

# Nouryon

## Liquid suspensions

Agricultural solutions



Finding ways to enhance your crop protection formulations is what we do. Every day. Nouryon is a global company with a broad range of environmentally safe, biodegradable and cost effective solutions. This guide shows how Nouryon products can be used to explore the full potential of your liquid suspension.

Agrochemical Formulation Guide for SC, SE and OD

## Key products for successful Liquid Suspensions

### Morwet® D-400, Morwet D-425

Anionic naphthalene sulphonate condensate used as primary dispersant. Benchmark to achieve short milling time and low viscosity premix. Brings electrostatic stabilization and makes the formulation stable towards temperature changes.

### Morwet EFW

An anionic blend for excellent wetting of most powders. The best choice for actives with crystallization problems.

### Ethylan® NS-500LQ

Block copolymer that provides steric stabilisation. Combine with Morwet D-425 for best performance. A liquid polymer that is easy to handle.

### Agrilan® 755

High performance hydrophobically modified polyacrylate polymer when extra stabilization is needed. Adsorbs irreversibly to solid surfaces and oil droplets. Full potential is reached when combined with Morwet D-425. Soluble in both water and oil based systems. In addition, this polymer inhibits crystal growth.

### Agrilan 700, Agrilan 789

White polyacrylate copolymers. Can be used as primary dispersants or in combination with Morwet D-400/D-425. Agrilan 789 is the premium product for high loadings or extreme water hardness conditions.



Soluble in both water and oil based systems. In addition, this polymer inhibits crystal growth.

# Suspension Concentrate (SC)

SC formulations are water based dispersions of fine particle active ingredients. The typical particle size is <5 µm. Due to their liquid nature SC formulations are easy and safe to handle.

Suspension concentrates require efficient formulation additives to ensure long term stability. Due to their inherent stability issues their compositions are more complex compared to standard EC or WP formulations.

## Preparation

1. Prepare a base mill by adding active ingredient, dispersing agent (Morwet D-425/Morwet D-400, Agrilan 789, Agrilan 700), wetter if necessary (Morwet EFW) and defoamer in water
2. Homogenize the premix with high shear mixer or homogenizer (Ultra Turrax) for few minutes.
3. Mill the slurry until desired particle size is achieved.
4. Formulate by adding stabilizer (Agrilan 755, Ethylan NS-500LQ) and mix properly with mill base.
5. Add other ingredients such as in-can adjuvant (Adsee AB 600, Adsee 611, Adsee 900), anti-freeze (propylene glycol, 5-8%), thickener (xanthan gum 0,1-0,3%) and biocide as necessary.

| Active Ingredients           | Conc               | Base mill - Step 1 (w/w)             | Formulation - Step 2  | Additional additives   |
|------------------------------|--------------------|--------------------------------------|-----------------------|--|
| Aclonifen<br>Metobromuron    | 250 g/l<br>250 g/l | 2.5% Morwet D-425                    | 1.0% Ethylan NS-500LQ | 3.0% MEG + 0.2% Biocide + 0.1% Defoamer + 0.2% Xanthan gum + water to 100% |
| Buprofezin                   | 250 g/l            | 2.5% Morwet D-400                    |                       | 8.0% PG + 1% Biocide + 0.1% Defoamer + 0.25% Xanthan gum + water to 100%   |
| Epoxiconazole                | 125 g/l            | 2.5% Morwet D-425                    | 1.0% Ethylan NS-500LQ | 0.15% Xanthan gum + 5.0% PG + 0.2% Antifoam + water to 100%                |
| Ethofumesate<br>Phenmedipham | 200 g/l<br>200 g/l | 2.5% Morwet D-425                    | 1.0% Ethylan NS-500LQ | 0.15% Xanthan gum + 5.0% PG + 0.2% Antifoam + water to 100%                |
| Tebuconazole                 | 430 g/l            | 2.5% Morwet D-425<br>1.0% Morwet EFW | 0.5% Agrilan 755      | 0.15% Xanthan gum + 5.0% PG + 0.2% Antifoam + water to 100%                |

## White formulations

| Active Ingredients                              | Conc                       | Base mill - Step 1 (w/w) | Formulation - Step 2  | Additives   |
|---|----------------------------|--------------------------|-----------------------|---|
| Cyromazine                                      | 30% w/w                    | 2.5% Agrilan 700         | 2.0% Agrilan 755      | 3.0% Glycerin + 0.15% Biocide + 0.1% Defoamer + 0.5% Bentonite + 0.15% Xanthan gum + water to 100%                  |
| Thiophanate-Methyl<br>Azoxystrobin<br>Metalaxyl | 6% w/w<br>3% w/w<br>3% w/w | 2.0% Agrilan 789         | 1.0% Ethylan NS-500LQ | 3.0% Glycerin + 1.0% Citric acid + 0.1% Biocide + 0.1% Defoamer + 1.0% Bentonite + 0.2% Xanthan gum + water to 100% |

## Formulations containing Adjuvants

| Active Ingredients | Conc    | Base mill - Step 1 (w/w) | Formulation - Step 2                | Additives  |
|--------------------|---------|--------------------------|-------------------------------------|--|
| Bispyribac-Na      | 10% w/w | 3.0% Agrilan 700         | 1.0% Agrilan 755<br>10.0% Adsee 611 | 5.0% PG + 0.1% Biocide + 0.1% Defoamer + 0.25% Xanthan gum + water to 100%   |
| Chlorfenapyr       | 10% w/w | 4.0% Agrilan 788         | 1.0% Adsee AB 615                   | 3.0% Glycerin + 0.25% Biocide + 0.1% Defoamer + 1.5% Bentonite + 0.25% Xanthan gum + water to 100%                     |
| Fipronil           | 5% w/w  | 4.0% Agrilan 788         | 1.0% Adsee AB 615                   | 3.0% Glycerin + 1.5% Magnesium aluminometa-silicate + 0.2% Biocide + 0.1% Defoamer + 0.25% Xanthan gum + water to 100% |
| Indoxacarb         | 15% w/w | 4.0% Agrilan 700         | 10.0% Adsee AB 615                  | 3.0% Glycerin + 0.1% Biocide + 0.1% Defoamer + 0.5% Bentonite + 0.2% Xanthan gum + water to 100%                       |

MEG = Mono Ethylene Glycol PG = Propylene Glycol

# Oil Dispersion (OD)

An OD is a non-aqueous suspension concentrate. It can be used as replacement for EC, SC and WDG as it combines good biological efficacy with cost-effective and environmental friendly properties. A key benefit is that high amounts of adjuvants can be built into the formulation. OD formulation presents several challenges in production. To obtain a good and stable formulation over the time, optimal formulation additives are required in addition to optimum process.

## Preparation

1. Make a base mill by adding the actives, the Emulsifier/Dispersant and the Bentone\* to the solvent.
2. Mill the content until the desired particle size is achieved.
3. Add the stabilizer (Agrilan 755) and stir gently.

| Active Ingredients | Conc      | Solvent                               | Emulsifier/Dispersant   | Stabilizer       | Additive              |
|--------------------|-----------|---------------------------------------|---|------------------|-----------------------|
| Imidacloprid       | 20% w/w   | Rape seed methyl ester,<br>up to 100% | 5.0% Witconate P-1460EH<br>5.0% Berol 266                     |                  | 2.0% Bentone SD-3     |
| Pyridate           | 40% w/w   | Rape seed methyl ester,<br>up to 100% | 2.0% Witconate P-1460EH                                       |                  | 2.0% Bentone SD-3     |
| Sulcotrione        | 22.5% w/w |                                       | 6.0% Berol 266  |                  |                       |
| Terbutylazine      | 30% w/w   | Coco methyl ester,<br>up to 100%      | 10.0% Witconate P-1460EH<br>10.0% Berol 266                   |                  | 2.0-4.0% Bentone SD-3 |
| Nicosulfuron       | 4% w/w    | Soybean oil,<br>up to 100%            | 5.0% Ethylan NS-500LQ<br>2.0% Ethomeen T/12<br>8.0% Berol 192 | 2.0% Agrilan 755 | 1.0-2.0% Bentone SD-1 |
| Azoxystrobin       | 12% w/w   | Soybean oil,<br>up to 100%            | 5.0% Adsee 615<br>1.0% Ethomeen SV/12<br>0.5% Amadol 511      | 2.0% Agrilan 755 | 0.5-1.0% Bentone SD-3 |

\* Bentone is a trademark of Elementis Specialties

Formulations in this guide comply with the following CIPAC methods;

Appearance: (CIPAC MT 148,1)

Stability (CIPAC MT 39.3, 46.3)

Particle size (CIPAC MT 187)

Suspensibility (CIPAC MT 160, 184)



# Suspo-Emulsion (SE)


SE formulations are water based dispersions of fine particles and oil droplets and can be used to combine water insoluble actives with oily/oil soluble actives as well as adjuvants. The development of suspo-emulsions needs careful consideration at the formulation stage as the dispersing and emulsifying agents can migrate between particles/oil droplets and create instability such as flocculation. SE offers the benefit of a broad spectrum of pest control due to mixed actives and in-can adjuvants.

## Preparation

1. Prepare SC part: Make a premix slurry by adding active ingredient, dispersing agent (Morwet D-425) and defoamer in water. Homogenize and wet mill until particle size is below 5  $\mu\text{m}$  (D50).
2. Prepare the oilphase by adding emulsifiers into the mineral oil.
3. Mix both parts under high shear to form a suspo-emulsion. Add the EC under low shear to the SC. High shear mix to form a small droplet emulsion.

| Active Ingredients | Conc    | Dispersant          | Emulsifier  | Additive                 | Solvent                            |
|--------------------|---------|---------------------|---|--------------------------|------------------------------------|
| Iprodione          | 250 g/l | 25 g/l Morwet D-425 | 25 g/l Witconate P-1460EH<br>25 g/l Berol 266<br>10 g/l Lankropol KPH70 | 0.2% Thickener, defoamer | 200 g/l Mineral oil, Balance water |

For more information visit [nouryon.com/agriculture](http://nouryon.com/agriculture)



We design and supply solutions optimized for your needs – today and tomorrow