

Etiology, Epidemiology and Management of Dieback Disease of Passion Fruit (*Passiflora* spp) in Central and Eastern Regions, Kenya

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Abstract:

Passion fruit is important in Kenya for nutrition and income. Current production is low and this is largely due to pests and diseases. In Kenya, major passion diseases include Fusarium wilt, Phytophthora canker, Brown spot, Woodiness virus and Dieback. Dieback causes over 80% of total produce loss and has negatively affected the passion fruit value chain. The objective of this study was to identify dieback pathogens, determine their aggressiveness, investigate its epidemiology and identify effective management measures. A survey was carried out in major passion fruit growing areas in Central and Eastern Kenya. Three research sites were set up in the study areas and 1 at Kenyatta University, where epidemiological and disease management trials were done. Passion fruit varieties assessed were *Passiflora edulis* var Sims and KPF 12 hybrid. Diseased samples were collected for isolation and identification of pathogens in the laboratory. Pathogenicity tests determined aggression of the isolates. Data on disease severity were collected using a dieback scoring chart (with a scale of 1 to 5, subjected to analysis of variance and means separated by LSD at $P = 0.05$ using the Tukey's test. Results showed that dieback is a disease complex caused by multiple pathogens (Genus *Fusarium*, *Phytophthora*, *Alternaria* and *Ascochyta*). Disease was most severe when pathogens were inoculated in combinations of 3 and 4. Proper field maintenance practices reduced disease incidence and severity (12% and 1.6 respectively) in Meru B while poor maintenance yielded high levels (55% and 4.0 respectively) in Mathioya. Agronomic practices important in transmission of dieback pathogens on the purple variety were pruning, grafting and wounding ($P < 0.05$). Mavuno and TSP fertilizers boosted plant growth leading to lower disease scores of 2.2 and 2.3, respectively, as compared to the control (2.92). None of the fungicides evaluated was curative. Plants treated with Ridomil MZ had a low severity score (2.1), while those treated with Milraz had a higher score (2.7). Water stress increased severity thereby suggesting that the lower the amount of water/rainfall available to a plant, the higher the dieback severity and vice versa. The relationship between rainfall and dieback severity yielded a negative correlation coefficient ($r = -0.70$). Multiple pathogens imply that there should be integrated measures for effective disease control. Positive effect of fertilizers indicates that proper nutrition is crucial to alleviating effects of dieback. This study identified dieback pathogens, showed that proper field maintenance and nutrition are important in disease management and indicated that major fungicides currently in use in production are ineffective. Recommendations were that although attention is largely on dieback, management of other passion diseases should not be neglected. There is need to strengthen role of nursery operators and training farmers/nursery operators on importance of tool disinfection. Dieback management packages should target multiple pathogens. To boost production there is need for nationwide rotational programs. This information is crucial in dieback disease management programs and will contribute towards reviving the passion fruit industry in Kenya.