

Kochia control in Sugarbeet

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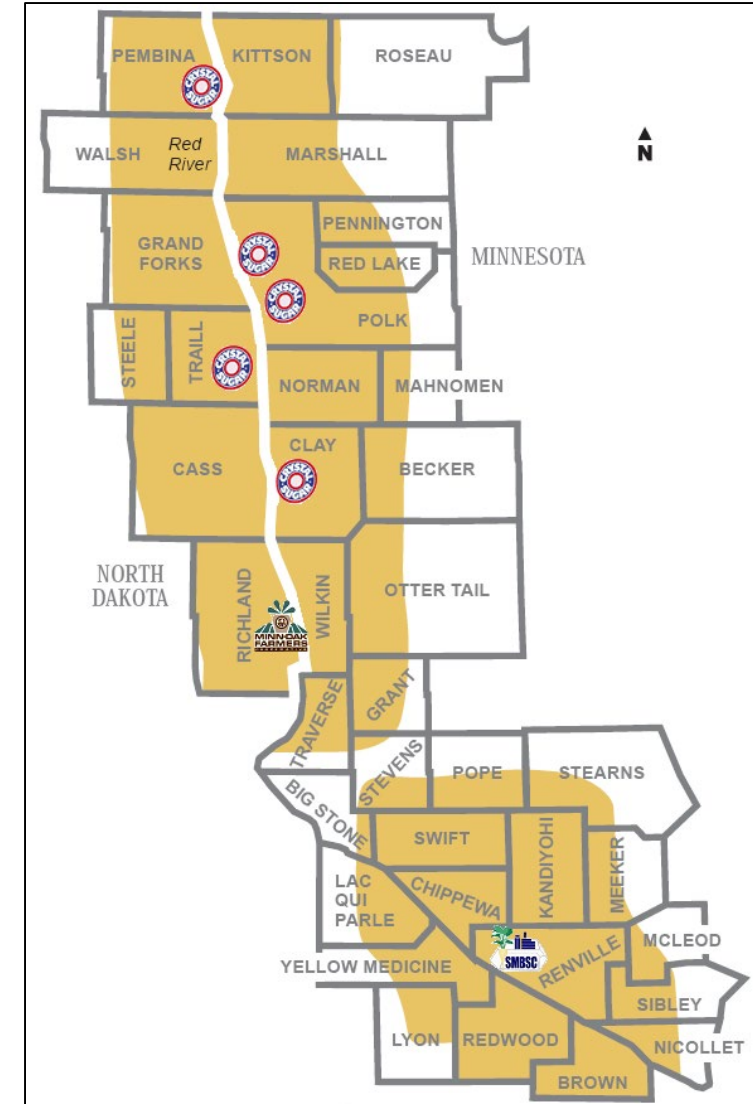
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GR weeds dominate the landscape in Minnesota and North Dakota

- GR **waterhemp** was the most troublesome weed control challenge; on 429,820 acres or 64% of acreage according to 2021 survey
- GR **common ragweed** was 9% overall but 26% in Crookston and EGF factory districts
- GR **kochia** was 22% overall but 57% in Drayton factory district





Kochia

- Life cycle, summer annual
 - One of the first weeds to emerge in spring
- Seed production, 15,000 seeds per plant
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Seed viability, 1 to 2 years
- Many document examples of herbicide resistance
 - ALS (SOA 2)
 - 2,4-D, dicamba, and fluroxypyr (SOA 4)
 - Triazines (5)
 - Glyphosate (SOA 9)
 - PPOs (SOA 14)
 - Multiple resistance in ND, 2+4 + 9, 2+4+9+14





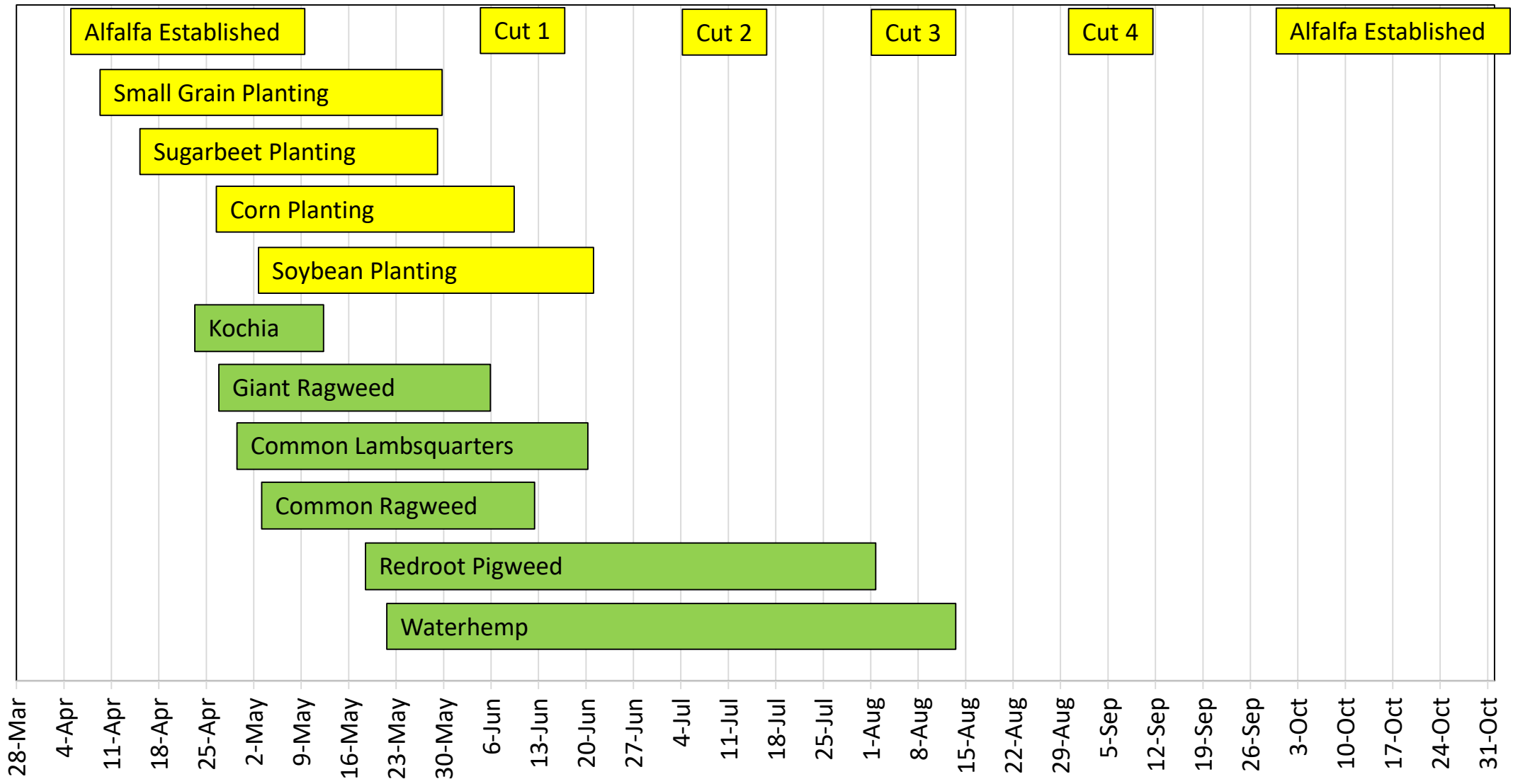
March 26th. The surface 1-inch was thawed and below that it was frozen.
Photo credit, Lee Briese

Key:

Emergence Period

Flowering Period

Crop Planting and Harvesting



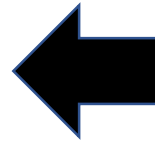
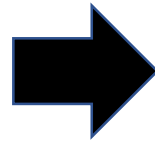
Adapted from Werle et al. 2014, Goplen et al. 2017, Weedometer 2008

Kochia

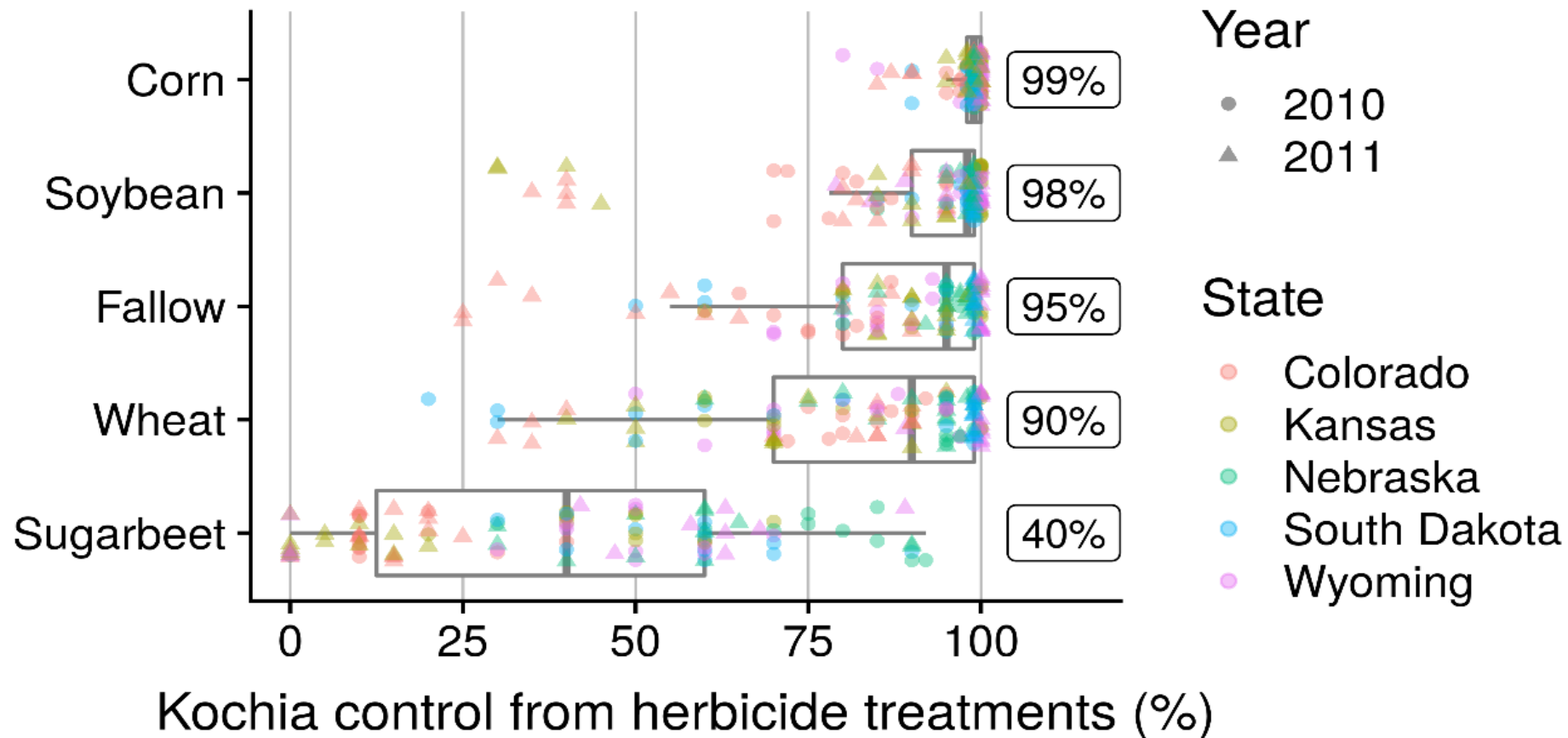
- Life cycle, summer annual
 - One of the first weeds to emerge in spring
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Seed production, 20,000 to 30,000 seeds per plant
- Seed viability, 1 to 2 years
- Many document examples of herbicide resistance
 - ALS (SOA 2)
 - 2,4-D, dicamba, and fluroxypyr (SOA 4)
 - Triazines (5)
 - Glyphosate (SOA 9)
 - PPOs (SOA 14)
 - Multiple resistance in ND, 2+4 + 9, 2+4+9+14



The Crop Sequence in the Red River Valley



Kochia control, 30 days after final application of herbicide treatment





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Image credit: Phil Westa,
Colorado State Univ.



Kochia size at application matters



- dime-size
- 4-leaves



- quarter-size
- 6- to 9-leaves



- too big
- Scout early next year

Kochia control from ethofumesate, Horace ND, 2020

Treatment	Application	Rate	Kochia control	
			28 DAT	35 DAT
		pt /A	------(%)-----	
Ethofumesate	PPI	2	28 d	28 bc
Ethofumesate	PPI	4	53 b	35 b
Ethofumesate	PPI	6	63 ab	55 a
Ethofumesate	PRE	2	25 d	20 c
Ethofumesate	PRE	4	40 c	33 b
Ethofumesate	PRE	6	65 a	53 a
		LSD (0.10)	11	11



Scouting after plant and before sugarbeet emergence

Paraquat might be our best answer for control of emerged kochia in sugarbeet

- Active over a wide range of environmental conditions
 - Cool weather (below 55F) will slow activity
 - Cloudy, overcast weather
 - Cool and cloudy conditions will not affect efficacy
- Herbicide mixtures with fertilizers
- Herbicide mixtures with soil residual herbicides
- Growers are required to complete training provided by the EPA to become certified applicators and apply paraquat products



YORKSHIRE NEWS

For more details of products mentioned in our editorial columns, please use the Editorial Enquiry Coupon with Agrifind Briefing on page 57

DESIGN FOR DAIRYING

SCIENCE in calf production will be demonstrated through work currently being undertaken by no less than eight world-famous research centres at this year's International Dairy Farming Event. Research on weed control in pastures and on European developments in dairy automation will also be illustrated.

These research features form only part of the most comprehensive range of technical and highly practical demonstrations for cheaper and more efficient milk production ever assembled at one time in Britain, say the organisers, the Royal Association of British Dairy Farmers.

The Event is open to members and non-members of the RABDF on Wednesday and Thursday, 9th and 10th May on the Great Yorkshire Showground, near Harrogate.

Research

Some of the ways in which scientists in the agricultural research service are seeking to improve calf production are to be demonstrated through the co-operation of the Agricultural Research Council. Practical application of egg transfer, determining pregnancy through milk analysis, predicting difficult calving and reducing risks of E. coli and salmonella infections are but some of the projects to be featured.

Other research on calf rearing involves the design of buildings for better health in intensive units, feeding, soyabean flour as an alternative to milk proteins, grass diets for young animals and the heritability of blood constituents

affecting high performance. Research on weed-free grassland will also be demonstrated.

Management

Experiments on the most efficient means for rearing herd replacements after the young calf stage will be demonstrated through trials at Great House Experimental Husbandry Farm, which have shown the most economic techniques for calving heifers at 24 months of age.

ADAS, who will be manning an expert advisory panel throughout the Event, will be demonstrating the setting up of a modern dairying system. This is concerned with the installation and choice of equipment including a parlour, collecting yard, dairy, office and cattle handling facilities as well as other vital management factors relevant to economic production.

Other major exhibits are being staged by the Milk Marketing Board, the Farm Buildings Centre, the Agricultural Training Board and commercial firms. Among the RABDF's individual efforts to demonstrate the latest techniques will be research in parlour automation to be seen for the first time in this country.

'There is no doubt that the technical demonstrations at our first Event at Stoneleigh last year were greatly appreciated,' says Frank Francis, RABDF Secretary. 'So great was the interest of our specialist visitors and so detailed their questioning, that our professional advisers were under constant pressure. This year, through an even wider range of exhibits, we are presenting a 'Design for Dairying' that will help all milk producers who are planning the improvement and development of their businesses for the 1980s.'

Ref.: 1348

NFU NEGOTIATE NEW OIL PIPELINE RATES

THE National Farmers Union has negotiated, on behalf of its Yorkshire West Riding and Lincolnshire County Branches a payment in excess of £1.00 per yard run of land for an oil pipeline - the first time a payment in excess of £1.00 has been made. This is for a strip of land 216ft in width.

The negotiations were with the Total Oil Company (Great Britain) which seeks a 99 year lease on the land. The purpose of the lease is to carry a pipeline of either 8in or 10in in diameter of white oil products from Immingham to Leeds. It is hoped to lay the line in 1974.

The total capital payment to an owner of occupier will be £1.10 per yard but where the property is tenanted the owner will receive 75p and the tenant 35p per yard run. The payment is subject to a minimum of £25 to an owner and £15 to an occupier. Ref.: 1372

POULTRY CHAIRMAN

W. D. AVERY of Avery Chickens Ltd., Ottringham, Hull has been appointed chairman of the NFU's poultry committee. Ref.: 1284

EXPORT CONTROL ON POTATOES

A STRONG DEMAND has developed for maincrop potatoes for export. In order to safeguard the supply of potatoes for the home market the Government is, therefore, making the export of potatoes of all kinds subject to temporary licensing control by the Department of Trade and Industry. As in the past, the limitation of exports is being associated with some relaxation of the ban on imports of maincrop ware potatoes. The Department of Trade and Industry is prepared now to consider applications for licences for the import of specific consignments of maincrop potatoes. The present intention is that these measures, which form part of the standing arrangements for the organisation of the potato market, should continue in force until May 31, 1973. Ref.: 1344

GORSE WARNING

THE BURNING of gorse can cause a great deal of harm to wild life, including the nests and eggs of birds. Farmers are therefore being urged by the Ministry to discontinue their gorse burning now that birds in many areas have begun nesting. Ref.: 1276

TO SELL IN ENLARGED AREA

G. & A. BLACKBURN Ltd. of Coningsby, Lincs., distributors of SBM heating equipment, have taken over the Northern Heating and Installation Co. of 130, Westburn Avenue, Kesteven, Yorks. The new Blackburn northern office at Kesteven has enabled the company to greatly extend its selling area to the Scottish border. The northern office is being run by John Knowles who was previously in charge of Northern Heating. He is confident of increasing sales of SBM products in the North. Ref.: 1278

In view of the high cost of feed, methods of controlling the consumption of silage are likely to create a great deal of interest. This electrical feed barrier is from Hoesler's. Ref.: 1349



TURKEY BAN UNLIKELY

THE proposed EEC ban on New York dressed poultry is unlikely to happen, according to Lancashire turkey breeder, Mr. E. W. Webster, of Bickerstaffe, near Ormskirk. He told a meeting of the Anglian Turkey Federation at Wisbech, Essex, that, if turkey producers could show that the New York trade was of special significance to the UK industry, they could ask the EEC to exempt it as a special case.

'We are not alone,' he said. 'We are likely to get the support of France, Italy and perhaps Belgium. Mr. Webster said Britain's entry into the EEC was certain to result in higher standards of hygiene being required in packing stations. But they were likely to be an encumbrance to the trade, not a block.'

'Although most of us agree that hygiene standards need to be stricter,' he said, 'there will be problems if Ministry inspectors carry out the regulations to the letter, for this could put us at a disadvantage compared with some countries in Europe, where packing station practices generally are often far wider of the regulations. Ref.: 1275

SALES AWARD FOR BRADFORD DISTRIBUTORS

THIS YEAR'S Whitmoyer Animal Health Division Distributor Shield for top sales in the UK has gone to Wade & Mitchell. The Bradford company achieved a higher sales figure in its area market than any other Whitmoyer distributor in 1972.

Whitmoyer markets its entire range of animal health and hygiene products through a network of official distributors. The Division's annual award scheme to recognise the greatest individual distributor effort was established in 1964, and comprises two shields: one for highest sales against potential; one for the highest percentage increase in sales.

Wade & Mitchell received their award at a special celebratory dinner held at Bradford's Victoria Hotel. Ref.: 1338

"Beet weeding again this year?"



"You won't believe this, but..."



"I was going to ask you."



"I won't be out of here for at least a month."



"I should be O.K. in about a fortnight."



"How much?"



"He's moved away but, can I be of some help?"



"Oh, didn't you hear?"



"I've got to look after my hands now mate."



"What?"

There is an alternative to hand weeding. A really reliable alternative: Betanal E.

Betanal E is the only effective, proven post-emergence beet weedkiller you can buy.

You can spray it on sugar beet, red beet and mangels as

soon as you see any broad-leaved weeds.

It's perfectly safe on all types of soil (you can spray crops drilled to a stand). At one single dose rate - band or overall.

And it's ideal for use in a planned programme in conjunc-

tion with a pre-emergence spray.

Every year more and more farmers are switching from hard labour to Betanal E. They find it works out cheaper. It's always reliable, and it doesn't make excuses.

Betanal E

Betanal is a registered trademark of Schering, A.G., Berlin Bergkamen



1973

Phenmedipham has had an interesting journey.^a

- 1970. Phenmedipham first registered by Fisons
- 1981. Fisons merged with Boots to become Fisons Boots Company
- 1984. FBC was purchased by Schering and created an ag division called NOR-AM
- 1994. NOR-AM merged with Hoechst-AG and was called AgrEvo
- 1999. AgrEvo merged with Rhone-Poulenc to become Aventis Crop Science
- 2002. Aventis Crop Science was purchased by Bayer to become Bayer Crop Science
- 2022. Phenmedipham acquired by Belchim Crop Protection USA

^aArnold Appleby, Oregon State University, Herbicide Company Genealogy, <https://agsci.oregonstate.edu/sites/agscid7/files/herb-co-genealogy-10-18.pdf>

Response of weeds to Spin-Aid[®] alone or mixtures with ethofumesate

Weeds	Spin-Aid	Spin-Aid + etho
Common lambsquarters	G	G-E
Kochia	G	G-E
Redroot pigweed	P	P
Common ragweed	F	F-G
Wild mustard	G	G-E

E= Excellent (90-99%); G = Good (80-90%); F=Fair (65-80%); P=Poor (40-65%)
(ND Weed Control Guide, 1980)

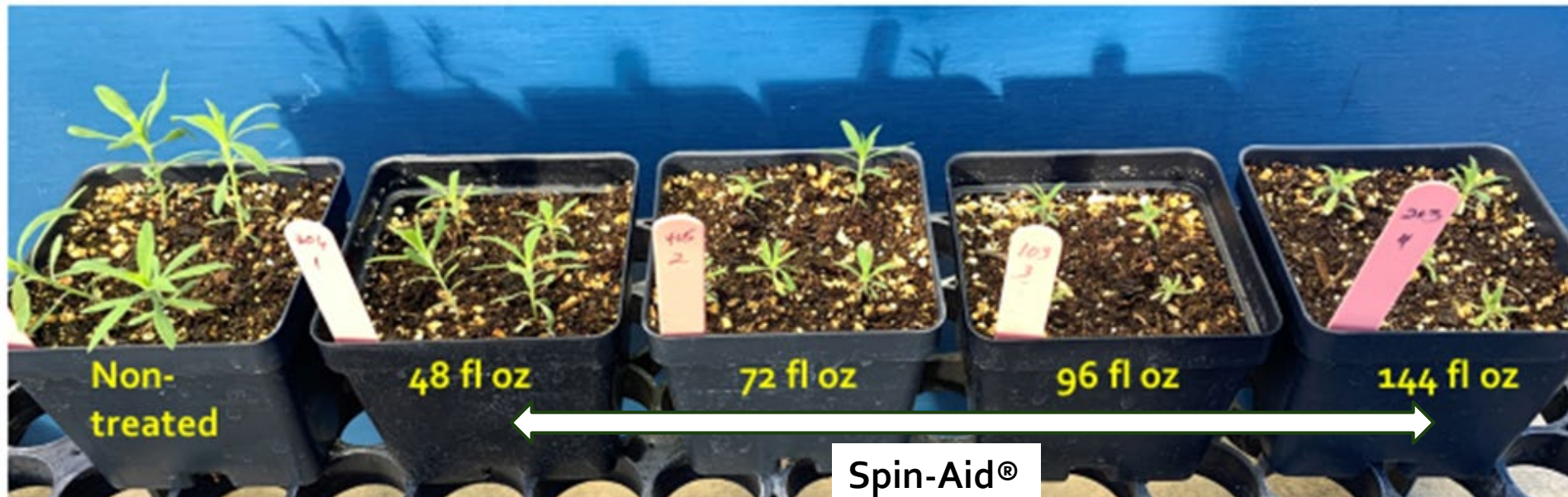
What we know about phenmedipham

- Sugarbeet rapidly metabolize Spin-Aid to less toxic compounds (Hendrick et al. 1974)
- Spin-Aid should be applied at the earliest growth stage possible that is safe to sugarbeet
- Time of day affects the injury level of PSII inhibitors
 - Phytotoxicity is less during cool temps and low light compared with strong sunlight (Abbaspoor and Streibig 2007)
 - Risk of injury is increased by temperatures over 80F and sudden changes from a cool, cloudy environment to a hot, sunny environment (Betamix BMPs).
 - Wait until late afternoon/early evening, when temperatures start to decrease, to make Betamix application (Betamix BMPs).



Redevelopment of Spin-Aid was a combination of historical field, greenhouse, and recent field experiments

- Field experiments beginning in 2016
- Greenhouse experiments in 2023 and 2024
 - Sugarbeet tolerance and kochia control from single and two-times Spin-Aid application
 - Spin-Aid plus ethofumesate
 - Spin-Aid mixed with ethofumesate and glyphosate
- Field experiments in 2023
 - Kochia control from Spin-Aid or Spin-Aid following ethofumesate PRE
 - Common ragweed control
 - Sugarbeet tolerance across genetic backgrounds



2023 Experiment objectives

Evaluate Spin-Aid® for control of kochia, common lambsquarters, and common ragweed

- Determine sugarbeet injury from Spin-Aid® alone or with ethofumesate in single or two-times applications
- Determine kochia, common lambsquarters, and common ragweed control from Spin-Aid® alone and with ethofumesate in single or two-times applications



Materials and Methods

- Locations with natural weed populations
 - Common ragweed, common lambsquarters, and kochia control
- Yield in a trait neutral environments
 - 6-replications
- Application with a bicycle wheel plot sprayer
- 17 GPA through 8002XR nozzles at 35 PSI
- Visible percent sugarbeet growth reduction and weed species control
- Root yield, % sucrose and recoverable sucrose



Sugarbeet yield components in response to Spin-Aid[®] treatment across two locations, 2023.

Factor A Sugarbeet Hybrid	Factor B Spin-Aid [®] rate	Sugarbeet Growth Reduction		Sugarbeet Yield Parameters		
		10 DAAA ^a	39 DAAA	Root Yield	Sucrose	Recoverable Sucrose
	-pt/A-	-----%-----		--Ton/A--	--%--	--lb/A--
CR 137	glyphosate	3	3	40.4	18.1	13,376
CR 137	4.5	31	7	38.7	17.8	12,838
	9	42	10	38.2	18.1	12,424
CR 793	4.5	28	11	37.2	17.7	12,208
	9	42	13	38.6	17.9	12,780
CR 130	4.5	24	5	40.0	18.1	13,337
	9	38	8	40.4	18.2	13,591
LSD (0.05)		NS	NS	NS	NS	NS

^aDAAA=Days after application A

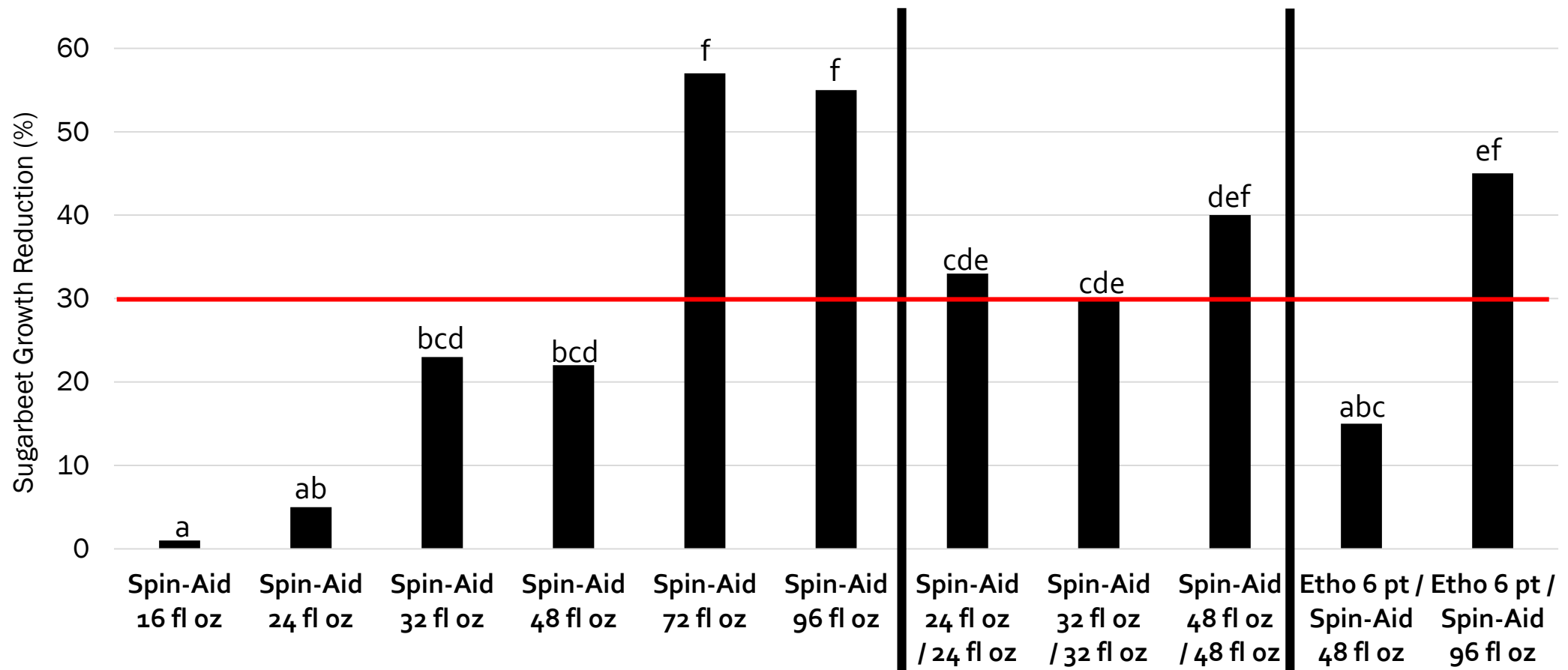
4 DAT



Crookston,
MN



Sugarbeet growth reduction in response to Spin-Aid[®] treatment^a across two locations, 2023^b.



^aTreatments included ethofumesate at 4-12 fl oz/A plus Noble (MSO) at 1.5 pt/A.

^bMeans within a rating timing that do not share any letter are significantly different by the LSD at the 5% level of significance.



Kochia and common ragweed control, 2023.^a

Herbicide treatment ^b	Rate	Kochia Control		Common Ragweed Control	
		10 DAAC ^c	20 DAAC	10 DAAC	20 DAAC
	--fl oz/A--	-----%-----		-----%-----	
Spin-Aid + etho	16 + 4	40 cde	30 c	8 c	5 e
Spin-Aid + etho	24 + 4	30 e	15 c	18 c	0 e
Spin-Aid + etho	32 + 4	33 de	68 a	18 c	5 e
Spin-Aid + etho	48 + 5	71 a-d	63 ab	15 c	28 d
Spin-Aid + etho	72 + 8	73 abc	72 a	43 b	40 cd
Spin-Aid + etho	96 + 11	65 a-d	70 a	60 ab	58 abc
P-Value		0.0027	0.0008	<0.0001	<0.0001

^aMeans within a rating timing that do not share any letter are significantly different by the LSD at the 5% level of significance.

^bTreatments include MSO at 1.5 pt/A.

^cDAAC= Days after application C.

Kochia and common ragweed control, 2023.^a

Herbicide treatment ^b	Rate	Kochia Control		Common Ragweed Control	
		10 DAAC ^c	20 DAAC	10 DAAC	20 DAAC
	--fl oz/A--	-----%-----		-----%-----	
Spin-Aid + etho / Spin-Aid + etho	24 + 4 / 24 + 4	74 abc	83 a	58 ab	50 bc
Spin-Aid + etho / Spin-Aid + etho	32 + 4 / 32 + 4	80 ab	75 a	70 a	65 ab
Spin-Aid + etho / Spin-Aid + etho	48 + 5 / 48 + 5	90 a	78 a	68 a	74 a
Etho / Spin-Aid + etho	96 / 48 + 5	58 bcde	33 bc		
Etho / Spin-Aid + etho	96 / 96 + 11	88 a	80 a		
P-Value		0.0027	0.0008	<0.0001	<0.0001

^aMeans within a rating timing that do not share any letter are significantly different by the LSD at the 5% level of significance.

^bTreatments include MSO at 1.5 pt/A.

^cDAAC= Days after application C.

3-times Spin-Aid Application might be a difference maker

Application A:

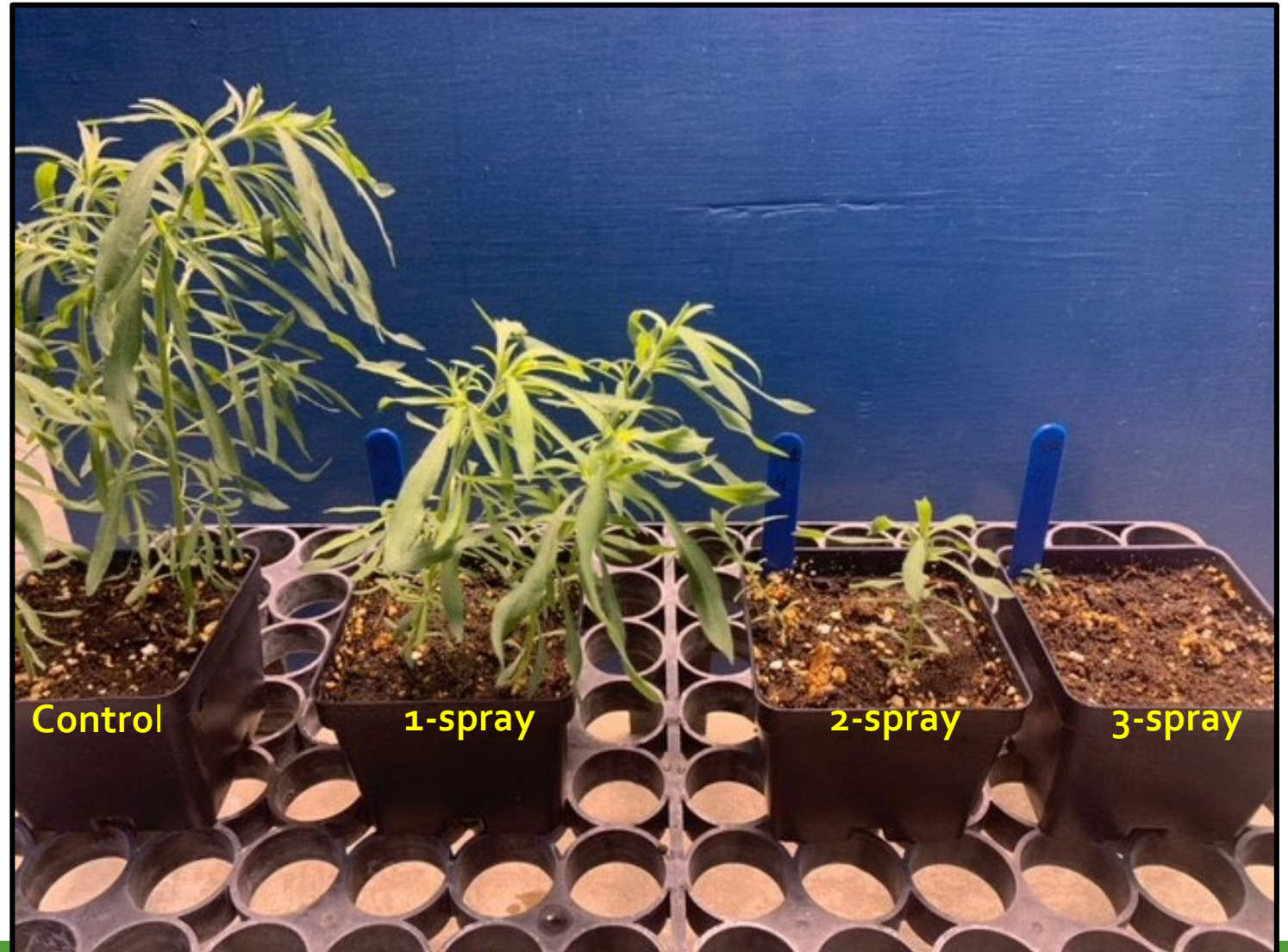
Spin-Aid at 16 fl oz +
etho at 4 fl oz

Application B:

Spin-Aid at 16 or 24 fl oz
+ etho at 4 fl oz

Application C:

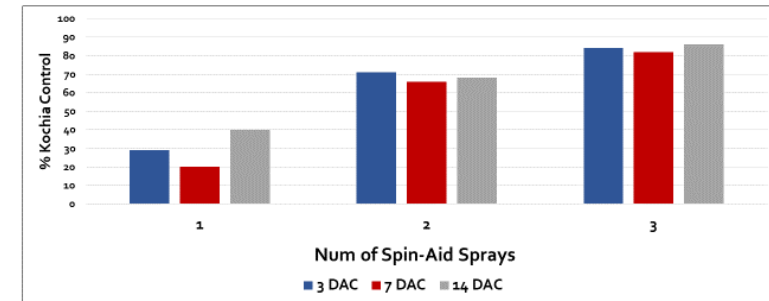
Spin-Aid at 24 or 32 fl oz
+ etho plus 4 fl oz



My sugarbeet have emerged; early POST kochia control recommendations

Kochia control in response to one-time, two-times, or three-times Spin-Aid sprays, Greenhouse, 2023

- Target kochia less than 1-inch tall kochia (dime size)
- Roundup PowerMAX₃ at 25 to 28 fl oz/A with Level Best at 0.25% v/v and AMS at 2.5% v/v
- Roundup PowerMAX₃ at 25 fl oz/A with NIS and AMS plus Spin-Aid and etho
 - Spin-Aid rate is dependent on sugarbeet size
 - Spin-Aid rate is dependent on if a soil residual herbicide was used
 - Plan for repeat Spin-aid applications on 5 day intervals for GR kochia control



Sugarbeet stage	Alone	Following soil residual herbicide
(lf stage)	Spin-Aid + etho (fl oz)	Spin-Aid + etho (fl oz)
Cotyledon	16 + 4	12 + 4
2	24 + 4	16 + 4
4	32 + 4	24 + 4
6	40 + 4	32 + 4

Summary

- No yield component differences across sugarbeet genetic backgrounds
- A single Spin-Aid application will not effectively control kochia
- Apply ethofumesate PRE prior to Spin-Aid applications; apply ethofumesate with Spin-Aid
- Time herbicide applications to kochia size using the appropriate Spin-Aid rate for sugarbeet safety
- Spin-Aid mixed with glyphosate improves control of common lambsquarters that is under moisture stress



Future Research and Activity

- Spin-Aid[®] alone and mixes with clopyralid for common ragweed control
- Adjuvants with Spin-Aid[®], ethofumesate and glyphosate for kochia control
- Update 24(c) local needs label for reduced rates on cotyledon sugarbeet and tank-mix applications with Group 15
- One- two- or three-times Spin-Aid[®] applications with ethofumesate



Thank you for your attention

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