

COMPLEX MIXTURES WITH EXCALIA

Thomas J. Peters¹, Alexa L. Lystad², and ³Adam Aberle

¹Extension Sugarbeet Agronomist and Weed Control Specialist, ²Research Specialist, and ³Research Technician
North Dakota State University & University of Minnesota, Fargo, ND and North Dakota State University

Summary

1. Quadris or Excalia can be mixed and applied with Mustang Maxx.
2. Sugarbeet injury from Excalia mixed with Roundup PowerMAX3, ethofumesate, Outlook, and Stinger HL was similar to injury with Roundup PowerMAX3, ethofumesate, and Outlook alone.
3. Quadris mixed with oil-based formulations or oil-based adjuvants causes necrosis injury.
4. Growers need to follow recommendations for complex mixtures or Roundup PowerMAX3 mixed with ethofumesate, the chloroacetamides, Stinger HL, and/or Mustang Maxx.

Introduction

Quadris is frequently used for control of *Rhizoctonia* in Minnesota and North Dakota. Questions about tank mixing Quadris with herbicides are common. Our research indicates Quadris can safely be tank mixed with glyphosate and Stinger HL, but mixing Quadris with oil-based herbicides like ethofumesate, the chloroacetamide herbicides for waterhemp control, or even oil-based adjuvants, such as methylated seed oil (MSO), causes unacceptable necrosis damage or leaf bronzing to sugarbeet. We recommend Quadris be applied three days prior to, or three days after, oil-based herbicides to avoid sugarbeet injury.

Drs. Chanda and Khan have been evaluating Excalia fungicide for *Rhizoctonia* control in sugarbeets. Valent has alluded that Excalia can be tank mixed with oil-based herbicides for both *Rhizoctonia* control and management of weeds. The objective of this greenhouse experiment was to compare sugarbeet tolerance with complex mixtures including Quadris or Excalia.

Materials and Methods

Betaseed 8927 sugarbeet was grown in 4 × 4 pots with a 1:1 mixture of Wheatville silt loam from the Northwest Research and Outreach Center, Crookston, MN and PROMIX greenhouse media to the 2-lf stage in the greenhouse. Sugarbeet were grown at 75°F to 81°F under natural light supplemented with a 16 h photoperiod of artificial light.

Herbicide treatments are in Table 1. All treatments were applied with Destiny HC high surfactant methylated oil concentrate (HSMOC) and ammonium sulfate (AMS) using a spray booth (Generation III, DeVries Manufacturing, Hollandale, MN) equipped with a TeeJet[®] 8002 even banding nozzle (TeeJet Technologies, Glendale Heights, IL) calibrated to deliver 15 gpa spray solution at 25 psi and 3 mph when sugarbeet was at the 2- lf stage. Visible sugarbeet necrosis injury (0% to 100%, 100% indicating complete necrosis) and sugarbeet growth reduction injury (0% to 100%, 100% indicating complete loss of stand) were evaluated approximately 5, 7, and 14 (+/- 3 days) days after treatment (DAT). Experimental design was randomized complete block with four replications. Data were analyzed with the ANOVA procedure of ARM, version 2022.5 software package.

Table 1. Herbicide treatment, rate, and sugarbeet stage at application, greenhouse, 2023.

Herbicide treatment ^a	Rate (fl oz/A)	Sugarbeet stage (Num of lvs)
Glyphosate + etho + Outlook	30 + 12 + 18	2-4
Excalia + glyphosate + etho + Outlook	2+ 30 + 12 + 18	2-4
Excalia + glyphosate + etho + Outlook + Mustang Maxx	2+ 30 + 12 + 18 + 4	2-4
Excalia + glyphosate + etho + Outlook + Stinger HL	2+ 30 + 12 + 18 + 2.4	2-4
Excalia + Mustang Maxx	2 + 4	2-4
Quadris + glyphosate + etho + Outlook	14.3 + 30 + 12 + 18	2-4
Quadris + glyphosate + etho + Outlook + Mustang Maxx	14.3 + 30 + 12 + 18 + 4	2-4
Quadris + glyphosate + etho + Outlook + Stinger HL	14.3 + 30 + 12 + 18 + 2.4	2-4
Quadris + Mustang Maxx	14.3 + 4	2-4
Non-treated control	-	2-4

^aTreatment with Destiny HC HSMOC at 1.5 pt/A and Amsol Liquid AMS at 2.5% v/v.

Results and Discussion

Tank mixing Quadris with Roundup PowerMAX3, ethofumesate, and Outlook, or tank mixing Quadris with Mustang Maxx or Stinger HL and Roundup PowerMAX3, ethofumesate, and Outlook caused necrosis injury (Table 2, Figure 1). Sugarbeet injury was similar for all treatments and necrosis injury tended to be along the edges of sugarbeet leaves. There was no injury, or injury was negligible, with Excalia mixed with Roundup PowerMax3, ethofumesate, Outlook, Mustang Maxx, or Stinger HL.



Figure 1. Sugarbeet injury in response to Excalia or Quadris mixed with various sugarbeet pesticides greenhouse, 2023. Images collected on May 1, 2023, 11 DAT. *Base is Roundup PowerMAX3 + ethofumesate + Outlook.

Table 2. Sugarbeet injury in response to herbicide treatment, greenhouse, 2023.

Herbicide treatment ^a	Rate	Necrosis		Growth Reduction	
		4 DAT	4 DAT	8 DAT	14 DAT
		-----%			
Base + Outlook	16	8 c	16 cd	5 d	13 bcd
+ Excalia + Outlook	2 + 16	0 d	16 cd	18 c	20 b
+ Excalia + Outlook + Mustang Maxx	2 + 16 + 4	0 d	8 de	10 cd	14 bc
+ Excalia + Outlook + Mustang Maxx + Stinger	2 + 16 + 4 + 2.4	0 d	19 c	28 b	21 b
Excalia and Mustang Maxx	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 Maxx	14.3 + 16 + 4	20 b	65 a	53 a	43 a
+ Quadris + Outlook + Mustang Maxx + Stinger	14.3 + 16 + 4 + 2.4	30 a	60 ab	55 a	43 a
Quadris and Mustang Maxx	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

^aBase = Roundup PowerMAX3 plus ethofumesate at 25 + 6 fl oz/A plus HSMOC at 1.5 pt/a and Amsol AMS at 2.5 % v/v.

Quadris mixed with Roundup PowerMAX3, ethofumesate, and Outlook, or mixing Quadris with Mustang Maxx or Stinger HL and Roundup PowerMAX3, ethofumesate, and Outlook caused growth reduction injury ranging from 65% to 33%, 4, 8 or 14 DAT (Table 2). Necrosis, or growth reduction injury, from Quadris with Roundup PowerMAX3, ethofumesate, and Outlook alone, or Quadris, Roundup PowerMAX3, ethofumesate, and Outlook mixed with Stinger HL or Mustang Maxx was the same or tended to be the same.

Roundup PowerMAX3 mixed with ethofumesate and Outlook tended to be negligible but growth reduction injury was statistically greater than the non-treated control. Tank mixing Mustang Maxx or Stinger HL with Excalia and Roundup PowerMAX3, ethofumesate, and Outlook did not increase sugarbeet injury.

Mustang Maxx mixed with either Quadris or Excalia did not cause necrosis damage or growth reduction damage (Figure 2).



Figure 2. Sugarbeet injury from Excalia or Quadris mixed with Mustang Maxx, greenhouse, 2023. Images collected on May 1, 2023, 11 DAT.

Conclusions

Questions about tank mixing herbicides are one of the most common telephone calls I receive from agriculturists and producers, and rightfully so. Combinations of postemergence herbicides can improve weed control and spectrum of control as compared with individual treatments. Mixtures also improve time efficiency as compared with making individual applications. However, the risk of sugarbeet injury also increases with combinations, especially under adverse environmental conditions. There are few herbicides truly safe to sugarbeet, meaning sugarbeet must detoxify herbicide sprays after application and before normal sugarbeet growth and development can resume. Detoxification is much more challenging with combinations, or as “complex mixtures” as I like to call them, especially in cold and wet environments.

Sometimes herbicides interact with components of other herbicides and/or adjuvants. Quadris should not be tank mixed with oil-based herbicide formulations or oil containing (petroleum or crop) adjuvants since sugarbeet injury may occur under certain weather conditions, particularly high temperature conditions.

This experiment concludes that Excalia mixed with oil-based adjuvants or herbicide formulations does not increase sugarbeet injury as compared with these same herbicides or adjuvants alone.