FUNGICIDE + BACTERICIDE CONCENTRATE
Thyme oil-based nano emulsion technology
For farmers who want to control detrimental fungal and bacterial plant pathogens, Thymox Control® is a botanical oil-based, broad-spectrum, contact fungicide-bactericide that contains thyme oil as the active ingredient. Thymox Control® efficacy is powered by an innovative nano emulsion technology that delivers billions of nano-size droplets of thyme oil for superior contact and higher killing effect. Unlike current underperforming conventional options, Thymox Control® is an effective, safe, and environmentally friendly way to protect commercial crops from pathogens – even the ones that are becoming resistant to fungicides or bactericides. Thymox Control® can be used in rotation in plant disease management plans to help control common fungal and bacterial diseases on fruit and vegetable crops, ornamentals, and for both indoor and outdoor growing sites.

NOVEL TECHNOLOGY BUILT ON 10 YEARS OF SCIENCE AND RESEARCH

At Kemin Crop Technologies, we only partner with experts to provide farmers and growers with innovative and robust solutions, so they can protect their crops and grow better and healthier plants.

Laboratoire M2, based in Sherbrooke, Canada, is the provider of breakthrough proprietary disinfecting technologies that help reduce exposure to toxic chemicals and resistance-causing antibiotics. The company offers a range of leading biodegradable, disinfecting and antimicrobial products in three different markets: Animal Health, Surface Disinfection, and Crop Protection.

Thyme essential oil is composed of antimicrobial active molecules, especially the naturally occurring phenolic compound, thymol, known to kill plant pathogens such as bacteria and fungi via cell membrane disruption. For more than a decade, Laboratoire M2 experts and researchers have meticulously screened the highest quality ingredients to develop a core proprietary nano emulsion technology to harness the power of the antimicrobial activity of thyme oil.

Kemin Crop Technologies has added the effective and innovative fungicide and bactericide solution Thymox Control® to the Crop Protection portfolio, along with the TetraCURB miticide-insecticide products.

EMULSION & NANO EMULSION 101

An emulsion is a biphasic, colloidal dispersion of two non-miscible liquids, an oily system dispersed in an aqueous one, formed by using mechanical shear and surfactants. Surfactants make the two phases miscible by creating an interfacial film of micelles (1 to 20 nm) that lowers the interfacial tension between the two phases. At the difference of an emulsion, a nano emulsion has nanoscale micelles (1 and 100 nm), is monophasic, low viscosity, and optically transparent.

THE THYMOX BREAKTHROUGH NANO EMULSION TECHNOLOGY

Thymox Control is designed with a unique surfactant that allows the spontaneous formation of billions of nanometric size droplets of thyme oil, when the liquid concentrate is thoroughly diluted in the water tank mix.
FEATURES AND BENEFITS

Fungicide and bactericide for the control of fungal and bacterial plant pathogens.

- Instantly mixes in water
- No agitation required after mixing
- Highly stable formula
- Broad-spectrum efficacy
- Powerful botanical biopesticide
- Worker safety (0 PHI, 0 REI)
- Safe for consumers
- 100% biodegradable

FORMULATION

Nano emulsion liquid concentrate

ACTIVE INGREDIENTS
Thyme oil...........................27%
Listed on the FIFRA 25(b) minimal risk pesticide

OTHER INGREDIENTS
Glycerin, Potassium sorbate, Butyl lactate, Water, Isopropyl alcohol, Soapbark and Citric acid .... 73%

The formulation contains ingredients derived from botanical origins that make a spontaneous dilution possible in water and create a stable mix.

KEY TARGET PATHOGENS CONTROLLED
Thymox Control® is formulated to protect crops during all stages of growth.

Thymox Control® is nonselective and combats a broad range of plant fungal and bacterial pathogens, such as:
  - Fungal diseases: Grey mold (*Botrytis cinerea*) and Powdery mildew
  - Bacterial diseases: Fireblight (*Erwinia amylovora*)

SITE FOR USE
For indoor and outdoor commercial use on a wide range of high value specialty crops, including but not limited to ornamentals, fruit and vegetable, orchard, tree-fruit, hemp, hops.

RESIDUE
Thymox Control® is exempt from food tolerance requirements (no MRLs, Maximum Residue Limits).
Advantage of a Nano-Size Active Ingredient

Billions of nanomicelles of Thymox Control® amplify the contact with the pathogen leading to a powerful killing effect!

Mode of Action – Cell Membrane Disruption

- Thyme essential oil contains the phenolic compound thymol that has the ability to kill pathogens such as bacteria and fungi via cell membrane disruption.
- Due to its hydrophobic nature, the thymol molecule interacts with the outer cytoplasmic membrane of the pathogen and affects the integrity and function of the microorganisms’ cell membrane.

Thymol inserts into the outer cell membrane, inducing instability in the microorganisms’ membrane, causing cell content leakage.

The outer cell membrane is destabilized, disrupted, and disintegrated causing pathogen death.

Thymox Control® micelle

Thyme oil micelle - Size range: 10-50 nm.

Superior coverage - Billions of thyme oil nanomicelles available to cover the pathogens.

Thymol

- Listed as a food additive in many countries
- GRAS molecule (Generally Recognized As Safe)
- Target Site: F7
- FRAC Code: 46
- MoA: Cell membrane disruption
- No known resistance
DIRECTIONS FOR USE

APPLICATION RATE - ONE RATE!
- 0.5%. Dilution = 64 fl. oz./100 gallons of water

APPLICATION TIMING
- Repeat application every 5-7 days, or as necessary to maintain the desired level of control
- Apply at any time during the growing season, when conditions (humidity, temperature, etc.) promote microbial growth or when fungal disease symptoms first appear
- For preventative control, apply before symptom development and pathogen reproduction.

MIXING INSTRUCTIONS
Thymox Control® is a liquid concentrate and must be diluted with water prior to use. Use the dilution immediately. Do not store the diluted solution.

Dilute 64 fl. oz. per 100 gallons of water.
- Spontaneous one-phase dilution
- Completely soluble in water
- Homogenous and stable solution
- No continuous tank-mix agitation is needed after mixing

APPLICATION DIRECTIONS AND EQUIPMENT
- Do not apply this product as a concentrate
- Applied as a foliar spray
- Spray application for controlling diseases that affect above-ground plant parts
- Use standard spray equipment such as airblast or boom spray
- For best control, ensure a uniform spray and complete coverage of the plant surfaces until runoff

PERSONAL PROTECTIVE EQUIPMENT (PPE)
When mixing, applying, or handling product, wear required appropriate PPE, including but not limited to safety glasses with side shields, long-sleeved shirt, pants, protective footwear, impervious gloves.

TANK-MIX
Thymox Control® can be tank-mixed with other fungicides or bactericides. If combining Thymox Control® along with other products in the tank, always read and follow the respective label directions. Perform a jar test and spray on a small scale before full-scale spray application.
EXCELLENT DISEASE CONTROL AND CROP PROTECTION

*in vitro* lab studies, McGill University, Montreal, Canada

**PATHOGENS TESTED** | **PATHOGEN TYPES** | **HOSTS AFFECTED BY THE PATHOGENS**
---|---|---
*Aspergillus ochraceus* | Fungi | Industrial Hemp
*Botrytis cinerea* (grey mold) | Fungi | Strawberries, wine grapes
*Fusarium equiseti* (Fusarium wilt) | Fungi | Wheat, barley, bananas
*Xanthomonas campestris* (black rot) | Bacteria | Crucifers (broccoli, cabbage)

**THYMox CONTROL KILLS FUNGAL AND BACTERIAL PLANT PATHOGENS**

**Powdery mildew 30-day controlled greenhouse trial on industrial hemp (Cannabis sativa)**

Great Bend, KS. Sept. 2019.

Foliar applications of Thymox Control were made every 5 or every 14 days, with potassium bicarbonate as a benchmark. Powdery mildew symptoms were observed on plants, and severity and incidence symptoms were measured on a numeric scale (0-10, 0 being no symptoms).

**Fireblight *in vitro* trial (Erwinia amylovora)**

St-Bruno-de-Montarville, Quebec, Canada. Mar. 2019.

Apple blossoms were inoculated with a streptomycin-resistant strain of Erwinia amylovora, isolated from an Oregon orchard. Treatment of Thymox Control and streptomycin were made on the flower. 7 days after treatment. The severity of symptoms was recorded and reported on a % basis (0% being no symptoms).

**CONTROL OF POWDERY MILDEW**

SYMPTOMS ON HEMP WHETHER YOU SPRAY EVERY 2 WEEKS OR EVERY 5 DAYS

**HIGHER CONTROL** ON STREPTOMYCIN-RESISTANT STRAINS VS THE STANDARD ANTIBIOTIC STREPTOMYCIN
CROP SAFETY (PHYTOTOXICITY)

We have not observed any phytotoxicity with Thymox Control® at the recommended rate. However, testing on all plants and crop varieties is not feasible. To ensure that Thymox Control® is compatible with the array of cultivars under your specific conditions, we recommend testing the product on a small scale and observe for phytotoxicity before making large-scale applications. Do not apply to stressed plants or crops; or when the temperature is 90º F or above.

PACKAGING SIZES
1 Gallon bottle | 2.5 Gallon bottle (F-Style Jug).

EXCELLENT TOOL FOR RESISTANCE MANAGEMENT

No resistance has been observed on microorganisms after the use of Thymox Control®. Growers can use Thymox Control in an integrated pest management program.
PREMIUM TECHNICAL SERVICE

Beyond serving as a responsible ingredient manufacturer, Kemin has a team of technical service managers and research development experts who are incredibly knowledgeable and assist as needed for support on trials, direction for use, and the most efficient application rates in an integrated pest management program. Our team of technical experts quickly guides growers with best practices and insights to ensure they are receiving the maximum value from our products, and ultimately, a successful profitable operation.

CROPTECH@KEMIN.COM

Laboratoire M2

Laboratoire M2, based in Sherbrooke, Canada, is a provider of breakthrough disinfecting technologies that help reduce exposure to toxic chemicals and resistance-causing antibiotics. The company currently markets a range of leading biodegradable, disinfecting and anti-microbial products under the trademark THYMOX™ based on their proprietary technology platform under three business units: Animal Health, Surface Disinfection and Crop Protection.

Image sources: Kemin; Shutterstock image: shutterstock_1441423991, shutterstock_132897480, shutterstock_1518611150, shutterstock_397347199 shutterstock_657308752, shutterstock_116521153.

For non-emergency Kemin product inquiries, please call Customer Service at 1-800-752-2864 between the hours of 7 a.m. - 4:30 p.m. Central Standard Time. Monday - Friday.

© Kemin Industries, Inc. and its group of companies 2020 all rights reserved. ® ™Trademarks of Kemin Industries, Inc., USA

Copyright 2020 © Thymox | Biodegradable Disinfecting Technologies Manufacturer.