Imperial County Agricultural Briefs

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Features from your Advisors

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WEED CONTROL EFFICACY AND CROP SAFETY OF PREFAR AND DACTHAL HERBICIDES APPLIED OVER BROCCOLI AND CELERY TRANSPLANTS

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Introduction

Broccoli (*Brassica oleracea*) is a major vegetable crop for the low desert region of the US and the Imperial Valley. Celery (*Apium graveolens L.*) is also grown in Imperial valley, but at low acreages. Vegetable growers of the Imperial Valley are faced with various pest problems on their broccoli and celery production fields. Weeds are among the major pests for vegetable production, including broccoli and celery. Many winter weeds emerge during winter vegetable production months and compete with the crops. If weeds are not controlled effectively and on time, vegetable crop yields are significantly reduced. Therefore, weeds should be controlled in order to grow healthy broccoli and celery crops and optimize their respective marketable yields. Of the various weed control methods, herbicides are widely adopted especially in the conventional vegetable production systems in the low desert. The major objectives of the project were to evaluate weed control efficacies of Prefar (active ingredient *Bensulide*) and Dacthal (active ingredient *dimethyl tetrachloroterephthalate*) herbicides and to investigate phytotoxicity effects of these herbicide treatments applied with various methods. The project was initiated by Dr. Devkota and later inherited by Dr. Bachie, upon Dr. Devkota' s transfer to another institution

Materials and Methods

The field experiment was conducted at the University of California Desert Research and Extension Center (UC DREC), located in Holtville during Fall and Winter seasons of the 2018-2019 vegetable production cycles. A 0.25 acre field was prepared into 40" wide beds on which broccoli and celery seedlings were transplanted. Both crops were machine transplanted (Figure 1) on October 19, 2018 in two lines per bed when the seedlings were at 3-4 leaf stage and at 7" spacing between plants. Each treatment plot was 30ft long. All trial plots were laid out in a Randomized Complete Block Design (RCBD) with four replications for each of the treatments. Both crops were treated as follows;

1. Untreated Check: 15 feet of the 30 ft row of the untreated check was weeded manually
2. Prefar 4-E Herbicide at 6qt/A – applied with backpack sprayer (Prefar Spray)
3. Prefar 4-E Herbicide at 6qt/A – applied with chemigation (Prefar chemigation)
4. Dacthal herbicide at 12 pt/A – applied with backpack sprayer (Dacthal spray)

Except for the Prefar chemigation plots, all treatment plots were 8 beds: 4 of the beds with broccoli and the other 4 beds with celery. On the same day of seedling transplanting, Prefar 4-E and Dacthal herbicide spray treatments were applied at 25 gallons per acre using a CO_2 backpack sprayer. Herbicide treatments were sprayed over the transplants and sprinkler irrigated (water only) for 10 hours on the next day of herbicide spray.

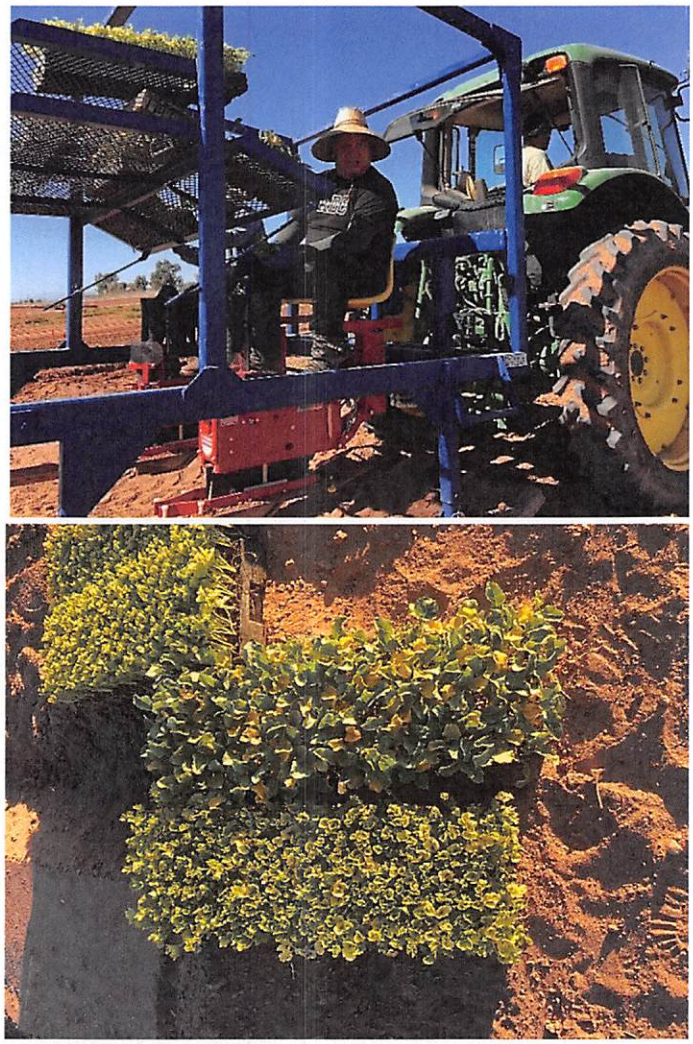

Figure 1: Transplanting method for both Broccoli and Celery

For the Prefar chemigation treatment, seedlings were planted on 12 beds: 6 with broccoli and 6 with celery. Unlike the 30 ft long bed length for spray treatments, the Prefar chemigation plots were on a 60ft long bed. Chemigation treatment was applied by running a water only sprinkler irrigation for 30 minutes and then mixing the Prefar 4-E herbicide without adjuvants into the sprinkler system and irrigating for 60 minutes more. Following 60 minutes of Prefar chemigation, a water only sprinkler irrigation was applied for 10 hours. The treatment plots for Prefar chemigation and spray treatment plots were separated with 2 beds (80" alley) to serve as buffer and avoid any contamination from the sprinkler applied Prefar chemigation.

The next day after all herbicide treatment applications, all treatment plots were sprinkler irrigated for 14 hours, delivering a total of 2 inch/acre water to incorporate and activate the herbicides (*Devkota & Bachie, 2018*).

Subsequently, we used standard growers furrow irrigation and fertilization practices for the rest of crop growth periods and treatment evaluation periods.

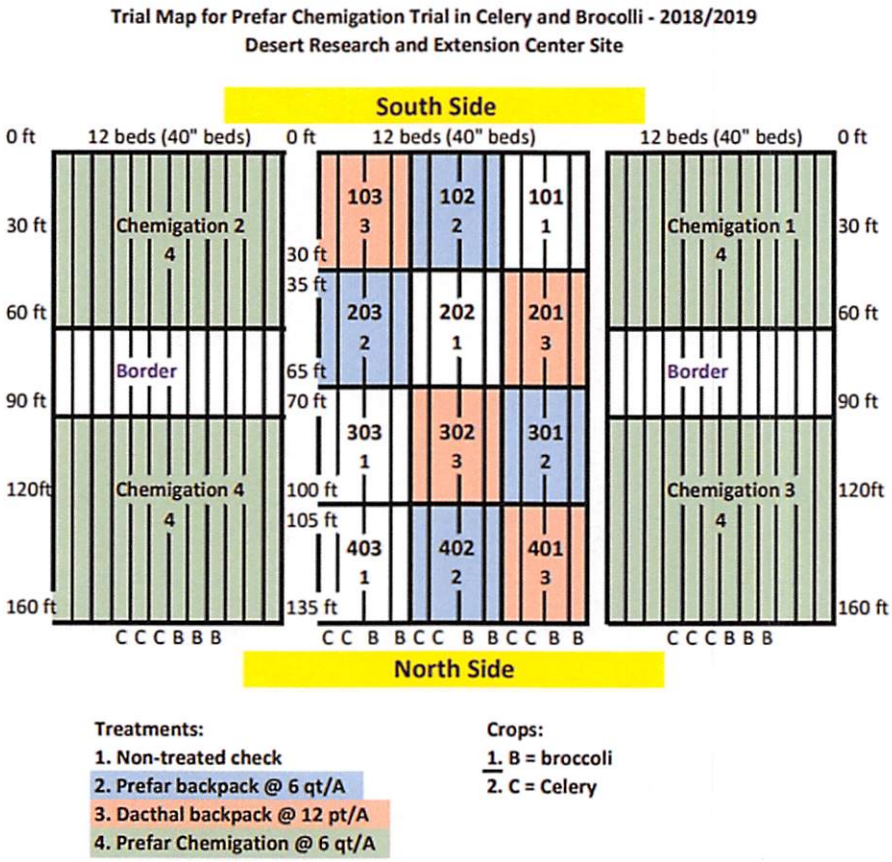

Figure 2 Treatment plot layout

Weed control efficacy and crop injury data for all treatments and treatment plots were collected. For weed control, we observed if the weeds surrounding the crop showed any signs of phytotoxicity from the applied herbicide. We also took weed density data for each plot accounting for visual area coverage ratings ranging from 0 to 100 in increments of 10; with 0 being no weed coverage and 100 being full weed coverage.
Along with weed control, the crops were also observed for any crop injury or signs of herbicide phytotoxicity. The crop injury rating scale was established on a percentage basis from 0 to 100 in increments of 5; with 0 = no visible effects of injury and 100 = total crop death. We rated crop phytotoxicity based on uniformity, discoloration, stunting and any other visible symptoms. Crop injury was rated every week until harvest. Crop yield data was collected at their respective crop maturity stages of the two crops. Broccoli was harvested for yield determination in late January and celery was harvested in mid-February. All treatment plots were harvested manually from the inner 5ft x 40in portion of the beds from each treatment plot to avoid any spatial or

inter-plot effects. For each of the sampling areas, the number of broccoli heads and celery bunches were counted and collectively weighed to generate the average weight of broccoli head or celery bundle from each

plot. All collected data were analyzed for statistical significance using JMP 14 Statistical program by SAS. Treatment means were separated using Adjusted Tukey's test and compared for mean differences.

Results and Discussion

Herbicide crop injury / Phytotoxicity responses;

Evaluations for crop phytotoxicity of the herbicides were conducted on a regular basis after treatment applications. Crop herbicide injury ratings (combined rating for all herbicide application types) were observed 1 and 2 weeks after herbicide treatments (WAT) followed by 6-week gap of no crop injury observation. Weekly crop injury rating resumed from 8 to 12 WAT. Celery, crop injury from herbicides was highest (about 30% crop injury level) at 9 weeks after herbicide treatments (Figure 3). Crop injury response of celery subsided on the 10th week although, slightly higher injury rating was observed during 11 and 12 WAT (Figure 3). Unlike Celery, herbicide injury to Broccoli was highest at 1 and 2 WAT with no eminent injury levels in the subsequent injury rating weeks (Figure 3), indicating that younger broccoli transplants are more susceptible to herbicide chemical damages than the established crop. Despite signs of phytotoxicity damages on both celery and broccoli, none of the crop transplants showed crop mortality due to herbicide phytotoxicity. Affected Celery crops showed signs of phytotoxicity, such as stunting and lack of uniformity, for a longer period than the broccoli crop (Figure 3).

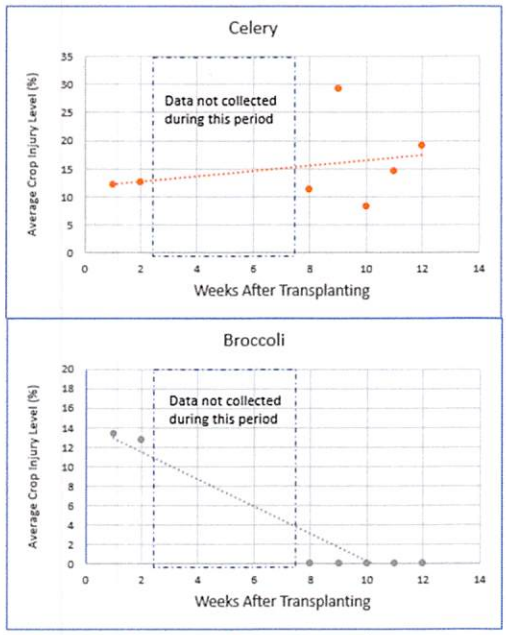

Figure 3: Average Crop Injury Ratings in all chemically treated plots by Week (dots show the injury levels)

The overall (averaged over 7-week ratings) herbicide injury levels are shown in Figure 4. Results show that all herbicide treatments showed some degree of crop injury, relative to the untreated control (Figure 4), that had zero injury level. Prefar chemigation however, caused the least crop injury, in both broccoli and celery (Figure 4) compared to the dacthal or prefar sprays. There were more visible crop phytotoxicity and damages from the backpack spray herbicide treatments than the Prefar chemigated fields for both broccoli and celery (Figure 4). There is approximately 1.5 -2.5% more injury to broccoli and about 13-14% more injury to celery from dacthal and prefar sprays respectively, relative to the prefar chemigated broccoli and celery (Figure 4). Crop injury

rating (different scales for broccoli and celery) differences among treatments was statistically significant for broccoli ($p=0.0097$) and for celery ($p < 0.0001$). These crop injury rating differences are from the methods of herbicide applications (backpack spray vs chemigation), and not due to the volume of applied herbicides (both

application methods used the same volume of herbicide ai). In general, our findings suggest that herbicide chemigation is an a more effective weed control and safer method of herbicide application to avoid crop injury / less crop toxicity and damage than the other methods of herbicide applications.

Effects of herbicide application methods on weed density and control

The efficacy of herbicide treatment methods for weed control were determined through visual observations and ratings of weed species. Because, only celery plots exhibited weed densities higher than 5%, most of our evaluation of weed density (percentage of field covered with weeds)

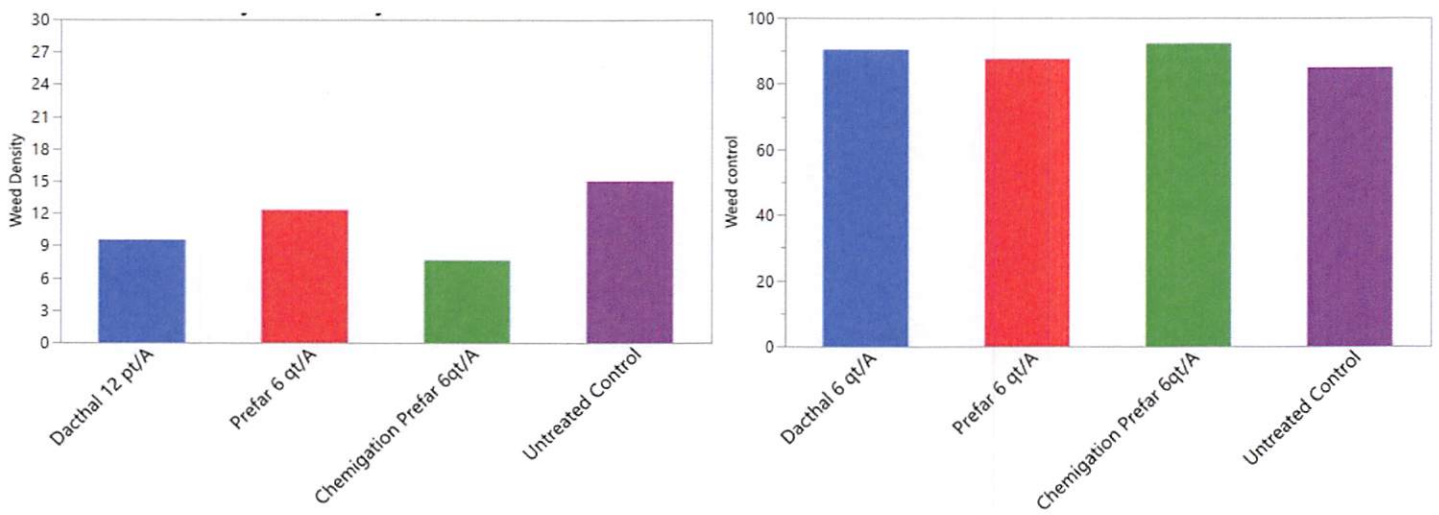

Figure 5: Density of weeds (left) and weed control ratings (right) in celery under different treatments

and weed control levels (percentage of field not covered with weeds) were done only on celery data and not broccoli. It should be noted that the untreated control plots were manually hand weeded on a regular basis, although it is not herbicide treated. The other plots were herbicide treated, but not supplemented with hand weeding. Weed density and control ratings were done 7 days after the initial manual hand weeding. Also, note that weed control ratings are derived from weed density ratings, hence are somewhat interrelated. As can be seen in Figure 5, weed control efficacy of the different herbicide treatments in celery as evaluated through weed density were not significantly different from each other ($p>0.05$) or from the manually weeded, herbicide untreated control. Herbicides were applied only once after transplant, and these treatments did not show any

difference in their weed control capabilities than a regular manual weeding (Figure 5). These differences may have been visible, had the comparison was made to a non-hand weeded and non-herbicide treated plots. The later treatment was not included in our experimental trials. Some notable weed species within the treatment plots were nettle-leaf goosefoot (*Chenopodiastrum murale*), common purslane (*Portulaca oleracea*), and milk

thistle (*Lactuca serriola*). The most dominant and common weeds were the goosefoot and purslane or creeping thistle plant occurring in at least 20% of the plots.

Broccoli Yield: Broccoli head weights from the different treatment plots were not significantly different ($p = 0.4141$) among herbicide treatments and the untreated control (Figure 6). However, comparisons of average broccoli head weights showed relative yield increases of 80 grams (22.8%) and 130 grams (37%) from Dacthal and Prefar sprayed and prefar chemigated broccoli plots respectively, compared to the untreated control (Figure 6), although these differences were not statistically significant The absence of statistically significant yield difference between the untreated and herbicide treated broccoli fields may be attributed to the fast broader leaf and canopy developments of broccoli and outcompeting weeds for sunlight. It may also be attributed to the low percentage of crop injury from herbicide treatments (Figure 3)

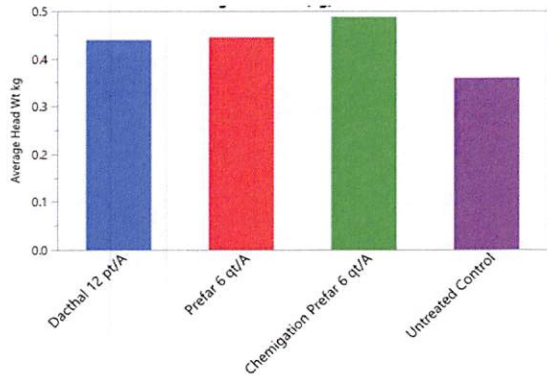

Figure 6: Average head weight (kg) of broccoli for the different herbicide

Celery Yield: Unlike broccoli, the variation in celery yield (bunch weight) differences among treatments was significant ($p = 0.0002$). Celery exhibited the most significant yield reduction under the un-weeded control (neither herbicide treated nor hand weeded). On the other hand, the untreated control plots (herbicide untreated, but manually hand weeded) produced slightly higher weight celery bunches than dacthal or prefar sprayed plots (Figure 7), which may have been due to herbicide spray injuries to celery.

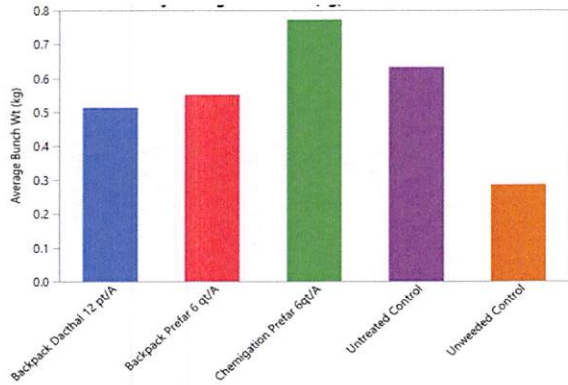

Figure 7: Average celery bunch weight (kg) for the different herbicide treatments

Consistent with the lower crop toxicity effects (Figure 4), prefar chemigated Celery produced greater biomass (higher weight bunches) than the celery from all other treatment plots (Figure 7). Herbicide untreated and un-weeded treatment produced less than a third of the biomass of celery harvested

from the chemigation plots. Yield variation and statistically significant differences between yield of celery treated with different herbicide applications, as opposed to the responses of broccoli crops indicate that celery may be more susceptible to weed competition than broccoli. This variation between susceptibility to weed competition may be attributed to the slow growth and slow canopy formation of celery compared to the broader leaves and fast canopy closure of broccoli. However, like broccoli crops, Celery is most productive under Prefar chemigation treatment (Figure 7).

Summary and conclusions

In summary, weeds emerged in the untreated control plots of both broccoli and celery crops two weeks after seedling transplanting. At two weeks after transplant however, no weeds emerged in any of the herbicide treated plots. Differences in weed emergence between untreated and herbicide treated plots, indicate that early application of herbicides could suppress, and delay weed emergence. Chemigation with Prefar-4E showed best ratings for weed control. In this study, chemigation was also the safest method of herbicide application as it showed the lowest crop phytotoxicity effect. Prefar spray application also had the same weed control efficacy as the conventionally used Dacthal herbicide spray. The two spray herbicide treatments exhibited some crop injury in celery and broccoli. Crop herbicide phytotoxicity may have been the reason for celery crop stunting in herbicide sprayed treatment plots. Overall, herbicide treated fields showed similar effect on weed control, but gave higher marketable crop yields compared to the herbicide untreated, but hand weeded fields. The highest crop yield, in both broccoli and celery was harvested from the Prefar chemigation fields. Prefar chemigation provided higher celery biomass yield than any other treatments. In general, chemigation with prefar resulted in lower weed density, provided the highest weed control and caused the least crop injury, making it the most promising method of prefar herbicide application.

Results of the first and 2nd week crop injury and weed control is published in Devkota P. and O. Bachie. 2018. Evaluation of Post-Transplant Application of Prefar 4-E Herbicide on Broccoli and Celery. Imperial Agricultural brief: 21 (10) 164-166. http://ceimperial.ucanr.edu/newsletters/Ag_Briefs77284.pdf

PRELIMINARY ESTIMATION OF DEHYDRATOR ONION CROP WATER NEEDS IN THE IMPERIAL VALLEY

Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial and Riverside Counties

Introduction. California is the largest onion (*Allium cepa* L.) producer in the U.S. and is the only state that produces both spring and summer-harvested onions. Bulb onions for dehydrator processing, which is simply called dehydrator onion, are produced throughout California with main production areas of Imperial, Kern, Fresno, Siskiyou, and Modoc counties. There was nearly 8,300-acre total dehydrator onion production in the Imperial Valley in April 2019 (IID monthly crop acreage report).

Fig. 1. The experimental dehydrator onion fields. The top picture shows the sprinkler irrigated field during an irrigation event and the bottom picture shows the drip irrigated field on March 5th, 2019.

Overhead sprinklers are typically used for germination and stand establishment of onion fields. After emergence, the crop is usually irrigated by drip or furrow. Some growers use drip irrigation for the entire crop season including plant stand establishment. Since dehydrator onion has a large acreage and is a six-seven-month crop in the Imperial Valley, irrigation management of this shallow root crop is critical. The different irrigation practices would require to develop accurate crop water use information and recommendations on irrigation management for this crop. I am conducting an ongoing study aimed at developing practical information on irrigation management of dehydrator onions in various soil types and farming practices in the Imperial Valley. This article presents the preliminary findings of the 2018-2019 crop season study at two commercial fields.

Field measurements. This experiment was conducted in two commercial dehydrator onion fields with Meloland and Holtville loam soil types in Brawley, California during 2018-2019 cropping season (Fig. 1). One of the fields was irrigated by sprinkler system and the other was irrigated by drip system (driplines installed at

the 1.5-inch depth) the entire crop season. Both fields were planted the second week of November 2018 on a 40-inch bed, fix rows per bed with a spacing of 2.5-inch between planting lines. The sprinkler and drip fields were harvested the second week of May and the first week of June 2019, respectively.

The actual crop water use (actual crop ET or ET_a) was measured using the residual of energy balance method with a combination of surface renewal and eddy covariance equipment (Fig. 2). The reference ET (ET_o, as well-watered grass crop water use) was derived from Spatial CIMIS (https://cimis.water.ca.gov). Spatial CIMIS combines remotely sensed satellite data with traditional CIMIS station data to produce more accurate maps of ET_o on a 2-km grid, which provides a better estimate of ET_o for the individual fields. The equation of $K_a=ET_a/ET_o$ was used to determine the actual crop coefficient (K_a) values of onion. Watermark soil moisture sensors were installed at multiple depths to monitor soil water status on a continuous basis.

Fig. 2. Fully automated surface renewal and eddy covariance ET station at the experimental field.

Dehydrator onion crop water use. Daily actual crop ET from the early season through the late season for each of the experimental fields is presented in Fig. 3. Variable values of onion crop ET on a daily basis were observed with a wide range of 0.001 inch/day to 0.32 inch/day in the sprinkler field, and of 0.001 inch/day to 0.29 inch/day in the drip field. In the sprinkler irrigated field, an average of 0.06, 0.13 and 0.18 inch/day was observed as crop water use during early-season (planting through late-December), mid-season (January through mid-April) and late-season (last 20 days before harvest), respectively. These values were determined 0.04, 0.13, and 0.17 inch/day during early-season, mid-season, and late-season, respectively in the drip irrigated field.

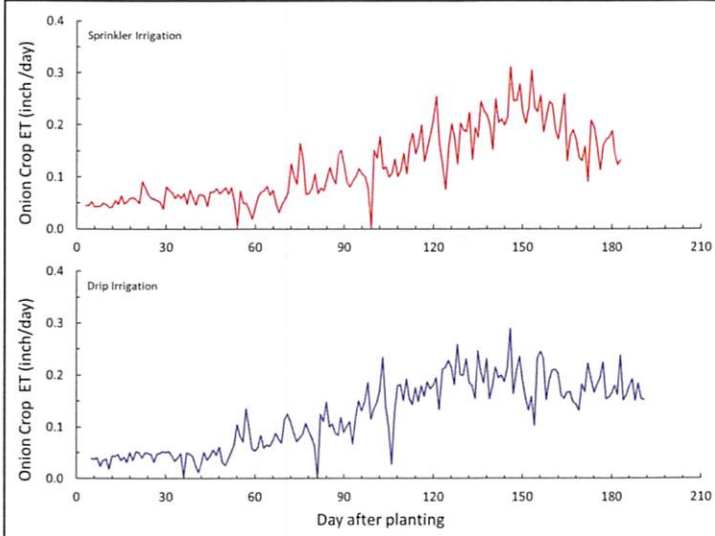

Fig. 3. Actual daily onion ET at the experimental fields

The crop season of the drip field was 16 days longer than the sprinkler field. The cumulative onion crop water use of the drip irrigated field was 23.1-inch, about 1.1-inch greater than the cumulative crop water use of the sprinkler irrigated field, which was 22.-inch.

Dehydrator onion crop coefficients. Throughout crop development, daily onion K_a varied from 0.3 to 1.3 in the sprinkler irrigated field and from 0.3 to 1.1 in the drip irrigated field (Fig. 4). More variable crop coefficient values were observed in the sprinkler irrigated field, especially in the mid-season. Growth stage-specific K_a for the sprinkler irrigated onion field was 0.40 at seedling emergence, 0.90 at bulb development, and 0.68 at dry leaf stage (Table 1). The K_a values for the drip irrigated onion field were 0.40 at emergence, 0.84 at bulb development, and 0.61 at dry leaf stage. Overall, lower crop coefficient values were determined for the drip irrigated onion field compared with the sprinkler irrigated field. It may differ depending on soil type and irrigation water management. The soil moisture data collected from the topsoil (6-24 inches depth) demonstrated that the plant was not under water stress throughout the crop season in any of the experimental fields. The average soil water potential of the topsoil was kept lower than 25 centibars throughout the crop season, and the soil occasionally had saturated conditions in the sprinkler irrigated field.

The K_a values obtained for dehydrator onion in this study are smaller than those from the Food and Agricultural Organization (FAO) for onions. These proposed crop coefficient values can be used and tested subsequently to estimate a seasonal crop water uses for dehydrator onion in the Imperial Valley. However, the proposed crop coefficient values are preliminary and need to be verified through more data collection during the upcoming years.

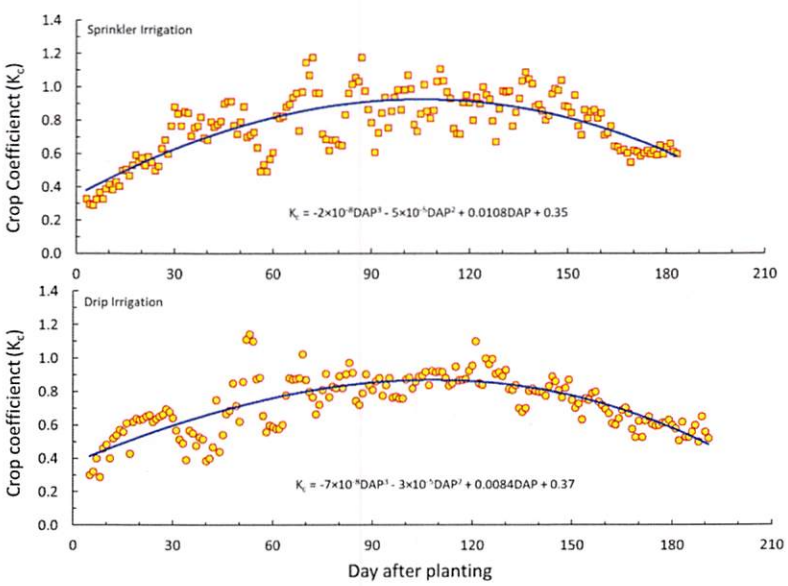

Fig. 4. Daily onion crop coefficient values at the experimental fields. The values are presented for day after planting (DAP). The third polynomial curves retrieved predict the daily crop coefficient values as a function of days after planting.

Table 1. Growth stage onion crop coefficient values determined using the data of sprinkler and drip irrigated fields.

Growth stage	DAP*	K_a (Sprinkler)	K_a (Drip)
Emergence (early season)	0-30	0.40	0.40
Two/three leaves – Bulb development (mid-season)	45-165	0.90	0.84
Bulb fully developed – Dry leaf stage (late-season)	170-harvest	0.68	0.62

* Days after planting

Preliminary estimation of dehydrator onion crop water needs. Onions require frequent irrigation throughout the crop season since the plant root system is shallow and very little water is extracted from soil depth of more than 2 feet. Most crop water need is extracted from the topsoil (12-inch). In addition, onion roots are mostly non- adventitious (branching), and all roots originate at the stem or basal plate of the plant. Keeping the upper soil areas moist is required to stimulate healthy onion root growth. Onions have low capacity for of reducing their leaf water potential by osmotic adjustment to compensate less water availability at the root, whether caused by dry soil or salinity issues. The amount and frequency of irrigation water depends on the irrigation practice, soil type and conditions, and temperature. For optimal plant growth, it is recommended to irrigate onion fields when 25% of the available water in the top 2 feet of soil is depleted.

The proposed crop coefficients for sprinkler and drip irrigation practices in this study and the average of long-term daily ET_o (1997-2017) from CIMIS station in Meloland (CIMIS#87) were used to estimate seasonal crop water use for dehydrator onion production in the Imperial Valley. A period of 210-day (early November through late May) was considered as the typical crop season of onions. Consequently, a seasonal crop water use (crop ET) of 29-inch (2.4 ac-ft/ac) and 26-inch (2.2 ac-ft/ac) was estimated for dehydrator onion crop irrigated by sprinkler and drip, respectively. This amount may vary due to irrigation management and farming practices, soil type and conditions, and the length of crop season.

Excess irrigation can be considered beneficial water use for salinity management in the Imperial Valley, as the 3-inch annual rainfall of the region is insufficient to accomplish this task. In other words, 2.2 - 2.4 ac-ft/ac is just an estimation of seasonal crop water use for onion crop. The amount of additional irrigation water to effectively drain salt from the crop root zone depends on the soil circumstances and level of salinity. If pre-irrigation (flood irrigation) is used to create better tillage and seedbed conditions, salt management may be adequately met.

The irrigation water that needs to be applied in an individual field depends on crop water requirements and the efficiency of the irrigation system. If we assume an average irrigation efficiency of 75% for a particular sprinkler irrigated onion fields and an average efficiency of 85% for a particular drip irrigated onion fields, the approximate irrigation water needs per acre of these fields would be 3.2 ac-feet for sprinkler fields and 2.6 ac-feet for drip fields. Part of this excess irrigation water may be necessary for salinity management. If we have a well-designed and properly managed drip irrigation, we may benefit from water conservation and less plant disease issue (particularly downy mildew disease). We need to keep in mind that crop water consumption and water conservation are two different terms. The total crop water consumption utilizing drip irrigation could be increased as a result of effective maintaining soil water status. In the meantime, we may conserve water in drip system because of less deep percolation and tailwater runoff in compared with a conventional sprinkler irrigation.

LIVESTOCK RESEARCH BRIEF

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Hello,

This month examines a study looking at the effect of supplementing rumen protected lysine and methionine on calf-fed Holstein performance in feedlots.

If you have any comments, questions, recommendations, or know someone who would like to be included on the mailing list, please feel free to contact me.

Best wishes,

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EFFECT OF SUPPLEMENTAL METHIONINE AND LYSINE ON GROWTH PERFORMANCE OF FEEDLOT HOLSTEIN STEERS

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Livestock Advisor

Introduction

Conventional steam-flaked corn-based growing-finishing diets do not meet metabolizable amino acid requirements of calf-fed Holstein steers during the initial growth phase (first 168 d on feed). This is largely due to deficiencies of both metabolizable methionine and lysine. Failure to meet amino acid requirements impacts both weight gain and efficiency of energy utilization. Unfortunately, balancing diet formulations using conventional protein supplements (ie. soybean meal, canola meal, cottonseed meal, distillers grains, etc.) is hardly feasible, as they are not good sources of metabolizable methionine and/or lysine. This study aimed to evaluate the effect of supplementation with rumen protected methionine and lysine on growth performance of calf-fed Holsteins during the first 84-d feedlot phase.

Methods

72 Holstein steers (128 ±9 kg) housed at the UC DREC feedlot were sorted into 12 pens (6 animals per pen) for an 84d trial. All animals were fed a steam-flaked corn-based diet that provided 105% of the theoretical metabolizable protein requirement plus 0, 0.4%, or 0.8% rumen protected methionine and lysine supplement (Smartamine ML, Addisseo). Full diet formulation can be found in Table 1.

Results and Implications

Supplementation with rumen protected methionine and lysine improved ADG, gain efficiency, and estimated dietary NE (Table 2). The ratio of observed vs expected dietary NE increased from 0.87 to 0.95, demonstrating an increase in efficiency of energy utilization as amino acid requirements are more nearly met. Supplementation did not affect DMI.

Overall, this study indicated that supplementing rumen protected methionine and lysine can improve performance of calf-fed Holsteins in the early feedlot growing phase when fed a steam-flaked corn-based diet, resolving amino acid deficiencies of the basal diet.

Table 1.
Experimental diet composition

Ingredient Composition	Smartamine ML, %		
Item	0	0.4	0.8
Sudangrass hay	12.00	12.00	12.00
Tallow	2.50	2.50	2.50
Molasses, cane	4.00	4.00	4.00
Distillers grain	25.00	25.00	25.00
Steam-flaked corn	53.21	52.81	52.41
Urea	0.75	0.75	0.75
Trace-mineral salt	0.40	0.40	0..40
Limestone	1.90	1.90	1.90
Dicalcium phosphate	0.16	0.16	0.16
Magnesium oxide	0.06	0.06	0.06
Smartamine ML	0.00	0.40	0.80
Rumensin 90	0.0165	0.0165	0.0165

Table 2.
Growth performance treatment effects

	Smartamine ML, %		
Item	0	0.4	0.8
Weight, kg			
Initial	127	129	128
Final	248	257	258
ADG, kg	1.44	1.52	1.56
DMI, g/d	5.54	5.58	5.52
ADG/DMI	0.260	0.273	0.282
Dietary NE, Mcal/kg			
Maintenance	1.93	2.01	2.06
Gain	1.28	1.36	1.40
Observed/expected dietary NE			
Maintenance	0.889	0.932	0.957
Gain	0.859	0.913	0.945

References

Montano, M. F., Chirino, J. O., Latack, B. C., Salinas-Chavira, J., Placencia, A., and Zinn, R.A. Influence of supplementation of growing diets enriched with rumen-protected methionine and lysine on feedlot performance and characteristics of digestion in Holstein steer calves. 2019. Applied Animal Science. 35:318-324.

IMPERIAL VALLEY CIMIS REPORT AND UC WATER MANAGEMENT RESOURCES

Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial and Riverside Counties

The reference evapotranspiration (ET_o) is derived from a well-watered grass field and may be obtained from the nearest CIMIS (California Irrigation Management Information System) station. CIMIS is a program unit in the Water Use and Efficiency Branch, California Department of Water Resources that manages a network of over 145 automated weather stations in California. The network was designed to assist irrigators in managing their water resources more efficiently. CIMIS ET data are a good guideline for planning irrigations as bottom line, while crop ET may be estimated by multiplying ET_o by a crop coefficient (K_c) which is specific for each crop.

There are three CIMIS stations in Imperial County include Calipatria (CIMIS #41), Seeley (CIMIS #68), and Meloland (CIMIS #87). Data from the CIMIS network are available at: http://www.cimis.water.ca.gov/. Estimates of the average daily ET_o for the period of May 1st to July 31th for the Imperial Valley stations are presented in Table 1. These values were calculated using the long-term data of each station.

Table 1. Estimates of average daily potential evapotranspiration (ET_o) in inch per day

June	July		August		September	
	1-15	16-31	1-15	16-31	1-15	16-30
Calipatria	0.32	0.31	0.30	0.28	0.26	0.23
El Centro (Seeley)	0.33	0.31	0.30	0.28	0.26	0.25
Holtville (Meloland)	0.32	0.31	0.30	0.28	0.26	0.24

For more information about ET and crop coefficients, feel free to contact the UC Imperial County Cooperative Extension office (442-265-7700). You can also find the latest research-based advice and California water & drought management information/resources through link below:

http://ciwr.ucanr.edu/.