Vegetables WEST

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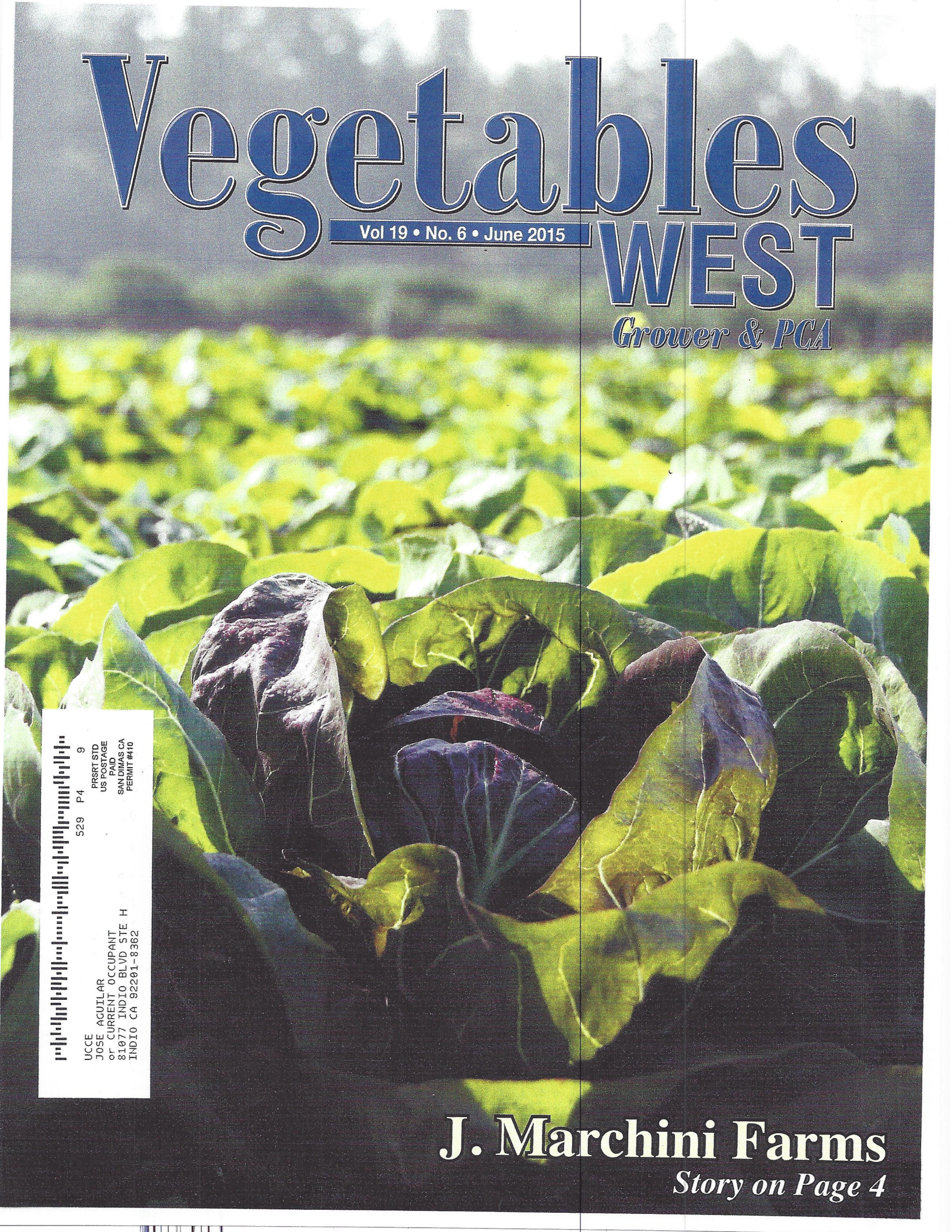
Grower & PCA



J. Marchini Farms

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Leaf Spots on Spinach Can Be Confusing

By UCCE Specialists Jose Luis Aguiar & Akif Eskalen

Spinach has become a crop of economic importance in the United States. California produced about 73% of the 2004-2006 crop; Arizona produced about 12% and New Jersey produced 3%. In the Coachella Valley the spinach crop has also seen its fortunes rise and fall with concerns about food safety. Table 1 documents the acreage and gross crop value of the spinach crop in the Coachella Valley from 2004 to 2013.

Late December 2014 ended with unusually cold and uncharacteristically wet weather. This weather contributed to some interesting spinach leaf spotting problems. The leaf spots started in a small area in the field but soon it was spread over the whole field, and then other growers began reporting leaf

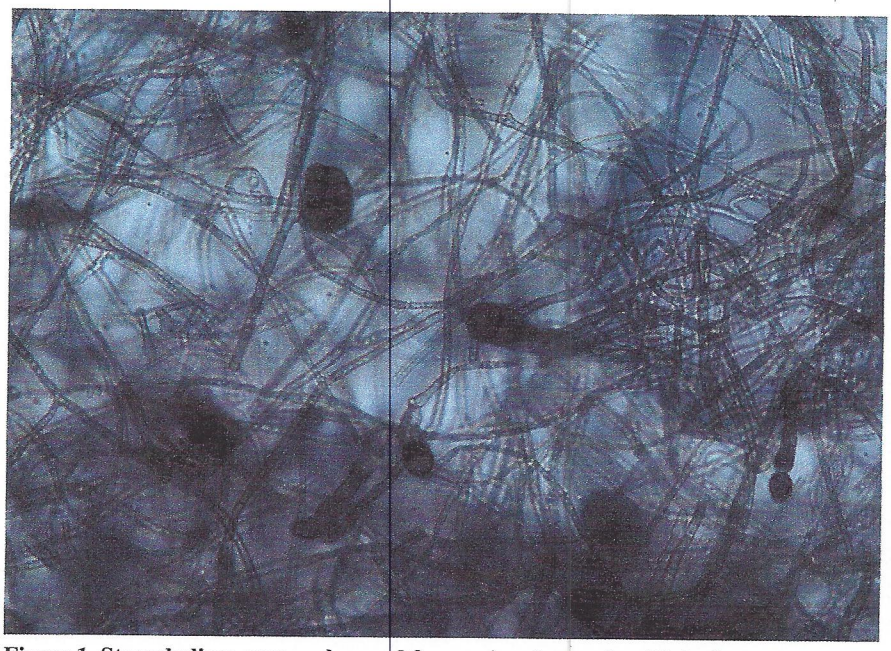

Figure 1. Stemphylium spores observed from spinach sample with leaf spots.

Figure 2. Cladosporium spinach leaf spots rarely exceed 1 cm in diameter.

Figure 3. Cladosporium leaf spot from a field close to harvesting.

spotting on their spinach fields.

Samples were collected in the field where the leaf spotting was first noticed and shipped to the diagnostic laboratory in Salinas for disease evaluation. Unfortunately, these samples arrived in very poor condition to the lab and they could not be evaluated properly. The lab found secondary molds and some colonies that appeared to be Stemphylium. These fungal colonies were plated onto another medium for confirmation. There are secondary non-pathogenic species of Stemphylium and it was unknown if these isolates were the pathogenic or non-pathogenic species of Stemphylium.

Stemphylium leaf spot was first documented in the Salinas Valley of California in 2001. Since then it has been found in Arizona, Delaware, Florida, Maryland, Washington and even in Europe. Confusion with this disease can occur because the spores of pathogenic and non-pathogenic Stemphylium are similar and time-consuming pathogenicity experiments would be necessary in order to differentiate these two types with certainty.

Because the samples arrived to the diagnostic lab in poor condition, Farm Advisor Aguiar decided to collect fresh spinach samples from the affected field. This sample was shipped to the diagnostic lab in Salinas and a subsample was delivered to Dr. Akif Eskalen at UCR. Dr. Akif prepared slides and based on the spores present suggested the presence of Stemphylium. To be certain his lab conducted ITS sequencing on this sample. The results confirmed it was Stemphylium spp. See Figure 1 for the spores observed.

Pathogenicity tests were not done with this sample and so it cannot be concluded that this is the pathogenic species to spinach. It takes time to get reliable results; plant pathologists want to be certain that what they are observing is the disease agent and not a secondary or non-pathogenic species. Growers and Pest Control Advisors will then base their control options on the information provided that identifies the causal agent.

The new samples collected by Aguiar arrived at the Salinas Diagnostic lab in good condition and Steven Koike was able to recover Cladosporium Leaf Spot caused by the fungus Cladosporium variable. This disease is occasionally a problem in spinach fields and is favored by high humidity and moisture during the growing season, conditions that were very present in these spinach fields. The leaf spots are round, tan in color; there can be a few leaf spots or there can be many spots on a leaf. (See Figure 2 with spinach leaf with many leaf spots.)

Cladosporium variabile produces dark green spores and the mycelium develops in the center of the spots. The conidia produced are dispersed by winds and splashing water from rain or sprinkler irrigation. The complete epidemiology of this disease has not been documented. (See figure 3 for another spinach leaf with Cladosporium leaf spot). This pathogen has been detected on spinach seed produced in Europe and the USA. There may be spinach varieties with partial resistance; growers should consult with seed companies. Once the disease is confirmed in a field, a 2-year crop rotation is recommended. Cultural practices that encourage air circulation in the field would also help. Affected fields should be disked as soon as possible.

This article references a foliar disease in spinach and explains our investigation of this problem. Laboratory investigation by a plant pathologist is one of the most important tools a grower should be accessing when he suspects a disease problem. Getting accurate lab results takes time; when the crop is in the field, it cannot wait weeks for the results. The information learned may not help this spinach crop but maybe it will the next. The reader should know that not all spinach fields in the Coachella Valley were affected by disease. Diseases and insects have evolved with plants and UC scientists spend a lot of time trying to understand these relationships.

Table 1. Coachella Valley Spinach Acreage and Gross Crop Value

YEAR	US DOLLARS GROSS VALUE: Coachella Valley	Coachella Valley ACREAGE
2004	8,836,500	975
2005	9,170,100	886
2006	5,578,700	616
2007	7,625,700	1077
2008	6,019,500	1,133
2009	7,715,500	767
2010	2,007,000	189
2011*	1,771,600	161
2012	9,036,100	859
2013	10,442,000	725

***2011 Data appears to be in error**

**Riverside County Agricultural Commissioners' Crop Reports