

## Update on Chemical and Precision Weed Control Tools in Leafy Green Vegetables

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### INTRODUCTION

The central coast of California is a key area for production of leafy green vegetables such as lettuces, brassica crops, spinach, cilantro and many others. Weed control in these crops is achieved by a combination of cultural, mechanical and chemical control methods. There are nearly no new herbicides in the development pipeline for these crops, and as a result, many of these crops are dependent on old chemistries to provide effective preemergent weed control (Table 1). However, recent experience has indicated that reliance on old chemistries is not without risk. For instance, Kerb was removed from the market in 2009 for leaf lettuce, the number one lettuce type in Monterey County, and is not expected to return to the market until 2012-13 (Fennimore and Smith, 2009). In addition, RoNeet, the key preemergent herbicide for use on spinach was recently off the market, but fortunately has been returned. In addition to the loss of registered herbicides, there have been issues with new registrations of old herbicides. For instance, Dual Magnum was registered for use on spinach, but the registration has a preharvest interval and plant back restrictions that severely restrict its use on the majority of spinach acreage in California (Smith and Fennimore, 2009). And finally, the registration of prometryn for use on cilantro has been at the EPA awaiting clearance for over 10 years. All of these examples illustrate the challenges to providing useful herbicides to the leafy green vegetable industry.

**Table 1. Year of registration of key leafy green vegetable herbicides.**

Trade Name	Chemical	Representative Crop	Year Registered
Kerb	Pronamide	Lettuce	1972
Dacthal	DCPA	Broccoli	1958
Caparol	Prometryn	Celery	1964
Dual Magnum	S-metolachlor	Spinach	1976
Devrinol	Napropamide	Broccoli	1972

Adapted from Fennimore and Doohan, 2008

To further complicate the situation, the leafy green industry has changed by the transition to high-density 80 inch wide beds for the production of baby lettuces, spinach and cilantro; this has nearly eliminated the ability to effectively cultivate the beds (Smith et al, 2006). As a result, of these challenges, growers have had to place greater emphasis on basic cultural practices such as preirrigation followed by shallow cultivation to kill the initial weed flush in the production

cycle and implement weed sanitation programs (e.g. removal of weeds from fields to reduce the weed seedbank). These practices are helpful, but have limits in their ability to provide excellent weed control. For instance, in 2010 growers faced the first year without the availability of Kerb in the spring when shepherd's purse and nettle are particularly problematic weeds. In general, there were higher weeding costs in fields impacted by these weeds because the alternative preemergence herbicides available for use on leaf lettuce do not control these weeds. Increased weeding costs varied from greatly, but in some cases were as much as \$400 more than normal costs (personal communication from various Monterey County growers).

Lettuce in Monterey County is predominantly direct seeded (>95%). However, the use of transplants provides opportunities to better control weeds. Prowl H2O and Dual Magnum are both in the registration process for use on transplanted lettuce. When these materials are approved growers will have an option to deal effectively with fields with high weed pressure. However, there are two key problems with the use of transplants in lettuce production that limit their use: 1) transplants cost over \$200 more per acre to produce than direct seeded lettuce, and 2) there are issues with post harvest longevity of transplanted lettuce. It will be interesting to see how growers weigh the negative aspects of the use of transplants with the positive weed control that can be achieved.

Robotic weed control technology, for example the Tillet Cultivator, is now available from Garford Corporation in England (<http://garford.com/>). The cultivator operates best where the crop is larger than the weeds, such as in transplanted crops. It is guided by a camera that looks down on the seedline and looks for green plants; a computer analyzes the images and directs spinning blades to cultivate between crop plants (Figure 1). This technology does not eliminate the need for hand labor but is capable of reducing the weeding time of subsequent hand weeding operations (Table 2). As technology improves in the future, it is expected that this technology will also improve in efficiency and efficacy.

**Figure 1. Tillet cultivator.** Note blade on the right is elevated to show the pie shaped design that allows the blade to spin around the crop plant as it travels down the seedline.



**Table 2. Weeding time and yield evaluations on October 7, 2010.**

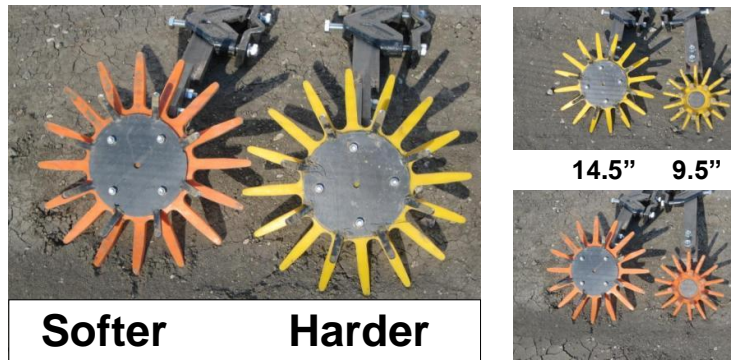
Cultivation treatment	Total weeding time	Stand count	Yield stand count	Yield mean head	Yield total
	Aug 7&14	Aug 7	Oct 7	Oct 7	Oct 7
	hr/A	Plant/A	Plant/A	lbs/head	tons/A
<b>Standard</b>	15.3	31,245	29,628	0.84	12.4
<b>Tillet</b>	11.6	30,721	29,119	0.88	12.7
Pr>F treat	<0.001	0.318	0.278	0.448	0.657
Pr>F block	0.156	0.221	0.073	0.251	0.447
<b>LSD 0.05</b>	<b>1.3</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>

**CONCLUSIONS**

Weed control in leafy green vegetables is as challenge. Using a combination of cultural, mechanical and chemical weed control strategies can provide acceptable weed control. It is critical to maintain current herbicide registrations. The main challenge is to achieve acceptable weed control in an economically acceptable fashion.

**Two sizes and two levels of hardness**

**Figure 2.  
Finger Weeder  
from Kress  
Co., Germany**



**LITERATURE CITED**

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