**Department of Pesticide Regulation**
**Environmental Monitoring Branch**
**Surface Water Protection Program**
**1001 I Street**
**Sacramento, California 95812**

# Analysis of Diazinon Agricultural Use in Regions of Frequent Surface Water Detections

Xuyang Zhang, Keith Starner

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Abstract

The objective of this analysis was to identify pesticide use scenarios that potentially contribute to the frequent surface water detections of diazinon in agricultural regions of California. Crop treated, pesticide product formulation, and pesticide application method were examined. The study targeted five regions with frequent detections and high concentrations in surface water: Salinas Valley, Sacramento Valley, San Joaquin Valley, Santa Maria Valley and Imperial Valley. Using surface water monitoring data from 2005 to 2010, sites with the most frequent exceedance of the 100 ng/L target concentration were identified in each of the five regions. For drainage basins where the identified monitoring sites were located, pesticide use was summarized by crop type, product formulation and application method. Salinas Valley had the highest use of diazinon between 2005 and 2010 accounting for about 35% of the statewide use. Sacramento Valley was the second-highest use region accounting for 14% of the statewide use. Uses in San Joaquin Valley, Imperial Valley and Santa Maria Valley were relatively lower, accounting for 9%, 6% and 2% of the statewide use, respectively. Top use crops in high detection areas varied among different regions with lettuce, broccoli and cauliflower being the top ones in the Lower Salinas Valley. Application method and product formulations did not vary significantly between areas with high and low detections. The majority of diazinon applications were made through ground application using EC formulated products. This analysis suggests that diazinon detections in surface water likely did not occur primarily due to the application method or formulation type. Besides use amount, other factors such as irrigation method, spray drift, timing of application, soil type, slope and field management practices are likely more relevant to the offsite movement of diazinon.

## I. INTRODUCTION

Diazinon is a broad-spectrum organophosphate insecticide currently used in California on a wide variety of agricultural crops. Non-agricultural uses of diazinon were phased out during 2002-2004, after which detections of diazinon in urban areas have decreased significantly (Starner, 2006). However, the pesticide is still frequently detected in streams in agricultural areas of California (Starner, 2009). California Department of Pesticide Regulation (DPR) placed diazinon dormant spray products into re-evaluation in early 2003. The re-evaluation was further expanded in 2010 to include in-season agricultural uses.

The expansion of the re-evaluation was based on analysis results from Starner (2009), which suggested that diazinon was frequently detected in areas with in-season agricultural use. Starner's analysis was based on surface water monitoring data between 2003 and 2008 (Starner 2009). Per requirement by the expanded re-evaluation, the registrant (Makhteshim-Agan of North America, INC.) assembled and summarized diazinon water column monitoring data between 2005 and 2010. Their report indicated that diazinon was still frequently detected in agricultural areas of California with concentrations exceeding the target concentration of 100 ng/L. This target concentration is the Total Maximum Daily Load (TMDL) developed by California State Water Resources Control Board for the San Joaquin and Sacramento River Watershed (California State Water Resources Control Board, 2008). It is the lowest water quality criteria for diazinon currently used in the United States.

## II. OBJECTIVE

Diazinon is used in California throughout the year: mainly on vegetable crops during the irrigation season and dormant tree crops during wet season. Between 2005 and 2010, more than 274,000 pounds of diazinon active ingredient (AI) were used each year in California. The objective of this analysis was to identify diazinon use scenarios that potentially contribute to its frequent detections in surface waters of California.

## III. MATERIALS AND METHODS

This analysis targeted diazinon use scenarios in areas with frequent detections at high concentrations. First, monitoring sites with the most frequent exceedance of the 100 ng/L target concentration were identified using monitoring data from 2005 to 2010. Second, drainage areas contributing to these sites were identified using CalWater 2.2 watershed maps that were developed by the California Interagency Watershed Mapping Committee (USDA 2009). Finally, diazinon use data in the drainage areas was summarized to identify the top use scenarios.

### Surface water monitoring data

Diazinon monitoring data for years 2005 to 2010 was from the report entitled "Summary of diazinon water column monitoring data for nine California regions: 2005-2010" which was submitted to DPR by Hall and Anderson (2011) on behalf of Makhteshim-Agan of North America, INC. The report assembled and summarized monitoring data from the nine use regions in California as identified in Starner (2009): Sacramento Valley Region, San Joaquin Valley Region, Pajaro Region, Salinas Valley Region, Tulare Region, Santa Maria Valley Region, Antelop Region, Ventura Region and Imperial Valley Region. Diazinon monitoring data was reported from 282 sites from these nine use regions containing 3,732 measurements from 2005 to 2010 (Table 1). The highest concentration (24,465 ng/L) was reported in the Salinas Valley Region. Among the nine use regions, Salinas Valley, Santa Maria Valley and Imperial Valley Region have the highest percentage of samples exceeding the target concentration of 100 ng/L (61.9%, 66.7% and 24.1%, respectively). In terms of sample numbers, Salinas Valley, San Joaquin Valley and Sacramento Valley Region have the largest number of samples exceeding the same target concentration (151, 60, and 44, respectively). Therefore, these five regions were selected as our study area. Monitoring sites with highest exceedance as well as top use scenarios were identified in these five regions.

Pesticide use data

Diazinon use information between 2005 and 2010 was collected from DPR's Pesticide Use Reporting (PUR) database (DPR 2011). PUR data was mapped with the basic spatial unit of township/range/sections. Applications occurring within the contributing drainage area of a certain site were identified by overlaying the GIS maps of township/range/sections with CalWater2.2 watershed boundaries. Crops with top diazinon use (pounds of active ingredients (AI)) were then identified in each drainage area.

## IV. RESULTS AND DISCUSSION

Statewide Diazinon Use

Statewide diazinon use decreased by 75% from 2005 to 2010 in both total pounds of AI and applied acreage (Table 2, 3 and Fig 1). Diazinon use in Salinas Valley was the highest among all the regions, accounting for 35% of the total pounds and 80% of the applied acreages (Table 2 and 3). Sacramento Valley ranked the second accounting for 14% of the statewide use (Table 2). Uses in San Joaquin Valley, Imperial Valley and Santa Maria Valley were relatively lower, accounting for 9%, 6% and 2% of the statewide use, respectively.

Table 4 and 5 summarized diazinon use by application method and product formulation for areas with frequent detections in the five study regions. Application method and product formulation did not differ significantly among different regions. Most of the applications were made through ground application using EC formulated products (Table 4, 5). Although Salinas Valley has more frequent detections and more exceedance compared to other regions, application method and product formulation are similar. Therefore, diazinon detections in surface water likely did not occur primarily due to the application method or formulation type. Besides use amount, other factors such as irrigation method, timing of application, soil type, slope and field management practices are likely more relevant to the offsite movement of diazinon.

Salinas Valley Region

Thirty-three sites were monitored for diazinon in Salinas Valley with data available from 2005 to 2008. A total of 244 samples were taken, 61.9% of which exceeded the target concentration of 100 ng/L (Table 1). All the sites with exceedances were located in the Lower Salinas Valley basin (Fig 2). A total of 380,508 lbs of diazinon were used in the Lower Salinas Valley Region between 2005 and 2010 accounting for over 63% of the use in the entire valley. Diazinon was mainly used on lettuce (head and leaf), broccoli, cauliflower and spinach (Table 4 and 5). Use of diazinon on lettuce alone accounted for about 77% of the total diazinon use in the area between 2005 and 2010. Diazinon was used throughout the year with the majority of applications occurring during the irrigation season between March and September (Fig. 3). Almost all the applications were implemented through ground application (Table 4). On lettuce, more than half of the applied diazinon was formulated as emulsifiable concentrate (EC) and over 20% was formulated as wettable powder (WP) (Table 5). On broccoli, cauliflower and spinach, EC products accounted for over 95% of the applied amount (Table 5).

The frequent detection of diazinon in Salinas Valley likely resulted from the great amount of use on a relatively small watershed. Since pesticide application method and product formulation are similar to other regions with few detections, it is unlikely that these two factors contribute significantly to offsite movement of diazinon.

<u>Sacramento Valley Region</u>

Seventy-three sites were monitored for diazinon in Sacramento Valley with data available from 2005 to 2010. A total of 850 samples were taken, 5.2% of which exceeded the target concentration of 100 ng/L (Table 1). Sites with exceedances were located at 10 drainage basins spread throughout in the entire valley (Fig 4). Between 2005 and 2010, a total of 152,702 lbs of diazinon were used in these drainage basins accounting for 75% of the use in the entire Valley. Diazinon was mainly used on tree crops (prune, peach, walnut, almond and cherry) and processing tomatoes (Table 4).  Applications occurred mostly in January through May with very few applications after August (Fig. 5). Almost all the applications were implemented through ground application using EC formulated products except for walnut, on which 32% of the applications were aerial and 20% of used products were WP (Table 4 and 5).

Compared to Salinas Valley, Sacramento Valley had less frequent detections and exceedances. This could be due to the lower amount of pesticide use and relatively larger watershed area. Other factors such as irrigation method, soil and slope may also play a role. However, application method and product formulation likely did not.

<u>San Joaquin Valley Region</u>

A total of 121 sites were monitored for diazinon from 2005 to 2010 in San Joaquin Valley Region. Among the 2,465 samples taken, 2.4% exceeded the target concentration of 100 ng/L (Table 1). Sites with exceedances were located at four drainage basins: Lower Mokelumne basin, San Joaquin Delta basin, Delta-Mendota Canal basin and Madera basin (Fig. 6). A total of 28,295 lbs of diazinon were used in these four basins between 2005 and 2010 accounting for 21% of the use in the entire valley. Diazinon was mainly used on tree crops (cherry, peach, almond, apple and prune) and corn (Table 4).Applications occurred in almost every month from January to September with fewer in October, November and December (Fig. 7). Almost all the applications were implemented through ground application using EC formulated products except for corn and apple. Applications on corn were mainly aerial using EC products. All the diazinon products used on apples were WP sprayed via ground application (Table 4 and 5).

<u>Imperial Valley Region</u>

Twelve sites were monitored for Diazinon in the Imperial Valley with data available from 2005 to 2008. A total of 58 samples were taken, 24.1% of which exceeded the target concentration of 100 ng/L (Table 1). Exceedances occurred in eight of the twelve sites (Fig 8). Between 2005 and 2010, a total of 105,761 lbs of diazinon were used in this valley.  Diazinon was mainly used on sugarbeet, lettuce, broccoli, carrots and onion, accounting for 90% of the use in the entire valley

(Table 4). Applications occurred mostly in winter months from September to December (Fig. 9). Ground application and EC products still being the majority but to a less degree compared to other regions (Table 4). For sugarbeet, 89% of the diazinon was applied aerially using mostly EC products (Table 4 and 5).

Santa Maria Valley Region

Twelve sites were monitored for Diazinon in the Santa Maria Valley with data available from 2005 to 2009. Most of the sites were sampled only once except for one site that was sampled 10 times. However, the detected concentrations were high with the majority of them exceeding the target concentration (Table 1). Eight of the twelve sites exceeded the target concentration (Fig. 10). Crop use of diazinon in Santa Maria Valley was much less compared to the other four regions with over 27,700 lbs of diazinon AI, composing 2% of the statewide use between 2005 and 2010. Major diazinon use crops include lettuce (head, leaf), broccoli and cauliflower accounting for over 81% of the total use in the region (Table 4). The majority of the applications occurred during the irrigation season between March and September (Fig. 11). Like other regions, diazinon was applied mainly through ground applications using EC products (Table 4 and 5).

## V. CONCLUSIONS

Diazinon is currently used on various agricultural crops in California throughout the year. Monitoring data indicated that the pesticide was still frequently detected with levels exceeding target concentrations. Areas with frequent diazinon detections include Salinas Valley, San Joaquin Valley, Imperial Valley and Santa Maria Valley. Salinas Valley has the highest use by total amount of diazinon AI, accounting for more than 35% of the statewide use. Sacramento Valley ranked second accounting for 14% of the statewide use. Uses in San Joaquin Valley, Imperial Valley and Santa Maria Valley were relatively lower, accounted for 9%, 6% and 2% of the statewide use, respectively. Top use crops vary among different regions. However, application method and product formulations were relatively consistent, with ground application and EC formulation being dominant. Application method and product formulation did not vary significantly between areas with high and low detection frequency. The analysis suggests that diazinon detections in surface water likely did not result primarily due to application method or formulation type. Besides use amount, other factors such as irrigation method, spray drift, timing of application, soil type and field management practices are likely more relevant to the off-site movement of diazinon into surface water. Several of these factors are crop-specific; as such, investigation into the relevance of those factors might best be focused on crops with high use in regions with frequent detections of diazinon in surface water.

## VI. REFERENCES

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TABLES

Table 1. Summary of diazinon monitoring data (2005-2010) for the 9 California use regions. A target concentration of 100 ng/L was used to determine number of exceedances and percent exceedance

| Agricultural Region | # of Sites | Mainstem Sites | Tributary Sites | Years of Data | # of Conc. | Conc. Range (ng/L) | % of ND Conc. | # of Exceedances | % of Exceedances |
|---|---|---|---|---|---|---|---|---|---|
| Sacramento | 73 | 5 | 68 | 2005-2010 | 850 | ND-2500 | 69.8 | 44 | 5.2 |
| San Joaquin | 121 | 13 | 108 | 2005-2010 | 2465 | ND-1200 | 90.0 | 60 | 2.4 |
| Pajaro | 18 | 5 | 13 | 2006-2007 | 36 | ND-289 | 75.0 | 1 | 2.8 |
| Salinas | 33 | 10 | 23 | 2005-2008 | 244 | ND-24465 | 9.0 | 151 | 61.9 |
| Tulare | 13 | 4 | 9 | 2005-2006 | 58 | ND-75 | 75.9 | 0 | 0.0 |
| Santa Maria | 12 | 1 | 11 | 2005-2008 | 21 | ND-977 | 9.5 | 14 | 66.7 |
| Antelope | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ventura | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Imperial | 12 | 8 | 4 | 2005-2008 | 58 | ND-3240 | 48.3 | 14 | 24.1 |
| All Regions | 282 | 46 | 236 | 2005-2010 | 3732 | ND-24465 | 78.6 | 284 | 7.6 |

Table 2. Total diazinon use in different regions of California by pounds of active ingredient, 2005 - 2010

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Average |
|---|---|---|---|---|---|---|---|
| Statewide | 403,798 | 386,244 | 353,098 | 258,533 | 142,059 | 102,087 | 274,303 |
| Salinas Valley (% of statewide) | 153,487 (38%) | 133,593 (35%) | 132,869 (38%) | 109,147 (42%) | 46,426 (33%) | 27,672 (27%) | 100,532 (35%) |
| Sacramento Valley | 42,756 (11%) | 45,312 (12%) | 36,671 (10%) | 28,768 (11%) | 27,162 (19%) | 23,467 (23%) | 34,023 (14%) |
| San Joaquin Valley | 34,318 (8%) | 28,120 (7%) | 22,304 (6%) | 18,637 (7%) | 14,177 (10%) | 15,861 (16%) | 22,236 (9%) |
| Imperial Valley | 30,880 (8%) | 30,509 (8%) | 24,730 (7%) | 12,219 (5%) | 5,212 (4%) | 2,212 (2%) | 17,627 (6%) |
| Santa Maria Valley | 6,369 (2%) | 5,614 (1%) | 4,936 (1%) | 5,964 (2%) | 2,888 (2%) | 2,232 (2%) | 4,667 (2%) |

Table 3. Total acres of agricultural fields with diazinon applications between 2005 and 2010

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Statewide | 966,885 | 838,806 | 2,058,852 | 1,567,700 | 775,038 | 246,987 |
| Salinas Valley (% of statewide) | 689,461 (71%) | 588,058 (70%) | 1,824,881 (89%) | 1,391,320 (89%) | 672,675 (87%) | 179,250 (73%) |
| Sacramento Valley | 34,182 | 31,014 | 26,890 | 23,689 | 20,983 | 16,325 |
| San Joaquin Valley | 25,321 | 27,364 | 19,480 | 15,522 | 10,488 | 10,670 |
| Imperial Valley | 49,054 | 47,012 | 40,473 | 21,157 | 10,768 | 4,479 |
| Santa Maria Valley | 34,006 | 14,985 | 7,561 | 19,963 | 7,186 | 5,185 |

Table 4 Diazinon use by application method on major crops in areas with frequent detections and exceedances, 2005-2010

| | Crop | Ground | | Aerial | | Other | | Total |
|---|---|---|---|---|---|---|---|---|
| | | lbs | % | lbs | % | lbs | % | lbs |
| Salinas Valley | Lettuce, Leaf | 151,235 | 96% | 5,585 | 4% | 101 | 0% | 156,921 |
| | Lettuce, Head | 132,028 | 96% | 5,206 | 4% | 0 | 0% | 137,234 |
| | Broccoli | 40,962 | 99% | 445 | 1% | 0 | 0% | 41,408 |
| | Cauliflower | 17,957 | 99% | 222 | 1% | 40 | 0% | 18,220 |
| | Spinach | 17,552 | 100% | 55 | 0% | 0 | 0% | 17,607 |
| | All crops (Total) | 368,295 | 97% | 12,071 | 3% | 141 | 0% | 380,508 |
| Sacramento Valley | Prune | 52,177 | 99% | 673 | 1% | 0 | 0% | 52,850 |
| | Processing tomatoes | 36,306 | 100% | 0 | 0% | 119 | 0% | 36,426 |
| | Peach | 35,776 | 100% | 110 | 0% | 0 | 0% | 35,885 |
| | Walnut | 8,158 | 68% | 3,904 | 32% | 0 | 0% | 12,062 |
| | Almond | 8,644 | 93% | 670 | 7% | 0 | 0% | 9,314 |
| | Cherry | 1,894 | 100% | 0 | 0% | 0 | 0% | 1,894 |
| | All crops (Total) | 146,974 | 96% | 5,464 | 4% | 119 | 0% | 152,557 |
| San Joaquin Valley | Cherry | 11,701 | 99% | 75 | 1% | 0 | 0% | 11,776 |
| | Peach | 6,756 | 100% | 0 | 0% | 0 | 0% | 6,756 |
| | Almond | 5,868 | 97% | 198 | 3% | 0 | 0% | 6,067 |
| | Corn | 55 | 1% | 5,194 | 99% | 0 | 0% | 5,249 |
| | Apple | 3,689 | 100% | 0 | 0% | 0 | 0% | 3,689 |
| | Prune | 2,423 | 100% | 0 | 0% | 0 | 0% | 2,423 |
| | All crops (Total) | 39,766 | 86% | 6,384 | 14% | 121 | 0% | 46,272 |
| Imperial Valley | Sugarbeet | 3,323 | 11% | 26,668 | 89% | 79 | 0% | 30,070 |
| | Lettuce, Head | 12,213 | 50% | 4,527 | 19% | 7,677 | 31% | 24,416 |
| | Broccoli | 7,427 | 55% | 3,552 | 26% | 2,644 | 19% | 13,623 |
| | Lettuce, Leaf | 6,592 | 54% | 1,536 | 12% | 4,163 | 34% | 12,291 |
| | Carrots | 6,186 | 74% | 61 | 1% | 2,094 | 25% | 8,340 |
| | Onion | 3,863 | 65% | 476 | 8% | 1,619 | 27% | 5,958 |
| | All crops (Total) | 46,767 | 44% | 39,591 | 37% | 19,403 | 18% | 105,761 |
| Santa Maria Valley | Lettuce, Head | 7,728 | 86% | 1,214 | 13% | 51 | 1% | 8,993 |
| | Broccoli | 7,155 | 82% | 1,620 | 18% | 0 | 0% | 8,775 |
| | Lettuce, Leaf | 1,905 | 87% | 282 | 13% | 0 | 0% | 2,187 |
| | Cauliflower | 1,780 | 99% | 15 | 1% | 0 | 0% | 1,795 |
| | Carrots | 1,361 | 100% | 0 | 0% | 0 | 0% | 1,361 |
| | Spinach | 1,329 | 100% | 0 | 0% | 0 | 0% | 1,329 |
| | All crops (Total) | 24,424 | 88% | 3,224 | 12% | 51 | 0% | 27,700 |

Table 5 Diazinon use by formulation type on major crops in areas with frequent detection and exceedances, 2005-2010

| | Crop | EC | | Wettable Powder | | Other | | Total |
|---|---|---|---|---|---|---|---|---|
| | | lbs | % | lbs | % | lbs | % | lbs |
| Salinas Valley | Lettuce, Leaf | 96,887 | 62% | 35,830 | 23% | 24,204 | 15% | 156,921 |
| | Lettuce, Head | 79,438 | 58% | 30,056 | 22% | 27,740 | 20% | 137,234 |
| | Broccoli | 39,983 | 97% | 557 | 1% | 868 | 2% | 41,408 |
| | Cauliflower | 17,554 | 96% | 128 | 1% | 539 | 3% | 18,220 |
| | Spinach | 17,574 | 100% | 34 | 0% | 0 | 0% | 17,607 |
| | All crops (Total) | 257,614 | 68% | 68,169 | 18% | 54,724 | 14% | 380,508 |
| Sacramento Valley | Prune | 50,346 | 95% | 1,765 | 3% | 738 | 1% | 52,850 |
| | Processing tomatoes | 35,258 | 97% | | 0% | 1,168 | 3% | 36,426 |
| | Peach | 35,753 | 100% | 60 | 0% | 73 | 0% | 35,885 |
| | Walnut | 9,566 | 79% | 2,455 | 20% | 41 | 0% | 12,062 |
| | Almond | 9,282 | 100% | 32 | 0% | 0 | 0% | 9,314 |
| | Cherry | 1,853 | 98% | 22 | 1% | 20 | 1% | 1,894 |
| | All crops (Total) | 145,349 | 95% | 4,884 | 3% | 2,325 | 2% | 152,557 |
| San Joaquin Valley | Cherry | 387 | 3% | 11,388 | 97% | | 0% | 11,776 |
| | Peach | 6,633 | 98% | 123 | 2% | | 0% | 6,756 |
| | Almond | 5,795 | 96% | 272 | 4% | | 0% | 6,067 |
| | Corn | 5,249 | 100% | | 0% | | 0% | 5,249 |
| | Apple | | 0% | 3,689 | 100% | | 0% | 3,689 |
| | Prune | 796 | 33% | 1,627 | 67% | | 0% | 2,423 |
| | All crops (Total) | 26,344 | 57% | 19,901 | 43% | 26 | 0% | 46,272 |
| Imperial Valley | Sugarbeet | 21,291 | 71% | 5,963 | 20% | 2,817 | 9% | 30,070 |
| | Lettuce, Head | 13,192 | 54% | 316 | 1% | 10,908 | 45% | 24,416 |
| | Broccoli | 6,658 | 49% | 25 | 0% | 6,940 | 51% | 13,623 |
| | Lettuce, Leaf | 5,855 | 48% | 582 | 4% | 5,854 | 48% | 12,291 |
| | Carrots | 8,275 | 99% | 35 | 0% | 29 | 0% | 8,340 |
| | Onion | 5,315 | 89% | 105 | 2% | 538 | 9% | 5,958 |
| | All crops (Total) | 68,997 | 65% | 7,257 | 7% | 29,506 | 28% | 105,761 |
| Santa Maria Valley | Lettuce, Head | 8,977 | 100% | 16 | 0% | | 0% | 8,993 |
| | Broccoli | 8,766 | 100% | 9 | 0% | | 0% | 8,775 |
| | Lettuce, Leaf | 2,153 | 98% | 34 | 2% | | 0% | 2,187 |
| | Cauliflower | 1,795 | 100% | | 0% | | 0% | 1,795 |
| | Carrots | 1,361 | 100% | | 0% | | 0% | 1,361 |
| | Spinach | 1,329 | 100% | | 0% | | 0% | 1,329 |
| | All crops (Total) | 27,352 | 99% | 332 | 1% | 17 | 0% | 27,700 |

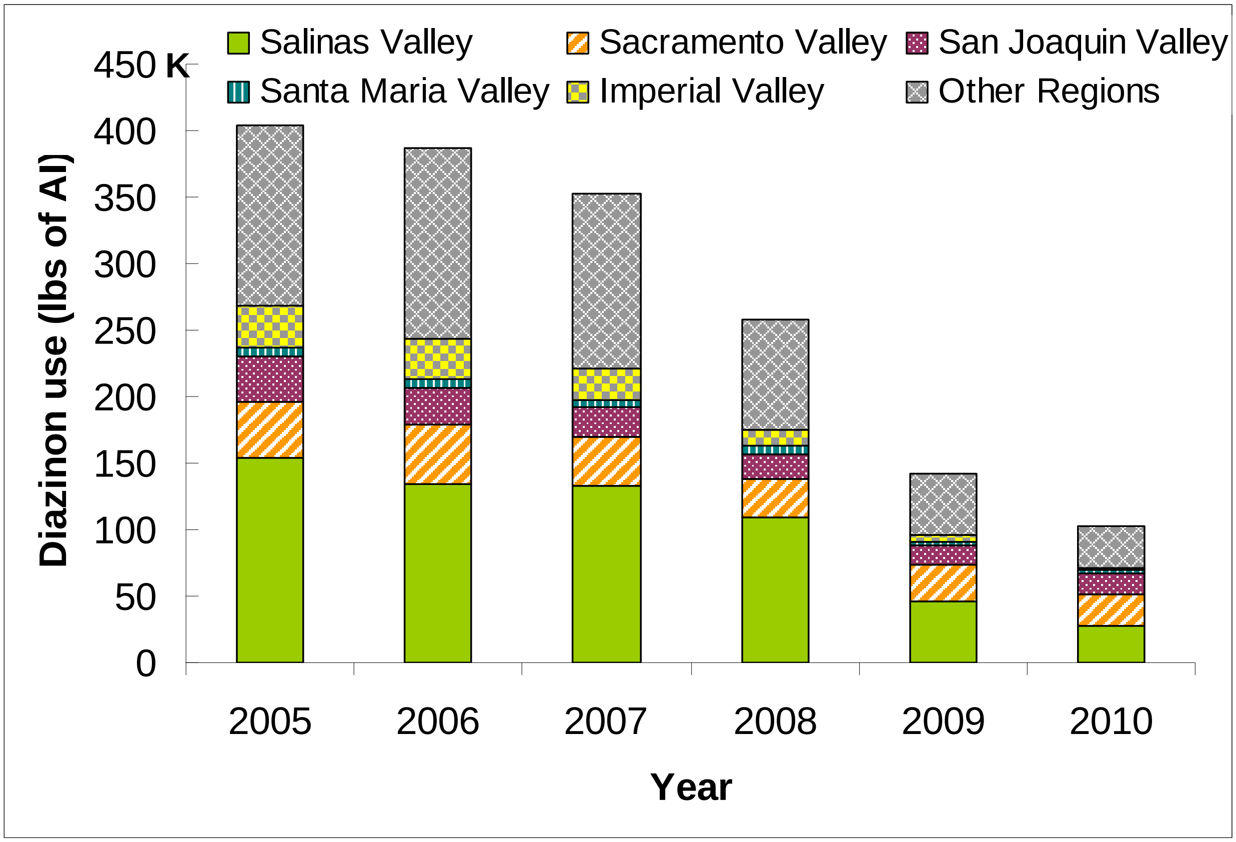


Fig 1. Diazinon use in different regions of California by pounds of active ingredients

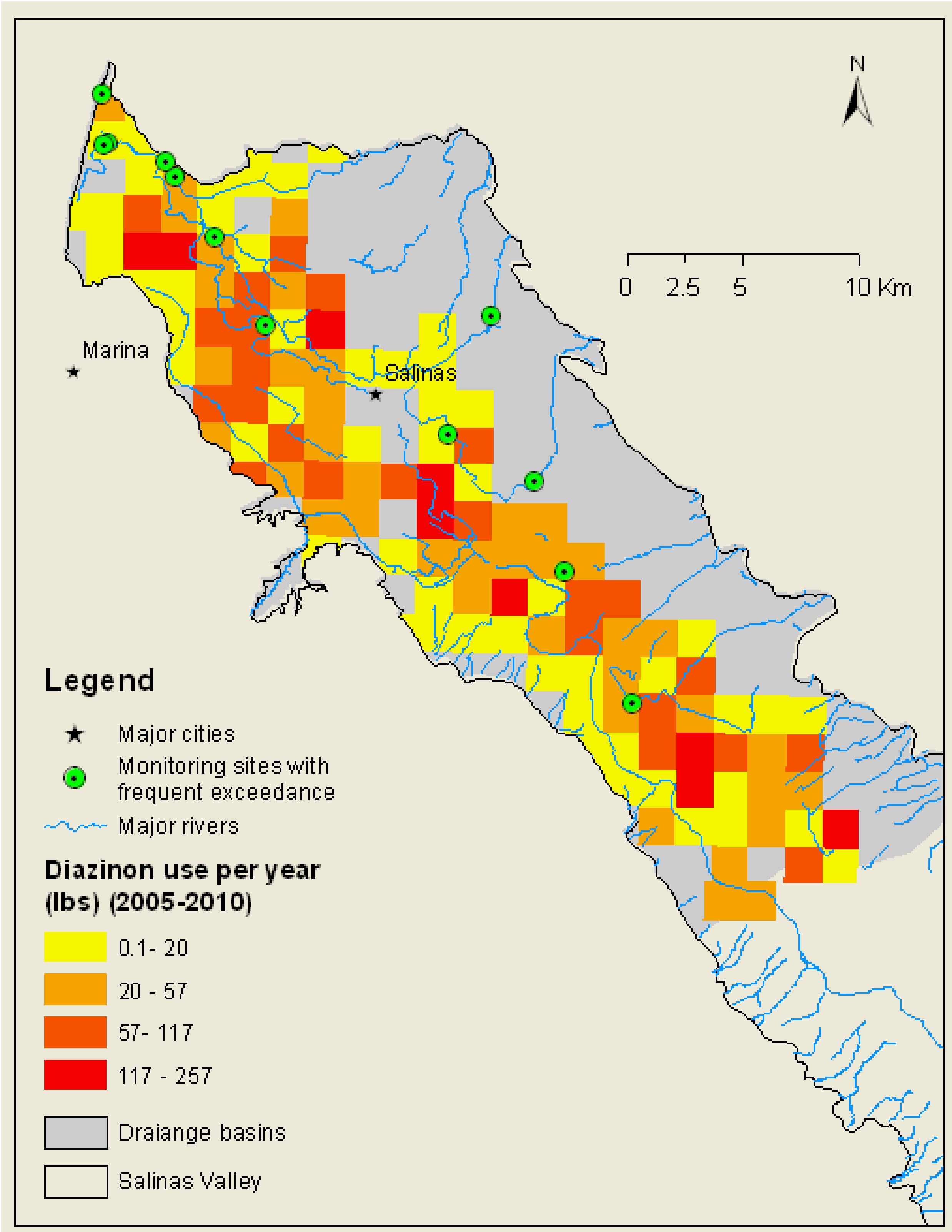


Fig. 2: Salinas Valley monitoring sites with most exceedances and diazinon use within their drainage basins

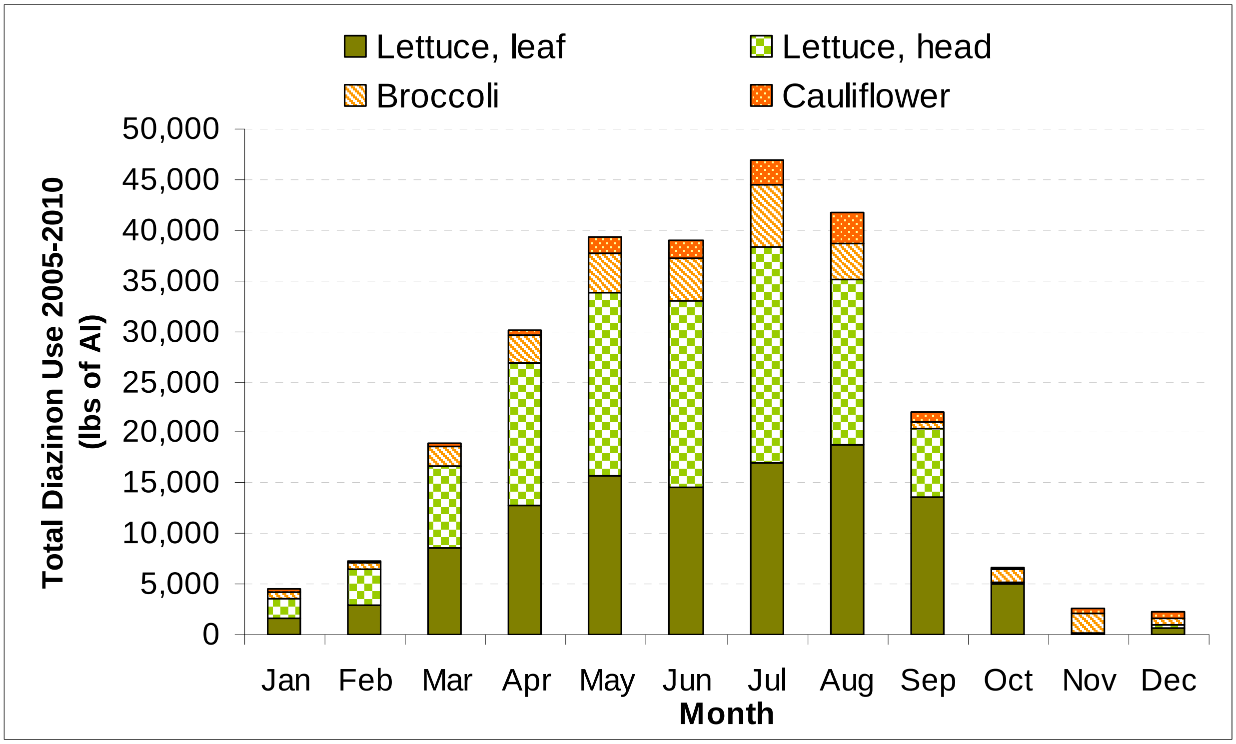


Fig. 3. Diazinon use on major crops in the Lower Salinas Valley 2005 -2010.

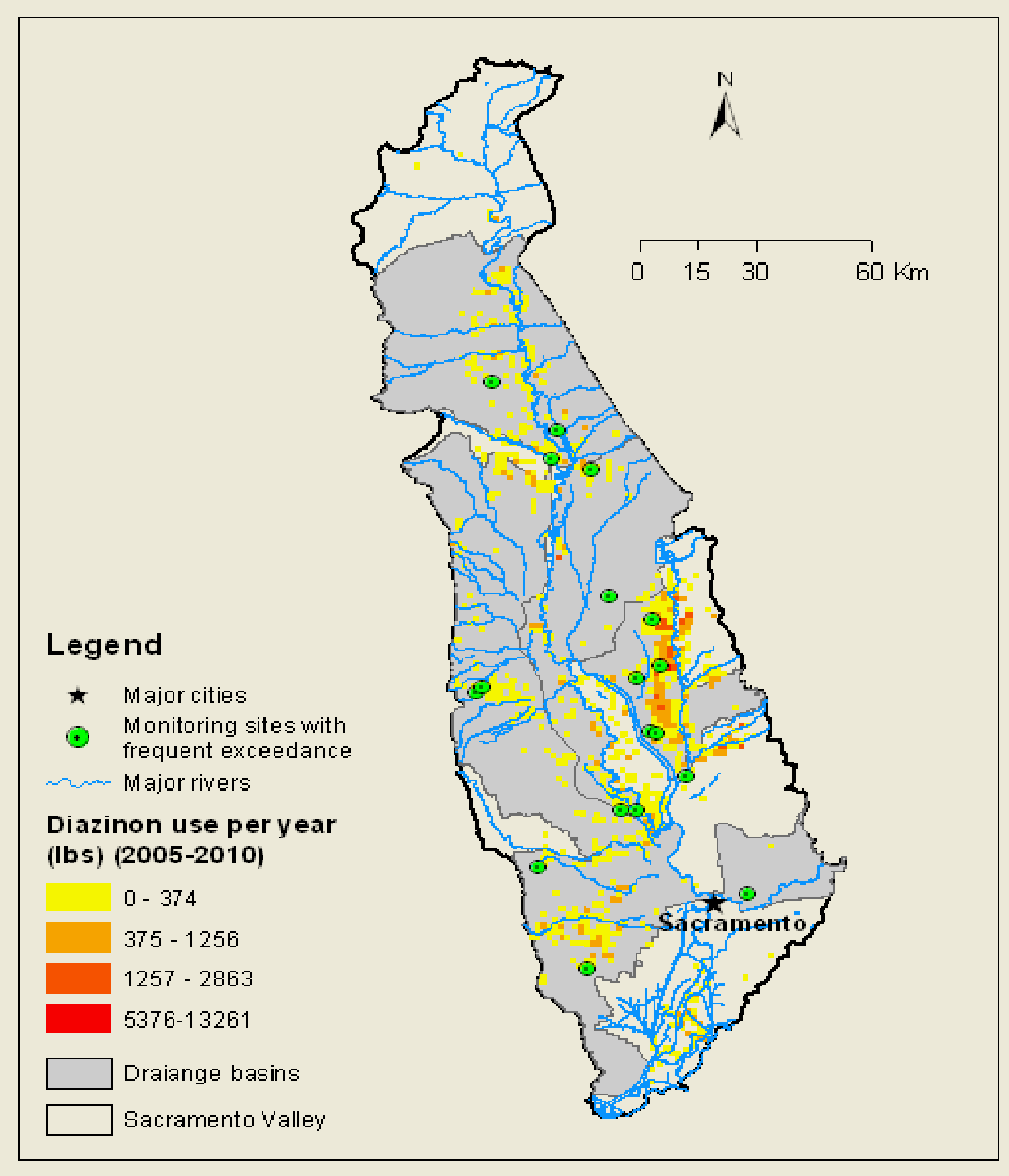


Fig. 4: Sacramento Valley monitoring sites with most exceedances and diazinon use within their drainage basins

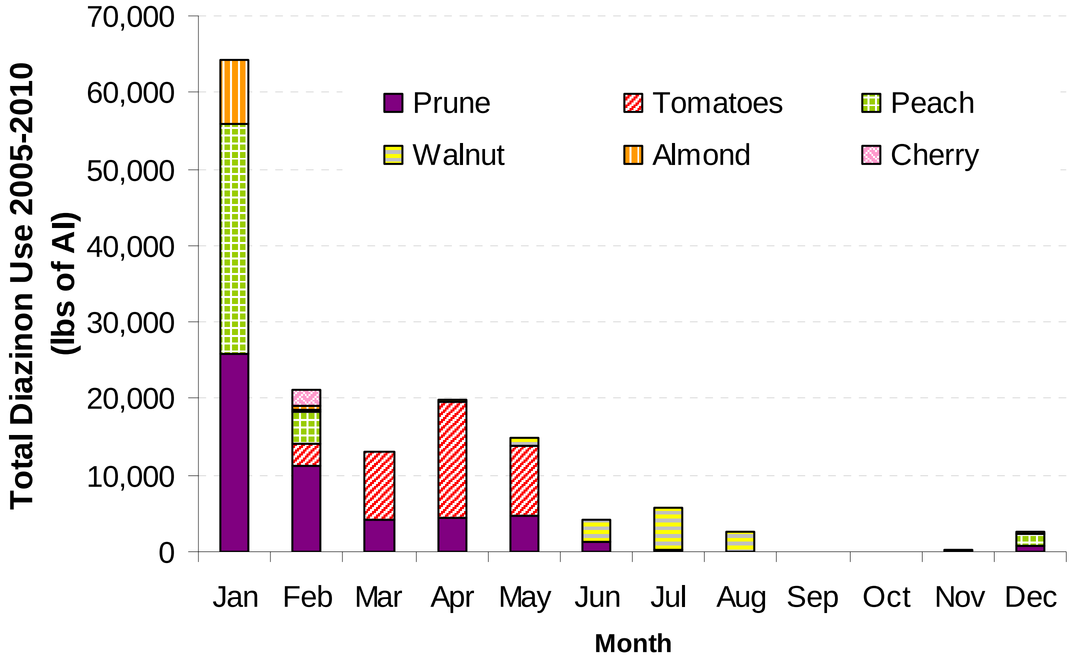


Fig. 5 Diazinon use on major crops in high detected areas of Sacramento Valley 2005 -2010.

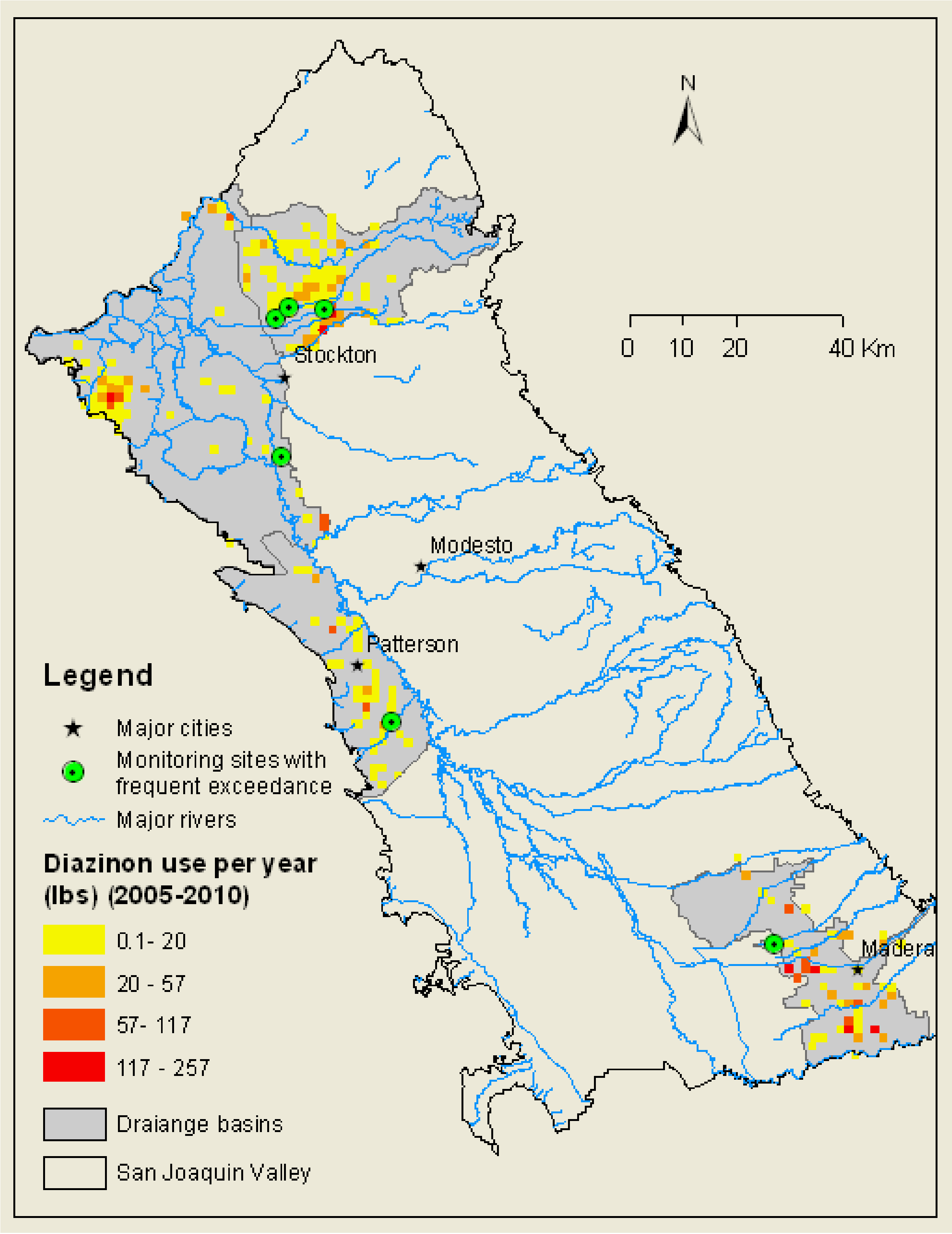


Fig. 6. San Joaquin Valley monitoring sites with most exceedances and diazinon use within their drainage basins.

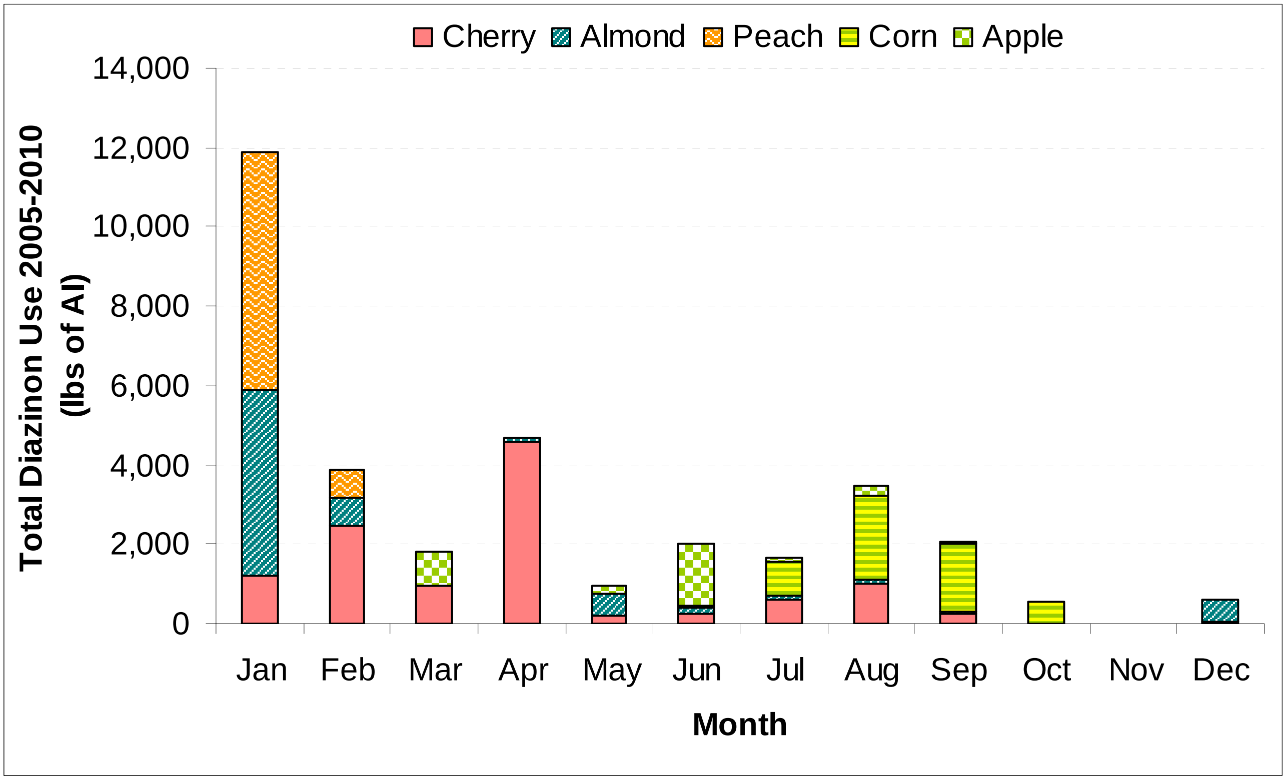


Fig. 7. Diazinon use on major crops in San Joaquin Valley Region 2005 -2010.

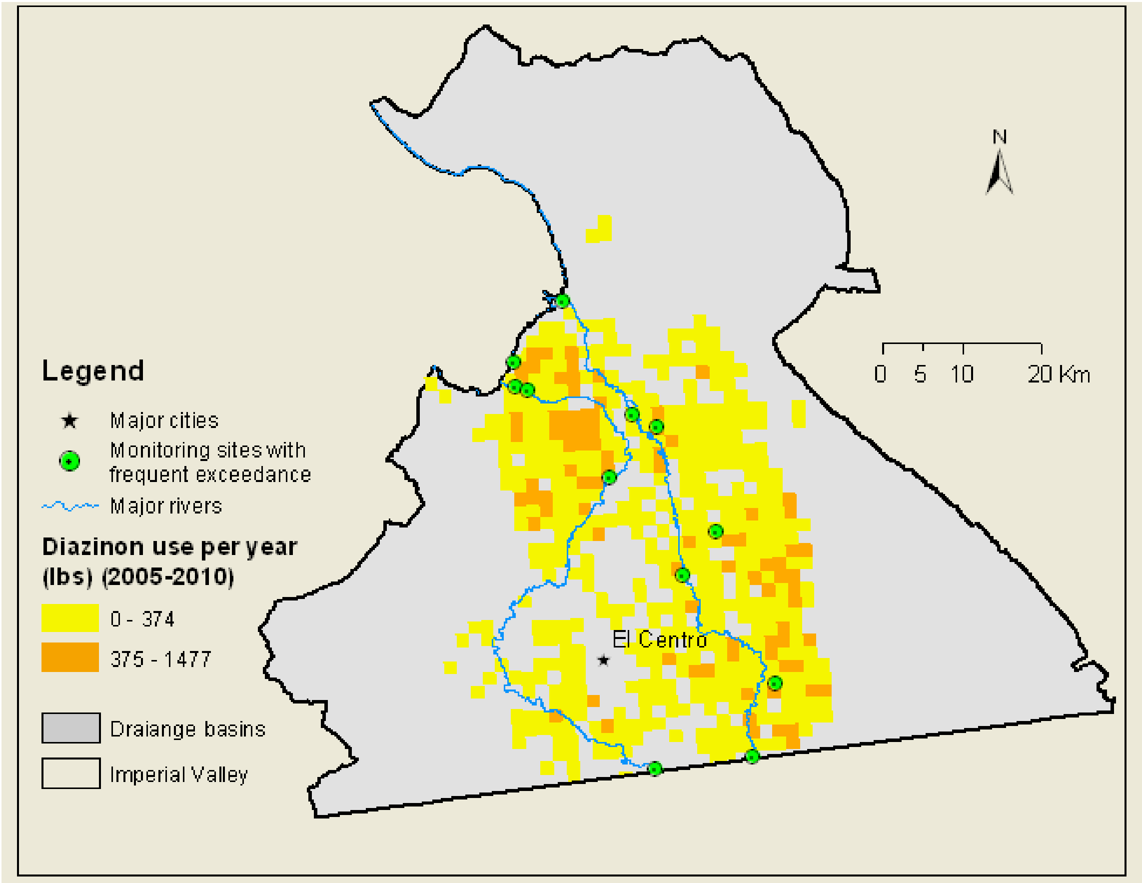


Fig. 8: Imperial Valley monitoring sites with most exceedances and diazinon use within their drainage basins.

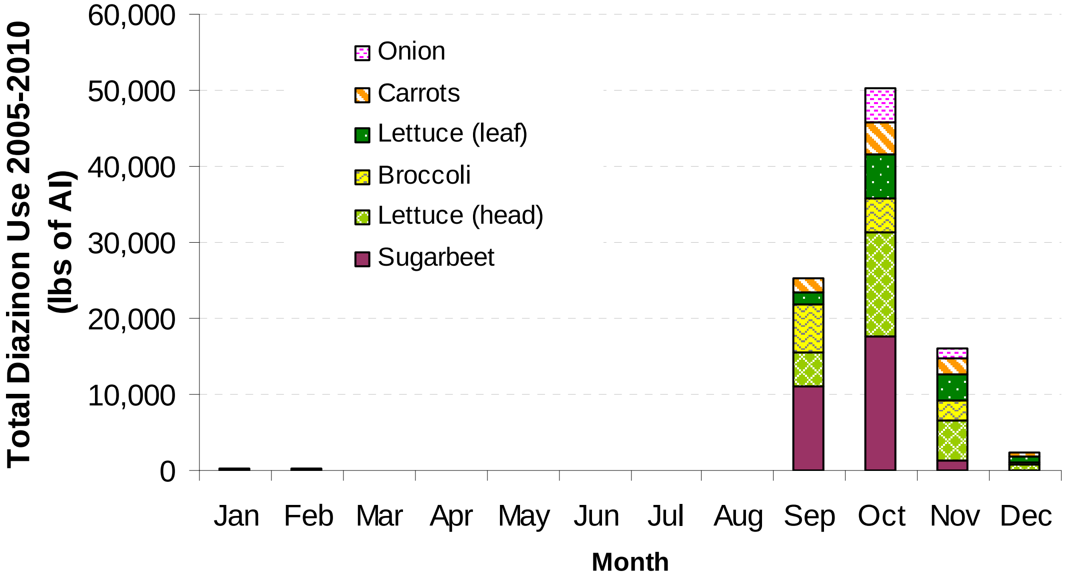


Fig. 9. Diazinon use on major crops in Imperial Valley Region 2005 -2010.

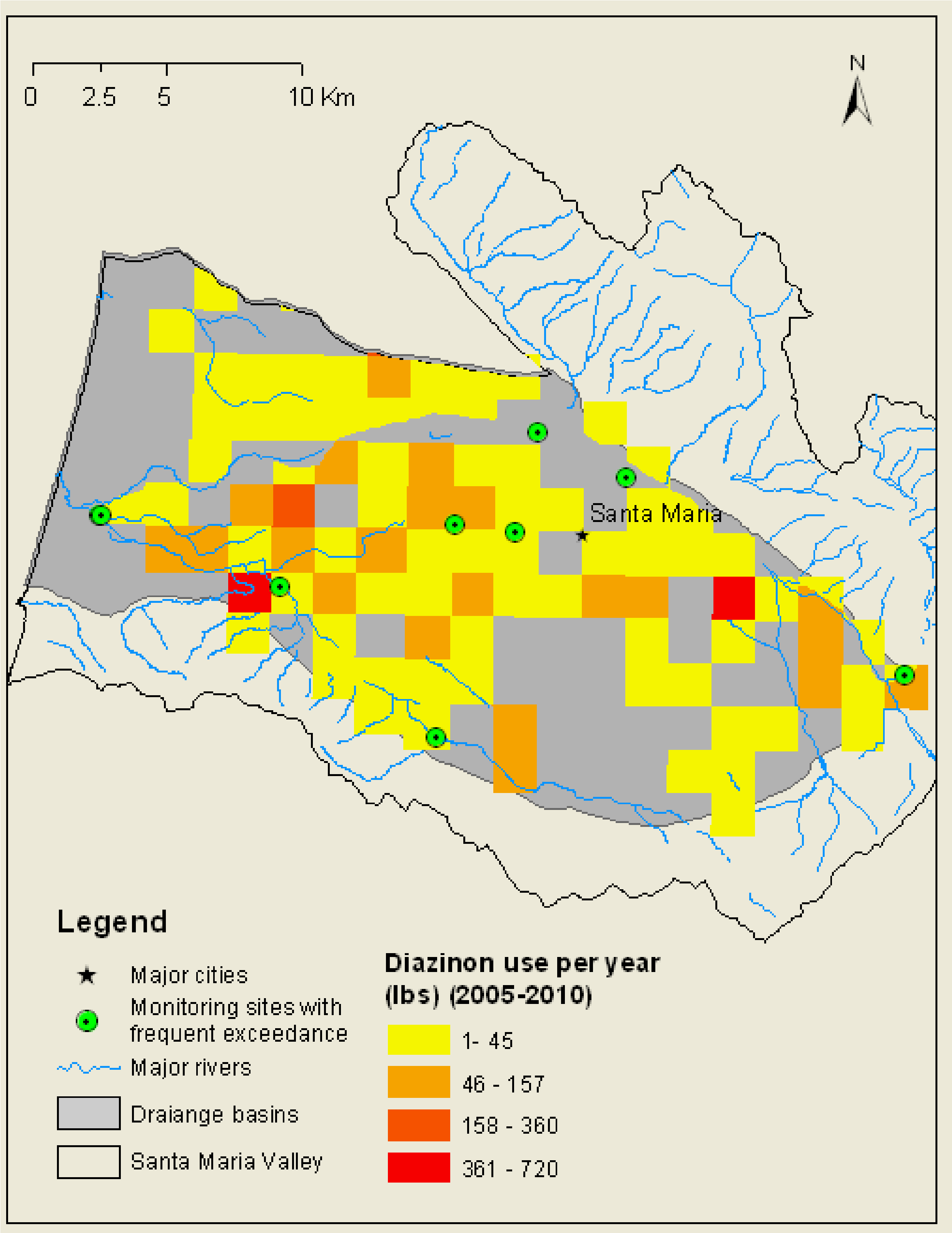


Fig. 10: Santa Maria Valley monitoring sites with most exceedances and diazinon use within their drainage basins.

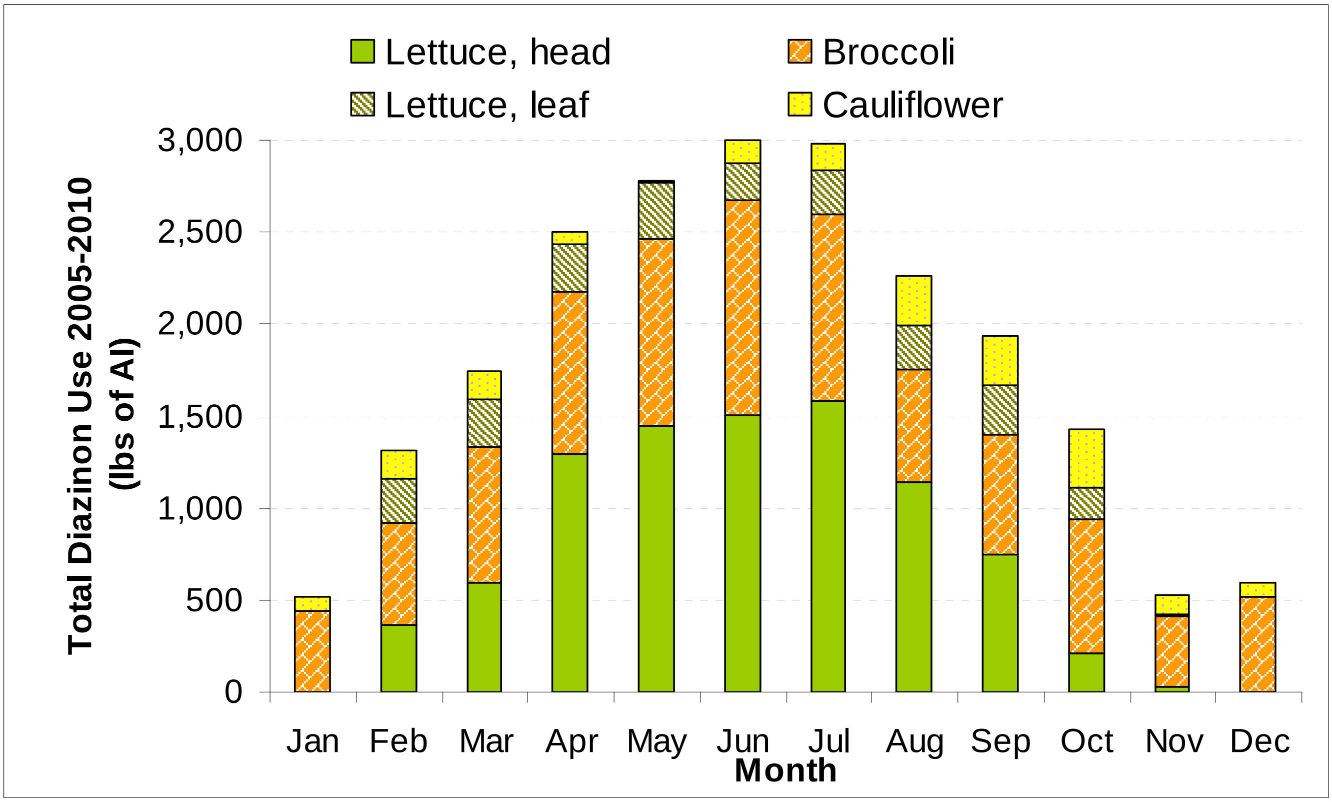


Fig. 11. Diazinon use on major crops in Santa Maria Valley Region 2005 -2010.