



Department of  
Agriculture and Food



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# Lime effects on the control of annual ryegrass and wild radish in low pH soils

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# Acknowledgements

- GRDC for funding the project
- AHRI, UWA for Research Collaboration
- Barb Sage, Chris Roberts, Dave Nicholson -Technical assistance
- Chris Gazey for his advice on lime treatment and measurements
- DAFWA Research Support units at Geraldton, Merredin and Wongan Hills
- Bayer Crop science: supplied Sakura<sup>®</sup> and Velocity<sup>®</sup>
- Liebe Group



# Background

- Anecdotal observations:
  - Hard to kill weeds in acid soils
  - Lime may enhance herbicide efficacy
- Lime reduced ryegrass and radish impact in a long-term lime trial demonstration (Gazey and Andrew)



# What does lime do in soils and plants?

- Low soil pH means high soluble Al and Mn
- Lime releases Ca or Mg,
  - reverses soil acidity, reduces Al and Mn, ↑ soil pH

**Ca??**

- Participates in *uptake of other nutrients*
- Promotes plant cell elongation
- An essential part of plant cell wall
- *Participates in enzymatic and hormonal processes*
- Protects the plant against heat stress -*regulates stomatal opening*



# Aims

- To examine the impact of lime and herbicides on the control of annual ryegrass or wild radish in low pH soils.
- **Hypothesis:** Application of lime should improve weed control and increase crop grain yield.

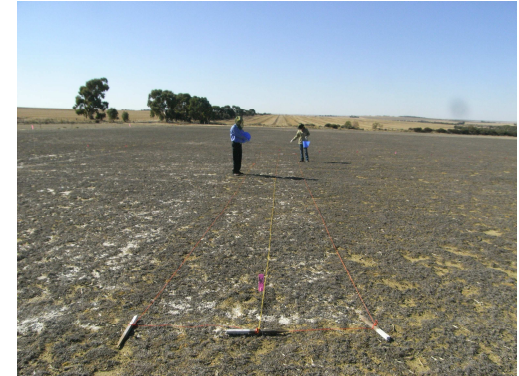


# Methods



# Methods

- **Main plots:** Lime @ 0, 1.25, 2.5, 5 t/ha applied in 2010 before sowing crop
- **Sub-plots:** 5 rates of herbicides
- **Design:** Split-plot design, 4 replications
- **Locations**
  - *Wild radish:* Eradu & Wongan Hills
  - *Annual ryegrass:* Wongan Hills and Merredin



## Crop rotation for wild radish at Eradu and Wongan Hills

Year	2010	2011	2012	2013
Crop	Wheat	Wheat	Lupin	Barley
Herbicide	Velocity®	Velocity®	Simazine (/Brodal + metribuzin)	Velocity®





## Crop rotation and herbicides for annual ryegrass at Wongan Hills and Merredin

Year	2010	2011	2012	2013
Crop	Wheat	Wheat	Lupin	Barley
Herbicide	Sakura <sup>®</sup>	Sakura <sup>®</sup>	Simazine (/Brodal + metribuzin)	Boxer Gold <sup>®</sup>

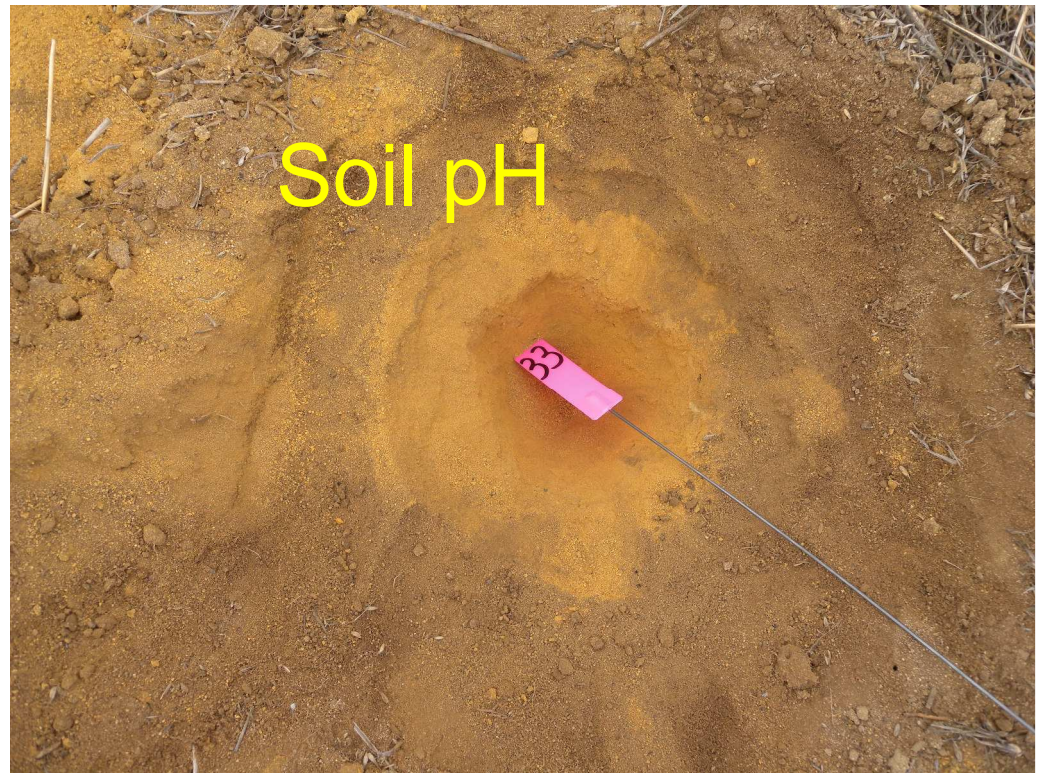


## Herbicide rates (sub-plots) in wild radish and annual ryegrass

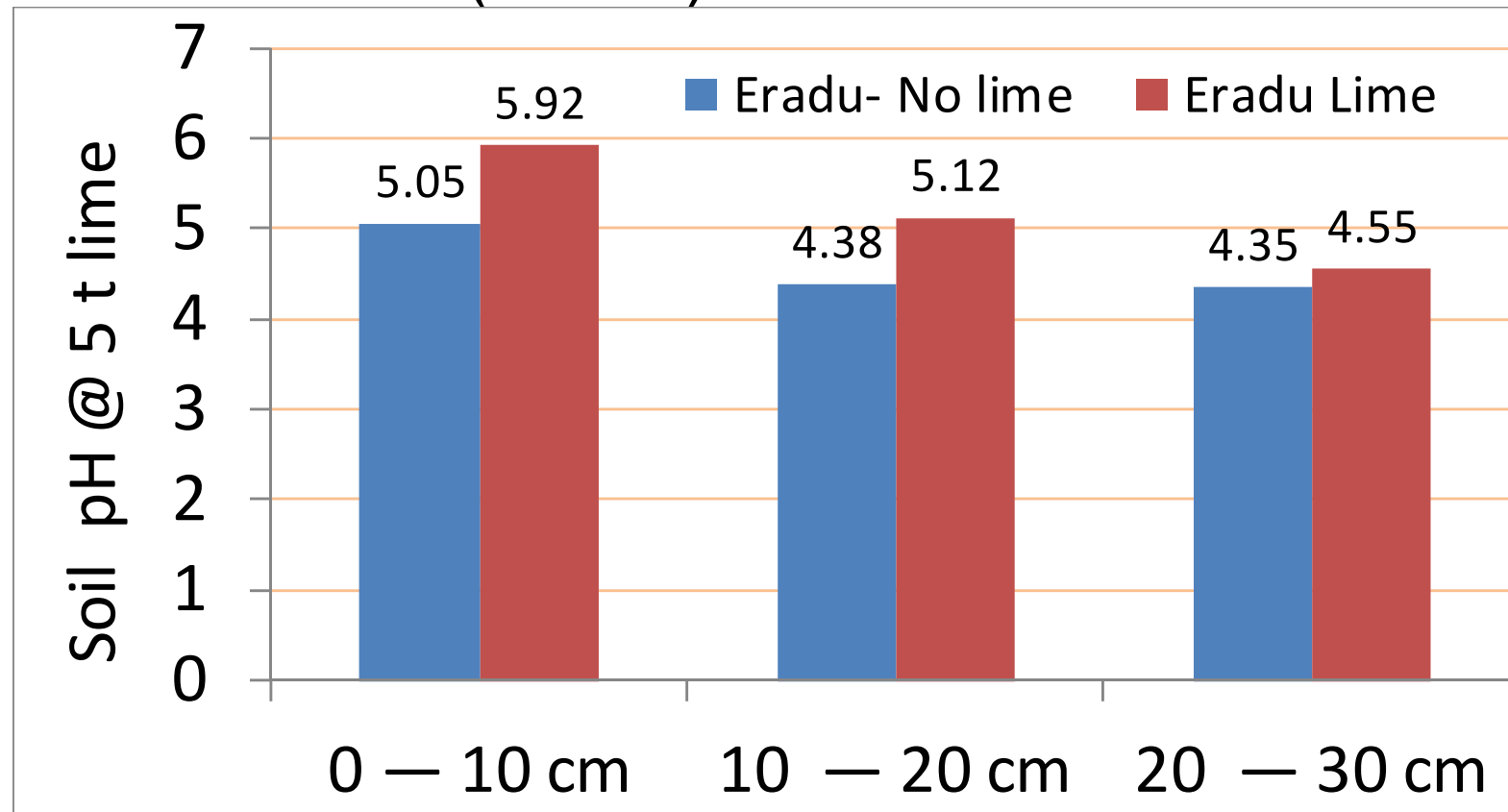
Weeds	Herbicide	Rate 1	Rate 2	Rate 3	Rate 4	Rate 5
Annual ryegrass	Sakura <sup>®</sup> (g/ha)	0	60	90	120	150
	Boxer Gold <sup>®</sup> (mL/ha)	0	1000	1500	2000	2500
Wild radish	Velocity <sup>®</sup> (mL/ha)	0	250	350	500	670



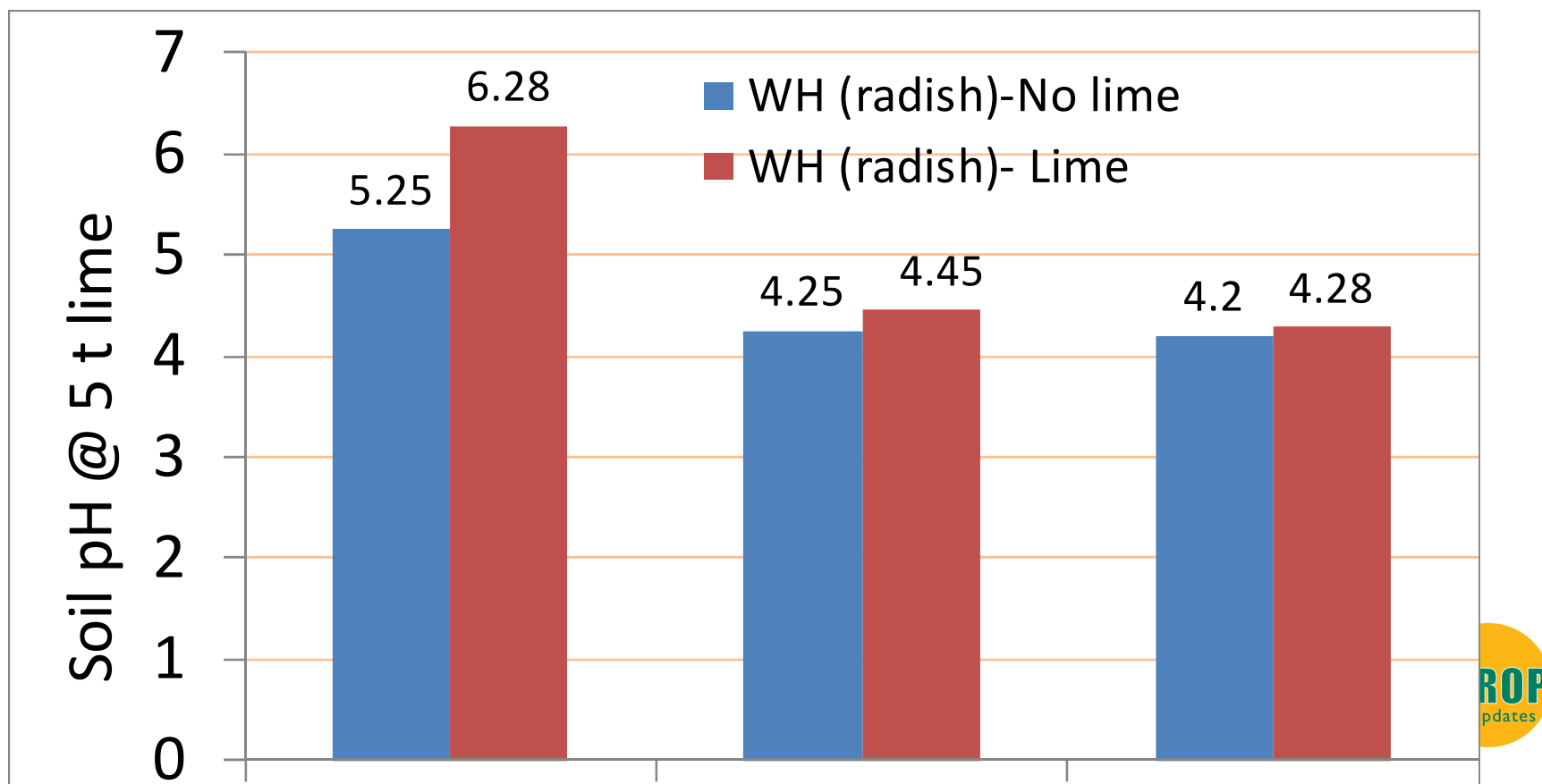
# Results



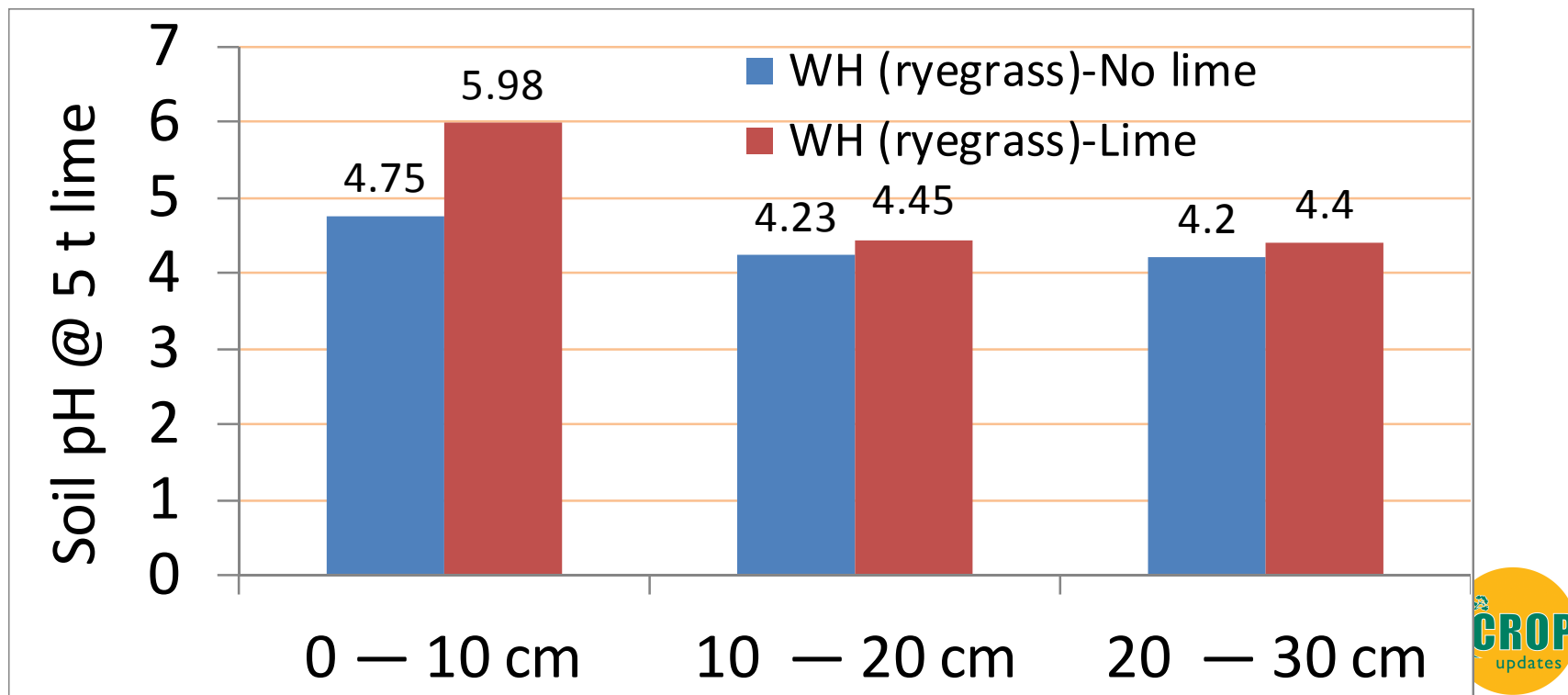
## Effect of lime at 5 t/ha on the soil pH at Eradu (radish) in 2013 season



## Effect of lime at 5 t/ha on the soil pH at W Hills (radish) in 2013 season



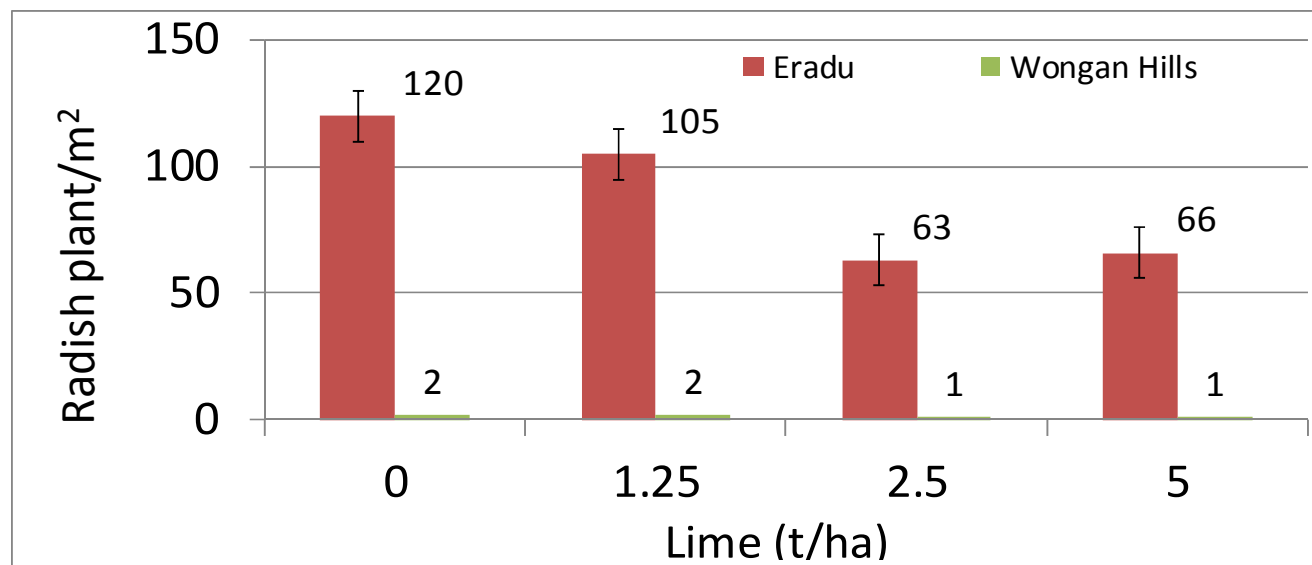
## Effect of lime at 5 t/ha on the soil pH at W Hills (ryegrass) in 2013 season



## Lime effect on initial weed density

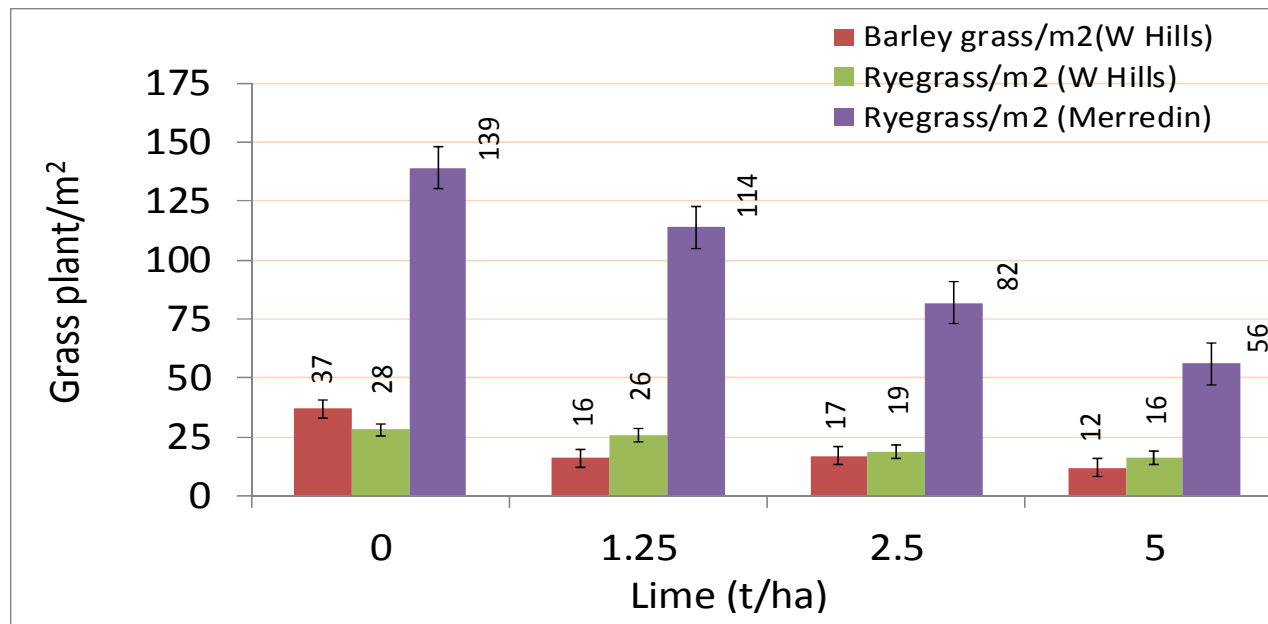


## Effect of lime on wild radish density in 2013 season at Eradu and W Hills





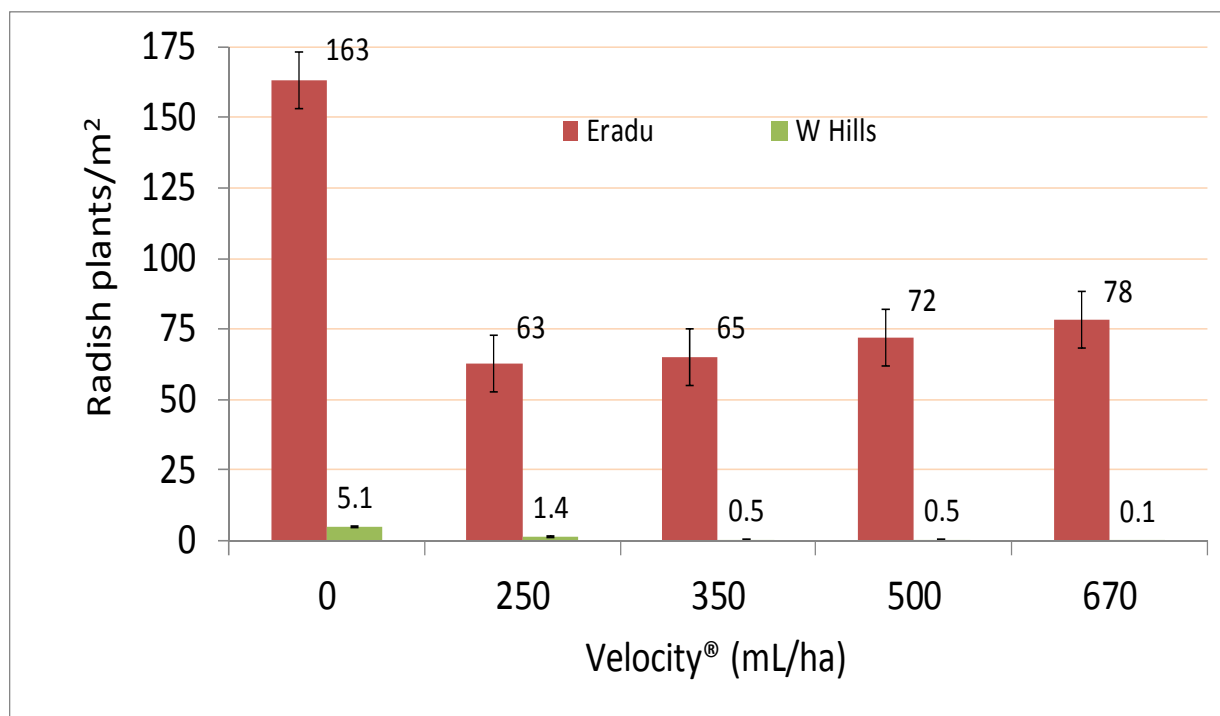
## Effect of lime on the density of barley grass and ryegrass at W Hills and Merredin in 2013



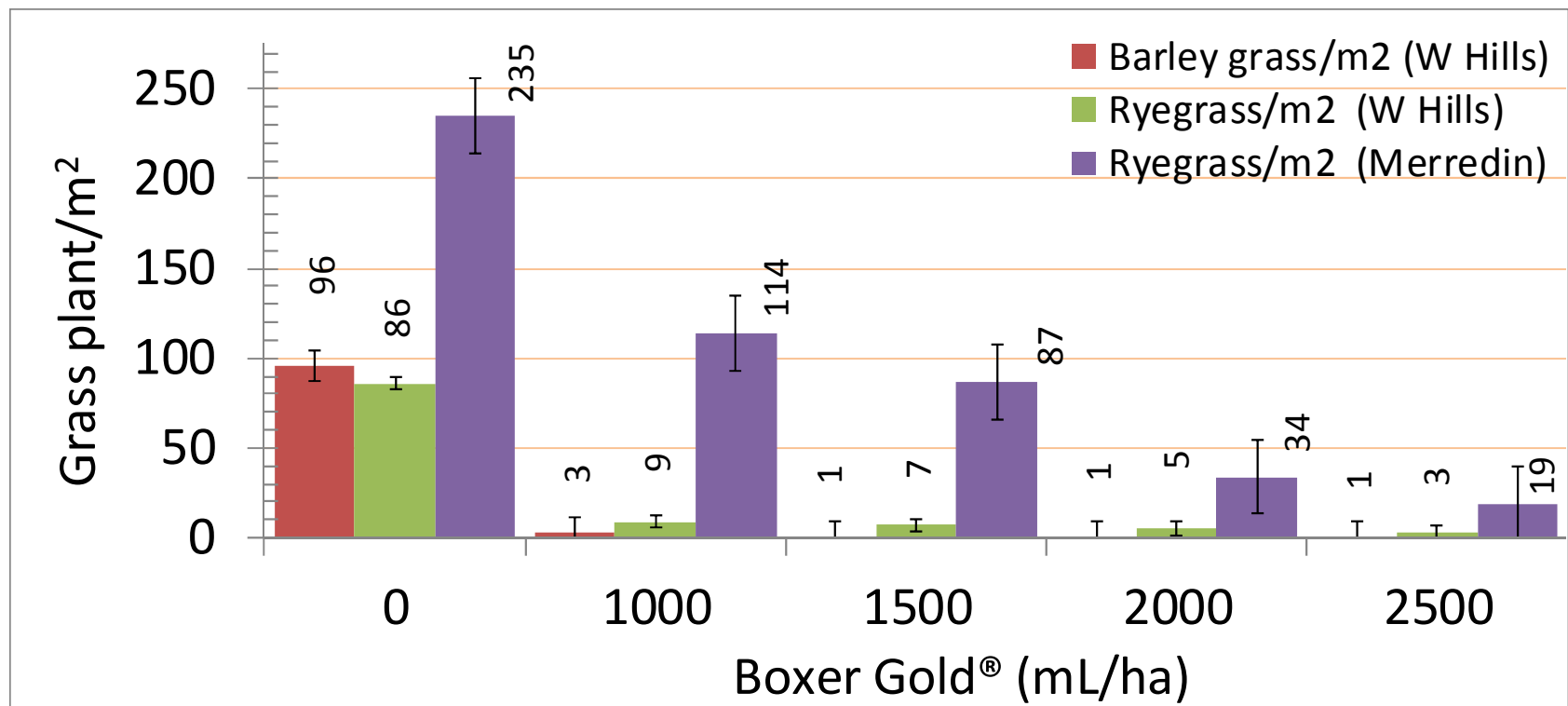
## **Herbicide effect on initial weed density**



## Effect of herbicides applied from 2010 to 2012 on the initial density of radish in 2013 season at Eradu and W. Hills



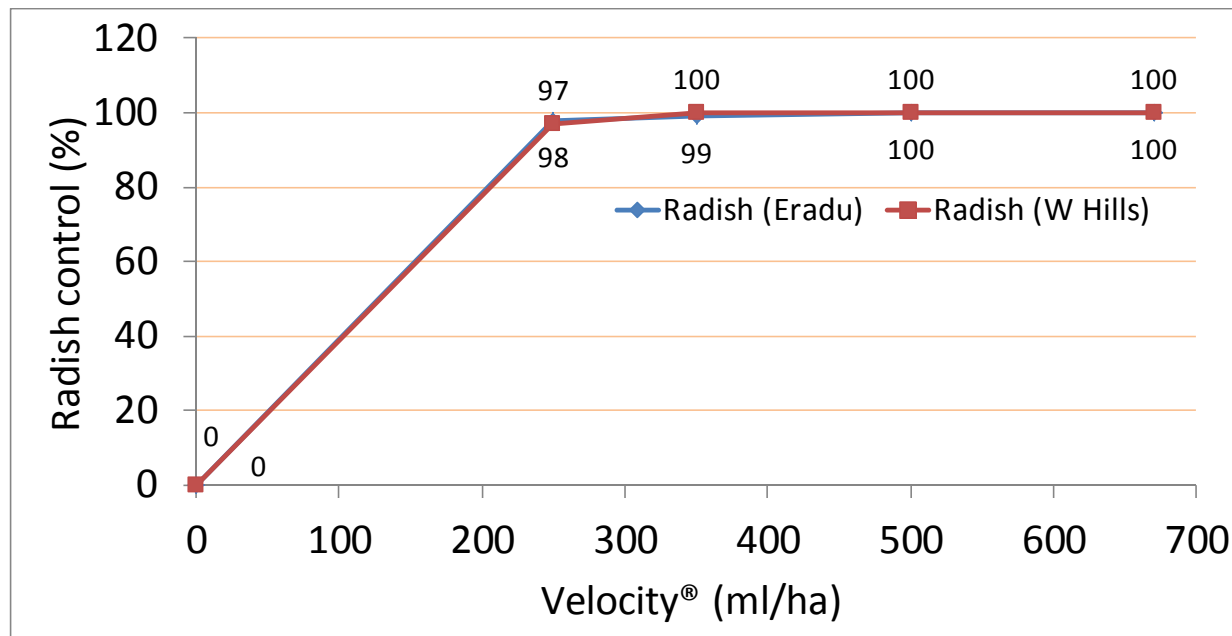
## Herbicide effect on the density of barley grass and ryegrass at W Hills and Merredin in 2013



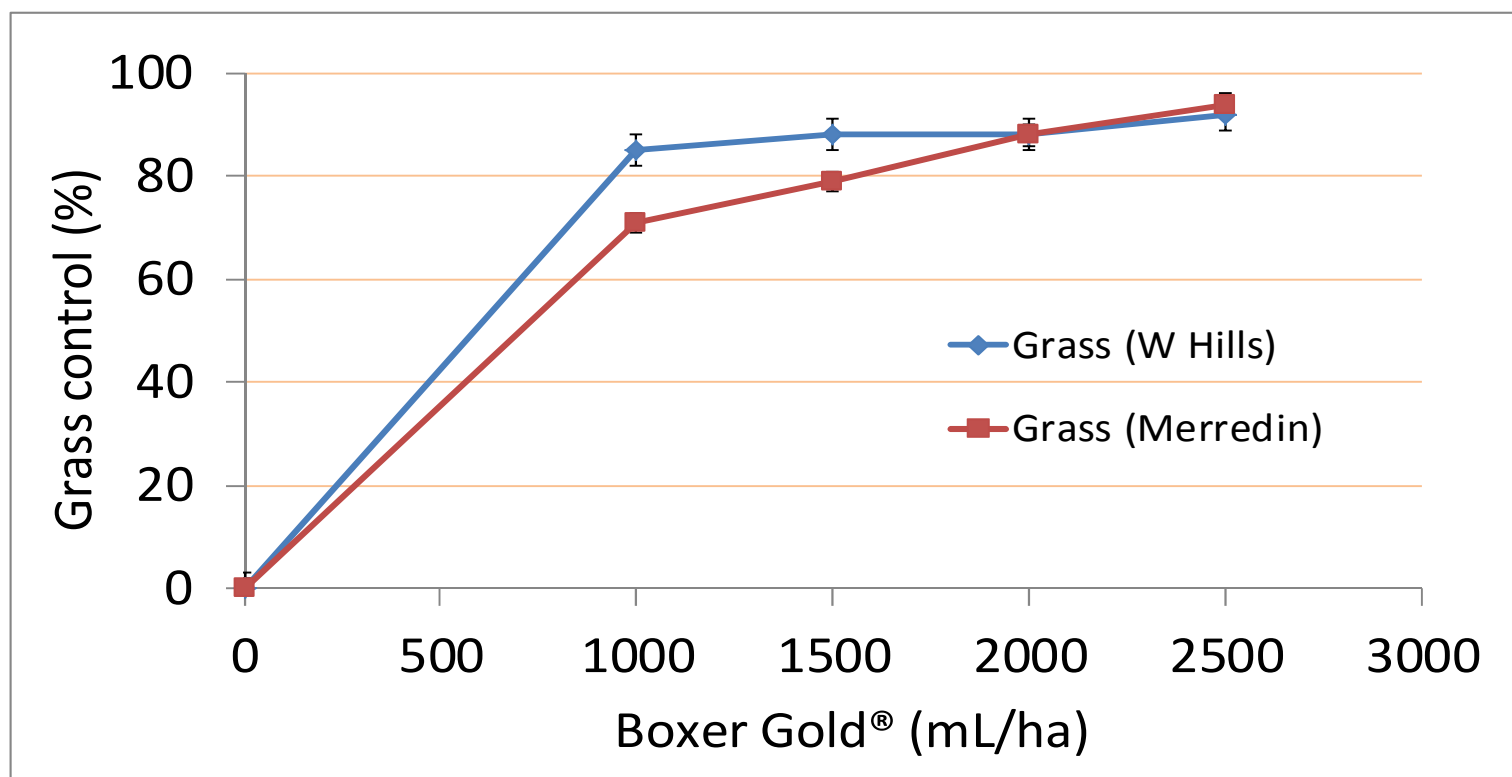
# **Herbicide effects on final weed control**



## Effect of broadleaf herbicides in 2010 to 2013 on radish control in 2013 at Eradu and W Hills



## Effect of grass herbicides applied from 2010 to 2013 on the control of barley grass and ryegrass in 2013



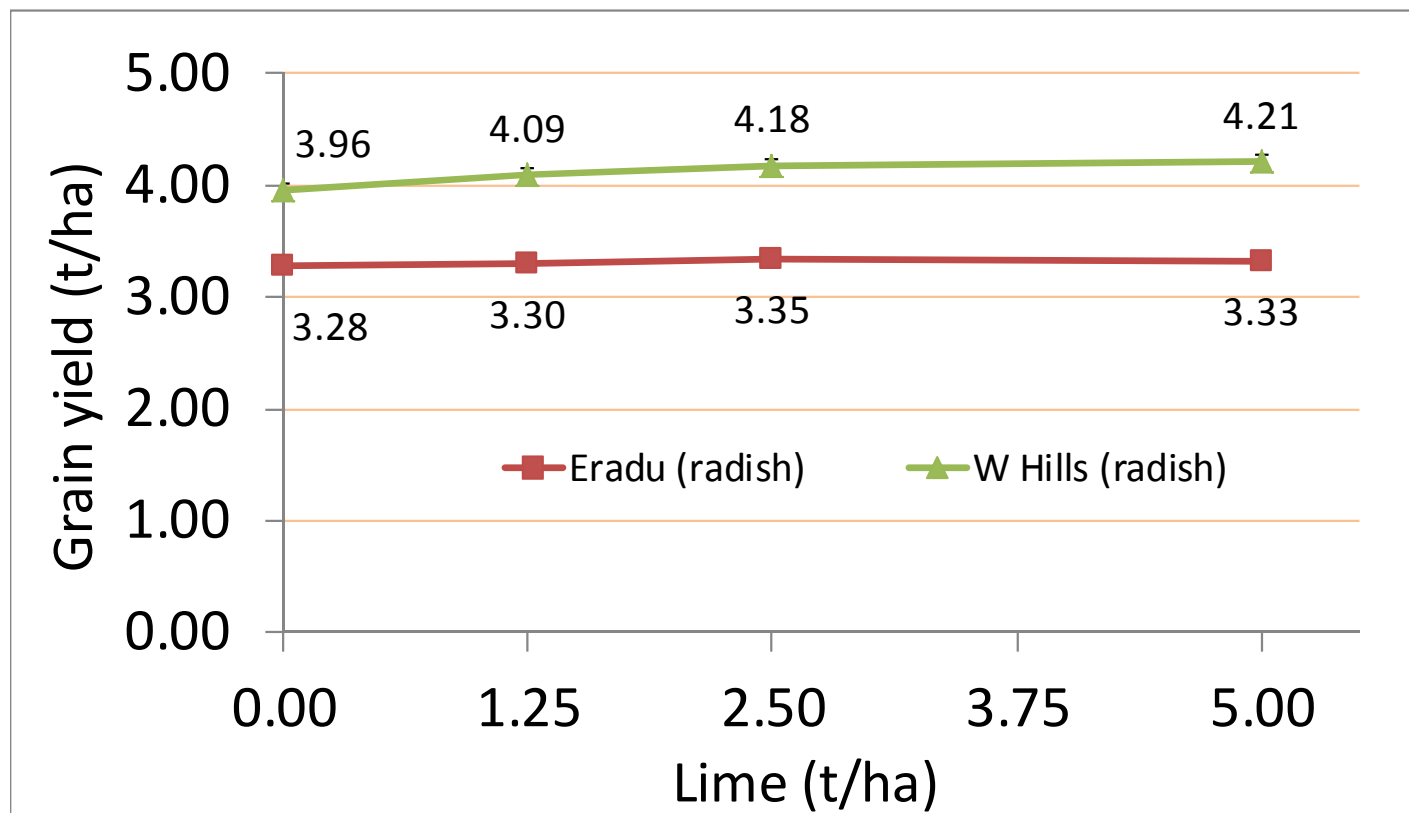
# Grain yield

Lime effect

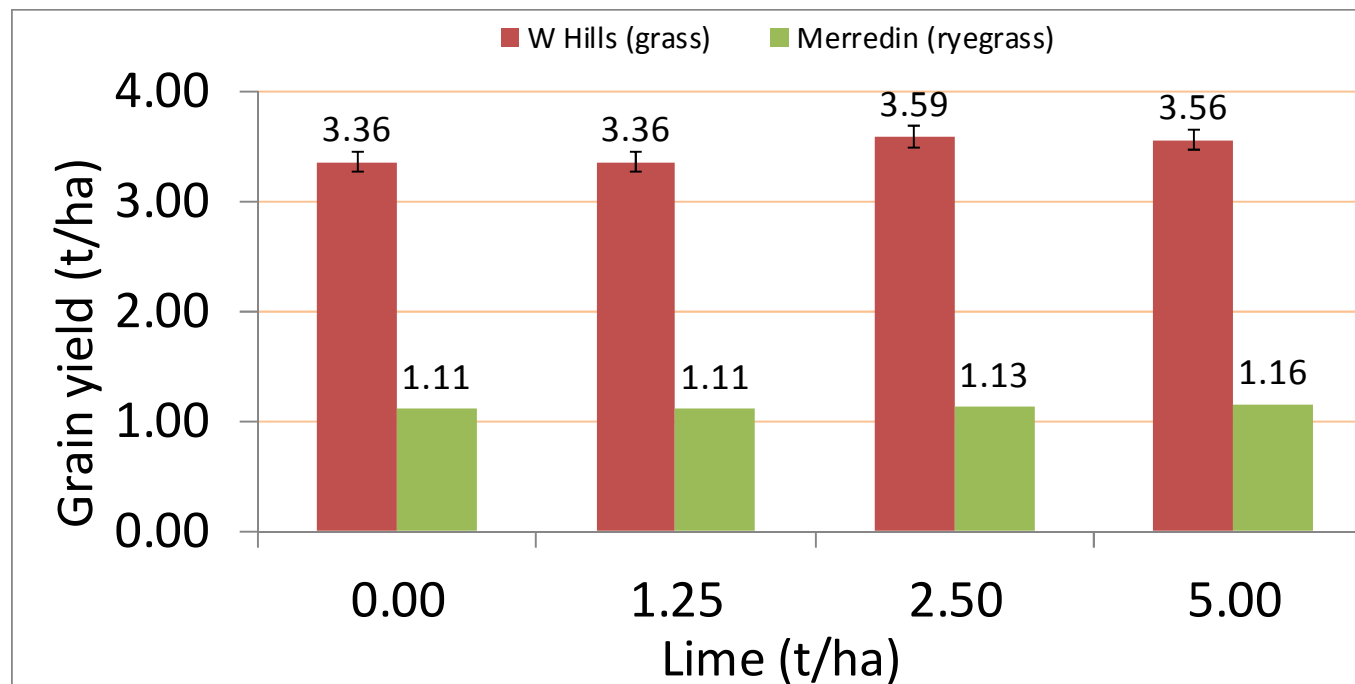




## Effect of lime applied in 2010 on the grain yield of barley crop in 2013



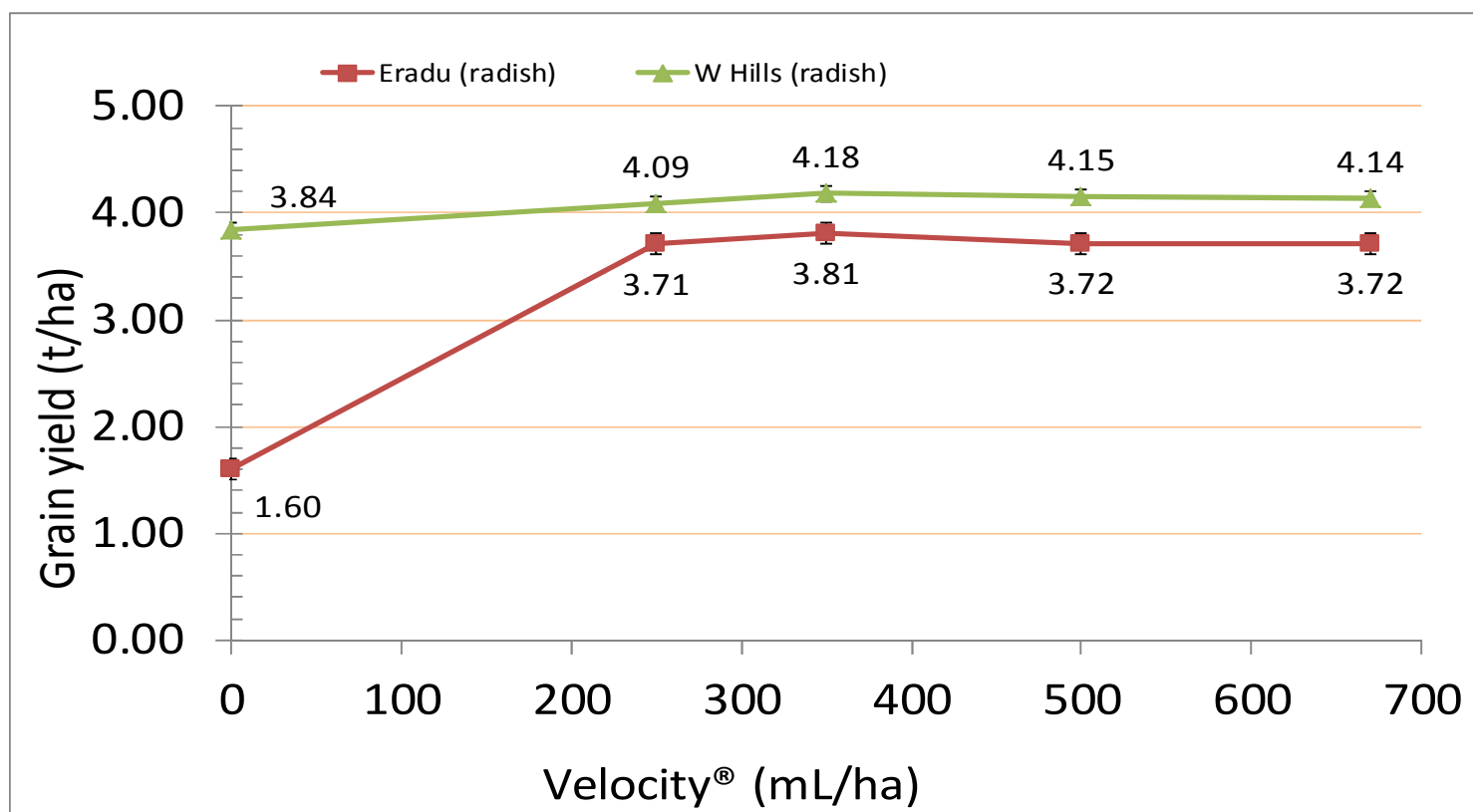
## Effect of lime applied in 2010 on grain yield of barley crop in 2013



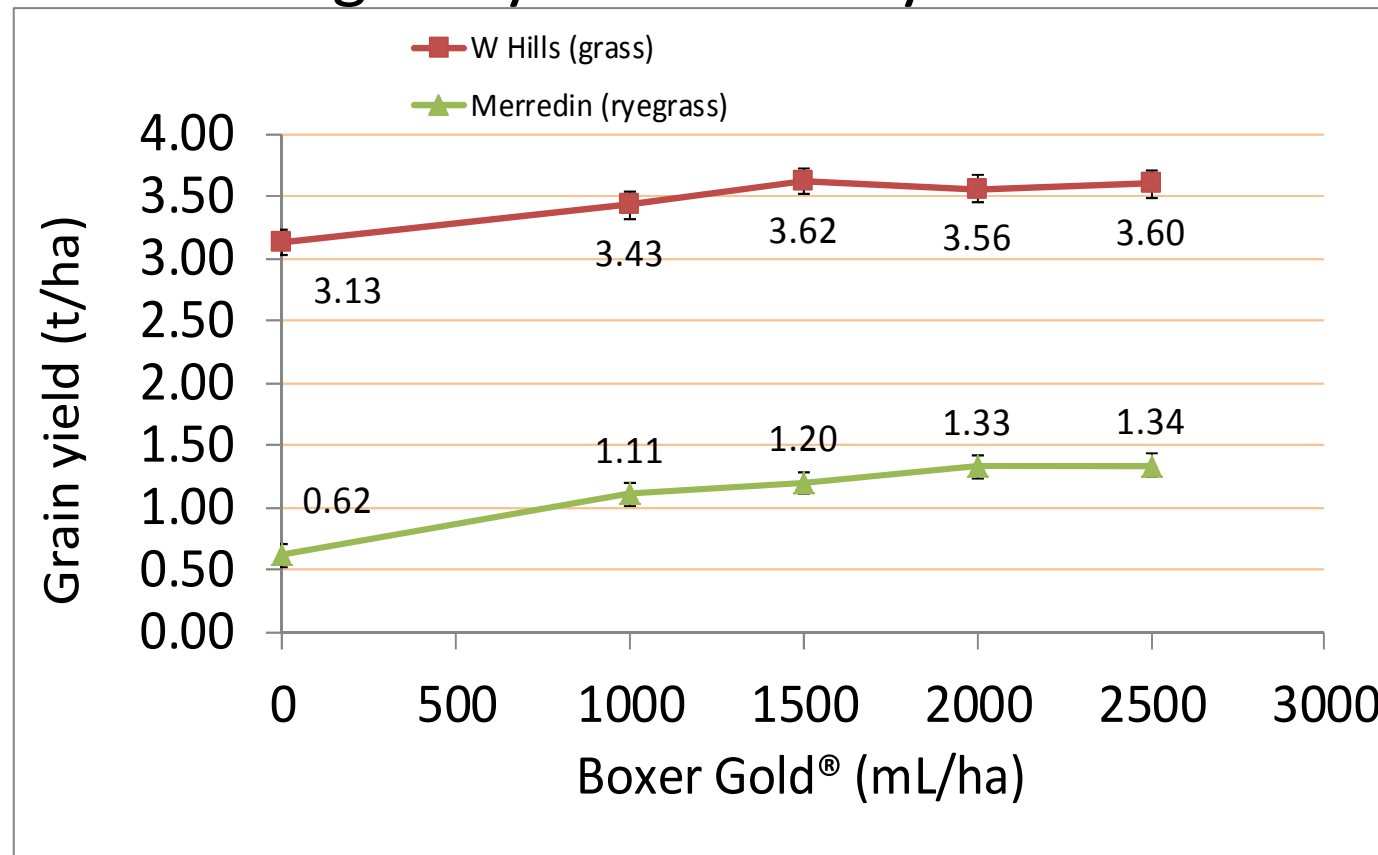
# **Herbicide effect on barley crop grain yield**



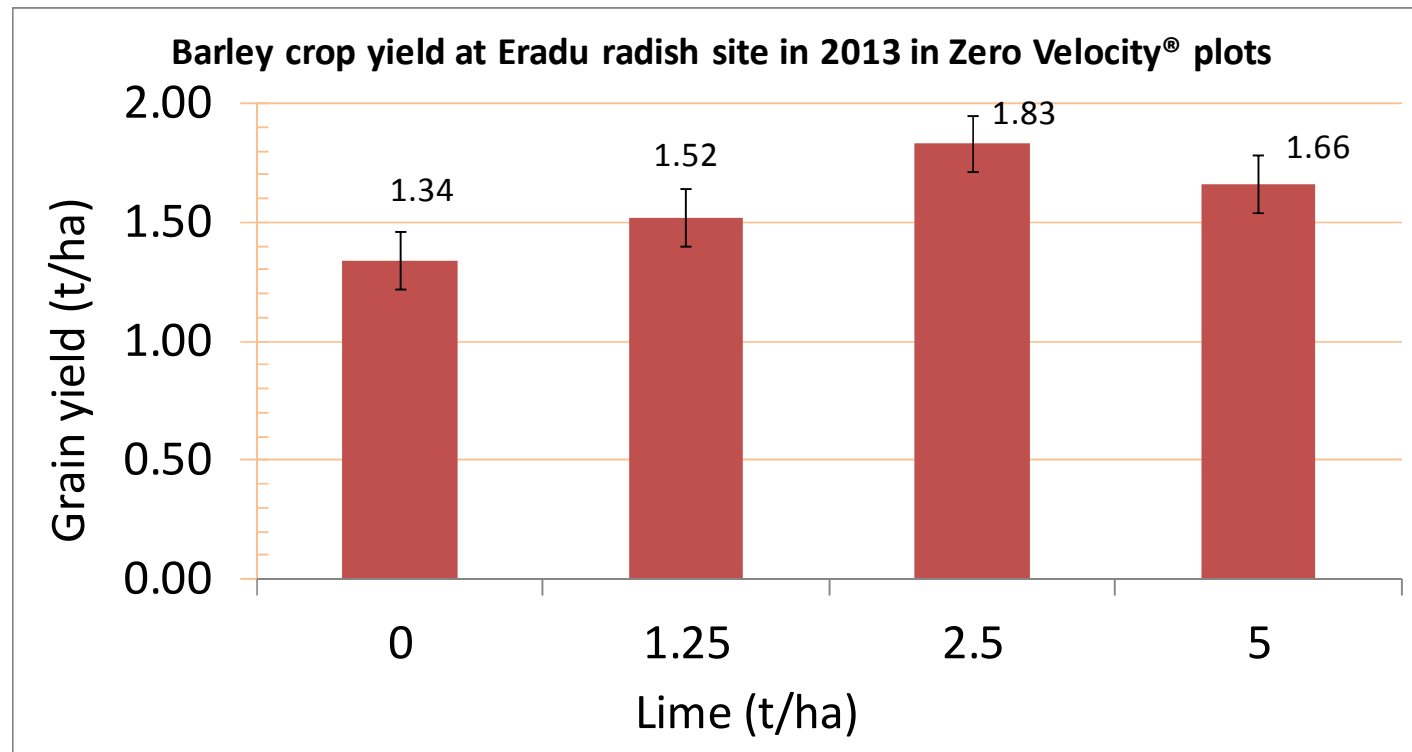
## Effect of broadleaf herbicides applied from 2010 to 2013 on the grain yield of barley crop in 2013



## Effect of Sakura® and Boxer Gold® from 2010 to 2013 on grain yield of barley in 2013

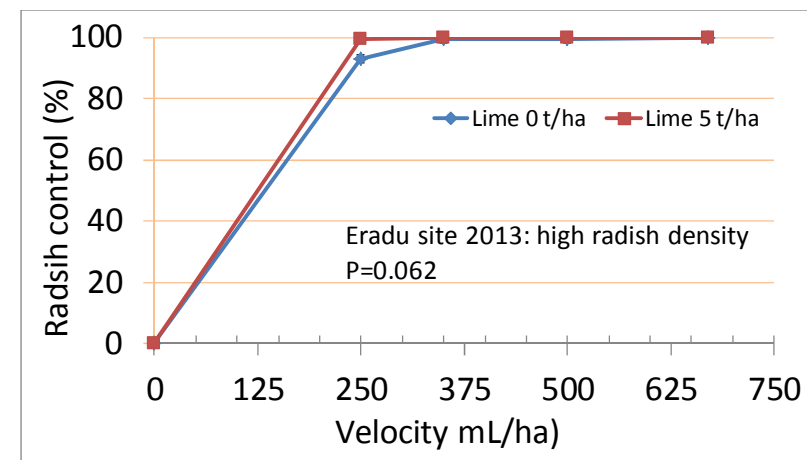
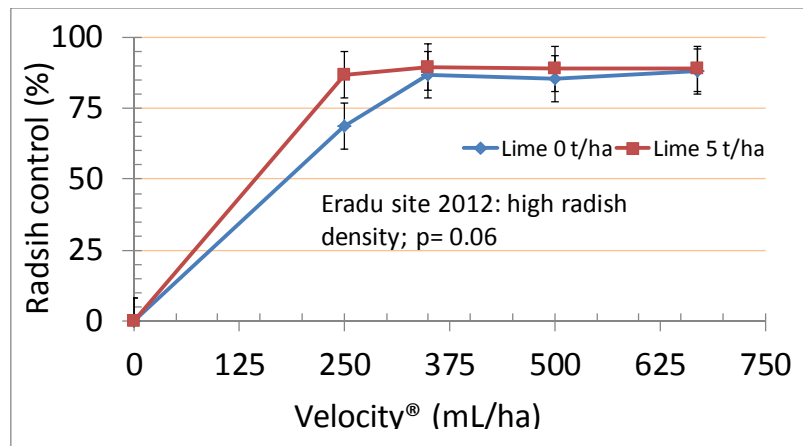


## Did lime influence grain yield in absence of herbicide?



# Did lime interact with herbicides to enhance weed control?

No strong interaction effect of lime and herbicide on weed control was evident. However, relatively weak interaction was observed in case of high density of wild radish.



## Key messages

- Lime increased soil pH but the soil pH at the sub-soil layers was still below recommended pH level even 3 years after application
- Lime reduced radish and grass weed density in all sites in 2013 but a small increase occurred in crop yield at 2 sites only.
- Herbicide was always effective on weeds and increased crop yield.
- However, a strong interaction of lime and herbicide was not evident.







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# Thank you

## Questions?

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