

Leafhoppers of the genus *Cicadulina* exclusively transmit Maize streak virus (MSV) disease which is an important constraint to maize production in Sub-Saharan Africa. Current literature indicates that agro-ecological factors influence leafhoppers and the MSV, but no information is available on the influence of altitude and soil nutrients on *Cicadulina* spp. and the MSV disease, and how these factors can be manipulated for disease control. The leafhopper populations and the viral strains that they transmit were assessed to determine the geographical distribution and the prevalence of the MSV disease. Farm interviews, insect vector and soil sampling were carried out in six study regions to determine the level of farmer perception, leafhopper species distribution and soil nutrient levels in the regions. The selected regions were Bahari, Mwea, Githunguri, Oyani, Muhoroni and Kimilili in Kenya. The results indicated that farmers in Mwea and Oyani regions incur high yield losses of more than 40% due to MSV disease. Between 7% and 30% of farmers apply inorganic fertilizers, although the differences were not significantly different. The species of leafhoppers identified in the regions included *Cicadulina mbila* Naude, *C. storeyi* China, *C. chinai* Ghauri and *C. bipunctata* (Melchar). The population sizes of the various *Cicadulina* species differed significantly ( $p = 0.021$  and  $j = 0.006$  respectively). Regression analysis showed that *C. mbila* numbers decreased significantly with altitude, and *C. mbila* correlated negatively with altitude. Most regions showed inadequate levels of phosphorus for plant growth, and the level of nitrogen and potassium differed significantly between the regions ( $p < 0.01$ ). The viral isolates transmitted by *C. mbila* from Oyani region caused significantly higher percent disease incidence (87 %) than that from (Githunguri, Muhoroni and Bahari regions (63, 60 and 53 % respectively). Screen house studies indicated that significantly low number of plants with MSV symptoms were recorded after high nitrogen treatment (75 kg N ha<sup>-1</sup>), compared to the rates of 0, 25 and 50 kg N ha<sup>-1</sup>. Plants that received 75 and 25 kg P ha<sup>-1</sup> treatments were significantly taller than those that did not receive any treatment. Nitrogen fertilizer correlated positively with the number of insects settling on the treated maize plants ( $r = 0.614$ ;  $p < 0.011$ ). Nymphal survival was significantly lower on the 25 Kg N treatment. However, plants treated with 25 kg N had comparatively higher percent lignin, and tannins, although differences of the latter two were not significant. Pair wise correlation matrix analysis indicated that nitrogen treatment correlated positively with the percent nitrogen present in maize plant tissues, negatively with the neutral detergent fibres ( $r = -0.510$ ;  $p = 0.043$ ) and positively with the number of surviving nymphs ( $r = 0.502$ ;  $p = 0.047$ ). Acid detergent fibres correlated positively with the percent lignin ( $r = 0.815$ ;  $p = 0.001$ ). In addition, no significant relationship between the longevity of both male and female leafhoppers and the rate of phosphorus treatment was indicated. The findings of this study suggest that the application of, different rates of nitrogen and phosphorus fertilizers influence leafhopper behaviour and consequently the expression of MSV disease. This information can be used by the fertilizer industry to reformulate fertilizers, particularly for use in the management of vector borne diseases. Further research to design experimental systems of investigating responses of leafhoppers to global environmental changes is proposed. Such a study would assist in mitigating the effects of environmental change within the context of establishing appropriate fertilizer regimes for crop production