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Indigenous knowledge practices for production and management of spider mites and anthracnose in smallholder French bean farmers in Nakuru County, Kenya

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Abstract

A field survey was conducted to inventory the major crops grown, French bean production constraints, pests and diseases and indigenous control strategies. A total of 56 smallholder French bean farmers were interviewed using structured questionnaires. Results showed that land ownership (82.2%) and household headship (66.1 %) were male dominated. The major crops grown were maize (31.6%), French bean (26.2%) and tomatoes (18.5%). Whiteflies, aphids, spider mites and thrips were identified as the major insect and mite pests whereas the major diseases were anthracnose, powdery mildew, leaf rusts, bacterial blight and black rots. Most farmers used synthetic pesticides for the control of spider mites (98.2%), anthracnose (96.4%) and aphids (69.6%) compared to 5.4% using botanical pesticides against same pests and disease. Aqueous leaf extracts of tobacco and Mexican marigold were the common botanical pesticides used against insects and spider mites. Majority (96.4%) of farmers expressed willingness to adopt a rationalised use of botanical pesticides for management of pests and diseases. The findings of this study are discussed in the context of their relevance to better insect pest and disease management for improved French bean production.

Key words: Aphids, Mixican marigold, whiteflies

Résumé

Une enquête de terrain a été menée pour faire l'inventaire des principales cultures, les contraintes de production de haricots vert, les stratégies de lutte des autochtones contre les ravageurs et les maladies. Un total de 56 petits producteurs de haricot vert ont été interrogés au moyen de questionnaires structurés. Les résultats ont montré que la propriété foncière (82,2%) et les chefs de famille (66,1%) étaient dominés par le sexe masculin. Les principales cultures plantées sont le maïs (31,6%), le haricot vert (26,2%) et les tomates (18,5%). Les aleurodes, les pucerons, les araignées et les thrips ont été identifiés comme les principaux insectes nuisibles et acariens, alors que les principales maladies sont l'anthracnose, l'oïdium, la rouille des feuilles, la brûlure bactérienne et la pourriture noire. La plupart des agriculteurs utilisent des pesticides de synthèse pour le contrôle des acariens (98,2%), l'anthracnose (96,4%) et les pucerons (69,6%) comparativement à 5,4% de l'utilisation de pesticides botaniques contre les mêmes organismes nuisibles et les maladies. Les extraits de feuilles

de tabac aqueux et le souci du Mexique ont été les pesticides botaniques couramment utilisés contre les insectes et les acariens. La majorité (96,4%) des agriculteurs a exprimé sa volonté d'adopter une utilisation rationnelle des pesticides botaniques pour la gestion des ravageurs et des maladies. Les résultats de cette étude sont discutés dans le contexte de leur pertinence pour une bonne gestion des ravageurs et des maladies aux fins d'améliorer la production de haricots vert.

Mots clés: pucerons, souci Mexicain, aleurodes

Introduction

French bean (*Phaseolus vulgaris* L.) is a major vegetable export crop (48%) and income earner to the smallholder farmers who constitute more than 80% of producers in Kenya (HCDA, 2012). However, the area under this crop has been declining mainly due to pests and diseases such as bean fly, spider mites, rust, blights and anthracnose (Monda *et al*., 2003). Literature survey show that majority smallholder farmers use synthetic pesticides as control measure and rarely use ecologically sound alternatives such as botanical pesticides due to various reasons such as lack of knowledge on their availability and anticipated benefits. Overreliance on synthetic pesticides has caused more problems than resolving them, such as insecticide resistance, mammalian toxicity, environmental pollution and rejections of export produce due to chemical residues (Kedera and Kuria, 2003; KEPHIS, 2006) has frequently been reported. Recent research has focused on botanical usage as best alternative to the synthetic pesticides due to their broad spectrum of activity, being easy to process and use, short residual activity, no resistance and ease of availability. A farm survey was conducted to inventory the major crops, French bean production constraints especially pests and diseases and farmers' indigenous control strategies

Literature summary

French bean is a major vegetable export crop and income earner for smallholder farmers. Although it accounts for 48% of foreign revenue on exports, its production has been limited by decreased acreage and yields attributed mainly to pests and diseases (HCDA, 2012). Farmers have been relying majorly on synthetic chemicals as control strategies but with mixed results. Recent research has focused on plant derived products as best alternatives, but farmers have been reported to lack knowledge on their importance. Hence, farmers have increasingly used chemicals for increased crop production at the expence of food safety and environment (KEPHIS 2006). The present study documented the major crops, pests and diseases of French bean and farmers' indigenous control practices against spider mites and anthracnose disease in smallholder French bean producing areas.

Study description

A survey was conducted in Naivasha and Subukia districts of Nakuru County, Kenya. A stratified random sampling procedure was used (Ogendo *et al*., 2003) and a simple structured questionnaire administered to 56 randomly sampled smallholder French bean farmers. Data

were collected on crops grown, major pests and diseases of French bean and current control measures. On-the-spot recognition and identification of pest species and diseases was done by the research team, field extension officers and farmers' description of local names of pests and diseases. This was conducted on the basis of expertise, experience and available literature. Data collected on all the variables under investigation were summarized using appropriate descriptive statistic which included frequencies and averages for pooled sample for different farmers related to variables of interest. The data was compiled and analysed using statistical package for social sciences (SPSS version 20.0) software.

Research application

Results showed that land ownership (82.2%) and household headship (66.1 %) were male dominated. The major crops grown by smallholder farmers were maize (31.6%), French bean (26.2%) and tomatoes (18.5%). Whiteflies, aphids, spider mites and thrips were identified as the major insect pests whereas the major diseases were anthracnose, powdery mildew, rusts, bacterial blight and black rots. Farmers mainly used synthetic pesticides for the control of aphids (69.6%) and army worms and spider mites (10.7%) compared to 5.4% who used botanical pesticides. Results further revealed that synthetic pesticides were the major control agents against spider mites (98.2%) and anthracnose (96.4%). Minority (5.4%) of the smallholder French bean farmers used botanical pesticides obtained from tobacco and Mexican

Table 1. Major crops and their socio-economic ranking.

Crop	Percent of respondents who ranked			Mean
	Crop 1st	Crop 2nd	Crop 3rd	
Maize	41.1	23.2	30.4	31.6a
French beans	33.9	33.9	10.7	26.2a
Irish potatoes	3.6	5.4	3.6	4.2c
Tomatoes	16.1	17.9	21.4	18.5b
Onions	3.6	3.6	10.7	6.0c

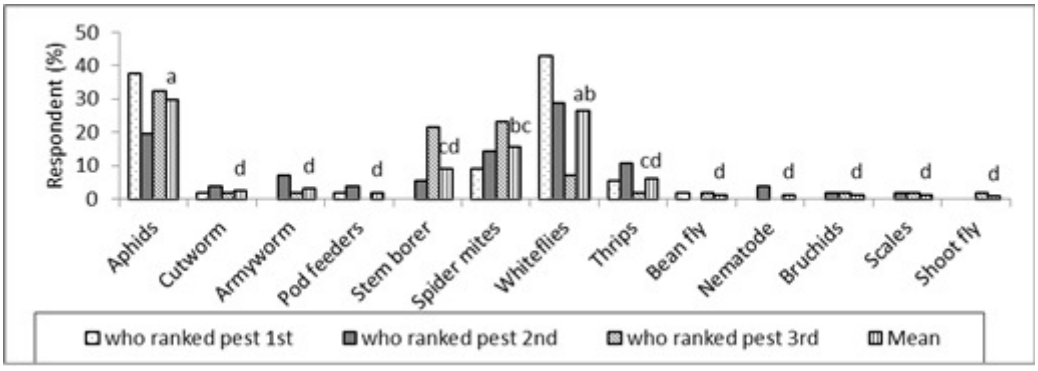

Figure 1. Common pests of field crops in Subukia and Naivasha Districts, Kenya.

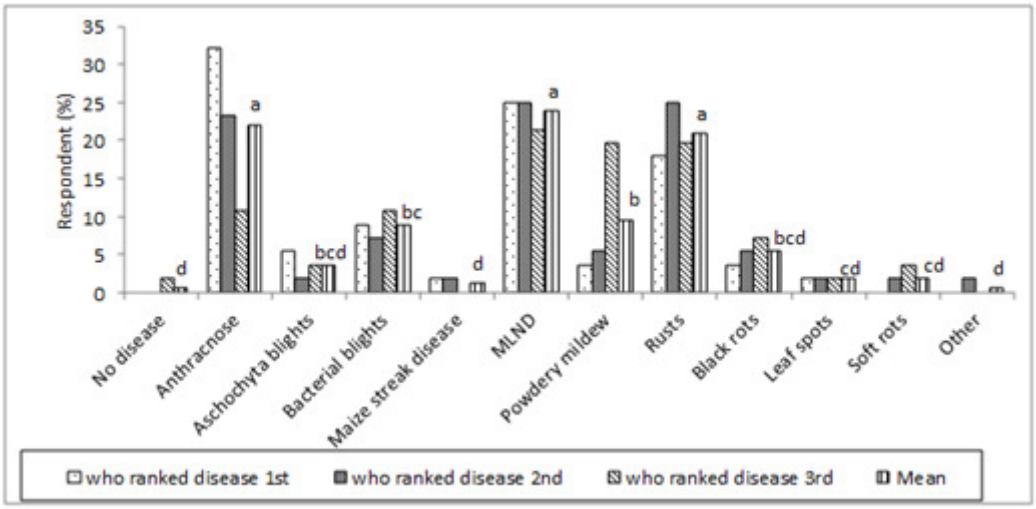

Figure 2. Common diseases of field crops in Naivasha and Subukia districts, Kenya.

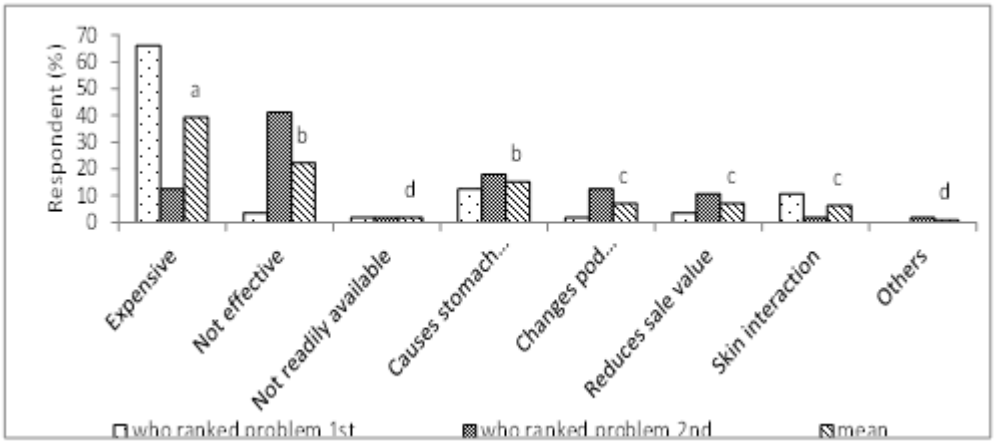

Figure 3. Problems associated with synthetic pesticides' use and their socio-economic ranking.

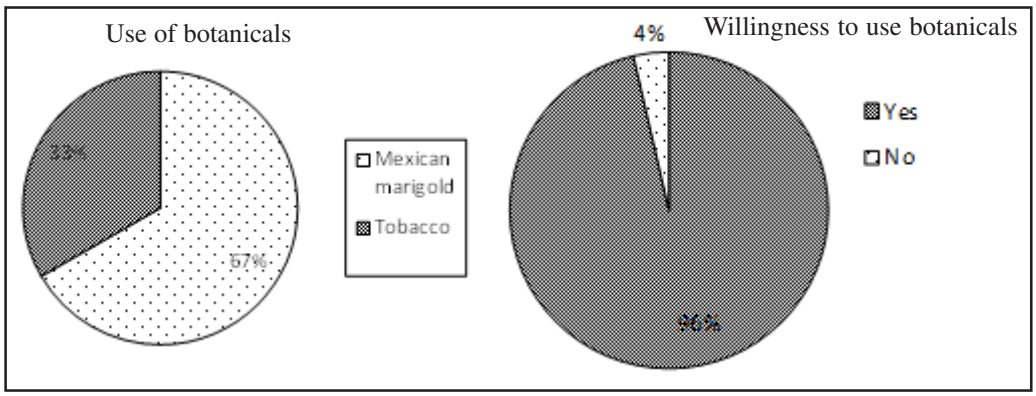

Figure 4. Types (a) and willingness (b) to use botanicals by smallholder farmers.

marigold leaves for control of insect pests. Majority (96.4%) of respondent farmers expressed willingness to adopt a rationalised use of botanical pesticides for management of insect pests and diseases in French beans**.**

On-going research. The results of the farm survey have been used to design two on-going graduate students theses researches:

(i) Efficacy of selected plant extracts for management of anthracnose in French bean (Sylvans Ochieng Ochola; KM12/3364/12).
(ii) Bioefficacy of lion's ear, *Leonotis nepetifolia* L., and African basil, *Ocimum gratissimum* L., extracts against spider mites on French bean (Ogayo Obuya Kennedy; KM14/3278/12). Progress on the two graduate students being presented during the 4th RUFORUM Biennial Conference in Maputo (July 2014).

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