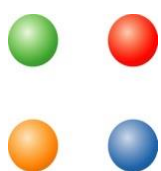


# KAO



# AGROCHEMICAL

ENRICHING LIVES, IN HARMONY WITH NATURE



**Kao** believes that research and development is vital, driving force for corporate progress. The company is constantly upgrading its research and development activities by introducing the latest instruments and human resources.

Kao Industrial(Thailand) research and development center encourages close communication and constant technological information exchanges with research and development centers in Japan and worldwide.

## R&D Activity

### Physical Evaluation and Analysis of Biological Effects

Kao Industrial(Thailand) is actively engaged in the development of new materials and innovative technologies. These ultimately lead to the new Agrochemical products to meet with the customer satisfaction and diversify the customer requirements.

Furthermore Kao Industrial(Thailand) has the enhancement supplementary, high technology equipment and laboratory instruments to support the customer testing for Agrochemical business by divided into two parts on the following :

#### 1) Laboratory

The specifically of laboratory instruments applied with R&D department to do the performance testing by emphasized on the Agrochemical product categories

##### 1.1 Wetting & Absorption Ability Testing

- Paraquat Adjuvant
- Glyphosate Adjuvant
- Tank-Mix Adjuvant

Contact Angle Machine



Micro-Scope Machine



##### 1.2 Dispersion & Stability Testing

- Emulsifiable Concentration

Best Dispersion  
Best milky blooming



Emulsion Stability :Observe oil  
separation at top or bottom  
Measure oil layer



#### 2) Greenhouse

Kao established the "Green House" for the main purposing to do the plot-testing by spraying application and killing efficacy. These encouraged the customer testing by basically and they can be applied this references data for supporting their field test.





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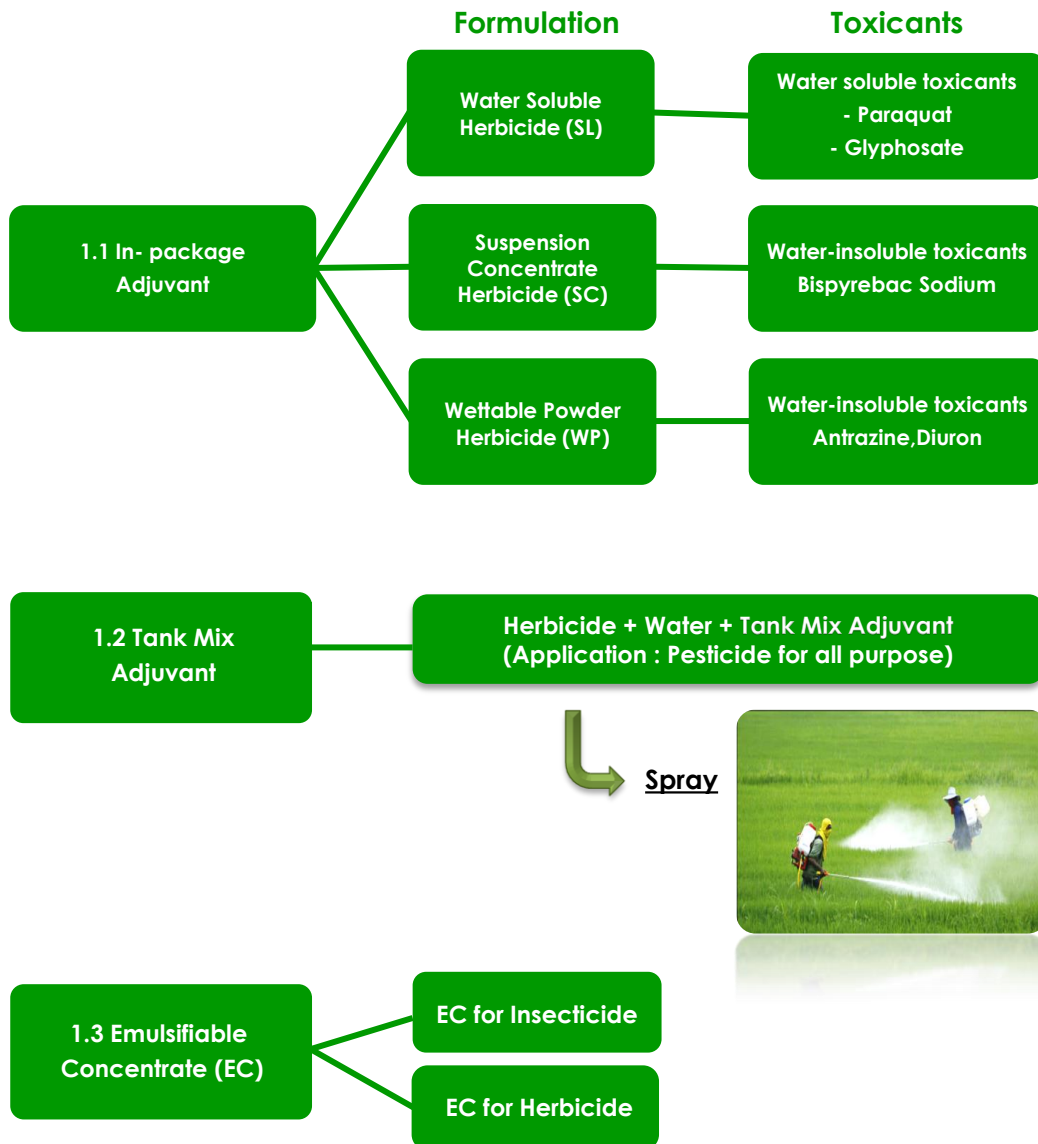
|                    |    |
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**Kao's** involvement in Agrochemicals is based on research from basic to applied development and ranges from work with raw materials to product manufacture. To continue to strive toward a better direction, we consider the environmental impact of the development and production of Agrochemicals and their use and disposal.

## Agrochemical Products

### 1. Surfactants for Pesticide



### 2. Surfactants for Fertilizer

- Anti-Caking for Urea, NPK , AN

### 3. Bactericides

- Disinfectant and Cleaning Agent

### 4. Fermentation

- De-Foamer  
- Releasing Agent

### 5. Other

- Fruit Coating

# PARAQUAT ADJUVANT

It is wetting agent for increasing of penetration and spreading. It also increase viscosity of Paraquat without any other material addition or can build up viscosity by Sodium Chloride addition.

## Characteristic :

Non-selective herbicide

(broad spectrum)

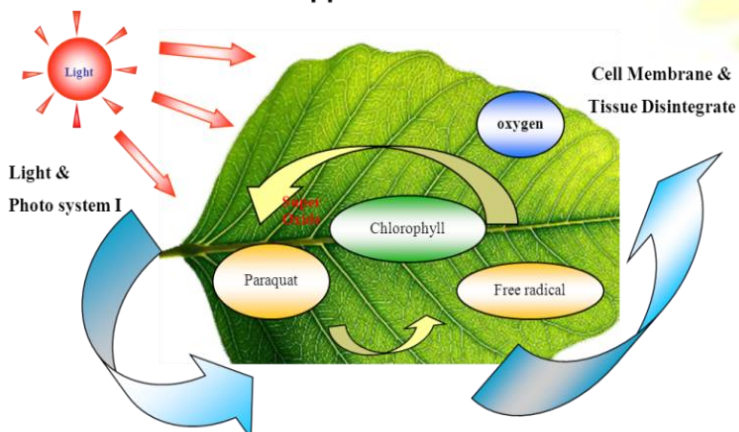
Contact-wetting

(react on leaf or green area)

**Quick acting**

(light and oxygen)

## Application

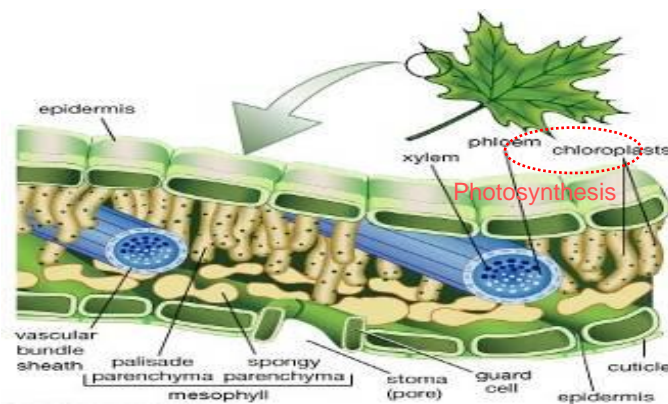


## BIO- EFFICACY

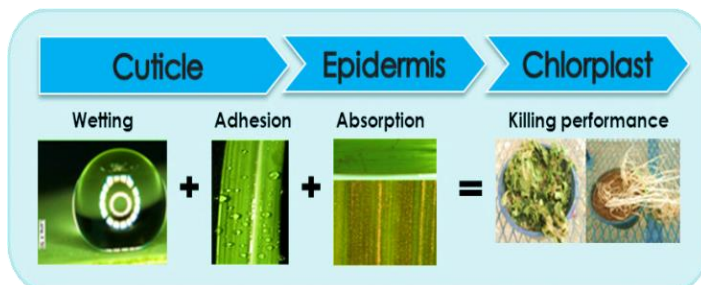
Spray on target crop



Spray Application



Spray application  
Depending on the recommend

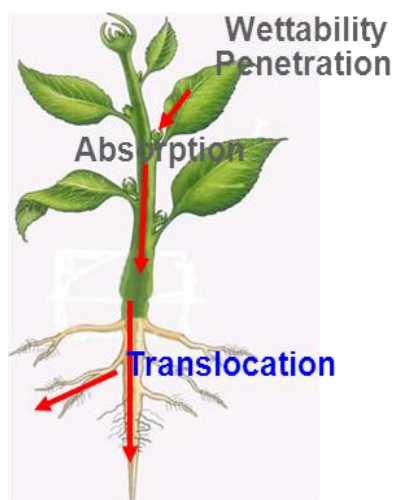


## PRODUCT LIST

| Product Name   | Surfactant type                | Appearance @ 25 °C          | Dosage | Characteristic  | Standard Packing |
|----------------|--------------------------------|-----------------------------|--------|---|------------------|
| AGRISOL A-470  | Anionic                        | Light Yellow Paste          | 4-6 %  | Highest Viscosity by NaCl   | 130 KG DM        |
| AGRISOL A-465  | Anionic and special surfactant | Clear Liquid                | 4-6 %  | Easy Handle , Provide Viscosity without NaCl                        | 120/200 KG       |
| AGRISOL A-475  | Anionic and special surfactant | Light Yellow Liquid         | 6-9 %  | Easy Handle , Provide Viscosity without NaCl , Transparent Solution | 120 KG DM        |
| AGRISOL A-3210 | Anionic and special surfactant | Light Yellow Viscous Liquid | 4-6 %  | Cost Focusing   | 120 KG DM        |
| AGRISOL A-3250 | Anionic and special surfactant | Clear Liquid                | 4-6 %  | High Rheology   | 120 KG DM        |

# GLYPHOSATE ADJUVANT

It show good wetting ,spreading and penetrating as well as improve rain fastness. It give high viscosity in Glyphosate Herbicide.



## Characteristic :

Non-selective herbicide  
(broad spectrum)

## Wetting = translocation

(absorb on leaf and transfer to another part)

Slow acting

(3-7 days after treat)

## Influence of adjuvant for Glyphosate Herbicide

### Formulation :

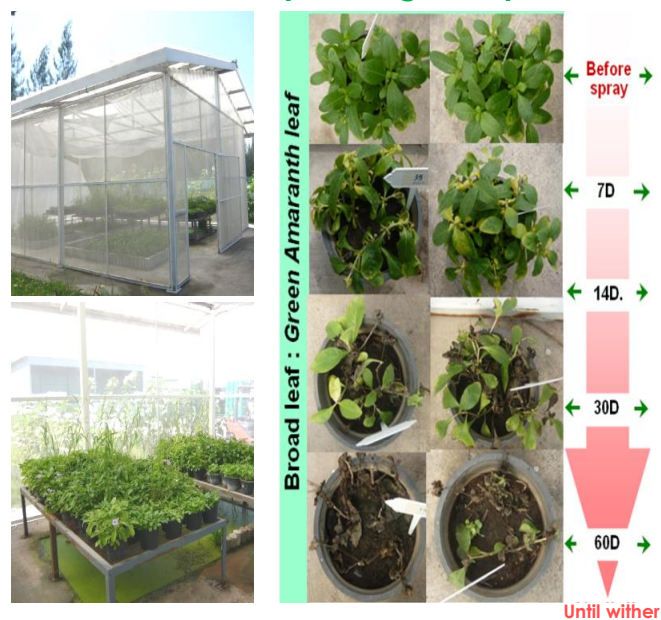
Viscosity : Appearance of product

Foam ability : Customer process

### Bio-Efficacy :

- Wetting
- Adhesion
- Absorption
- Killing

## Bio-efficacy : Killing ability

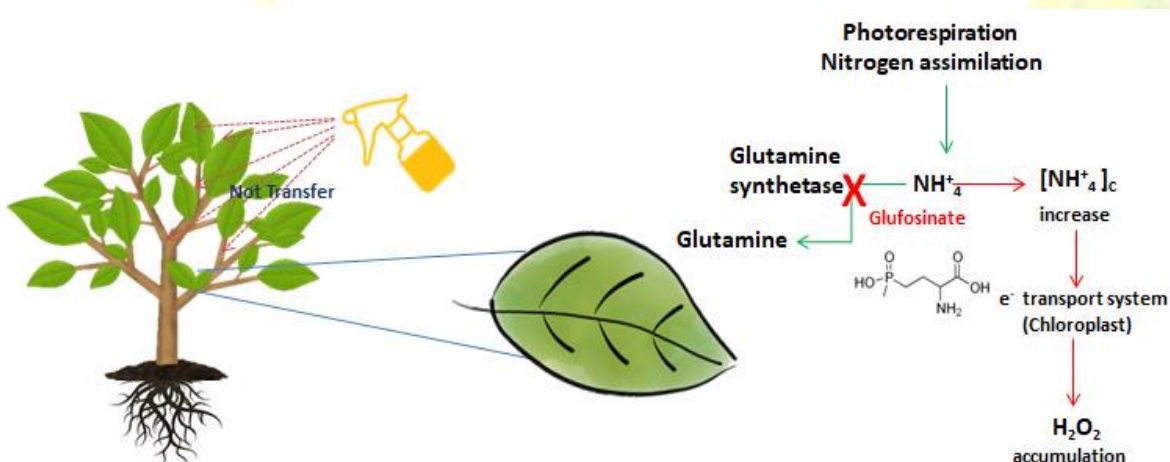


## PRODUCT LIST

| Product Name   | Surfactant type            | Appearance @ 25 °C | Dosage | Characteristic                            | Standard Packing |
|----------------|----------------------------|--------------------|--------|---|------------------|
| AGRISOL A-480G | Special Nonionic Mixture   | Liquid             | 6-10 % | Good Efficacy , Low Viscosity             | 200 KG DM        |
| AGRISOL A-488G | Special Surfactant Mixture | Liquid             | 5-8 %  | High Efficacy , High Viscosity ,High Foam | 200 KG DM        |
| AGRISOL A-425N | Special Surfactant Mixture | Liquid             | 5-10 % | High Efficacy , Low Viscosity , Low Foam  | 200 KG DM        |
| AGRISOL A-495  | Special Surfactant Mixture | Liquid             | 6-10 % | High Efficacy , Low Viscosity , High Foam | 210 KG DM        |
| AGRISOL A-3020 | Special Surfactant Mixture | Liquid             | 6-8 %  | High Viscosity , Low Cost                 | 185 KG DM        |
| AGRISOL A-3110 | Special Surfactant Mixture | Liquid             | 5-10 % | High Efficacy , High Viscosity            | 200 KG DM        |

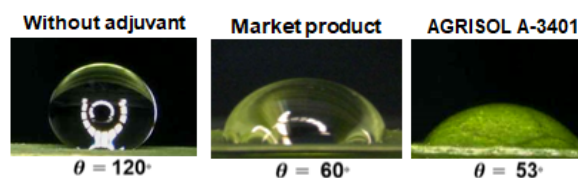
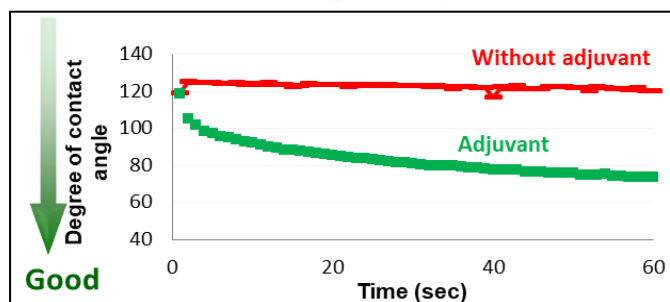
# GLUFOSINATE ADJUVANT

It is Amino acid synthesis inhibitors. Uptake of Glufosinate is through the leaves and stem. And then it inhibit the activity of an enzyme. It accumulate  $H_2O_2$  which toxicant to plant, then the plant die.

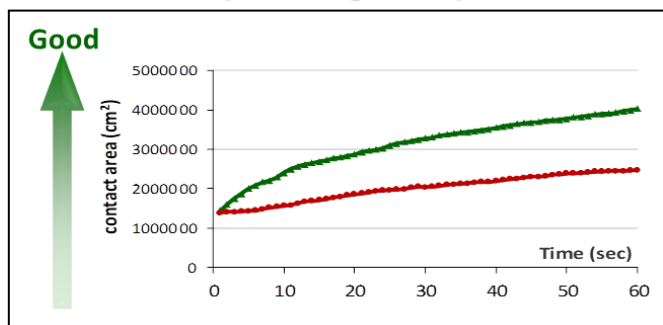


## BIO- EFFICACY

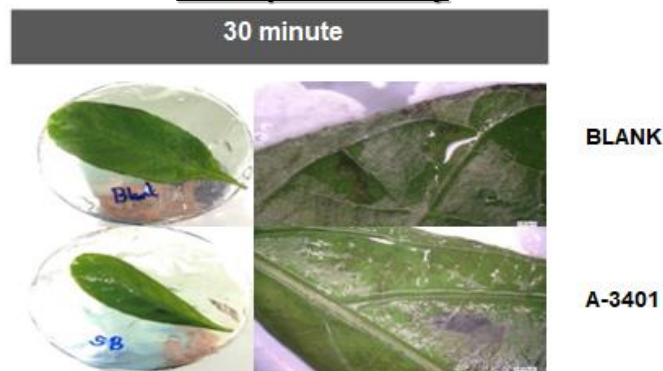
### Wetting Ability



### Spreading Ability



### Absorption Ability



Condition: Glufosinate-ammonium herbicide 1.06% in hard water (342 ppm), with 0.3%  $AgNO_3$  Test leaf: Board leaf (Ruellia Tuberosa)

## PRODUCT LIST

| Product Name   | Surfactant type                | Appearance @ 25 °C           | Dosage   | Characteristic  | Standard Packing |
|----------------|--------------------------------|------------------------------|----------|---|------------------|
| AGRISOL A-3401 | Anionic and Special Surfactant | Clear to Light Yellow Liquid | 8 - 12%  | Wetting agent for increasing of penetration   | 120 KG DM        |
| AGRISOL A-3480 | Anionic surfactant mixture     | Light yellow viscous liquid. | 10 - 12% | Improve wetting, spreading and penetrating performance to provide the high efficacy | 200 KG DM        |

## TANK MIX ADJUVANT

Their function are mainly use outside of the formulated product. Most are added to the spray tank in the field. These products promote activity in the spray tank as wetting and spreading agents.

### Wetting Ability

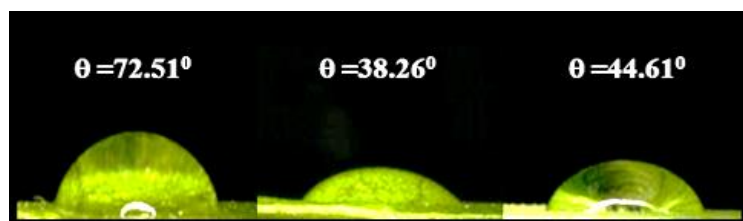
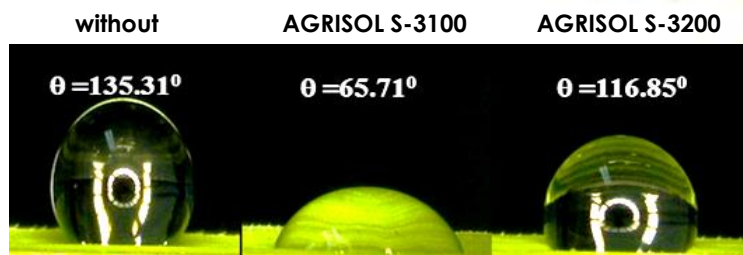
Type of leaf evaluation



*Imperata Cylindrica*  
(หญ้าคา)



*Ruellia Tuberosa*  
(ต้อยติ่ง)



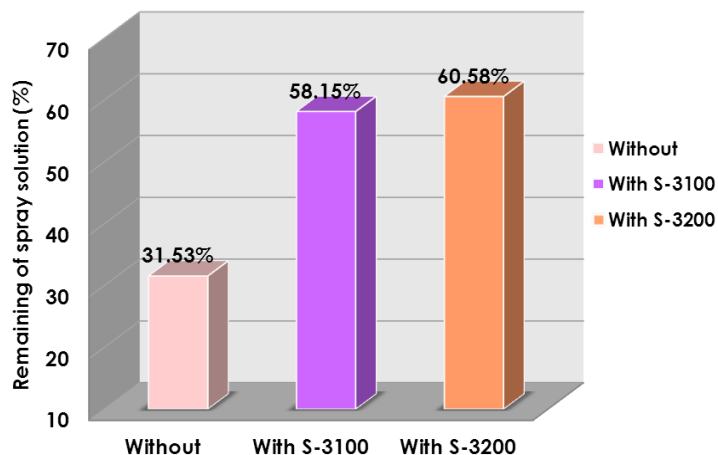
Spray application : Depending on the recommend

### Spreading Ability



Spray application and leaf  
Depending on the recommend

### Adhesion Ability



## PRODUCT LIST

| Product Name       | Surfactant type                         | Dosage         | Appearance @ 25 °C | Characteristic   | Standard Packing |
|--------------------|---|----------------|--------------------|--|------------------|
| AGRISOL A-451      | Nonionic and special Surfactant         | 0.025 - 0.10 % | Liquid             | High Wetting , Spreading , Penetrating and improve rain fastness                   | 200 KG DM        |
| AGRISOL A-453      | Anionic Surfactant Mixture              | 0.025 - 0.10 % | Liquid             | Low Cost   | 200 KG DM        |
| AGRISOL S-3100     | Anionic and Nonionic Surfactant Mixture | 0.020 - 0.04 % | Liquid             | High Wetting , Spreading , Penetrating and improve rain fastness                   | 200 KG DM        |
| AGRISOL S-3200     | Nonionic Surfactant Mixture             | 0.020 - 0.04 % | Liquid             | High Wetting , Spreading , Penetrating and improve rain fastness                   | 200 KG DM        |
| KAO ADJUVANT A-134 | Special nonionic surfactants            | 0.10 – 0.20 %  | Liquid             | High Wetting , Penetrating , Increase herbicidal effect and improve rain fastness  | 20 KG JERRY CAN  |
| KAO ADJUVANT A-145 | Special nonionic surfactants            | 0.10 – 0.20 %  | Liquid             | High Wetting , Penetrating , Increase biological effect and improve rain fastness. | 20 KG JERRY CAN  |

## EMULSIFIABLE CONCENTRATION

It can act as Emulsifier, Solubilizer, Wetting Agent and Dispersant. It is also the environmental friendly product which do not contain Alkyl Phenol.

### Performance score as follows

| Score | Dispersion score | Stability score                        |
|-------|------------------|--|
| 5     | Best milky bloom | Not separation                         |
| 4     | Good milky bloom | Oil, cream or water layer ≤ 1 ml       |
| 3     | Fair milky bloom | Oil, cream or water layer 2 ml         |
| 2     | Low milky bloom  | Oil, cream or water layer 3-4 ml       |
| 1     | Oil dispersion   | Oil, cream or water layer 5 ml or more |

The performance score level was determined by blooming the sample in dispersion test and doing the stability test.

### Toxicant Application

| Toxicant            | % W/V | Solvent |
|---------------------|-------|---------|
| Cypermethrin        | 10%   | Xylene  |
| Cypermethrin        | 25%   | Xylene  |
| Cypermethrin        | 35%   | Xylene  |
| Alpha Cypermenthrin | 10%   | Xylene  |
| Chlorpyrifos        | 40%   | Xylene  |
| Carbosulfan         | 20%   | Xylene  |
| Diazinon            | 60%   | Xylene  |
| Deltamethrin        | 5%    | Xylene  |
| BPMC                | 50%   | Xylene  |
| Dichlorvos          | 50%   | Xylene  |
| Acetochlor          | 50%   | Xylene  |
| Chorpyrifos         | 50%   | Xylene  |
| Cypermethin         | 5%    | Xylene  |
| Chlorpyrifos        | 20%   | Xylene  |
| Cypermethrin        | 2%    | Xylene  |

### Performance Test

#### Dispersion



**Best dispersion**  
**Best milky blooming**



Shaking 10 times

#### Emulsion stability



**Top layer**      **bottom layer**

## PRODUCT LIST

| Product Name  | Surfactant type                               | Appearance @ 25 °C  | Dosage   | Characteristic   | Standard Packing |
|---------------|---|---------------------|----------|--|------------------|
| AGRISOL H-472 | Nonionic and Calcium dodecylbenzene sulfonate | Liquid              | -        | Use main suitable toxicant as Propanil and Thiobencarb mixture                                       | 200 KG DM        |
| AGRISOL H-483 | Nonionic and Calcium dodecylbenzene sulfonate | Liquid              | -        | Use main suitable toxicant as 2,4-D and Propanil mixture   | 200 KG DM        |
| AGRISOL P-700 | Nonionic                                      | Liquid              | 4.8%     | Use main suitable toxicant as Cypermethrin, Chlorpyrifos, Carbosulfan, BPMC, Dichlorvos, Acetochlor. | 200 KG DM        |
| AGRISOL P-710 | Nonionic                                      | Liquid              |          |  |                  |
| AGRISOL P-300 | Nonionic                                      | Brown Liquid        | 2 – 5%   | Use main suitable toxicant as Cypermethrin, Chlorpyrifos, Carbosulfan, BPMC, Dichlorvos, Acetochlor. | 200 KG DM        |
| AGRISOL P-310 | Nonionic                                      | Yellow-Brown Liquid | 0.5 – 3% |  |                  |

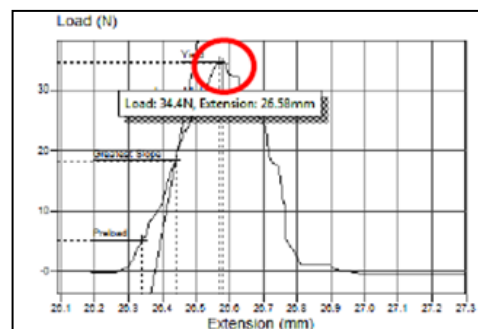
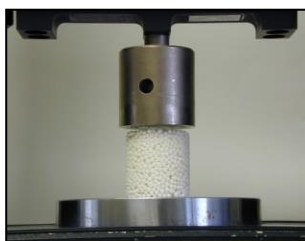
## FERTILIZER

Kao's Anti-caking agents show remarkable effectiveness in preventing the caking of Urea and Ammonium Sulfate. They are applicable in varied forms of Urea such as granule, powder and fertilizer.

### PERFORMANCE EVALUATION : CAKING TENDENCY



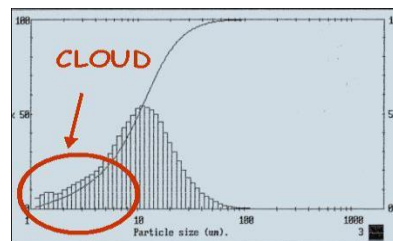
Under climatic conditions



Record the maximum force to break the cake

- Measure : Crushing strength (Kg)
- Results : Caking Protection (%)
- Measure : Lumps remaining in 6,3 mm sieve (g)
- Results : % Caking after crushing

### PERFORMANCE EVALUATION : DUST



#### Sieving:

- Sieve: 0,5 mm
- Elongation: 2 mm
- Time : 10 min.

Apply with shaker machine at 2 Amplitude for 10 minute and check weight lose after shaking

*\*Condition depend on fertilizer formulation*

#### Particle size distribution:

- Laser diffraction
- Solvent dispersion
- Malvern counter size

### PERFORMANCE EVALUATION : MOISTURE ABSORPTION

Coating fertilizer



Grained 5 g. of fertilizer and then, add MeOH 20 g. into the vial.



Prepared samples at before and after absorption.



## PRODUCT LIST

| Family   | Application                               | Nomenclature | Description   | Application Temperature  | Recommended Dosage                                      |
|----------|---|--------------|---|--|---|
| SK FERT® | Granulated AN & NPK<br><b>Anti-Caking</b> |              |   |  |   |
|          | AN, CAN, DAP, NPK                         | FW5AG        | Anti-caking and hydrophobic agent based on mixture of amines dispersed in mineral oil and wax.                              | 80 - 95°C  | 0.5 - 1.2 kg/MT   |
|          |   | F50AG        | Anti-caking agent based on mixture of mineral oils and fatty derivatives  | 80 - 90°C  | 0.5 - 1.2 kg/MT   |
|          |   | FA-143       | Anti-caking and anti-dusting agent for wide range of NPK fertilizers based on mixture of mineral oils and fatty derivatives | 80 - 100°C<br>(Not lower than 80°C)  | 1.5 - 2.5 kg/MT   |
|          |   | AC-32        | Anti-dusting and anti-caking agent for AS and wide range of NPK fertilizers base on Paraffinic oil                          | Normal temperature by spray and drop application   | 1.5 - 2.5 kg/MT   |
|          |   | AC-33        | Anti-dusting and anti-caking agent for AS and wide range of NPK fertilizers base on Petroleum oil                           | Normal temperature by spray and drop application   | 1.5 - 2.5 kg/MT   |
|          |   | AC-38        | Anti-dusting and anti-caking agent for wide range of NPK fertilizers  | Room Temperature<br>(25°C - 30°C)  | 1.5 - 3.0 Kg/ MT  |
|          |   | EXP          | Porous agent for ammonium nitrate based on anionic polymer  | Diluted to 25% in warm water before application.   | 2.5 - 3.0 kg/MT<br>of diluted product<br>(25% in water) |
|          |   | FA-80N       | Anti-caking agent based on mixture of mineral oil and fatty derivates.  | 85 -100°C.   | 0.5 – 1.2 Kg/ MT  |
|          | Bulk Blending                             | C-1406       | Anti-caking agent based on mixture of amines.   | 25 - 40°C  | 1.0 - 2.5 kg/MT   |
|          |   | FT-300       | Hydrofobic agent based on complex mixture of oils and parafins.   | Not lower than 85 °C   | 2.5 – 3.5 kg/MT   |
|          | NPK (AS/UREA)                             | FA-286       | Anti-caking and hydrophobic agent for NPK granulated fertilizers base on mixture of mineral oil and fatty derivatives.      | 80 - 100°C<br>(Not lower than 80°C)  | 1.5 - 2.5 kg/MT   |
|          |   | FA-356       | Anti-caking agent for NPK granulated fertilizers base on mixture of mineral oil and fatty derivatives.                      | 60°C   | 2.5 - 3.0 kg/MT   |
|          |   | AC-40        | Anti-caking agent based on complex mixture of surfactant and polymer.   | Normal temperature by spray and drop application   | 0.2 - 0.4 kg/MT   |
|          | KNO3 Crystal<br><b>Anti-Caking</b>        | PN           | Water soluble anti-caking agent based on mixture of complex anionic polymers.   | Product normally solubilized in water (~25%) prior application   | 0.7 - 1.0 kg/MT<br>(as 100%)                            |
| URESOF®  | Prilled Urea<br><b>Anti-Caking</b>        | 150          | Anti-caking agent for Prilled Urea based on complex of surfactant and polymer.  | Application temp. 20 -30 °C for Urea / AS : AS application, recommendation addition point before the dryer | 0.25 - 1.0 kg/MT  |

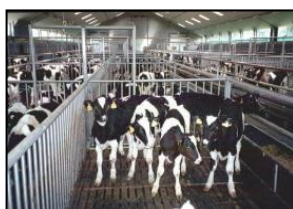
## BACTERICIDES

It is Disinfectant and Cleaning Agent for Livestock, Sugar mill and General proposal.

### Dosage recommendation for killing bacteria

| Organism                          | SANISOL C-80 concentration | SANISOL M-80 concentration | QUARTAMIN D-10P concentration |
|-----------------------------------|----------------------------|----------------------------|-------------------------------|
| <i>Staphylococcus aureus</i>      | 400 ppm                    | 200 ppm                    | 15.8 ppm                      |
| <i>Pseudomonas sp.</i>            | 200 ppm                    | 100 ppm                    | N/A                           |
| <i>E. Coli</i>                    | 100 ppm                    | 100 ppm                    | 2 ppm                         |
| <i>Listeria monocytogenes</i>     | 25 ppm                     | 25 ppm                     | N/A                           |
| <i>Salmonella gr.B</i>            | 100 ppm                    | 100 ppm                    | N/A                           |
| <i>Pseudomonas aeruginosa</i>     | N/A                        | N/A                        | 2 ppm                         |
| <i>Vibrio parahaemolyticus</i>    | N/A                        | N/A                        | 2 ppm                         |
| <i>Klebsiella pneumoniae</i>      | N/A                        | N/A                        | 3.9 ppm                       |
| <i>Salmonella typhimurium</i>     | N/A                        | N/A                        | 2 ppm                         |
| <i>Staphylococcus epidermidis</i> | N/A                        | N/A                        | 2 ppm                         |
| <i>Streptococcus faecalis</i>     | N/A                        | N/A                        | 7.8 ppm                       |
| <i>Candida albicans</i>           | N/A                        | N/A                        | 3.9 ppm                       |

## APPLICATIONS



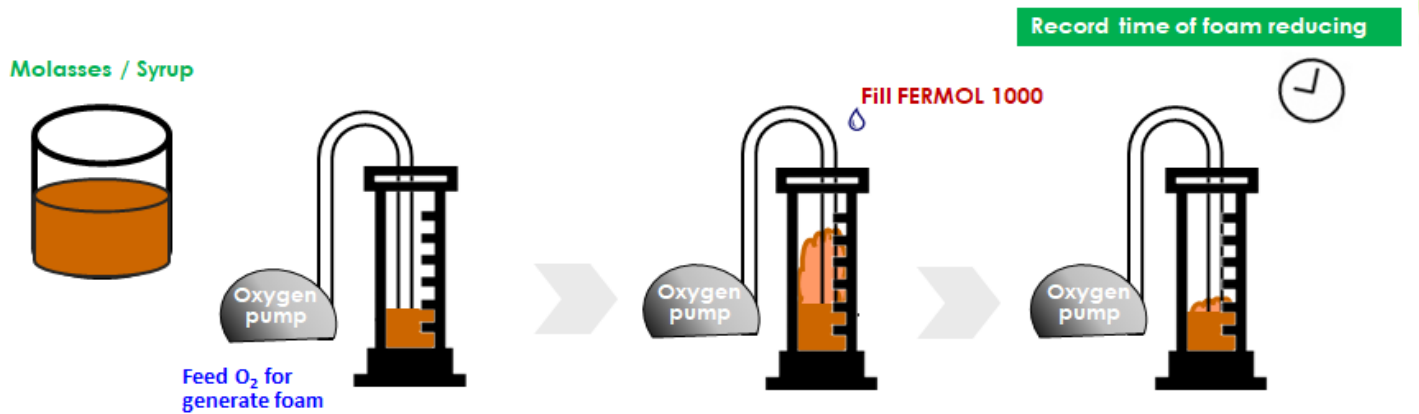
## PRODUCT LIST

| Product Name    | Main Ingredients/Composition            | Appearance @ 25 °C                      | Dosage      | Standard Packing |
|-----------------|---|---|-------------|------------------|
| SANISOL C-80    | Alkyl dimethyl benzyl ammonium chloride | Liquid                                  | 0.02-0.05 % | 200 KG DM        |
| SANISOL RC      | Alkyl dimethyl benzyl ammonium chloride | Liquid                                  | 0.02-0.05 % | 210 KG DM        |
| SANISOL M-80    | Alkyl dimethyl benzyl ammonium chloride | Liquid                                  | 0.02-0.05 % | 200 KG DM        |
| QUARTAMIN D-10P | Didecyl dimethyl ammonium chloride      | Clear Colourless to Light Yellow Liquid | -           | 160 KG DM        |

## FERMENTATION

The main application for this product group, it can be the Anti-Foam, Releasing Agent for the Fermentation processing and improving yield for general purpose.

### PERFORMANCE EVALUATION : FOAM REDUCING



### APPLICATIONS

Anti-Foam for Fermentation processing in various industries.



### PRODUCT LIST

| Product Name | Application     | Surfactant type | Main Ingredients/<br>Composition                           | Appearance<br>@ 25 ° C     | Standard<br>Packing |
|--------------|-----------------|-----------------|--|----------------------------|---------------------|
| FERMOL 200   | Releasing Agent | Nonionic        | Polyoxyethylene Glycerine<br>Hydrogenated Fatty Acid Ester | Liquid                     | 200 KG DM           |
| FERMOL 1000  | Anti-Foam       | Nonionic        | Glycerin Alkoxylate  | Clear, yellowish<br>liquid | 200 KG DM           |
| ACETAMIN 40  | Improving yield | Cationic        | Tetradecylamine Acetate                                    | Flake                      | 20 KG BG            |

# FRUIT COATING

Kao fruit coating is a specially formulated fruit coating compound designed to:
















- Prevent the occurrence of IBS or Internal Browning Syndrome
- Reduce the growth of micro-organisms
- Retard ripening
- Maintain freshness and prolong shelf-life

The use of fruit coating on fresh pineapple fruits has been consistently proven to prevent IBS and stop pre-mature ripening and it also delays shell colour advance. This ensures that your pineapples will reach your customers in their best and freshest condition.



## PERFORMANCE EVALUATION : FRESHNESS AND BROWNING

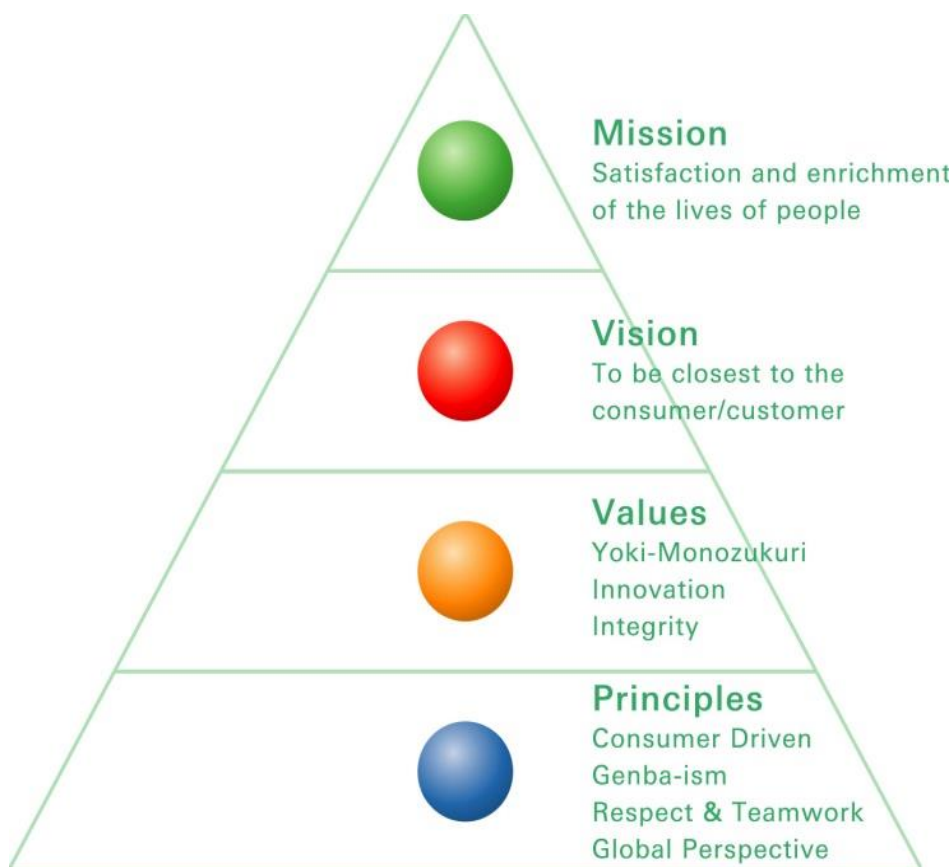
PREPARATION : 10% Solution of fruit coating in Deionized Water  
TESTING : 20 grams of solution was sprayed in Pineapples

|         | Untreated   | Treated with KD-112  | Treated with KD-119   |
|---------|---|--|---|
| 0 Day   |    |   |    |
| 14 Days |   |    |   |
| 30 Days |   |   |   |

## PRODUCT LIST

| Product Name | Application                      | Main Ingredients/ Composition | Appearance @ 25 °C                       | Standard Packing |
|--------------|----------------------------------|-------------------------------|--|------------------|
| KD-112       | Spraying or Dipping entire fruit | Sugar Ester Blend             | Clear, Yellow to Brownish Viscous Liquid | 200 KG DM        |
| KD-119       | Spraying or Dipping entire fruit | Sugar Ester Blend             | Clear, Yellow Viscous Liquid             | 200 KG DM        |

# The Kao Way



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