Gold Flecking in Tomato Not Caused by Thrips or Mite Feeding

Introduction: Tomatoes are one of the most profitable crops mid-Atlantic vegetable growers can produce, rivaling tobacco on a per acre basis. Though profitable, tomatoes are subject to many problems that can reduce yield and quality. One consistent quality reducing problem that growers in Maryland and across the nation face is gold fleck, or flecking. This is a frustrating problem as it appears just as fruit is beginning to ripen and is ready for harvest. In Maryland the flecking usually begins to appear sometime in mid to late July in field tomatoes and 3-4 weeks earlier in high tunnel tomatoes. It appears as a light sprinkling of gold flecks in the top layers of the skin of the fruit. The condition is only noticeable on mature, red fruit (Fig. 1). Usually, the amount of gold fleck is not conspicuous and does not affect the marketability of the fruit, however in some years in some fields the percentage of fruit effected and the severity (Fig. 2) of the condition can greatly reduce yields. Plum, Roma and saladette tomato types appear to be more susceptible to the problem than round tomatoes while cherry and grape tomatoes are somewhere in-between these two groups.

Fig. 1 Low to moderate levels of gold fleck on tomato fruit. Fruit still marketable.

Fig. 2 Severe amount of gold fleck on fruit. Fruit probably not marketable.
Most growers and pest management advisors believe gold flecking is caused by insect feeding, usually thrips or mites, directly on the fruit. This has resulted in growers in several areas of the country over applying pesticides for mite or thrips control. These applications however, usually have not reduced the incidence of flecking although in some instances they seemed to reduce the incidence of the malady. These inconsistent results have been frustrating to both growers and IPM researchers. To try and answer the question as to whether thrips or mites are responsible for gold flecking a series of studies was set up in the field in May 2010.

**Methods:** The study was conducted at the Central Maryland Research and Education Center-Upper Marlboro, MD. The plants were grown in staked culture on raised beds, with black plastic mulch and drip-irrigation. Treatments consisted of one variety of tomato BHN 410. This is a plum tomato that yields well, but like all plums is susceptible to gold flecking. Treatments consisted of a combination of insecticide (Radiant SC) and miticides (Agri-Mek EC rotated with Acramite 50WS) to reduce thrips and mite populations (as well as controlling worm species) vs. a control with no insecticides (although 3 applications of \textit{Bt} were used for worm control).

The study was arranged as a randomized complete block design with four replications. The insecticides were applied at the maximum label rates starting two weeks after transplanting at 10- day intervals until mid-July when they were on 7-day intervals. The control (water) treatment did not receive any insecticides other than \textit{Bt}. Transplants were grown at the greenhouse facility on the UMD campus and the field was set on 5 May. Each plot consisted of 30 plants. Mites and thrips were sampled by taking five leaves (branches), 20 flowers (when available) and 10 fruit (when available) from 5 randomly selected tomato plants per plot and dropping them in plastic bags which contained a 90% alcohol solution. The plant parts were shaken in the bags to thoroughly coat each in an alcohol bath. The liquid was taken to the lab and examined for the presence of thrips or mites. Plots were harvested ten times. Only red-ripe fruit was harvested. By late July four harvests had shown only very low incidences of gold flecking in any treatment (Fig. 4). An additional set of treatments was started on 28 July that either maintained irrigation amounts or reduced irrigation amounts by 50%. This irrigation treatment was set up so that each spray treatment was included in each of the two irrigation regimens. This experiment was conducted to see if stressing plants in late July could induce gold flecking and to see if the amount of gold flecking had any relationship to the amount of thrips or mite populations found on the plants.

**Results and Discussion:** Mite and thrips populations remained at very low levels in the Insect management treatment and rapidly increased in the control treatment starting in mid-July and stayed above thresholds for thrips and mites from 20 July through 10 September (Fig. 3). The amount of gold flecking was at very low levels in all treatments before the end of July, after the beginning of August gold flecking increased significantly in percentage of fruit affected (Fig. 4) and in its severity (Fig. 5) but only in the stressed treatments. There was no relationship between the numbers of thrips or mites present on the plants and the amount of gold flecking. However, by stressing the plants there was a greater than 5x increase in the amount of gold flecking in two weeks in the stressed treatments and no significant change in the normal irrigation treatments (Fig. 4). Whether plants were stressed or not the presence or absence of insect or mite pests had no effect on the percentage of fruit affected with or on the severity of gold flecking (Fig. 6). There was however, a strong relationship between water stress on the plants and the incidence and severity of gold flecking on the fruit (Fig. 6). Even at the end of the study in mid to late September with mite and thrips densities near zero (Fig. 3) the severity and amount of gold flecking did not significantly decrease in the stressed or non stressed treatments (Figs. 4 & 5).
Fig. 3 Numbers of thrips or mites per tomato plant in insecticide treated and non-treated plots.

Numbers of thrips or mites per tomato plant

Fig. 4 Percentage of tomato fruit with gold flecking in plant-stressed and non-stressed treatments with and without insect or mite control

Percent fruit with gold flecking

Date

% fruit with gold flecking
Fig. 5 Severity of gold flecking on tomato fruit in plant stressed (after 30 July) and non stressed treatments.

**Severity of Gold flecking**

- **Stressed Plants**
- **Non-stressed Plants**

![Severity of Gold flecking chart]


Fig. 6 The percentage of tomato fruit with gold flecking at each of the harvests in stressed and non-stressed plants.

![Gold flecking percentage by harvest chart]

In the areas where thrips and mite populations were always very low the same amount and severity of gold flecking was found as where there were greater populations of the pests throughout the season (Figs. 7 & 8). Figure 7 shows flecking damage from the low pest population area that usually has been attributed to thrips or mite feeding. The photos show the gold flecking is worse just under the calyx (black arrows), and it was assumed this was caused by thrips or mites hiding under the calyx and feeding on the fruit. The photos also show where two fruit were touching which would cause the thrips or mites to feed on the area around the contact spot, but unable to “squeeze” between the two fruit and feed within this contact spot causing the characteristic gold flecking circle effect (white arrows) and where the tomato fruit was rubbing against the support string where thrips or mites would not feed except for around the string (purple arrow). But all of these symptoms were reproduced with little if any thrips or mites ever being present. The other factor from this study that shows thrips and mites are not directly responsible for the damage is how quickly the symptoms appeared- basically over a 10-day period from time to time the stressing took place, but thrips and mite populations did not change during this period. The only factor that appeared to bring the problem on was that of stress - stress of a hot dry period, with reduced irrigation and the presence of a full fruit load. Another study (Davis 2000) demonstrated...
a reduction in gold flecking when pyrethroids were used on a consistent basis over the course of the season. This may have been due to a general reduction of pest pressure that reduced the stress on the tomato plants allowing fruit to develop without gold flecking problems. So it is possible that thrips and mites as well as other pests may put enough stress on plants during late summer when temperatures are high and fruit load is great to cause an increase in gold flecking. But this would only take place if pests were significantly above threshold. The pests are not directly responsible for the damage.

Growers and researchers have assumed that thrips or mites cause gold flecking because they are often found on the plant and the fruit during the same period that flecking occurs. Both these pests favor hot dry conditions which often occur in mid-July through August—the same time gold flecking occurs. However, I was able to reproduce the exact same type of damage that has always been attributed to thrips or mites with few thrips or mites being present.

Fig. 7  White arrows show where two fruit were touching and the development of gold flecking around the two. Black arrows show gold flecking under the calyx and purple arrow shows gold flecking developing around where support string touched tomato all without thrips or mites present

Fig. 8  Fruit with gold fleck from insect-mite controlled treatments (left) and from the control-no insecticides (right).

References cited