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(Thesis Title)

POTENTIAL OF POTASSIUM SALTS OF FATTY ACIDS AND INTEGRATED PEST MANAGEMENT STRATEGIES IN THE MANAGEMENT OF SNAP BEAN PESTS

Thesis Abstract

Production of snap beans for the export market in Kenya is mainly by small scale farmers but insect pests remain a major constraint to production. Farmers rely mainly on synthetic chemical pesticides to manage insect pests. Overreliance on chemical pesticides has led to adverse effects on the environment and high chemical pesticide residues on fresh produce resulting in noncompliance with the strict maximum residue level (MRLs) requirements for export vegetables by European markets. This has led to rejection of export produce causing high economic losses to farmers. Therefore, this study was carried out to develop sustainable options of managing snap bean pests with the aim of reducing chemical residues on snap bean produce. Two field experiments were carried out in farmers' fields in Mwea and Embu under irrigated conditions over two cropping cycles from July 2013 to January 2014. The first experiment was to determine the effectiveness of potassium salts of fatty acids in the management of whiteflies and thrips in snap beans. Different

concentrations of potassium salts of fatty acids evaluated were potassium salts of fatty acids at 0.5%, 1% and 1.5% spray solution. Applications of potassium salts of fatty acids were carried out starting from two weeks after emergence then weekly until early podding. The collected data included thrips and whitefly populations, yield and pest damage on the harvested produce.

The second experiment evaluated pest management options that included: i) seed dressing only, ii) seed dressing followed by three neem sprays, iii) seed dressing followed by two pyrethroid sprays and one neem spray, iv) seed dressing followed by three pyrethroid sprays and intercropping snap bean with maize, v) seed dressing followed by two pyrethroid sprays plus one spray with a biological product, vi) seed dressing followed by two neem sprays plus one spray with a biological product, and vii) two pyrethroid sprays and one neem spray only. The data collected included plant emergence, nodulation, the bean stem maggot population, thrips population, whitefly population, yield and pest damage. Potassium salts of fatty acids were effective in reducing whiteflies and thrips population. The application of potassium salts of fatty acids at the rate of 1.5% of spray solution significantly ($P < 0.05$) reduced white fly and thrips populations by up to 65% and 60% respectively. Pod damage due to thrips was also significantly ($P < 0.05$) reduced and the yield was significantly ($P < 0.05$) increased. The untreated control and potassium salts of fatty acids at the rate of 0.5% did not have significant ($P > 0.05$) effect. The integration of seed dressing, two pyrethroid sprays and a neem spray applied at the vegetative stage, early flowering and early podding respectively and the integration seed dressing, intercropping with maize plus three pyrethroid sprays applied at the vegetative stage, early flowering and early podding, reduced the bean stem maggot, white

fly and thrips population by up to 59%, 57% and 60%, respectively. These options also increased emergence, reduced pod damage and increased yield of extra-fine and fine pods. The above results show that potassium salts of fatty acids at 1.5% are effective in the management of thrips and whitefly in snap beans and can be integrated in a pest management system for snap beans. Similarly, the integration of seed dressing, foliar sprays and intercropping with maize is effective in the management of the bean stem maggots, thrips and whitefly in snap beans and can be integrated in a pest management system for snap beans. Potassium salts of fatty acids and the integration of seed dressing, foliar sprays and intercropping with maize would therefore be viable alternatives to synthetic chemical pesticides thereby enabling farmers meet the strict maximum chemical residue level requirements set by European markets.

Key words: *Phaseolus vulgaris* L, chemical pesticide residues, potassium salts of fatty acids, seed dressing, foliar sprays, intercropping