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PLANTING
SOLUTIONS

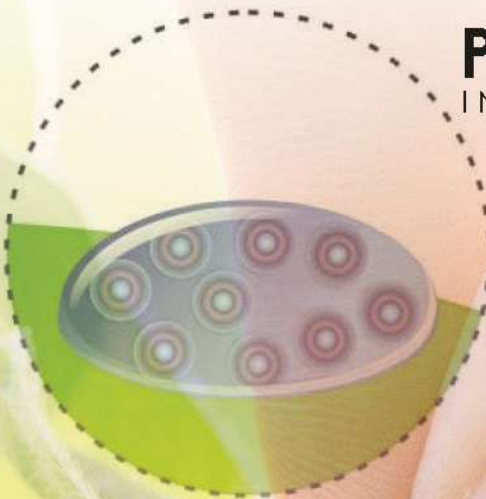
CHANGE THAT DOESN'T COST THE EARTH

I-CAT International Consulting & Trading (PTY) Ltd Reg. No. 2012/058514/07 VAT. No. 4960229799

CYFLO®
Crop Science In Motion

Act 36 REG. NR – L10511

PRODUCT INFORMATION SHEET



Cyflo[®] is a carrier molecule and has, as main active ingredient, a liposome fatty acid. The molecule itself takes on the structure of a mono-layered, linear, phospholipid. The molecule converts to a monolayer ring structure or liposome once in contact with other chemicals, lipophilic mineral and organic

compounds – transferring them in different matrices and across most cell membranes. The molecule binds to gluco-protein receptors on the plant cell membranes, enabling it to mimic the enzymatic system and cellular membrane transport system of the plant. The uptake is rapid and distribution rate within the plant is unequalled.



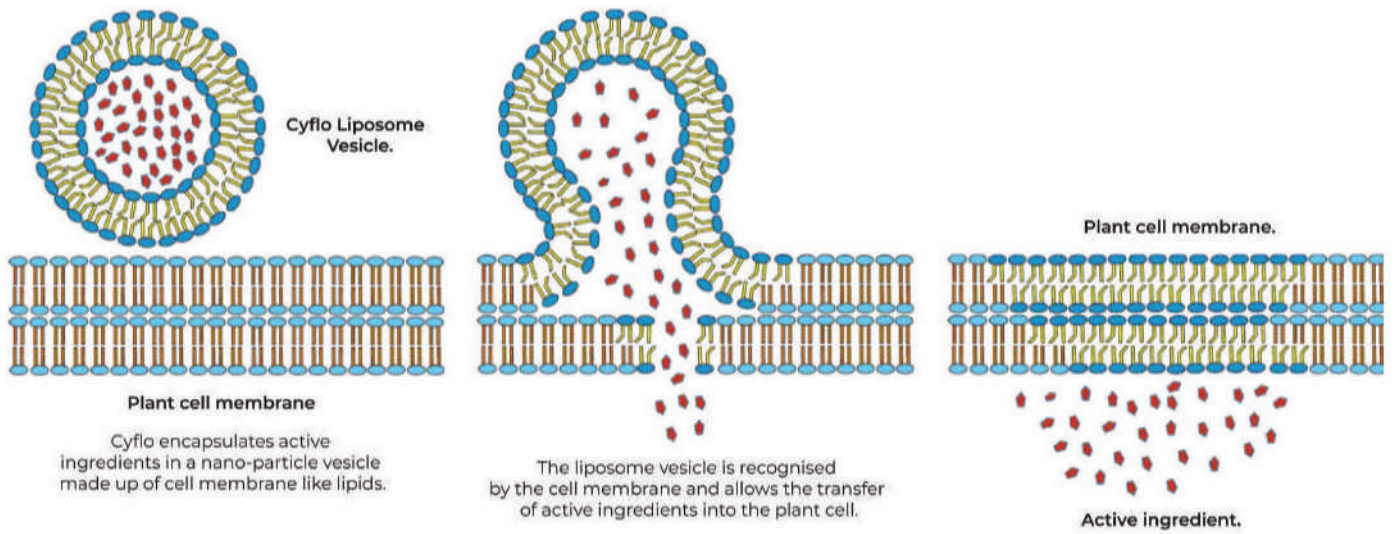


Figure 1: Interaction of Cyflo[®] liposome vesicles with a plant cell membrane.

Cyflo[®] mode of action:

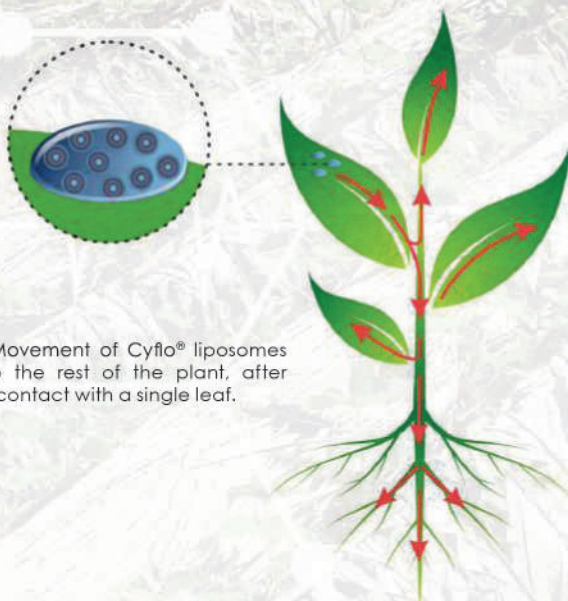


Figure 2: Movement of Cyflo[®] liposomes through to the rest of the plant, after coming in contact with a single leaf.

Additional to above Cyflo[®] "mode of action" pictorial explanation, a more detail discussion on the movement of Cyflo[®] liposomes are provided in the below confocal micrograph images (Photos courtesy AS.)

Liposomes, 100-nm in diameter, loaded with green fluorescein, were applied to a single apical leaflet of cherry-tomato plants (*Solanum Lycopersicum* var. *cerasiforme*). Primary, secondary and tertiary roots were washed, segmented and imaged using confocal microscopy. Time-dependent accumulation of the liposomes was observed in the roots already 24 hours post foliar application, peaking at 72 hours (Figure 2(A)). Intracellularly, the liposomes were found to be closely associated with the nuclei (Figure 2(B)), where they gradually formed aggregates. 96-hours post application the entire cell body was stained fluorescently (Figure 2(A); 96 hrs.), suggesting release of the dye from the liposomes. Intracellular cargo release can be mediated by the disruption of the nanoparticle by lipases, or due to dye leakage caused by osmotic destabilization.

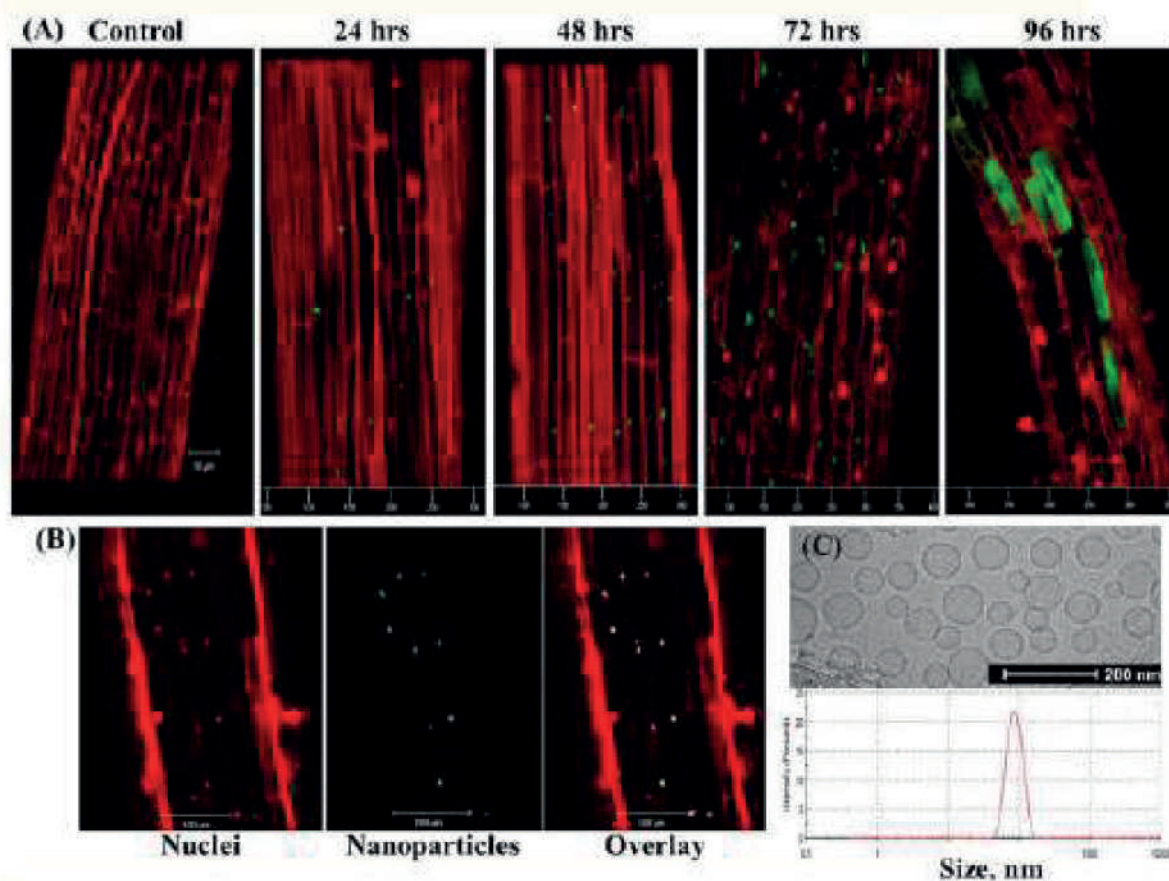


Figure 3: Nanoparticles applied to the leaves translocate to the plant roots. (A) Liposomes containing a fluorescent tracer (fluorescein, green) were applied foliarly to cherry tomato plants. Secondary and tertiary roots were imaged over a period of 96 hours, using confocal microscopy (the plant plasma membrane is stained red). During the first 72 hours post application, particles gradually accumulated in individual root cells. 96 hours post foliar application the liposomes disintegrate and release their cargo into cytoplasm.

Lower panel – confocal images of a tertiary root 72 hours post foliar application. (B) Left - propodeum iodide (PI) stained root nuclei (red) and the corresponding fluorescent nanoparticle distribution (green, (B) Middle), as well as the overlay of both imaging channels ((B) Right), indicating the nuclei colocalization of the particles. (C) Particle size was measured using dynamic light scattering and cryoTEM, having a mean particle size of 88.37 ± 21.13 nm (PDI = 0.037). **Photos courtesy AS.*

Functions of Cyflo®:

- Primary – To effect cellular permeability of agro-pharmaceuticals.
- Secondary – To attain a homogeneous distribution of such chemical within the target plant within the shortest possible time without compromising the cuticle.

Due to the unique function of Cyflo[®] – complimenting plant behavior in a variety of ways – the following questions are recurrently asked:

1. Why was it decided to develop a product like Cyflo[®]?

Agro-pharmaceuticals are more often than not applied with a "wetter/sticker/spreader" for many obvious reasons – being rain resistant, allows good leaf coverage and soak up ingredients more readily, improves nutrient uptake, etc.

In most cases the waxy layer on the leaf surface – which acts as a protective barrier – is compromised (damaged) to facilitate contact between the chemical and the epidermis. Unless the application is an herbicide, this destruction potentially exposes the plant to secondary compromises such as water loss, fungal/bacterial diseases and insect damage.

The development of Cyflo[®] was to get Agro-pharmaceuticals to the epidermis and beyond, to improve the permeability of the cellular structures to effectively deliver the chemical without exposing the crop to negative secondary effects. Because of improved cellular permeability, the distribution of Cyflo[®] within the plant structure is not dependent on the chemical reaching the vascular bundles. Distribution is also not dependent of the target plant growing "actively" as is often required for efficacy. Crops to which chemicals are applied along with Cyflo[®] has the minimum requirement of having "sap", it does not need to be growing actively. This allows for the application of chemicals to be applied year-round without compromising efficacy.



2. What can be carried by Cyflo[®]?

Cyflo[®] – due to its molecular construction – has the capacity to bind with both hydrophobic as well as hydrophilic chemicals. These chemicals include all known agricultural chemicals, herbicide, insecticide, fungicide, foliar feeds and fertilizers. The uptake is rapid and distribution rate within the plant is unequaled. It must be emphasized that NO stickers, spreaders or surfactants may be added to Cyflo[®]. Due to its construction, all these have the capacity to render the molecule ineffective.



3. What is the mechanism of distribution within the plant?

Once Cyflo[®] and the active ingredient is in the plant, the distribution commences by the movement of the complete "solution" (not only the solvent or only the solute) from areas of high concentration to areas of low concentration.

This means that the plant need not be active in any of its systemic/distribution functions to effect Cyflo[®] distribution. The plant only needs to have plant

sap. The distribution continues until homogeneity throughout the plant has been established. The Cyflo[®] itself breaks down as the distribution continues. The result of this breakdown allows the molecular constituents of Cyflo[®] to compliment the production and synthesis of a variety of hormones conducive to plant growth and health. For example, when Cyflo[®] is added to a target specific herbicide, the assimilation of the active ingredient by the plant is improved, leading to enhanced effect.

4. How does Cyflo[®] compliment plant behavior – Benefits of using Cyflo[®]?

Cyflo[®] is made from natural (organic) ingredients and has an extremely low environmental footprint, if any. The uptake and distribution of the "active ingredient" into individual cells throughout the target plant is rapid, completing delivery into the cytoplasm within 2 to 3 days. The homogeneous distribution and delivery of the "active ingredient" results in early visual observation of effect with a sooner and higher than expected result.

Farmers are dependent on return on investment. Investments are high, especially when purchasing chemicals and so too is the expectation of best results. The use of Cyflo[®] in its prescribed manner along with agro-pharmaceuticals significantly improves the efficacy thereof, often preventing the necessity of secondary or follow up applications. This translates into personnel savings, as these may be applied to other responsibilities. Cost savings is achieved on reduced follow up sprays, accompanied by savings on maintenance of mechanical infrastructure (tractors, applicators, etc.) and a critical cost, diesel.

More detailed Cyflo[®] benefits:

Penetration (Membrane transfer agent): The liposome fatty acid which is part of the molecular structure assists at rapid uptake and distribution through the cell wall.

Translocation: Cyflo[®] does not require "sap flow" in Xylem or Phloem for distribution since distribution follows faster pathways.

Equalizer: Plant cells internalise Cyflo[®] through faster endocytic (endocytosis) and signaling pathways allowing even distribution throughout plant. Efficacy of systemic chemicals is also enhanced this way.

Stimulant: Due to Cyflo[®] being organic, the dissociation of the mother molecule stimulates or assists at stimulating plant hormone production critical at the prevailing physiological plant stage.

Stress relieve: Cyflo[®] induces natural stress relief by stimulating the plant to produce more Tocopherols and Tocotrienols during heat, moisture and light stress. These substances are directly linked to the plants' stress management and defence systems.

Repair capacity: Cyflo[®] liposomes will induce cellular repair due to the fact that it contains those components used by the plant during the repair of non-mechanical damaged cells. These components may also assist at triggering the messenger system in the plant which activates immune responses against infection.

Increased flowering: Plants having received a single or more Cyflo[®] application, whether singularly or in combination with other chemicals have responded with an increase in blossoming. This resulted in an adjustment to the fertilization program to assist the plant at maturing its increased yield.

Advanced ripening: With reference to all the preceding points, fruit trees that received Cyflo[®] responded with earlier ripening.

Fruit quality: Shelf life of fruit, from all treated fruit trees, were enhanced.

Left: Cyflo[®] treated (biggest & smallest red turnip)

Right: Untreated (biggest & smallest red turnip)



Strawberries treated with Cyflo[®]:

1. More fruit 2. Less leaves



Untreated Strawberries:

1. Less fruit 2. More leaves



**SEED GERMINATION AND ROOT DEVELOPMENT
TRIAL USING CYFLO[®]**



BEANS TREATED:
14-03-2007

PHOTO TAKEN:
21-03-2007

TREATMENT CONCENTRATION:
0.1 % CYFLO[®]

BEAN TREATED:
14-03-2007

PHOTO TAKEN:
21-03-2007

TREATMENT CONCENTRATION:
WATER



5. What are the risks associated with Cyflo® applications?

Cyflo® is unsuitable for human or animal ingestion. Due to its transdermal absorption capacity, particular care must be taken when mixing and applying "organophosphate" based chemicals. Cyflo® also possesses the capacity to convert chemicals from being contact fungicides to foliar absorbed systemic fungicides. This may also result in the fungicide becoming, partially, a foliar feed.

A. How risks can be managed:

1. Establish the primary objective of the application.
2. Do not attempt to strike two or more objectives with one application.
3. Prepare the mixture according to the objective.
4. When in doubt, ask.
5. Inform users of the risks.
6. Supervise, if necessary, mixing and application practices.
7. Remain within the recommended application rates of the chemicals to be applied with Cyflo® – please see product label.
8. Phytotoxicity to non-target plants remains a risk when full dosages of herbicide are applied along with Cyflo®.

B. With holding periods:

It is unlikely that Cyflo® will increase or significantly affect registered withholding periods of chemical substances.

Cyflo® – Mixing procedure:

1. The applicator must be free of residual chemicals from previous sprays.
2. Fill the tank with water to approximately 50% capacity.
3. Use water of the highest quality.
4. The ideal pH at which to add Cyflo® into the mix tank is 6.5 – lower or higher pH's can be tolerated, but not for extended time periods; any mix outside the pH 6.5 rule should be applied soonest.
5. Add the chemical to be applied to the water and agitate well to get a uniform emulsion or solution
6. Check the pH and adjust if necessary.
7. Slowly add the Cyflo®.
8. Agitate the mix for a minimum of 5 – 10 minutes prior to application to facilitate thorough encapsulation of the remedy.
9. Prepare only sufficient mixture for the day's application. If a mixture should stand over to the next day, the risk exists that Cyflo® may bind with water impurities and be rendered less or completely ineffective. A precipitate may also form.



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GROUP IV



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CAUTION:

Although this product has been tested under a variety of conditions, the registration holder does not warrant that the product will be efficacious under all conditions as the action and effect of the product may be affected by factors such as abnormal climatic and storage conditions; quality of dilution water, compatibility with other substances not indicated on the product label and the occurrences of resistance of pests against the pesticide used; as well as the method, time and accuracy of application. The registration holder furthermore does not accept responsibility for any damage to crops, vegetation, the environment or harm to man or animal or for the lack of performance of the adjuvant concerned due to failure of the user to follow the label instructions or the occurrence of conditions that could not have been foreseen in the terms of the registration.