)

- Generate (more) efficacy data under practical circumstances and over several years

- No in depth analysis
<table>
<thead>
<tr>
<th>location</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td>HG</td>
<td>Biofilter</td>
<td></td>
<td></td>
<td>Fytobac</td>
<td></td>
</tr>
<tr>
<td>RN</td>
<td></td>
<td></td>
<td>Biofilter</td>
<td></td>
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<td>GOY</td>
<td></td>
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<td></td>
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<tr>
<td>UT2</td>
<td></td>
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<td>Biofilter</td>
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<td>FL</td>
<td></td>
<td></td>
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<tr>
<td>VR</td>
<td>Fytobac</td>
<td></td>
<td></td>
<td>Fytobac</td>
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</tr>
</tbody>
</table>
Biofilter en Fytobac
Phytobac meer voorbeelden
Setup

- Extensive monitoring
- Sampling frequency:
  - +/- every 4-6 weeks
  - Gaps in measuring periods did occur at some locations

- Sampling:
  - Influent: from collection tanks
  - Effluent: from collection tank (most locations), or drainage water tapped straight from the last filter or evaporation unit
Setup

- **Influent:**
  - Sprayer cleaning + remnant
  - Spiked influent in 2009 (location GOY) and 2010 (location RN): 0,5 – 0,5-30 mg a.i. per litre
Concentration before and after purification (example, contract sprayer - Biofilter)
Example experimental fruit farm - Biofilter
Example arable farm - Biofilter

Linuron (o.a. Afalon)

Concentration (microgram/liter)

- Norm: 0.25
- Apr '11: 290
- Mei '11: 4400
- Jun '11: 2300
- Jul '11: 1000
- Aug '11: 670
- Sep '11: 1100
- Okt '11: 450
- Nov '11: 310

IN
UIT
Efficacy (%) = \( \frac{[\text{IN}] - [\text{OUT}]}{[\text{IN}]} \times 100 \)

- For most relevant substances
- Ranking: max conc. / water quality standard
- Example for 1 location
<table>
<thead>
<tr>
<th>Stof</th>
<th>Locatie-jaar -&gt;</th>
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<tbody>
<tr>
<td>AMPA (afbraakproduct van glyfosaat)</td>
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<tr>
<td>abamectine (o.a. Vertimec Gold)</td>
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<tr>
<td>acetamiprid (Gazelle)</td>
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<tr>
<td>aclonifen (Challenge)</td>
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<td>asulam (o.a. Asulox)</td>
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<tr>
<td>azoxystrobine (o.a. Amistar)</td>
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<tr>
<td>bentazone (o.a. Basagran)</td>
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<tr>
<td>bifenthrin (Bistar)</td>
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<td>boscalid (o.a. Bellis)</td>
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<tr>
<td>carbendazim (afbraakproduct van thiofanaat-methyl)</td>
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<tr>
<td>chlorendazine (afbraakproduct van chloprofam)</td>
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<tr>
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<td>cycloxydim (Focus Plus)</td>
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<td>cyproconazool (o.a. Sphere)</td>
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<td>cyprodinil (o.a. Switch)</td>
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<td>deltametrin (o.a. Decis)</td>
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<td>difenoconazool (o.a. Score)</td>
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<td>dimethoat (o.a. Perfektion)</td>
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<td>dimethomorph (o.a. Acrobat)</td>
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<td>dithianon (o.a. Delan)</td>
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<td>dodine (o.a. Syllit)</td>
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<td>esfenvalerate (Sumicidin Super)</td>
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<td>fenhexamid (Telidor)</td>
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<td>glyfosaat (o.a. Roundup)</td>
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<td>hexythiazox (Nissorun)</td>
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</tbody>
</table>
Efficacy
location x measuring period

- Average: 95%
- If OUT > IN: calculated as efficacy ‘0’
- No correction for volume decline: actual efficacy may be higher

- Despite good overall result, low or negative calculated efficacy for a substance occurs frequently

Reason for a closer look:
Labeling mistake duplo bottle?

prochloraz (o.a. Mirage, Allure)
Negative efficacy: permethrin

![Graph showing permethrin concentration over time with a peak at 30 units in October 2011.](image-url)
Biocide not used in the orchard...
Expect the unexpected
**Efficacy**

- **Overload?** (water saturated substrate with heavy rainfall)
Efficacy: a closer look at exemptions

- No relation with substance properties (degradation or sorption properties)
- They seem random substances
- Cross contamination in most cases not plausible
- Substrate contamination not plausible
- New installations in practice (2011) less effective than multi-year measurements at experimental farms
- Possible relation with overload (concentration x volume) in the start up period
Practical conclusions

- Minimalize the risk of obstructions in tubes and nozzles
  - Use in line filters for the waste water
  - Use aeration tubes between vessels
- Evaporation: often overestimated in NL
- Smaller Biofilters (less then 3 filter compartments) work well for small volumes
- Drainage water from Biofilter / Fytobac does not always meet water quality standards: no discharge to surface water
- Users are content with the installations!
Communication for implementation
Communication for implementation

- Numerous presentations, demonstrations and publications

- Stakeholders joined. Exposure boost.
  - Bayer Crop Science
  - Advisory organisations
  - Farmer suppliers
  - Farmers union
  - Water boards
Communication effects

- Bioremediation and remnant management included in many farmers’ projects
- Inclusion in product certification schemes (market directed)
- Dutch Phytobac suppliers: Beutech, Horticoop / Agrifirm
- Raised point source pollution awareness
- Installation in practice (farmers and contract sprayers): slowly but surely
- Reference to guidelines bioremediation in regulation
Implementation in regulation

- Reference in legislation since January 2013
  - A measure to be able to emit cleaning water to the soil or public sewage system
    - If to soil: spread over field where PPPs are applied
  - No facilities needed for outside cleaning at farm yard if ≤ 2x per year
Implementation in regulation

- If emitting drainage water to soil or sewage:
  - System has to fit demands described in construction and user manual
  - Only for sprayer cleaning water
  - Water from internal tank rinsing: tank and booms need to be pre-rinsed in the field; no undiluted remnant
  - Substrate: Biomix (chopped straw, compost/peat, field soil, 45-45-10 vol.%)
Other fluids?

- Dipping fluid left overs:
  - Very high concentration of mainly fungicides
  - Bayer: on farm degradation monitoring

- Condensation water from storage cells?

- ?
More info? rik.dewerd@wur.nl

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