学 位 論 文 要 旨

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題　目	Factors affecting population dynamics of aphids and interactions between *Turnip mosaic virus* and its aphid vectors （アブラムシの発生動態とその決定要因およびカブモザイクウイルスと媒介アブラムシとの相互作用）

Among insects, aphids are known to have an extraordinary capacity for population increase. Because they are parasitized or predated by various kinds of organisms, they play an important role as food source. Aphids also cause major economic losses in various crops directly and indirectly by transmitting plant viruses. Therefore, the studies of aphid population dynamics are important subjects for the management of agricultural pests.

In Part 1, I studied the factors affecting the seasonal occurrence of *Uroleucon nigrotuberculatum*. The aphid *U. nigrotuberculatum*, native to North America, was introduced into Japan in the late 1980s. In Japan, the aphid is primarily associated with *Solidago altissima*, which also invaded Japan from North America. A previous study revealed that, in Japan, the aphid suddenly disappeared from low elevation areas in mid-summer, while the aphid was continuously found in a mountainous area throughout the season. Firstly, I conducted field investigations, and field and laboratory experiments to clarify the mechanism of such population dynamics in northern Kyushu, Japan. As a result, I showed that top-down and bottom-up effects contribute to the rapid decline of *U. nigrotuberculatum*, and high temperature in lowlands causes the summer disappearance of the aphid. Secondly, I studied the effects of temperature and lace bug *Corythucha marmorata*, coexisting with *U. nigrotuberculatum*, on the aphid density in northernmost areas of its distribution ranges in Japan. As a result, I concluded that *U. nigrotuberculatum* populations were at least partly affected by high temperature during summer, but not by *C. marmorata* in the northern areas.

In Part 2, I studied the effects of seasonal changes of vector aphids on expansion of *turnip mosaic virus* (TuMV). TuMV is usually spread by various aphid species in non-persistent manner, and causes economic damages especially to Japanese turnip and Japanese radish in our country. However, wild hosts of TuMV and main vectors contributing to the infection to these crops are still unknown. Among three phylogenetic groups of TuMV, world-B, basal-BR, and Asian-BR, known to occur in Kyushu, Japan, the basal-BR group was suddenly appeared around 2000 and replaced world-B group, which had been predominant before. Firstly, I detected *Rorippa indica* as the main wild host of TuMV, and several species of generalist aphids as main vectors transmitting TuMV from wild hosts to Japanese radish, then the specialist aphid *Lipaphis erysimi* as the main vector playing an important role to expand TuMV on Japanese radish. Secondly, I newly reported the distribution of *Aphis nasturtii* associated with Brassicaceae, in Honshu, Shikoku, and Kyushu. Thirdly, I compared the performance of some vector aphids between TuMV-infected and non-infected turnips and between different phylogenetic groups of TuMV. As a result, the effects of TuMV infection were different among aphid species, but not related to phylogenetic groups. Finally, I demonstrated that infection efficiencies to *R. indica* and Japanese radish were higher in basal-BR than in world-B, which may cause the shift of predominant group from world-B to basal-BR in Kyushu.