

Abstract of a thesis submitted in partial fulfilment
of the requirements for the Degree of Ph.D.

SOME ASPECTS OF THE BIOLOGY, DAMAGE, POPULATION
DYNAMICS AND FLIGHT OF ACYRTHOSIPHON KONDOI

SHINJI (HOMOPTERA : APHIDIDAE) IN

CANTERBURY, NEW ZEALAND

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The effect of temperature on aspects of survival fecundity morph determination, rate of development and relative growth rate of the bluegreen lucerne aphid (Acyrtosiphon kondoi Shinji) (BGLA) is discussed. Age specific life tables for BGLA under different temperatures have been developed. Significant regressions were obtained with rate of development of life stages and the temperature. Temperature thresholds were deduced and a base temperature of 2.63°C was considered to be of most significance in ecological work. Adult apterae are 1.86 times heavier than alatae. Colour polymorphism of BGLA is apparent at constant low temperatures. Survival and performance of BGLA on lucerne cultivars 'Saranac', 'Wairau' and 'Washoe' under different temperatures have been discussed. The cultivars did not affect the survival of BGLA. 'Washoe' is generally more resistant to aphids under variable temperature than the other two cultivars. A laboratory assessment study of BGLA damage on 'Wairau' is described. The number and the density of leaves produced, and the number of side branches are positively influenced by infestations. Total length in side branches and the number of secondary stems remain the same under the attack. Plant height, length of

aerial shoots, total leaf area, mean length of secondary stems, diameter and dry matter of roots and plant dry weight are significantly affected by the aphids' feeding. A comparative sampling study for three stages during the year is discussed. Whole stems, suction and total removal of circular areas were compared. Aphid population dynamics and the field damage reflected in agronomic features in 'insecticide' and 'no-insecticide' treated lucerne is discussed. Population dynamics studies of BGLA under two hay cutting practices indicated that harvesting after the spring flight is advantageous. Pea aphid population fluctuations during the 1977-78 season are presented. Peak pea aphid populations occurred in summer. Grazing in early autumn, mid autumn and early winter as a means of regulating the spring aphid buildup is investigated. Early winter grazing after the autumn flights have ceased reduces BGLA buildup markedly in spring. An aerial sampling study of BGLA is discussed and the flight pattern of BGLA and natural enemies in two years is presented. Two major flight peaks per growing season are apparent. Diurnal density changes of BGLA and natural enemies are given. Four conventional aphid flight traps are compared using correlation analysis and the influence of the climatic factors on aphid catch in traps is discussed. Threshold analysis of BGLA flight for climatic factors is described. The occurrence of the spring and autumn peaks of BGLA with respect to physiological time is discussed. Autumn and spring median flight days are $1625 D^{\circ}$ or 11.2 generations apart. Ninety percent of the spring flight peak lasts for 2.5 generations. Four Fortran computer programmes utilized in the thesis for (1) obtaining the heat units accumulated over a

period, (2) averaging and plotting weather data on the insect's physiological time scale, (3) obtaining the climatic thresholds of the aphid flights, and (4) for estimation of the physiological time for future days for flight prediction work are described.