Pepper Spot (Gomasho) of Cabbage Revisited

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Over the years, “pepper spot” (gomasho or black speck) of cabbage continues to be a problem for growers, particularly for Chinese napa cabbage. While pepper spot is often called a disease, actually it is a physiological disorder whose cause is still being debated. In looking at various reports in the literature, this problem has been attributed to many conditions including excess water, excess N, warm temperatures at the heading stage, rapid growing conditions, cloudy weather, cold snaps, early nutrient stress, harvesting of over-mature heads and varietal differences. Recent research about this disorder is difficult to find and often is inconsistent, however the problem can have significant economic impact.

Pepper spot typically causes black to brown spotting or specking of the white leaf midribs of napa, almost as if someone had sprinkled pepper on the leaves, hence the name. (Fig. 1) It is typically thought of as a postharvest disorder and while not always obvious at harvest, it is exacerbated by certain storage conditions. Research has been conducted on temperature, carbon dioxide levels and ethylene. Cool storage followed by warm temperatures seems to make it worse. Storage with high (10%) CO₂ reportedly reduces development on round cabbage, while ethylene does not appear to promote it.

This disorder is not just a postharvest problem as it is frequently seen in the field in West Central and on the East Coast of Florida. This fall we have
seen fairly severe symptoms in napa cabbage in West Central Florida and we may even be seeing it in transplants. (Fig. 2) Although we have never observed it in transplants before, no pathogens have been isolated and there is no definitive test for pepper spot. Most of the research that has been conducted has focused on fertility, most often N rate and source. The general consensus is that in the leaves, absorbed nitrate is located in the midribs and it changes to amino acids in the leaf blades. If nitrate cannot be reduced fast enough due to excess N, cloudy weather (nitrate reductase is a light-induced enzyme), etc., then nitrite that is produced as an intermediate accumulates in the midribs thereby causing the “pepper spots”. The presence of nitrite has been detected even before the spots are completely formed, lending further credence to this theory. It has also been reported that excess N side-dressing during head formation contributes to the problem. In at least one study spotting was worse with high rates of N or P and at a high soil pH (8.3). Ammonium nitrate resulted in more spotting than urea.

Napa cabbage cultivars vary greatly in their susceptibility to pepper spot. In work at UC Davis, ‘T-740’ and ‘Yuki’ had the least amount, followed by ‘Spring Flavor’ and ‘Southern King’. ‘Blues’ and ‘WR-70’ had much higher amounts. Growers with pepper spot problems are advised to choose less susceptible varieties and take a close look at their fertility program. On-farm trials would also be helpful in evaluating cultivars as well as N rate, source and timing on the incidence of “pepper spot”.

![Fig.1 “Pepper spots” on napa cabbage midribs](image)
Fig. 2 Possible “pepper spots” on napa cabbage transplants