

# Complex Mixtures with chlorpyrifos, Mustang Max, Betamix, Excalia and Quadris

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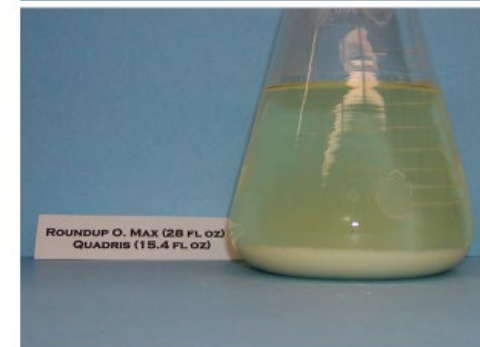
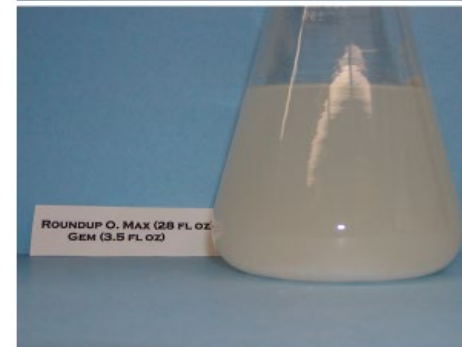
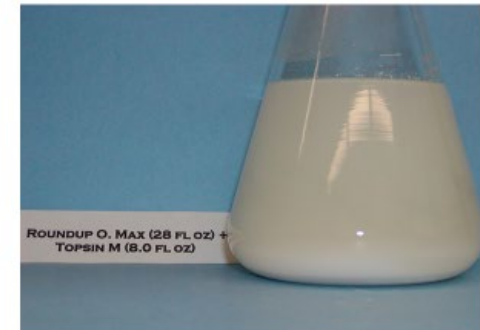
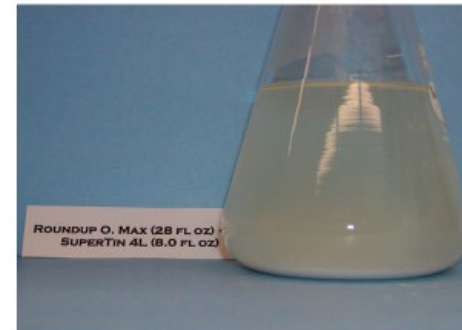
# Background

- We call mixtures of PowerMAX<sub>3</sub>, ethofumesate, and a lay-by, complex mixtures
- Sometimes an insecticide and/or Stinger HL is added to the mixture
- We don't include Quadris since the formulated oils interact with Quadris causing bronzing or necrosis damage to sugarbeet
- Some have asked about Excalia

# Growers use mixtures to improve efficacy, broaden spectrum, and create management efficiency

- Herbicide tank mixtures
- Herbicide – insecticide mixtures
- Herbicide – insecticide – fungicides (for soil borne disease)
- Fungicide – insecticides (leaf diseases and lygus bugs)
- Herbicide – fungicides (for leaf disease)

First step should be to conduct a physical compatibility test



# Materials and Methods

- Betaseed 8927 sugarbeet in 2023
- Crystal 572 in 2024
- Treatments applied in 15 gpa water carrier
- Herbicide, insecticide and fungicide treatment rates are labeled rates
- Necrosis and growth reduction evaluation, 4, 7 and 14 DAT
- Visible necrosis and growth reduction injury, 0% to 100%

**Question. Can I tank-mixing an insecticide or both an insecticide and Stinger with RUPM, ethofumesate and Outlook?**

# Sugarbeet injury, greenhouse, November 2020

Treatment	Rate	GR, 6 DAT	GR, 13 DAT	% Fresh weight reduction
	fl oz /A	-----%-----		
RUPM + ethofumesate (base)	32 + 12	3 c	5 c	0
Base + Outlook	21	6 c	14 b	12
Base + Outlook and Lorsban	21 + 16	31 b	19 b	11
Base + Outlook, Lorsban and Stinger	21 + 16 + 6	45 a	30 a	7

- Injury from Lorsban and Lorsban plus Stinger at first. Injury became less and there was no fresh weight differences
- Asana or Mustang Maxx would be safer than Lorsban
- Add adjuvant with RUPM, ethofumesate and Outlook. Leave it out with RUPM, ethofumesate, Outlook, Lorsban and/or Stinger

**Question. I've got a little bit of Betamix left. Can I add it to a mixture containing RUPM + ethofumesate + Stinger and Dual Magnum ?**

# Sugarbeet injury, greenhouse, 2020.

Herbicide treatment <sup>1</sup>	Necrosis <sup>2</sup>	Malformation	Growth Reduction
	----- % -----		
Base <sup>3</sup>	1 c <sup>4</sup>	4 c	3 b
Base + Stinger	1 c	16 b	3 b
Base + Stinger + Dual Magnum	3 c	11 bc	2 b
Base + Stinger + Dual Magnum + Betamix	11 b	28 a	17 a
Base + Stinger + Dual Magnum + Betamix + Lorsban	18 a	26 a	18 a

<sup>1</sup>Base = Roundup PowerMax at 32 fl oz/A + Ethofumesate 4SC at 12 fl oz/A. All POST entries included Destiny HC (HSMOC) + N-Pak Liquid AMS at 1.5 pt/A + 2.5% v/v.



# We have observed that Stinger is an 'activator'

- Stinger with an insecticide; Stinger with a herbicide
- We do not believe Betamix or Lorsban are the culprits
- Sugarbeet injury from Betamix and/or Lorsban are exacerbated by 'activators' such as a Stinger
- ....under certain environmental conditions
- Be certain sugarbeet are actively growing before spraying this complicated mixture.

**Question. We know Quadris does not mix with oils. How about Excalia?**

# Sugarbeet injury in response to herbicide treatment, greenhouse treatment, 2023

Herbicide treatment <sup>a</sup>	Rate -----fl oz/A-----	Necrosis 4 DAT %	Growth Reduction		
			4 DAT	8 DAT	14 DAT
Base + Outlook	16	8 c	16 cd	5 d	13 bcd
+ Ecalia + Outlook	2 + 16	0 d	16 cd	18 c	20 b
+ Ecalia + Outlook + Mustang Max	2 + 16 + 4	0 d	8 de	10 cd	14 bc
+ Ecalia + Outlook + Mustang Max + Stinger HL	2 + 16 + 4 + 2.4	0 d	19 c	28 b	21 b
Ecalia and Mustang Max	2 + 4	0 d	10 cde	3 d	0 e
+ Quadris + Outlook	14.3 + 16	30 a	50 b	48 a	33a
+ Quadris + Outlook + Mustang Max	14.3 + 16 + 4	20 b	65 a	53 a	43 a
+ Quadris + Outlook + Mustang Max + Stinger HL	14.3 + 16 + 4 + 2.4	30 a	60 ab	55 a	43 a
Quadris and Mustang Max	14.3 + 4	0 d	11 cde	5 d	5 cde
Non-Treated Control	-	0 d	3 e	3 d	3 de
LSD (0.10)		5	11	10	11

<sup>a</sup>Roundup PowerMAX<sub>3</sub> and ethofumesate at 25 + 6 fl oz/A plus HSMOC and AMS at 1.5 pt/a and 2.5 % v/v.

# Pesticide mixtures with Excalia or Quadris, green-house, 2023. Images collected on May 1, 2023, 11 DAT



\*Base = Roundup PowerMAX3 + Nortron + Outlook with Destiny HC and Amsol Liquid AMS

# Mustang Max mixed with Excalia or Quadris, greenhouse, 2023. Images collected on May 1, 2023, 11 DAT



# Excalia and Quadris respond differently with oils

- Mix Excalia with oil based formulations including ethofumesate, Dual Magnum, Outlook, and Warrant and adjuvants
- Follow best practices for mixing complex mixtures
- Excalia or Quadris can be mixed with Mustang Max

**Question. Chlorpyrifos is back. How about chlorpyrifos mixtures with Quadris or Excalia?**

# Govern mixed with Excalia or Quadris, greenhouse, 2024. Images collected on April 13, 2024, 9 DAT





# Sugarbeet injury in response to herbicide treatment, greenhouse treatment, 2024

Herbicide treatment <sup>a</sup>	Rate ---fl oz/A---	Necrosis 4 DAT %	Growth Reduction		
			4 DAT	9 DAT	16 DAT
Non-Treated Control		0 b	5 b	6 b	
Excalia plus Govern	2 + 32	0 b	3 b	6 b	
Quadris plus Govern	14.3 + 32	48 a	35 a	39 a	
LSD (0.10)		10	8	7	

<sup>a</sup>Govern 4E, chlorpyrifos, Tenkos, Inc.

# Pesticide mixtures with Excalia or Quadris, greenhouse, 2024. Images collected on April 13, 2024, 9 DAT



\*Base = Roundup PowerMAX3 + Nortron with Destiny HC

# Sugarbeet injury in response to herbicide treatment, greenhouse treatment, 2024

Herbicide treatment <sup>ab</sup>	Rate	Necrosis 4 DAT	Growth Reduction		
			4 DAT	9 DAT	16 DAT
	---fl oz/A---	%	-----%-----		
Non-Treated Control		0 b	5 c	6 c	
Base + StingerHL	1.8	0 b	13 bc	24 b	
Base + Govern + StingerHL	32 + 1.8	0 b	18 b	25 b	
Base + Excalia + Govern + StingerHL	2 + 32 + 1.8	0 b	20 b	23 b	
Base + Quadris + Govern + StingerHL	14.2 + 32 + 1.8	65 a	50 a	51 a	
LSD (0.10)		3	9	9	

<sup>a</sup>Roundup PowerMAX and ethofumesate at 25 + 12 fl oz/A with HSMOC at 1.5 pt/a.

<sup>b</sup>Govern 4E, chlorpyrifos, Tenkos, Inc.

# Summary

- Mix Excalia with Govern 4E, RUPM3, ethofumesate and StingerHL and adjuvants but not Dual Magnum, Outlook, and Warrant
- Follow best practices for mixing complex mixtures
- Excalia or Quadris can be mixed with Mustang Max
- Quadris should not be mixed with Govern 4E