

## T E C H N I C A L B U L L E T I N

# Ecolife®

## **Reinvigorant for Plants** **(biostimulates Plants to Produce their own Defence Mechanisms)**

### **Composition of Ecolife®**

Each 100 ml of Ecolife® contains:

- Citrus Bioflavonoids and Citrus Phytoalexins;
- Ascorbic Acid (Vit. C), Citric Acid and Lactic Acid;
- Inert Carrier q.s.p..

### **Origin and working performance of Ecolife®**

Ecolife® uses synergetic action, which strengthens plant resistance against diseases. This action is controlled by Citrus Bioflavonoids (vitamin P) Citrus Phytoalexins, and Ascorbic Acid (vitamin C). Plant tissues are induced to produce their own Citrus Phytoalexins, which are then used to repair damage caused by bacteria and fungi. The organic acids (ascorbic, citric and lactic) and the bioflavonoids provide Ecolife® with anti-oxidizing action and together with peptides they act microbiostatically, helping to balance the microbial vegetal flora.

### **Recommendations for use of Ecolife®**

#### **TO IMPROVE PLANT RESISTANCE AGAINST “STRESS” AND DISEASES CAUSED BY BACTERIA AND FUNGI**

Begin spraying as preventative treatment before the development of diseases, taking into consideration the culture phase, the most common pathogens present and the inoculation potential in the area as well as favorable climatic conditions.

If there is an increase in the inoculation pressure the recommended dosage can be intensified after evaluating the culture state, so as not to cause burning on the superficial parts of the plant. Ecolife®<sup>40</sup> can also be used with other fungicides/bactericides, in rotational spraying.

The spraying interval is 15 days, but this can be intensified or reduced in function of the environmental conditions and the criteria of the Agricultural Engineer in charge.

In the case of high contamination levels (Fungi and Bacteria), it is recommended to double the dosage and spray every 7 days, if protection is still required.

The product is easily absorbed by vegetation in between 12 to 24 hours after spraying. The product is partially translocated and after it is metabolized there is an increase in resistance in vegetable tissues under the influence of Ecolife®, which results in the lesser likelihood of the treated vegetation being infected again.

In the case of ornamental plants and other cultivated plants during the flowering phase, the minimum dosage may be reduced by half and the number of sprayings increased in accordance with the risk of contamination.

Plants which show the most favorable response to Ecolife® are shrubs, creepers and climbers which have a greater quantity of non-lignified tissue, such as vegetables, flowers and some fruits.

#### **TO PROLONG THE LIFESPAN OF FRUIT AND VEGETABLES DURING THE “PRE-HARVEST”**

Ecolife® should be diluted in potable water and sprayed uniformly on the part of the plant to be harvested. This spraying should take place a few hours before harvesting.

This kind of treatment is recommended for fruit and vegetables such as Cauliflower, Broccoli and pilous type fruit which due to their shape or epidermal characteristics are difficult to dry after harvesting, thereby complicating post harvest treatment. After the superficial humidity loss the vegetable or fruit is ready to be harvested and packed, thereby benefiting from the microbiostatic effects and the prolonged action of Ecolife®.

**TO PROLONG THE LIFESPAN OF FRUIT AND VEGETABLES DURING THE “POST-HARVEST” STAGE**

The use of Ecolife® during the Post-Harvest stage is responsible for maintaining the superficial vegetal tissues intact. Those that benefit most from this kind of treatment are fruit, vegetables and smooth skinned tubers.

When disinfecting the vegetable or fruit all visibly infected parts must be removed such as calyxes/flowers and leaves. Wash the item in clean water to eliminate organic residues. Quickly immerse it in a solution of Ecolife®, making sure that the whole surface is exposed to the action of the product. After removing, allow the excess liquid to run off and package only when the product is completely dry.

**How to use Ecolife® with vegetables**

To guarantee the efficient use of Ecolife® with vegetables it is imperative to follow the method set out below:

- a) Begin with low dosages (less than 100 ml/100 l of water), so as not to cause a sudden increase in Phytoalexin production.
- b) Spray over periods of 15 days (pulverization), principally for preventative reasons.
- c) When there is a sudden increase in disease levels the dosage should be increased and the interval between sprayings reduced, after the initial contact a priori with Ecolife®, apply as previously set out.

Do not begin the treatment of vegetables with high dosage levels and reduced spraying intervals, as this may cause a rapid increase in Phytoalexin production by the plant, which will interfere with normal plant growth.

**Ecolife® Dosages**

Applications	Dosages	
	ml/100 liters of water	ml/ha
To improve plant resistance against “stress” and diseases caused by bacteria and fungi.	100 - 150	500 - 1000
To prolong pre-harvest lifespan of fruit and green vegetables.	150 (fruit) 80 (green vegetables)	_____
To prolong post-harvest lifespan of fruit and green vegetables.	150 (fruit) 80 (green vegetables)	_____

**Recommendations for Cultures:**

CROP	DOSAGE	OBSERVATION
Pepper	200ml / 100 liters	Apply weekly. Begin applying dosage to seedlings. To control Erwinia, increase dosage to 300 ml / 100 liters.
Banana	½ liter / ha	To control Sigatoka’s Disease, spray every 20 days during the months November through to March.
Tomato	200-300 ml / 100 liters	Spray weekly. When the first signs of disease appear, alternate with conventional agrotoxins and increase dosage.
Grape	200-300 ml / 100 liters	Spray fortnightly after flowering. Do not mix with copper based solutions. During the rainy season apply weekly.
Brassica	200 ml / 100 liters	Spray fortnightly to prevent bacteriosis to aid in pre-harvest. Harvest only after plants have dried.
Rose	200-300 ml / 100 liters	Spray fortnightly. Increase dosage to control mildew.
Strawberry	200-300 ml / 100 liters	Spray weekly. To control bacteriosis, increase dosage. To aid fruit preservation, spray during pre-harvest and harvest when the fruit is dry.

## **Ecolife® and organic agriculture**

As Ecolife® is a product made up of non-toxic, naturally acting ingredients. It is a product, which integrates itself perfectly with the organic culture system without interfering with the adjoining macro or microenvironment. It has a revigourating effect and acts as a Bactericide and Fungicide. It can be used with this kind of cultivation for all applications previously described, on its own or alternately with copper based solutions and fermented solutions. Spraying with these solutions should take place on different days preferably after the application of Ecolife®.

## **Waiting period of Ecolife®**

As it is considered to be NON TOXIC by international standards, Ecolife®, can be immediately applied before or after harvesting, as a disinfectant of fruit and vegetables. It doesn't have secondary effects, and bears no risks to human health or to the environment. There is no waiting period after its use.

## **Toxicity of Ecolife®**

### **Acute Oral Toxicity**

DL<sub>50</sub>

Greater than 5.00 ml/Kg of body weight of the animal tested.

### **Molecular Toxicity Test**

It does not affect protein or cellular DNA of mammals. It is non-mutagenic.

### **Skin Irritation**

It doesn't cause skin irritations at concentrations recommended for use.

### **Skin Irritation**

It can cause slight irritation due to its low pH.

## **Specifications for the use of Ecolife®**

### **COMPATIBILITY**

Ecolife® is very stable, and can be used together with fungicides (non-ionic or cationic), oils and agricultural wetting agents. It should not be mixed with products that contain a high metal concentration or with alkaline products. Mixing Ecolife® with foliar fertilizer should be done with great care. Prior to use it is advisable to carry out a test on a small area of the plant to evaluate the risk of damage.

The pH of the solution is between 4.0 and 6.5. The use of alkaline water or the addition of base substances will diminish the efficiency of Ecolife®.

Never use the product in hidroponic cultures systems as the organic acids of Ecolife® can have a negative effect on the nutrient solution.

The use of hard water (calcium and magnesium) reduces its efficiency.

### **PREPARATION OF THE SOLUTION**

Ecolife® should be added to half the volume of water required for the solution, the other half should be then added while mixing slowly. If mixed quickly foam may appear which is quite normal and doesn't interfere with the product's efficiency.

The addition of other products to the solution should follow the manufacturer's recommendations. Apply the solution within 24 hours of its preparation.

### **APPLICATION OF ECOLIFE®**

In the case of dipping we recommend that the water be changed periodically as the increase in organic material can reduce the efficiency of the treatment.

When spraying post harvest fruit, apply the solution in such a manner as to avoid run off.

When field spraying use conical tips set at the correct pressure which will permit uniform covering of the treated item. Spraying should be carried out in ideal wind conditions at temperatures up to 28°C, and relative humidity above 60%. The occurrence of rain within 12 hours of spraying will reduce the efficiency of the treatment.

## **Further information about Ecolife®**

- Ecolife® is Biodegradable and Non Toxic;
- It is non corrosive, non volatile and non inflammable;
- Over a period of time its coloring may change to brown but this doesn't interfere with the efficiency of the product.
- There is no waiting period for pre and post harvest applications.

## **Storage instructions for Ecolife®**

- Keep the Ecolife® containers closed and store in a cool dry place.
- Keep the product out of the reach of children and domestic animals.

### Precautions when using Ecolife®

- Even though the product is non toxic Ecolife® residues should not be disposed into watercourses, because due to its acidic pH it may have adverse reaction on fish fry and eggs.
- The empty containers should be disposed of in landfills appropriate for the disposal of agro-chemical containers.
- The use of protective equipment (glasses, gloves, headwear, boots and boiler suits) is recommended to avoid direct contact with the product, as some people may be allergic or sensitive to its exposure.
- Due to its citric origin skin contact with Ecolife® and subsequent exposure to the sun may results in marks which disappear in a few days.
- If accidental contact with the eyes occurs, the acidic pH can cause irritation. Wash with water and seek medical assistance, bringing the Ecolife® label.

### Bioflavonoids (vitamin P)

Bioflavonoids are natural compounds found in all plants. To date more than 8000 bioflavonoids have been identified.

Bioflavonids originate from a complex metabolic process in the plant that is responsible for the production of lignin, anthocyanins and phytoalexins. Bioflavonids are antioxidants, which are normally found in the plant together with Vitamin C and protect it from oxidation and natural degradation.

As antioxidants bioflavonoids sequester free radicals and help in the chelating of metals.

Bioflavonoids increase plant resistance against pathogenic infections, due to their synergism with phytoalexins.

### Ascorbic acid (vitamin C)

Vitamin C is an essential element for growth. Its existence in plants is directly related to the vital functions of the plant such as respiration, growth, photosynthesis and cellular reproduction.

When working in association with Bioflavonoids Ascorbic Acid is extremely stable.

Several studies have demonstrated that the foliar spraying with Ascorbic Acid can increase the synthesis of phytoalexins in plants, thereby reducing the possibility of disease.

### Phytoalexins

Phytoalexins are biochemical compounds, regularly produced by plants and known to researchers since the 1940's.

- Phytoalexins are organic compounds with low molecular weight that build up in plants after pathogenic infections or environmental stress. Phytoalexins are natural anti-microbial compounds.
- Some substances can induce the production of Phytoalexins. These substances are known as elicitors. Amongst the organic elicitors are Ascorbic Acid and Bioflavonoids. Bioflavonoids are the forerunners of Phytoalexins.

The idea of using products to induce Phytoalexins is based on the fact that in nature, disease is the exception not the rule.

When a pathogen infects a plant, a chemical war breaks out, where on one hand the plant begins producing Phytoalexins and on the other where the pathogen tries to break them down.

Phytoalexins are only part of a series of defense mechanisms that plants possess to fight off pathogens. However Phytoalexins are the plant's most powerful weapons in the war against pathogens.

The most important factor in the war of pathogen versus host depends on the plant's ability to produce Phytoalexins quicker than the pathogen is able to break them down.

If the production of Phytoalexins by the plant supercedes the pathogen's capacity to break them down then the infection will be small or may not even manifest itself at all.

One of the reasons why this natural defense mechanism doesn't often occur in cultivated plants is that modern agricultural practices, such as the use of nitrogen fertilizers and herbicides, which seek to increase plant productivity interfere in the production of Phytoalexins.

### Physical chemical specifications of Ecolife®

- |                                 |   |
|---------------------------------|---|
| - Chemical Formula of Ecolife®: | There is no chemical formula as Ecolife is a complex chemical compound which contains Citric Bioflavonoids (Vitamin P), Citric Phytoalexins, Ascorbic Acid (vitamin C), Citric Acid and Lactic Acid.  |
| - Appearance:                   | Crystalline viscous liquid  |
| - Organoleptic characteristics: | <ul style="list-style-type: none"> <li>- Taste: Bitter Acid and Astringent (Citrus Bioflavonoids)</li> <li>- Odour: Agreeable (light fermented citrus smell)</li> <li>- Color: Clear crystalline lemon color, which with aging darkens, but doesn't affect its efficacy.</li> </ul> |

- Density (g/ml at 25°C):	1,050 (+/- 5%).
- pH (10% dilution in water at 25°C):	2,65 (+/- 10%).
- Acidity (quantity of product in (mg) neutralized by 1 (mg) de NaOH 1N):	2060 (+/- 10%).
- Solubility:	100% in water.
- Nitrogen (Kjeldahl Method):	2500 ppm (+/- 15%).
- Corrositivity:	At 0,50% in water it is similar to the corrositivity potable water.
- PH for use in mixing:	Best below pH 7,0.
- Validity:	Three (3) years after manufacturing date.

## References of official technical experiments carried out in universities and institutes on Ecolife products

### 01) Report on the Efficiency and Practicability of Ecolife®

Universidade de São Paulo USP  
Escola Superior de Agricultura "Luiz de Queiroz" ESALQ  
Departamento de Agricultura - Piracicaba-SP Brasil March to May /98

Responsible: Prof. Dr. Geraldo José Aparecido Dario  
Eng. Agr. Peter Willians Dario

**Conclusions:** The results obtained permit us to conclude:

A) The fungicide Ecolife® (Citric Biomass + Organic Acids) at dosages 100.00, 200.00 e 300.00 ml/hectare, is extremely efficient in controlling SIGATOKA Disease (*Mycosphaerella musicola* Leach) which occurs in Banana crops (*Musa* spp.), Its action doesn't significantly differ from that of the fungicide CERCOBIN 500 SC (Thiophanate methyl) which is commonly used;

B) Ecolife® (Citric Biomass + Organic Acids) was found to be non-toxic to the culture at the three dosages tested.

### 02) Determination of the Efficiency of Biocitro (Citric Biomass) in Desinfection of Fresh Vegetables (Complementary report).

Universidade Estadual de Campinas UNICAMP  
Faculdade de Engenharia de Alimentos - Campinas-SP Brasil October to December /95

Responsible: Profa. Dr. Pilar Rodriguez Massaguer Ph.D  
Sr. Fernando José Leite Junior (Estudante Bolsista)

**Conclusion:** Concerning Ecolife<sup>20</sup> we can say that it is one of the best products for the disinfection of lettuce. We suggest that the product be washed in a solution of Ecolife<sup>20</sup> 250 ml/100 l of water for a period of 15 minutes which will result in a 99% reduction of total flora and a 99% reduction of bacterial coliforms.

Obs.: The purpose of this study was to determine the reduction of bacterial flora and not the shelf life of the product.

### 03) The Effect of Ecolife<sup>20</sup> on the Preservation of Fruit under Environmental Conditions.

Instituto de Tecnologia de Alimentos ITAL  
Centro de Tecnologia de Hortifrutícolas FRUTHOTEC - Campinas-SP Brasil October/97 to February /98

Responsible: Dra. Eliane A. Benato Rodrigues da Silva

#### Conclusions:

1) Ecolife<sup>20</sup> at the following dosages (150 to 800 ml / 100 l of water) does not significantly interfere with the maturing parameters (skin color, pulp color, texture, soluble solids °Brix, pH and total acidity) of guava, peach, nectarine, mango and papaya, stored at 25°C / 85% UR over a period of 8 days.

2) For peaches "Aurora II", the most efficient treatment in the control of putrefaction due to artificial contamination by fungi "Monilinia e Rhizopus" is:

- Romilan (Vinclozolin) (100 g / 100 l) + Ecolife<sup>20</sup> (300 ml / 100 l)

3) For Nectarines "Sunripe". As stated above in No 2

- Ecolife<sup>20</sup> (400 ml / 100 l)

4) For mangoes "Tommy Atkins", the most efficient treatment in the control of pathogens is:

- Ecolife<sup>20</sup> (400 ml / 100 l)

5) For papaya "Solo", the most efficient treatment in the control of pathogens is:

- Thermic treatment (49°C / 20 min) + Ecolife<sup>20</sup> (400 ml / 100 l)

6) For guava "Branca Kumagai", tests were inconclusive.

**04) PostHarvest Bacterial Treatment for “Vibrio cholerae” in lettuce (Lactuca sativa).**

Universidad de Costa Rica San José, Costa Rica January and February /94  
 Instituto de Investigaciones en Salud y  
 Laboratório de Manejo Poscocecha de Perecederos Centro de Investigaciones Agronómicas.

Responsible: Dr. Daniel Saborio A.  
 Dr. Leonardo Mata J.  
 Dr. Luís Felipe Arauz C.

**Conclusion:** The concentration of the strain (log 5) is similar to that which can infect vegetables due to the use of contaminated water. The results demonstrate that disinfection with Ecolife<sup>20</sup> is extremely efficient in that the number of surviving bacteria is less than log.5 which is the minimum infecting dose.

**05) Fungicide Tests for the control of “Sclerotium rolfsii” in vitro.**

Fundación La Salle de Ciencias Naturales  
 Instituto Universitario de Tecnología Agropecuaria IUTEAGRO  
 Campus COJEDES Venezuela

Responsible: Dra. Lizeth Ramirez Muños

**Conclusion:** The best forms of combating Sclerotium rolfsii in vitro, were found to be:

- VITAVAX - Agrochemical
- Trichoderma - Probiotic
- Ecolife<sup>20</sup> - Phytotherapeutic

**06) The Use of Ecolife<sup>20</sup> in Controlling Black Sigatoka in Bananas in Ecuador.**

Plan Nacional del Banano de Ecuador  
 Ministerio de Agricultura del Ecuador 1º semestre/94

Responsible: Eng. Agr. Luiz Tarzán

**Conclusion:**

- a) Under the conditions in which the tests were carried out in May/94 (end of the rainy season), Ecolife<sup>20</sup> CLEARLY SHOWED ITSELF TO BE EFFICIENT IN THE CONTROL OF “BLACK SIGATOKA”.
- b) Ecolife<sup>20</sup> functions in the control of “Black Sigatoka”, in the same way as the best fungicides (highly toxic Agro-Chemicals) on the world market such as: Propiconazole, Tridemorph, Thiophanate and Benomyl.
- c) We recommend the use of Ecolife<sup>20</sup> in the control of “BLACK SIGATOKA” in ROTATION, with any of the FUNGICIDES (Agro-Chemicals) normally used.

**07) Practical evaluation of Ecolife<sup>20</sup> in the Post-Harvest Treatment of Banana and Plantain in Costa Rica for the prevention of stalk rot.**

PROVEQUI E BANDECO  
 San José, Costa Rica August/91

Responsible: Agr. José Escorriola (PROVEQUI)  
 Eng. Carlos Molina (BANDECO)  
 Eng. Abraham Medina (Diretor Qualidade BANDECO)

**Conclusion:** Despite the fact that treatment with thiabendazole / Alúmen resulted in branches without moderate to severe infection, treatment with Ecolife<sup>20</sup> resulted in more UNINFECTED STALKS. However there is no significant difference between the two forms of treatment.

**08) Control of Black Sigatoka in Bananas.**

LAN ECUADOR Grupo Nooboa Ecuador  
 Lineas Aéreas Nacionales Ecuador S. A. March-94

Responsible: Eng. Agr. Segundo Huellas Ramirez - Superintendente Zona Sur

**Conclusion:** It could be observed that on farms where treatment with Ecolife<sup>20</sup>, was carried out that Ecolife<sup>20</sup>, when applied with an average frequency of 17 days, worked well controlling spots, of 1 to 1.5 mm on the leaves.

**09) Test of Ecolife® as a Fungicide in the control of Sigatoka Amarela (Mycosphaerella musicola) in Venezuela.**

CITRADE C. A.  
 Caracas, Venezuela July to August /94

Responsible: Enga. Agra. Maria Eugenia Pacheco

**Conclusions:**

- 1) The products Ecolife® and Propiaconazole, perform similarly in controlling Yellow Sigatoka.
- 2) Ecolife® can be used in rotation with any of the other products recommended for the control of Yellow Sigatoka.

**10) Test of Ecolife® as an Ecological Fungicide in the control of the Yellow Sigatoka fungus (Mycosphaerella musicola) in comparison with other Fungicides (Calixin, Dithane + Benlate), in Banana Plantations in Venezuela.**

CITRADE C.A.

Caracas, Venezuela September to October/94

Responsible: Enga. Agra. Maria Eugenia Pacheco

**Conclusions:**

- 1 The number of spots per leaf is greater when CALIXIN is used,. The efficiency of Ecolife® in controlling and preventing Yellow Sigatoka in banana. plantations is evident.
- 2 When comparing the results of Ecolife® with (Benlate + Dithane), it was observed that Ecolife® obtained a better rate in reducing the number of spots per leaf (less than them spots per leaf).

**11) The effect of Ecolife®<sup>40</sup> on the production of “Niagara Grape”, between harvest (February to June/1999).**

- Coordenadoria de Assistência Técnica Integral (CATI).

Responsible: Eng. Agr. Silvio Roberto Penteado - DEXRU/CATI - Campinas  
 Eng. Agr. Ismael Secco - C.A. Indaiatuba - CATI/Regional - Campinas  
 Local: Fruticultura “CAUSARO”, Bairro Saltinho Indaituba, SP.  
 Proprietário: Sr. Armando Caus.

**Objective:** To test the ECOLOGICAL products, which could serve as an alternative to the intensive use of AGROTOXICS.  
 To study the potential effect of Ecolife® on “Niagara Grape”.

**Results and Conclusions:**

**a) Germinating and Pre Flowering Phase**

The best result for this period was treatment 1, with a solution of Copper + Mancozeb for the germination phase Ecolife® for the Pre-Flowering period, with 16,6% of the bunches being affected.

**Table 1** - Percentage of bunches of Niagara Grape affected by Plasmopara viticola (mildew) after being treated at the Germinating and Pre-Flowering Phase with different fungicides. Evaluation carried out on 10/03/99 (after flowering).

Obs.: CB (Copper based solution) in the form of Biomicron, changed the pH from 7.0 to 8.0. CV (Calda Viçosa) in the form of salts, changed the pH from 7.0 to 8.0. (x) Signs of copper phytotoxicity on the leaves.

TREATMENTS AND DOSAGES		METHOD AND INTERVALS	BUNCHES AFFECTED
Germinating Phase	Pre Flowering Phase		
1	Dithane (Mancozeb) 0,35% + CB 0,4 SC (Sem corrigir pH)	Ecolife® 0,25% CB 0,6%	Every 4 days 16,6%
2	Calda Viçosa 1% (CV)	Ecolife® 0,25% e CB 0,8%	Every 4 days 33,3%
3	Standard treatment: Curzate 0,5% + Dithane 0,35%	Standard treatment: Curzate 0,5% + Dithane 0,35% e Ridomil	Twice weekly 37,5%
4	CB 0,6% SC	CB 0,6% SC	4 days 25,0%
5	CV 1,6%	CB 0,8%	4 days 12,5%
6	CB 0,4% SC	CB 1,0% SC	4 days 12,5%
7	Ajifer 1% + CB 0,6%	Ajifer 0,5% + CB 0,6%	4 days 4,1%

**B) Bunch growth phase**

The best result was found to be treatment 1, which alternated the use of Ecolife® and Copper based solution (CB). There was a Productivity increase of 80% in relation to the standard treatment (8).

**Table 2** - The Effect of treatment on Niagara Grape during the bunch growth phase, using different agriculture fungicides Indaiatuba-SP. Between harvest (Feb. to June/1999) 1º harvest year.

T	Products	Interval in days		Average production	Increase in relation to standard treatment
		PF	CC		
1	Ecolife® 0,25% e 0,3% e CB 0,6% e 0,8% SC	Every 4 days	Every 7 days	18Kg	80%
2	Ecolife® 0,25% e CB 0,8%	Every 4 days	Every 4 days	14Kg	40%
3	Ecolife® 0,3% (Cancho) e CV 1,6%	4	7	16Kg	60%
4	CB 0,6% SC	4	7	14Kg	15%
5	CB 0,8% SC	4	7	14Kg	40%
6	CB 1,0% SC	4	7	14Kg	40%
7	Ajifer 0,5% + CB 0,6%	4	7	12Kg	15%
8	Standard treatment: Curzate 0,5% + Dithane 0,35%; Ridomil, Score, CB 1%	Twice weekly	7	10Kg	Standard

**PF (Post Flowering Phase). CC (Bunch Growth Phase).****Observations:**

- CB: Copper Based Solution (SC) (0.6 -0.8-1.0%).
- CV: Solution of copper sulphate (0.5%) and micronutrients (boron, zinc and magnesium).
- Ajifer 6: With 25% of organic material and 6-7% of sulphur.

**12) The Efficiency of Ecolife® in the control of Uromyces Appendiculatus (rust fungus) in bean plants.**

- 1- Universidade Federal de Goiás UFG
- 2- EMBRAPAArroz e Feijão<sup>2</sup> Jul/99 Goiânia-GO

Responsible: Caroline S. Castro<sup>1</sup>  
Dr. Gerson P. Rios<sup>2</sup>  
Dr. Belmiro P. das Neves<sup>2</sup>

**Conclusion:** The efficiency of Ecolife®, was tested in the control of rust fungus under greenhouse conditions. The plants were sprayed eight days after germination and when they were free of superficial humidity the inoculation with a solution of the pathogen  $2.10^4$  ure spores /ml was carried out. After inoculation the plants remained at a temperature of 22°C, for 24 hours. Afterwards they were taken to the growing house where they were subjected to 12 hour alternative periods of light and darkness at 22°C. The number of flecks and pustules /4cm<sup>2</sup> were evaluated 7 and 15 days after inoculation respectively. The product Ecolife® effectively eliminated 98,66%, 98,08% e 89,10% of the disease at the following concentrations 1,5, 2,0 e 1,0 ml/L H<sub>2</sub>O, respectively.

**13) The Efficiency of Ecolife®<sup>40</sup> in the control of Bean plant mildew (Erysiphe polygoni).**

- 1 - Universidade Católica de Goiás UCG
- 2 - Universidade Federal de Goiás UFG
- 3 - EMBRAPAArroz e Feijão July /99 Goiânia-GO

Responsible: Dr. Bruno O. Jayme<sup>1</sup>  
Caroline S. Castro<sup>2</sup>  
Dr. Gerson P. Rios<sup>3</sup>  
Dr. Belmiro P. das Neves<sup>3</sup>

**Conclusion:** Bean plant mildew is a disease found world wide which occurs at any stage of the plants development. It infects the entire above ground part of the plant and can cause losses of up to 69% in yield. It has always been a serious problem for experiments carried out in greenhouses, plastic coverings or other controlled environments.. Greenhouse bean plants naturally infected with mildew were sprayed with a 1,5 ml/L of water concentration of Ecolife®. The first spraying was carried out when the plants were 20 days old and had a high degree of infection. The second using the same level of product concentration took place eight days later. Evaluations of the percentage leaf area affected were carried out eight days after each spraying. The first set of results showed a 92,51% reduction and the second 92,59%.

#### 14) The Effect Ecolife® in the control of Black Sigatoka in Banana plants.

EMBRAPA Amazônia Ocidental, Manaus AM

Responsible: Dr. L. Gasparotto  
Dr. J.C.R. Pereira  
Dr. M. C. N. Pereira  
Dr. M. M. Costa

**Conclusão:** Black Sigatoka in bananas , caused by **Mycosphaerella fijiensis**, is the most destructive disease affecting this species. Due to the fact that all commercially cultivated crops are susceptible, with up to possible losses of 100%, crops have been cultivated with regular doses of fungicides. The efficiency of Ecolife® 1 liter/ha, Tebuconazole 125 ml/ha, Tebuconazole 62,5 ml/ha + Ecolife® 1 litre/ha and water + mineral oil, at 14 day intervals and Ecolife® 1 liter/ha and Ecolife® Tebuconazole 62,5 ml/ha + Ecolife® 1 liter/ha, at 21 day intervals and a control without fungicides. The experiment was carried out in Manaus-AM, from December/99 to July/00, on bananas type prata aña. The treatment was applied four times in randomized block design on groups of three plants each spaced three meters from the other. The products were applied using a motorized backpack sprayer. 400 liters of water/ha were used in the treatment with Tebuconazole a 125 ml and 60 liters of water + 20 liters of mineral oil in the subsequent treatments. During the flowering stage the newest leaf to show the symptoms and the number of viable leaves were noted. During the harvest the bunch weight , that of the hands and the fruit were recorded. The results, according to the total analysis of the variables, indicated that, Ecolife® 1 liter/ha, Tebuconazole 125 ml/ha, at 14 day intervals, and a mixture of Ecolife® 1 liter/ha + Tebuconazole 62,5 ml/ha, at 14 and 21 day intervals were efficient in controlling the disease. It is worth mentioning that the systematic application of mineral oil induced symptoms of phytotoxicity.

**Bibliografias**

1. Altman, J. and Campbell, C. L.  
Effect of Herbicides on plant diseases. *Ann. Rev. Phytopathol.* 1977 15:361-85.
2. Arnoldi, A., et al.  
Analogues of phytoalexins. Synthesis of some 3-phenyl coumarins and their fungicidal activity. *Journal of Agricultural Food Chemistry.* 34: 181-185, 1986.
3. Ayers, A. R. et al.  
Plant Detection of Pathogens. Harvard University. Cambridge, Massachusetts 02138, 1988.
4. Beggs, C.J., Kuhn, K., Böcker, R., and Wellmann, E.  
Phytochrome-induced flavonoid biosynthesis in mustard (*Sinapis alba* L.) cotyledons: enzymic control and differential regulation of anthocyanin and quercetin formation. *Plant* 172, 121-126, 1987.
5. Chinoy, J.J.  
The role of ascorbic acid in growth, differentiation, and metabolism of plants. Martinus Nijhoff / Dr. W. Junk Publishers, Boston, 1984. 322 p.
6. Dakora, F. D.  
Plant Flavonoids: Biological molecules for useful Exploitation. *Aust. J. Plant. Physiol.*, 1995, 22: 87-99.
7. Dakora, F. D. and Phillips, D. A.  
Diverse functions of Isoflavonoids in legumes transcend anti-microbial definition of phytodexin. *Physiological and Molecular Plant Pathology*, 1996, 49: 1-20.
8. Dixon, R. A. and Paiva, N. L.  
Stress Introduces Phenylpropanoid metabolism. *The plant Cell*, vol 7, 1085-1097, 1995.
9. Hahlbrock, K.  
Flavonoids. In *Biochemistry of Plants*, vol 7. P. K. Stumpf and E. E. Conn, eds (New York: Academic Press), pp. 425-456. 1981.
10. Hahlbrock, K. and Scheel, D.  
Physiology and molecular biology of phenylpropanoids metabolism. *Annu. Rev. Plant Physiol. Plant. Mol. Biol.* 1989, 40:347-69
11. Harbone, J.B. (1988).  
The Flavonoids: recent advances. In "Plant Pigments". (Ed. T.W. Goodwin) pp. 299-343. Academic Press: San Diego.
12. Kuc, J.  
Phytoalexins, Stress Metabolism, and Disease Resistance in plants. *Annu. Rev. Phytopathol.* 33:275-297. 1995.
13. Kuc, J.; Rush, J.S.  
Phytoalexins. *Archives of Biochemistry and Biophysics.* Vol 236, Nº2, pp. 455-472, 1985.
14. Lydon, J and Duke, S.O.  
Pesticide Effects on Secondary metabolism of higher Plants. *Pesticide science.* 1989, 25, 361-373.
15. Osbourn, E. A.  
Preformed Antimicrobial compounds and Plant Defenses Against Attack. *The plant Cell*, Vol 8, 1821-1831 – 1996.
16. Peters, N. K. and Verna, P. S.  
Phenolic Compounds as Regulators of Gene Expression in Plant-microbe Interactions. *Molecular Plant – Microbe Interaction.* Vol 3, Nº1, pp. 4-8, 1990.
17. Phillips, D.A.  
Flavonoids: plant signals to microbes. In: Stafford, H.A. and Ibrahim, R.K., eds. *Metabolism in Plants.* New York, Plenum Press, 1992. P.201-231.
18. Pietta, P. G.  
Flavonoids as Antioxidants. *J. Nat. Prod.* 63, 1035-1042. 2000.
19. Smith, C. J.  
Tansley Review nº 86. Accumulation of phytodexins: defense mechanism and Stimulus response system. *New Phytol.* (1996) 132, 1 45.
20. The Merck Index – 12º Edição. Bioflavonoids. Nº 1269. Pág. 206.
21. Van Etten H.D.  
Antifungal activity of pterocarpans and others selected isoflavonoids. *Phytochemistry* 15:655-656, 1976.

22. Van Etten, H. D. et al.  
Two Classes of plant antibiotics: Phytoalexins versus "Phytoanticipins". *Plant Cell* 6, 1191-1192, 1994.
23. Wollenwerber, E., and Diets, V.H.  
Occurrence and distribution of free flavonoid aglycones in plants. *Phytochemistry* 20,869-932, 1981.

**Consult the Quinabra Technical  
Department to Obtain Further  
References and Updates About Ecolife®.**