

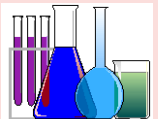
# **The use of oil based adjuvants to improve pesticide uptake**

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**What are adjuvants**

**How do they work**

**Oil based adjuvants for foliar penetration**



80 YEARS



# What are spray adjuvants?

*“A material added to a tank mix to aid or modify the action of an agrichemical, or the physical characteristics of the mixture.”*

ASTM International Standard Terminology

## What do adjuvants do?

- help protect against degradation or losses
- help deliver a pesticide to its target
- help penetrate into the target



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# What are spray adjuvants?

## Chemical Types

### Surfactants

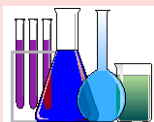
- Increase droplet adhesion onto target
- Spread spray droplets to effectively cover the target

### Oils

- Aid penetration through waxy cuticle
- Slow evaporation of spray droplets and deposits

### Others

- Buffers to control pH
- Water conditioners to complex with water hardness ions

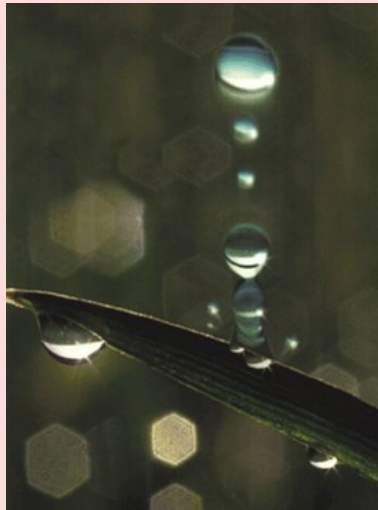


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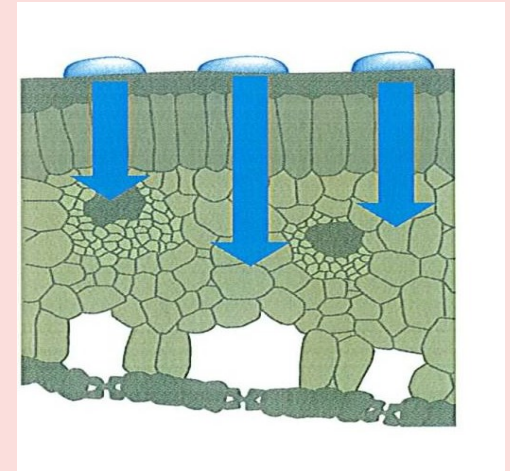


# How do adjuvants work

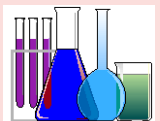
Adhesion



Penetration



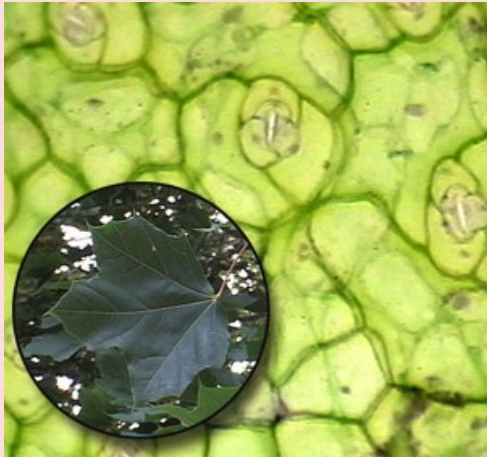
Spreading



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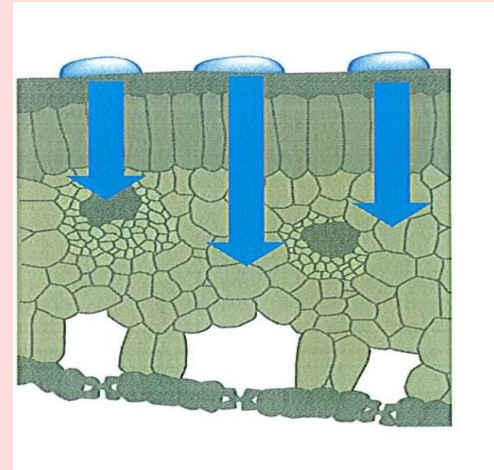
# How do adjuvants work - penetration

Aqueous pathway - Penetration of aqueous substances via aqueous pores

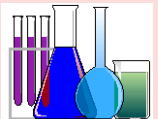


Assisted by surfactant adjuvants

Lipophilic pathway – lipophilic diffusion through the cuticle



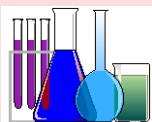
Assisted by oil-based adjuvants



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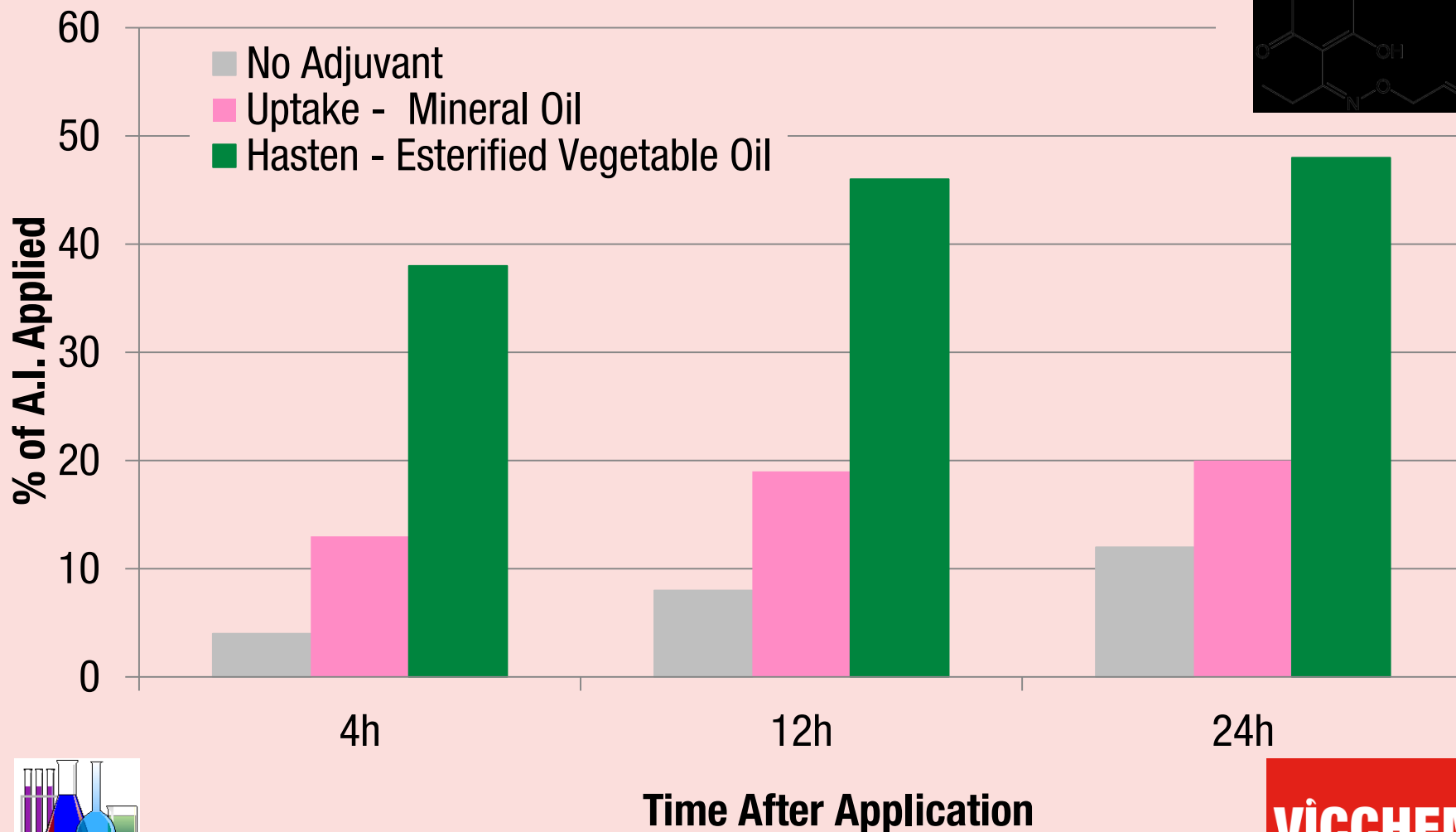
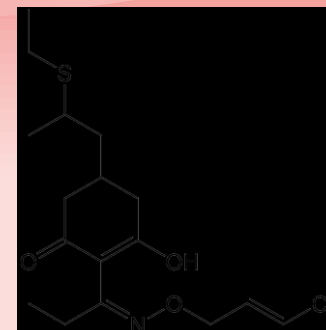
# Oil types as Adjuvants

Oil Type	Synonyms	Adjuvant Products	Properties		
			Penetration	Crop Safety	Droplet Size
Mineral Oils	Petroleum Oil Paraffin Oil White oil	Bonza* Uptake*	Fair	Good	No effect
Vegetable Oils	Canola Oil Seed oil Natural Oils	Synetrol*	Poor	Good	Increases
Esterified Oils	Methyl Oleate Methylated or Ethylated Seed Oil MSO / ESO Fatty Esters Vegetable esters	Hasten	Good	Generally OK	Increases



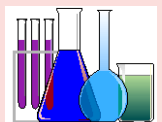
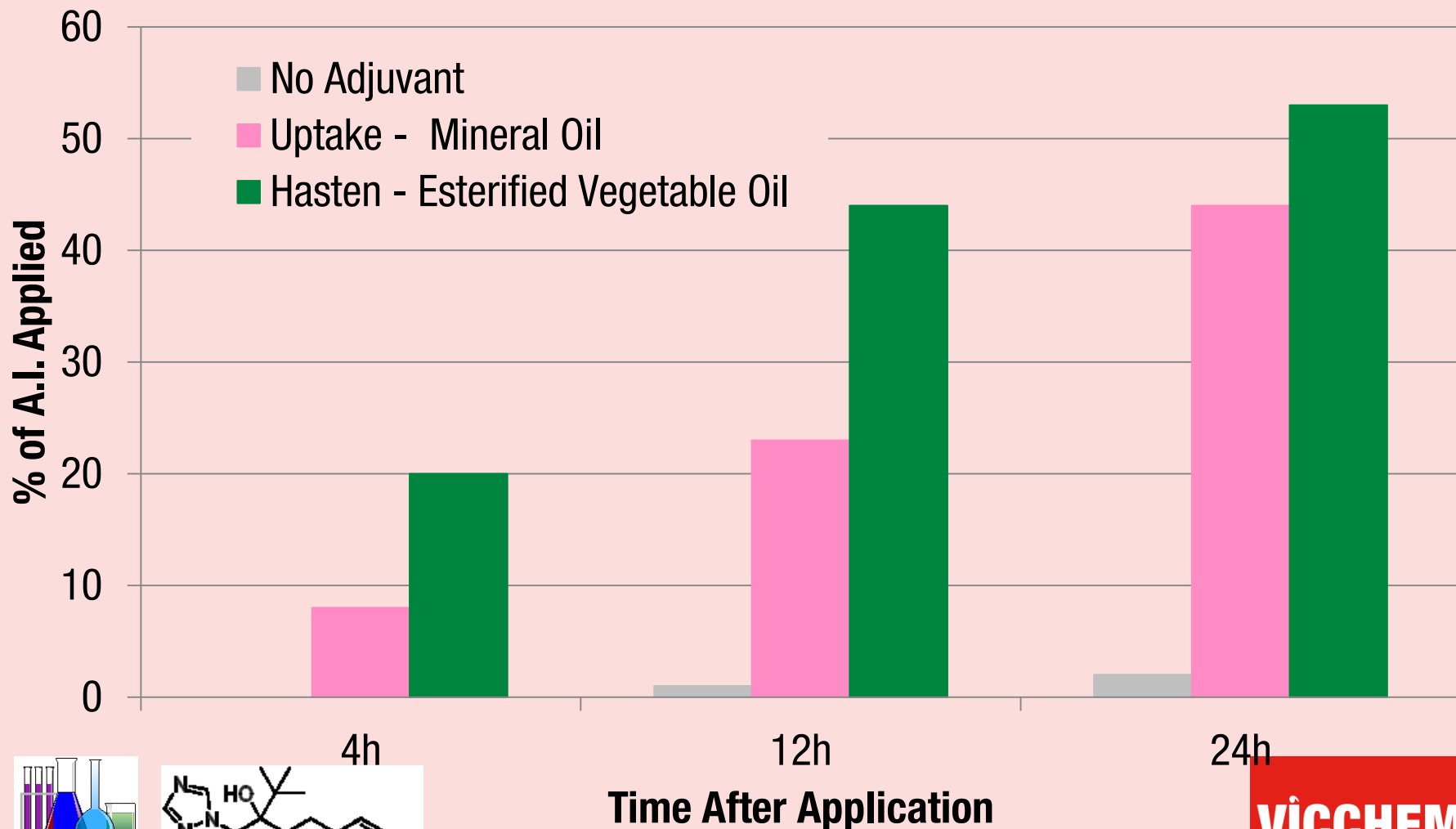
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# Clethodim Penetration

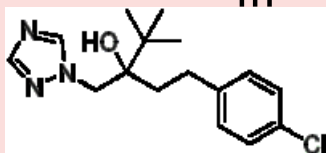


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# Tebuconazole Penetration

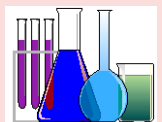
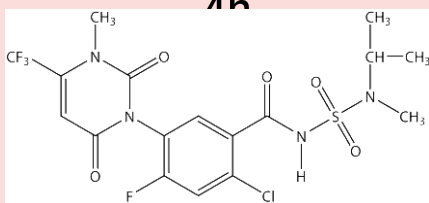
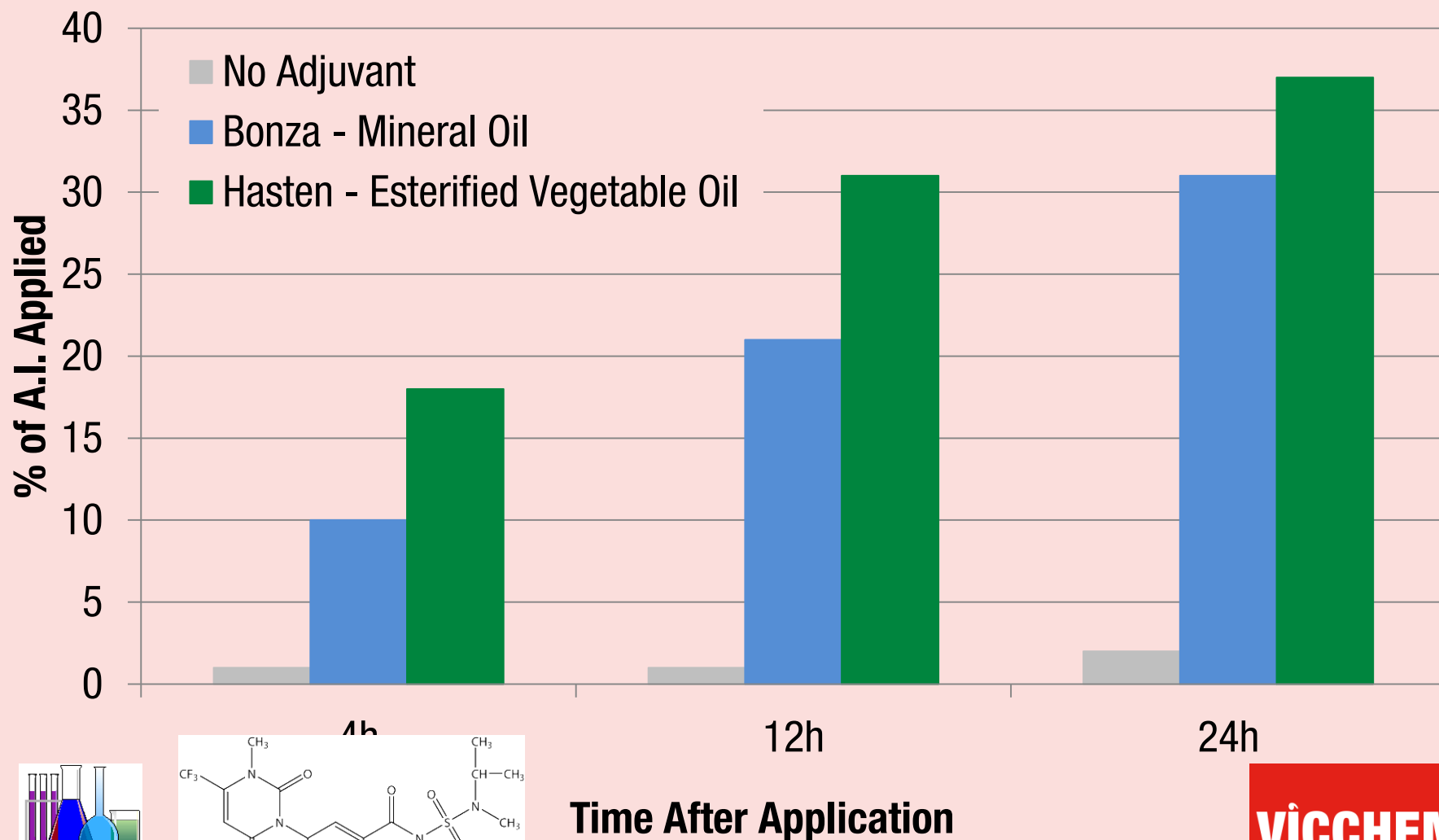


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# Saflufenacil Penetration

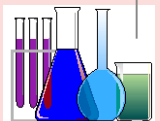
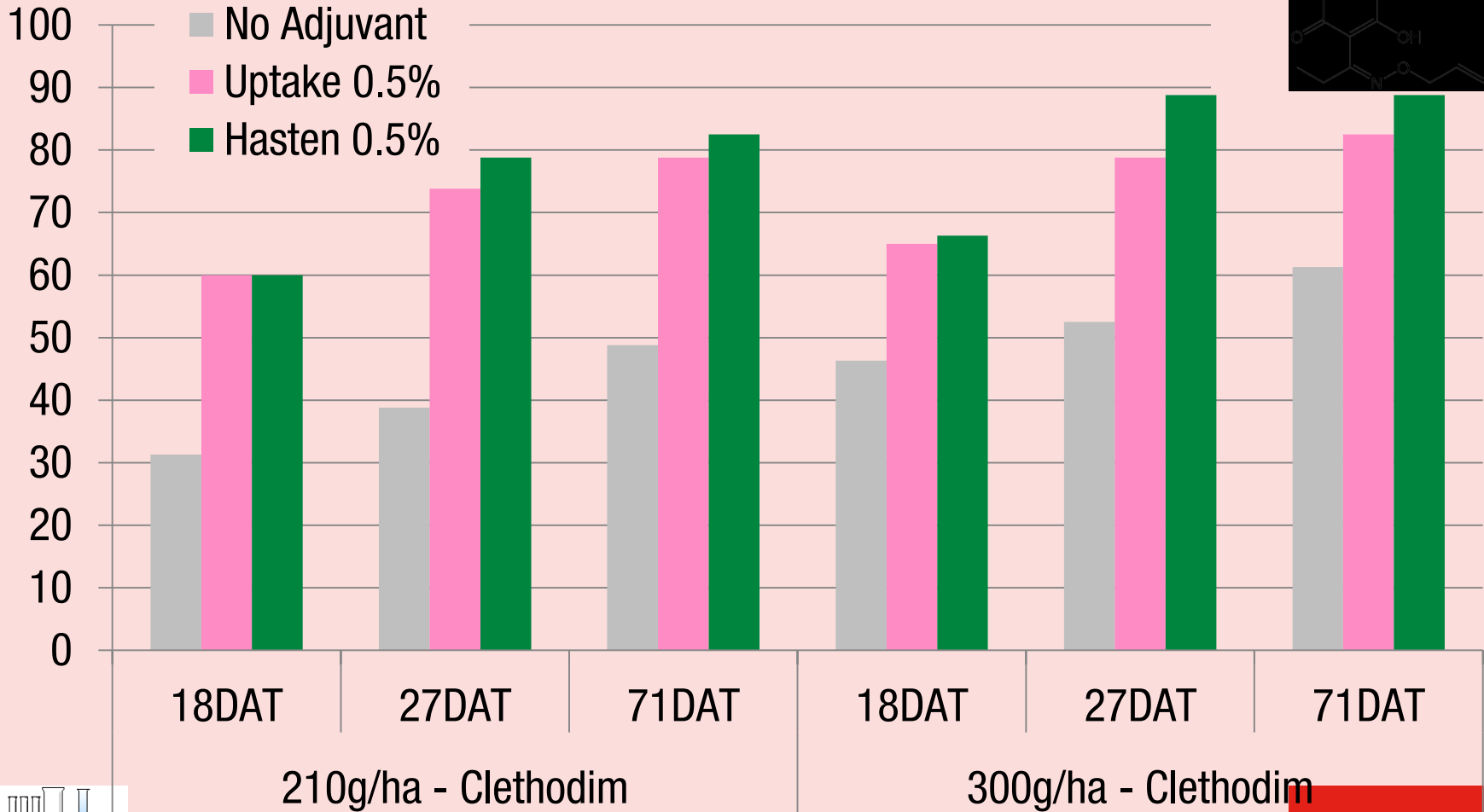
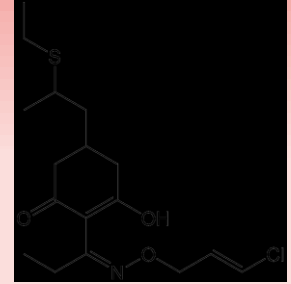


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Time After Application



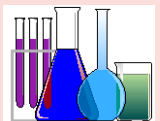
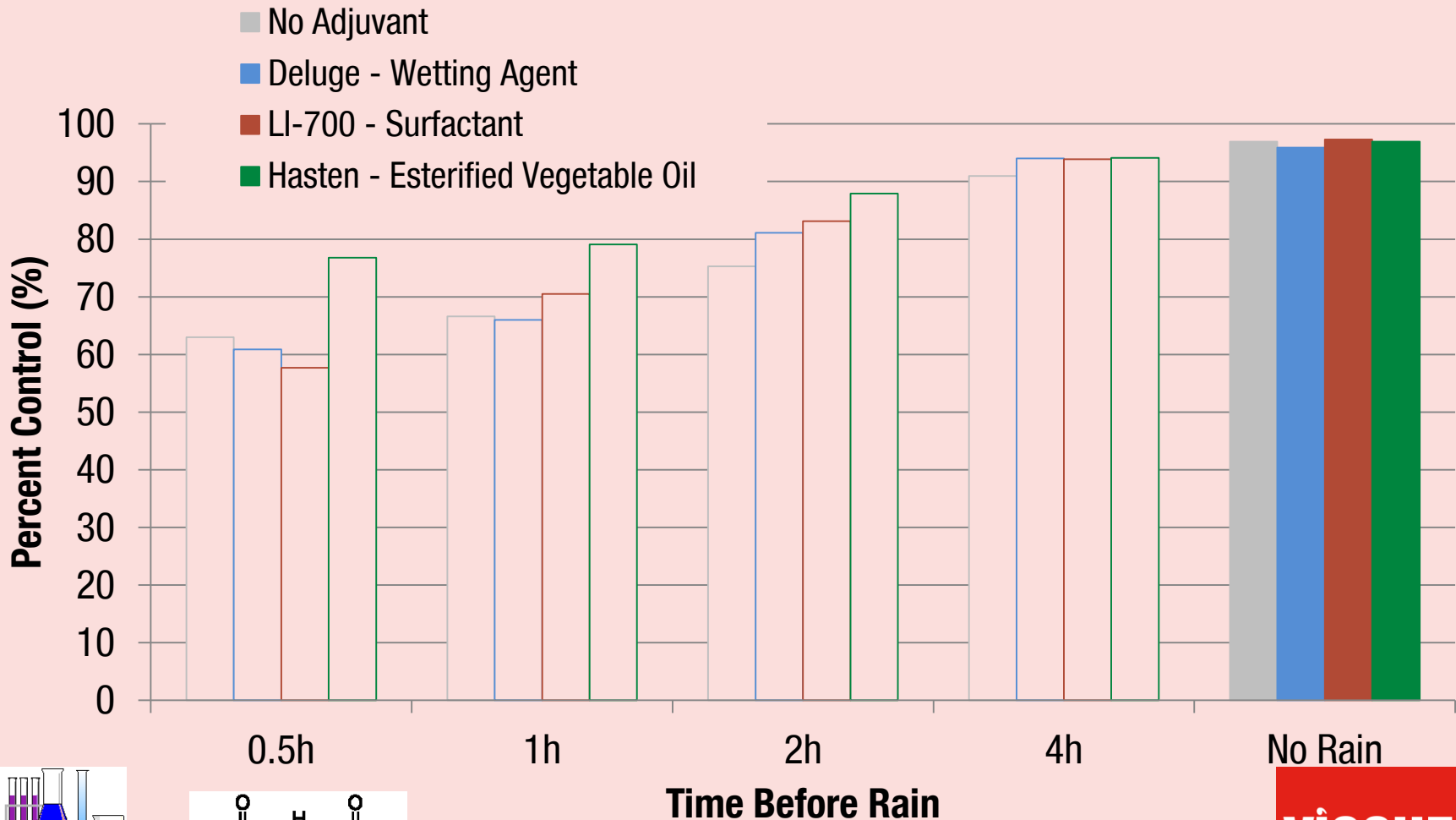
# Clethodim field trial



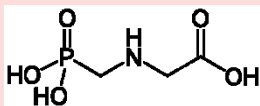
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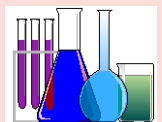
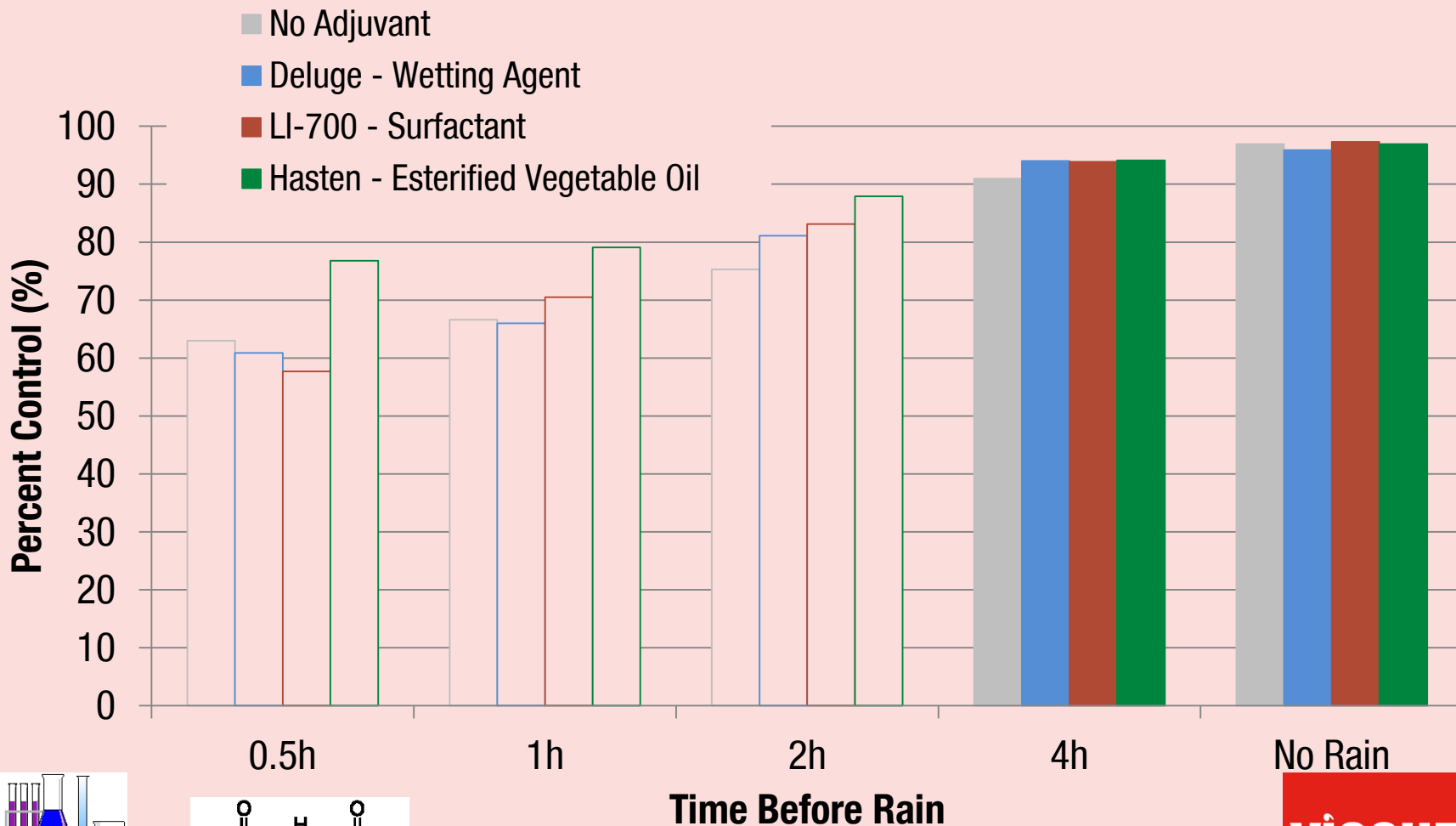
# Glyphosate Rainfastness



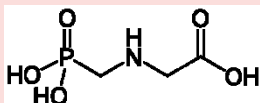
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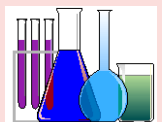
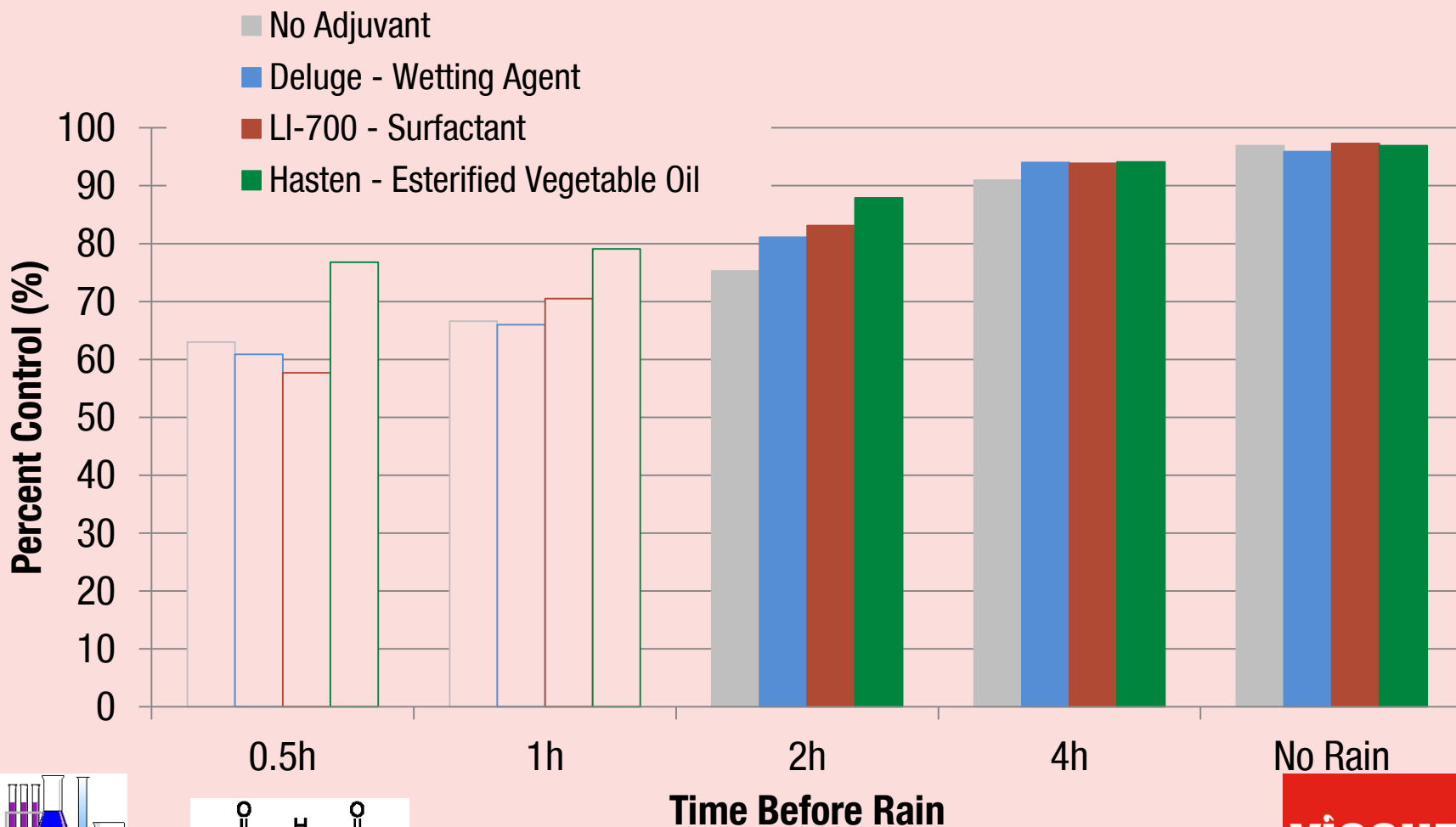
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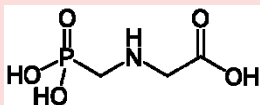
80 YEARS



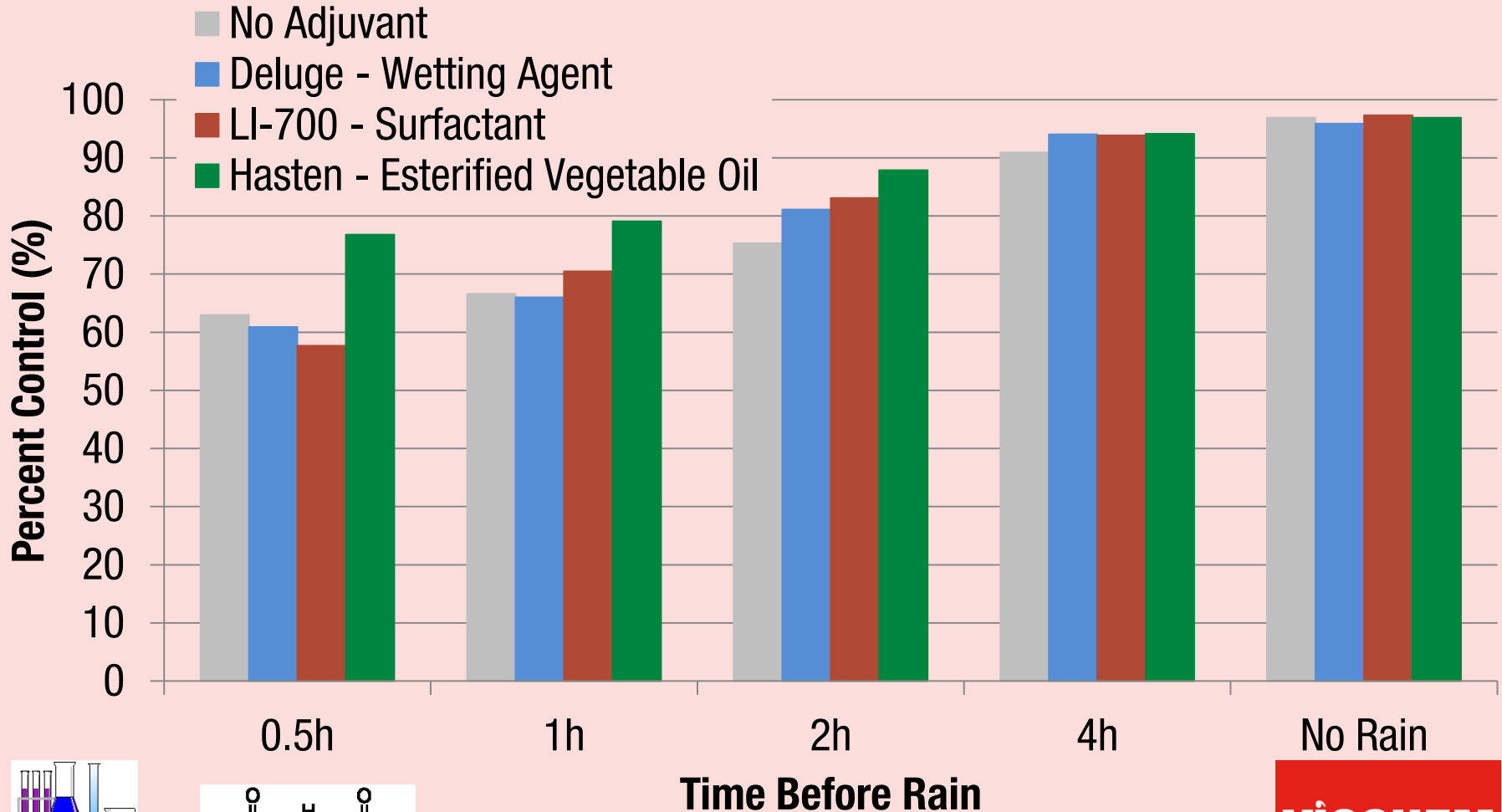
# Glyphosate Rainfastness



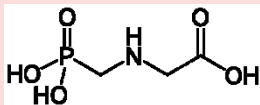
80 YEARS



# Glyphosate Rainfastness



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# Conclusions

Spray adjuvants are useful for enhancing efficacy of pesticides

Oil based adjuvants can greatly enhance foliar penetration of lipophilic active ingredients

Esterified Vegetable Oils are generally the most effective oil based adjuvants for foliar penetration

