

Factors affecting thrips resistance in cabbage

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Cabbage is one of the main field crops grown by organic farmers in the Netherlands. When cabbage is cultivated for storage, it is usually harvested around mid-October. This type of cabbage crop may be severely damaged by thrips (*Thrips tabaci*). The damage caused by thrips is due to the symptoms that develop after feeding, which are small callus growths that will turn brownish after some time. These symptoms necessitate the removal of the outer leaf layers before marketing. Among modern cabbage varieties, large differences exist in the susceptibility to thrips damage, but it is not clear whether these differences are due to resistance (affecting the thrips population in the plant) or to tolerance (affecting the development of symptoms upon thrips feeding).

Through farmer interviews we learned that from their experience certain morphological variety traits, such as wax layer and compactness of the head, might be related to thrips damage. We carried out field experiments to further elucidate which plant traits are involved in resistance or tolerance. A diverse collection of old and modern storage cabbage varieties was grown in 2005 and 2006. Seedlings transplanted to the field by the end of May, and in 2005 four accessions were also planted mid-June. The experiments were replicated in two organically managed fields at different locations in the Netherlands. At four dates from early August to early October three plants per plot were evaluated for morphology, anatomy and Brix., as well as for thrips damage and thrips numbers.

In the 2005 experiment, four accessions were sown and planted at two dates. For developmental stage, size and compactness large differences between the two dates were observed during the earlier harvests, which decreased towards the last harvest date. No clear effects on leaf wax or leaf thickness were observed, while Brix and dry matter content were slightly lower in heads from the late planting. The number of thrips was considerably smaller, and the damage slightly smaller in the late planting, with exception of the highly resistant cultivar Galaxy which showed no consistent differences between the plant dates.

The ten varieties showed a large variation for all traits studied, as was expected from the selection criteria. Thrips population and damage were highly correlated ($R=0.81$ to 0.96 in the third and fourth harvests of both years). There were no varieties with a remarkably low damage in relation to the number of thrips, which suggests that some form of resistance rather than tolerance causes the difference in damage between varieties.

Thrips damage positively correlated with Brix, and also with compactness and developmental stage in the first two harvests. This indicates that a cabbage head with tightly packed leaves early in the season leads to higher thrips damage; presumably because the insects are sheltered against predators. Further, a high amount of leaf surface wax is negatively correlated with thrips damage, indicating that wax gives some protection against thrips.