Field Crop & Nutrient Notes
Vol. 1, Issue 7, June 2018
University of California
Agriculture and Natural Resources
Kings, Tulare & Fresno Counties
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2017 Tulare County Blackeye Cowpea Strip Trial

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Trial conditions: In the summer of 2017, a replicated strip trial was established in Tulare County to test Blackeye yield and resistance to Fusarium Wilt of Blackeye Race 4 – *Fusarium oxysporum* f. sp. *Tracheiphilum race 4* – in three experimental lines. Site conditions are described in Table 1.

Strip plots were planted 6 beds wide using the grower's equipment and ran the length of the field (appx. 0.25 mile). Three experimental lines were tested against the local grower standard, Blackeye cultivar CB-46 (Table 2).

Table 1. Strip trial site characteristics

Soil series – texture	Colpien – loam
2016-17 Crop rotation	Wheat-Beans
Row spacing	38"
Planting rate	27 lbs/ac
Inoculated?	Yes
Fertilizer	Foliar micronutrients
Planting date	6/9/17
Cutting date	8/29/17 – 8/31/17
Threshing date	9/15/17
Bean flushes	Single
Herbicide	Dual Magnum + Treflan

Table 2. Experimental line and check variety characteristics

	CB-46	CB-46-RK2	10K-29	N2
Seed qualities	Medium size (0.21 g/seed), cream colored, no splits, non-leaking eyes	Slightly smaller than CB-46	Larger than CB-46	Similar or slightly larger than CB-46
RKN resistance	+	+	/	+
Fusarium Wilt race 4 resistance	-	?	+	?
Lygus tolerance	-	-	-	+

"+" indicates yes or positive, "/" indicates similar traits, "-" indicates no or negative, and "?" indicates more information is needed.

In-season: Early in the season after the first irrigation, young plants began exhibiting moderate to severe yellowing, or chlorosis, of the new leaves (Figure1). There was no difference between the commercial check and experimental lines, but the discoloration pattern tended to follow a soil moisture gradient. That is, the more recently irrigated sets of the field exhibited more severe levels of chlorosis than the earlier sets. Having observed similar symptoms under these conditions, it was determined that the cause was likely temporary iron deficiency induced chlorosis due to saturated soil conditions which creates a reducing, or high pH

Figure 1. Interveinal chlorosis of newly emerged leaves in blackeye.

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environment, limiting iron availability to the plant. As the soil drained, the plants quickly restored color in their leaves and continued to grow normally.

Plant populations between lines varied significantly (**Figure 2**), but it was not determined if this was due to variations in seed size or germination rate. Seed size can have an influence on plant population in the field since the planting plates used for planting all lines used the same size holes and spacing.

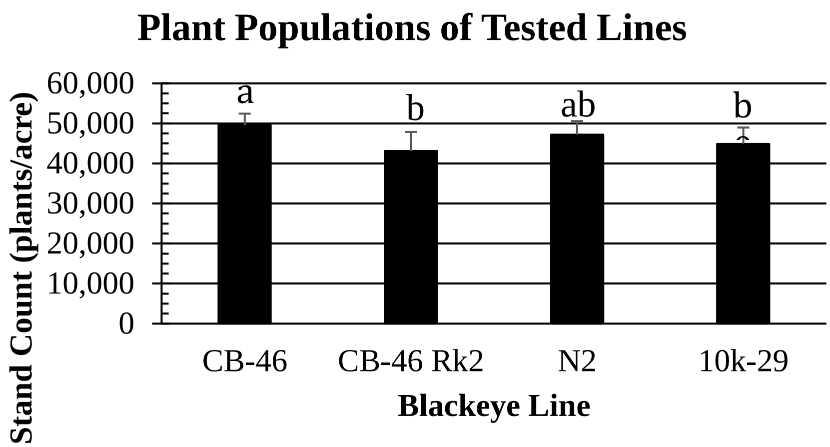

Figure 2. Emerged, established plant population. Error bars represent the standard deviation. Solid bars under the same lower case letters are not significantly different at $\alpha = 0.05$.

Fusarium species were identified within the field, but disease pressure did not reach a damaging level.

Harvest & processing: The harvest in 2017 was of a single-flush crop. There were no significant differences in dirt (pre-cleanout) yield between blackeye lines in 2017, nor were there any significant differences in 2016. Overall, dirt yield in 2016 of the single flush crop was significantly lower (p = 0.001) than in 2017 (**Figure 3**). In 2017, cleanout at the warehouse averaged 17.8% ± 8.7% of the dirt yield weight (Figure 4). One-hundred seed weights were significantly higher (p = 0.01) in 2017 (21.6 g ± 0.7 g) than in 2016 (18.5 g ± 1.1 g). There was a significant interaction (p = 0.02) between year and blackeye line (Figure 5). The interaction is explained by there being no significant difference in one-hundred seed weights in 2016, but a significant difference in 2017. In 2017, the one-hundred seed weight of line 10k-29 (22.7 g ± 2.4 g) was significantly higher (p = 0.003) than all other lines tested.

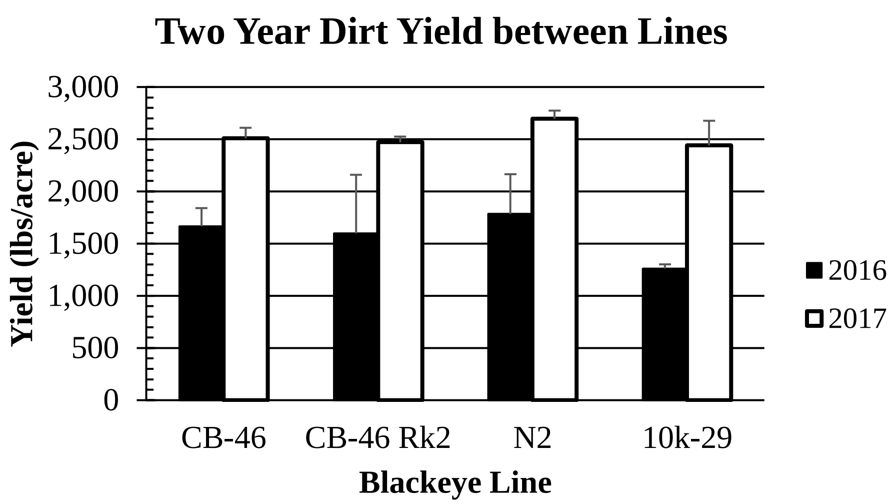

Figure 3. Yield of blackeye lines between last two years. Error bars represent the standard deviation.

Acknowledgements:
These strip trials were funded by the California Dry Bean Advisory Board under a grant received by Dr. Philip Roberts, UC Riverside Nematology Department. Thanks to Dr. Roberts and his post-doctoral researcher, Bao Lam Huynh, for their support of the Tulare strip trials. Thanks to Eric Jewell, student assistant, for his data collection work. Much gratitude goes to cooperating grower, Rick Borges, for providing his time, land, and expertise in growing this blackeye crop. Harvester, Gary Warnock, and Cal Bean and Grain Cooperative warehouse manager, Chad Vanderfeer, for providing invaluable material and logistical support throughout the growing season and bean processing.

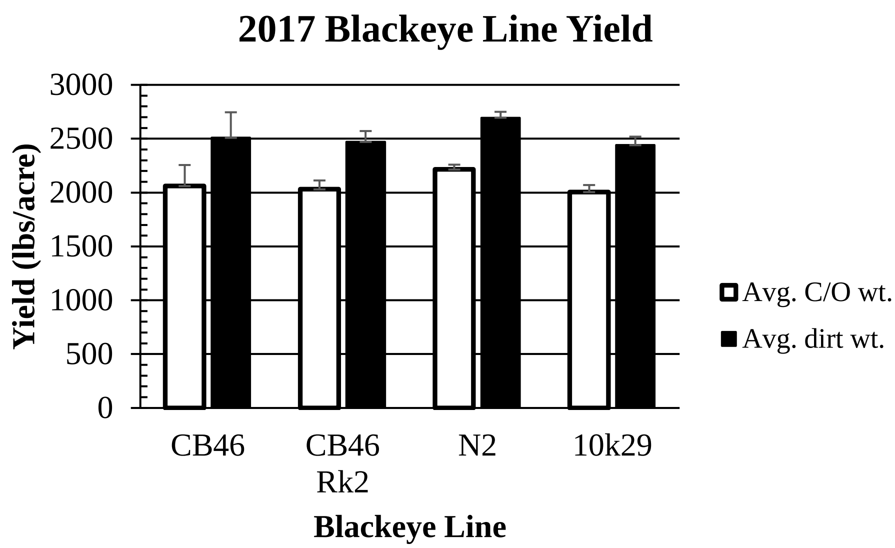

Figure 4. Comparison of cleanout versus dirt yield weights between lines. Error bars represent the standard deviation.

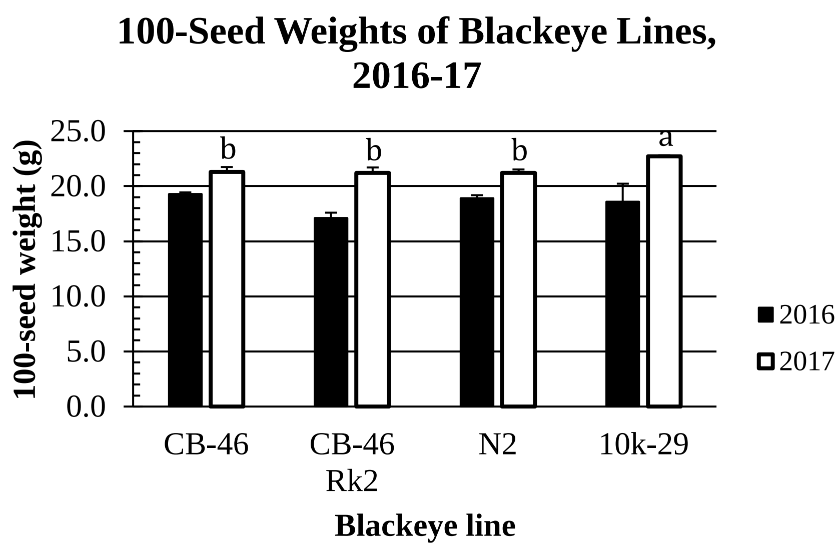

Figure 5. 100-seed weights of blackeye lines in 2016 and 2017. Error bars represent the standard deviation. Solid bars under similar lowercase letters are not significantly different at $\alpha = 0.05$, Tukey HSD.

Sugarcane Aphid of Sorghum – Insecticide Efficacy

Figure 1. Sugarcane aphid on CA forage sorghum leaf.

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Introduction: Sugarcane aphid (SCA) – *Melanaphis sacchari* – is a serious insect pest of sorghum in the US. Infestations of CA forage sorghum first occurred in summer, 2016, in the southern San Joaquin Valley (SJV). Local county Ag Commissioners, UCCE Advisors, and the CDFA confirmed the presence of a SCA as an invasive species in CA after samples were submitted from fields where broad-spectrum insecticide materials showed little to no efficacy at controlling the bug.

The CA sorghum cropping system is unique from the rest of the US in that it is dominated by forage production for dairy animals. Research conducted in the US exists to support pest management recommendations for SCA in sorghum, but it is almost exclusively targeted at grain production. Bowling et al. (2016), studied the effect of sulfoxaflor on SCA in forage sorghum and hay quality and showed that treatment reduced aphid population but did not have an effect on hay quality. It is probable that aphid numbers did not reach sufficient levels to impact hay quality in that study (a maximum of about 25 aphids/leaf was reported). Heguy at al. (2017) studied the impact of SCA infestation of forage sorghum on dairy feed quality at harvest at 16 dairies. Significant reductions in starch and non-fibrous carbohydrate and increases in acid-detergent fiber, ash, and crude protein were reported and probably resulted from severe SCA infestation.

This project aimed to study the impacts of insecticide spray treatments on SCA population, crop yield, and feed quality in forage sorghum in CA for the first time.

Table 1. Trial conditions

Trial parameter	Date/Frequency	Variable
Cultivar:		NK-300
Planted:	6/22/2017	
SCA augmented:	8/10/2017	Crop stage V10
Treated:	8/31/2017	Crop stage: early heading
Harvested:	10/9/2017	Crop stage: dough
Herbicide:	Preplant	Dual Magnum, AAtrex, and Roundup
Cultivated	7/6/2017	
Fertilized	7/14/2017	80 lbs. N/ac
Crop rotation	2016	Alfalfa
Pre-irrigated		8 inches
Irrigated	~ every 10 days	24 inches total

Methods: One acre of sorghum cultivar NK-300 (safened) was planted on June 22, 2017, at 100,000 seed/acre to moisture on 30" beds. Fertilizer, irrigation, and weed management programs were executed to imitate common commercial practices for the region (Table 1).

On August 9, SCA were collected from local commercial fields and distributed onto the sorghum leaves in the research plots. Aphids were allowed to establish in the field and multiply for approximately three weeks before treating.

Insecticide applications were made on August 31, 2017, at heading using a high clearance spray rig with an 8 row boom and drop nozzles. Insecticide treatments are shown in Table 2. Aphid populations were monitored at approximately five day intervals from Aug 31 through harvest.

Table 2. Insecticide treatments.

Treatment	Active ingredient	Rate (fl. oz./ acre)
Untreated control	n/a	n/a
Sivanto Prime	Flupyradifurone	4
Sivanto Prime	Flupyradifurone	7
Transform WG	Sulfoxaflor	1.5
Malathion 57 EC	Malathion	24
Dimethoate 4EC	Dimethoate	16
Lorsban Advanced	Chlorpyrifos	32

Harvest was performed at dough stage on October 8, 2017. Although there was lodging throughout the trial, no significant lodging occurred in harvested portions of the plots. Samples were sent to a forage lab to analyze feed quality.

Results and discussion:

Aphid population. Sivanto Prime applied at the rates of 4 and 7 fl. oz./acre reduced cumulative aphid-days by 78 and 92%, respectively (Table 3[1] & Figure 2). However, this reduction was not significant. The effect of Transform WG applied at 1.5 fl. oz./acre on cumulative aphid-days was similar to the untreated control and broad spectrum materials tested. Insecticides Malathion, Dimethoate and Lorsban Advanced all resulted in less than a 50% reduction in cumulative aphid-days.

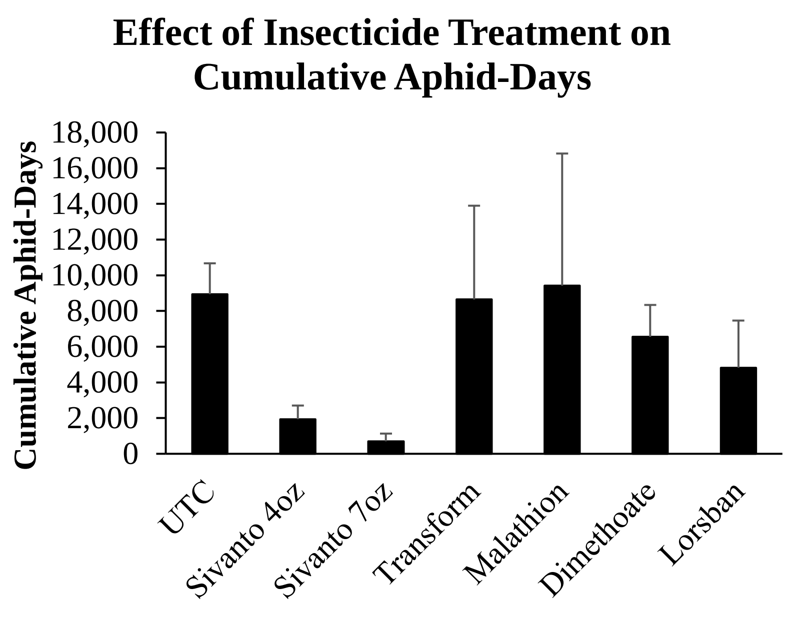

Figure 2. Effect of insecticide treatment on cumulative aphid days. Error bars represent the standard error of the mean.

[1] Tables 3 & 4 are oversized and placed at the end of this article.

Data suggest that Sivanto is currently the best candidate for control of sugarcane aphid in California forage sorghum. This is consistent with data collected from multiple trials on grain sorghum in the southern US. Also consistent with data from the south is that broad spectrum insecticides, although less expensive than Sivanto, do not provide sufficient control to justify their use. We do not think it is appropriate to make any statements regarding the efficacy of Transform from this trial due to the inconsistency between our results and results from research in the south, especially considering that our trial was limited to two replications at one site.

Yield. Treatments with Sivanto Prime applied at 4 and 7 fl. oz./acre had the highest average yields, followed by Dimethoate applied at 16 fl. oz./ac and Transform WG at 1.5 fl. oz./acre (Figure 3). The untreated control, Lorsban Advanced, and Malathion treatments on average yielded less. Only Sivanto Prime at 7 fl. oz./acre significantly outperformed the untreated control, Lorsban, and Malathion treatments.

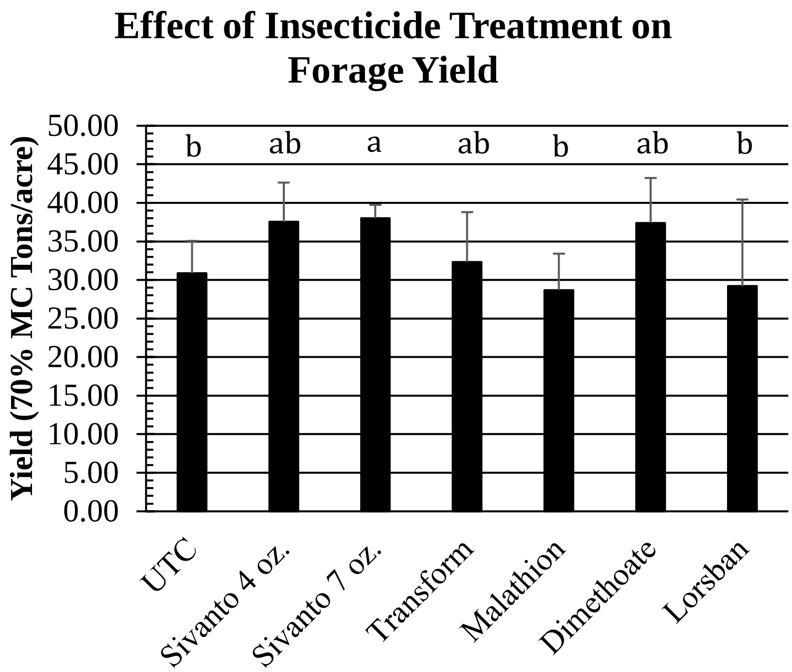

Figure 3. Effect of Insecticide treatment on sorghum yield. Error bars represent the standard deviation. Solid bars under similar lowercase letters are not significantly different at alpha = 0.05, Tukey HSD.

Feed quality. Samples from two replicates of each treatment were sent to Rock River Laboratory to be evaluated by wet chemistry analysis for ash, crude protein, neutral-detergent fiber, 30 hour *in vitro* neutral-detergent fiber digestion, acid-detergent fiber, lignin, and starch. No statistically significant differences were found between treatments for any of the feed quality constituents tested (Table 4).

Acknowledgments

Special thanks to all of the technical support and data collection performed by Stephanie Rill (Research Associate) and Chelsea Gordon (Research Associate). Walter Martinez (Agriculture Technician) is appreciated for preparing and operating the spray rig. This research was financially supported by donations from Bayer CropScience, Dow AgroSciences, and Western Milling.

Table 3. Effects of insecticide treatments on aphid density in forage sorghum

Treatment	Rate (form. prod./acre)	Mean aphids per leaf ± SEM[1]								Cumulative aphid-days
		6 DAT	12 DAT	15 DAT	20 DAT	26 DAT	29 DAT	34 DAT	39 DAT	
UTC	N/A	11 ± 6	292 ± 176	349 ± 246	292 ± 100	647 ± 326	354 ± 234	25 ± 21 ab	28 ± 10	8942 ± 1728
Sivanto Prime	4 fl oz	16 ± 16	105 ± 104	101 ± 98	63 ± 55	8 ± 6	54 ± 52	37 ± 33 ab	57 ± 56	1940 ± 764
Sivanto Prime	7 fl oz	12 ± 12	34 ± 34	67 ± 67	1 ± 1	2 ± 0.2	8 ± 6	4 ± 1 a	8 ± 6	700 ± 432
Transform WG	1.5 fl oz	82 ± 74	756± 752	462 ± 453	44 ± 39	143 ± 57	2 ± 0.2	120 ± 7 bc	59 ± 29	8643 ± 5256
Malathion 57%	24 fl oz	48 ± 40	141 ± 140	231 ± 225	229 ± 180	352 ± 337	733 ± 729	265 ± 82 c	129 ± 127	9419 ± 7402
Dimethoate 4EC	16 fl oz	35 ± 19	164 ± 123	336 ± 179	426 ± 364	285 ± 187	87 ± 70	30 ± 25 ab	13 ± 7	6553 ± 1786
Lorsban Adv.	32 fl oz	1 ± 0.4	25 ± 25	54 ± 50.	41.9 ± 34	78 ± 49	618 ± 389	191 ± 82 c	192 ± 19	4824 ± 2639

Means ± SEM within a column followed by identical lowercase letters are not significantly different according to Fisher's LSD[4] at α = 0.05.

[1] Standard error of the mean

[2] Days after treatment

Table 4. Proximal analyses of feed quality constituents.

Treatment	CP	ADF	aNDF	Fat (EE)	Ash	Lignin	Starch	NDFD 30	uNDF30om	NFC
	----------% DM ± SEM----------									
UTC	9.2 ± 0.13	31.2 ± 2.59	44.4 ± 3.55	2.4 ± 0.19	10.2 ± 0.1	5.5 ± 0.75	19.0 ± 8.88	28.5 ± 8.15	27.9 ± 1.01	35.3 ± 3.44
Sivanto	8.7 ± 0.18	31.1 ± 2.00	41.7 ± 2.94	2.1 ± 0.02	10.1 ± 0.05	6.3 ± 0.73	23.5 ± 2.58	34.6 ± 3.70	24.0 ± 0.35	38.8 ± 2.65
Sivanto	8.5 ± 0.29	32.3 ± 0.21	43.3 ± 1.11	2.3 ± 0.10	10.2 ± 0.24	5.4 ± 0.76	23.6 ± 0.68	33.4 ± 3.17	25.5 ± 1.92	37.1 ± 1.06
Transform	8.8 ± 0.60	29.2 ± 1.31	40.1 ± 0.17	1.9 ± 0.14	9.7 ± 0.01	4.5 ± 0.79	26.9 ± 3.54	32.3 ± 2.15	24.0 ± 0.90	40.9 ± 0.79
Malathion	7.4 ± 2.02	32.5 ± 0.28	47.1 ± 2.80	2.3 ± 0.35	10.2 ± 1.18	4.8 ± 1.37	15.0 ± 2.59	40.0 ± 3.09	24.9 ± 0.33	34.6 ± 0.12
Dimethoate	8.2 ± 0.66	33.4 ± 2.27	46.2 ± 4.01	2.1 ± 0.16	10.2 ± 0.06	5.5 ± 1.29	16.0 ± 9.41	37.6 ± 5.39	25.5 ± 0.13	34.8 ± 3.28
Lorsban	8.9 ± 0.59	29.2 ± 0.23	39.4 ± 0.80	2.2 ± 0.02	9.7 ± 0.00	4.7 ± 1.19	26.7 ± 2.45	33.6 ± 0.70	23.1 ± 0.23	41.2 ± 1.27

No statistical differences were found between treatments at α = 0.05.

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June 2018

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