Management Practices Of Insect-Pests And Diseases Of Common Vegetable Crops Of Selected Districts Of Central And Northern Tanzania

Julius S. Missanga[1], Chrispinus D. Rubanza[2]

[1]University of Dodoma (UDOM), Department of Biotechnology and Bioinformatics, School of Biological Sciences, P. O Box 338, Dodoma, Tanzania
jmissanga@gmail.com

[2]University of Dodoma (UDOM), Department of Conservation Biology, School of Biological Sciences, P. O Box 338, Dodoma, Tanzania

ABSTRACT: Vegetable crops are known for their enriched vitamins and essential nutrients. Vegetable production is among the main sources of income to a majority of smallholder farmers in central and northern Tanzania. Despite a number of factors affecting vegetable production, farmers' knowledge and skills are so important towards proper management of insect-pests and diseases. This study was therefore carried out to assess the farmers' management practices of insect-pest and diseases of common vegetable crops mainly tomatoes and sweet peppers in selected districts of semi-arid climates of central and northern Tanzania. To obtain baseline data, a socio-economic survey was carried out is the selected areas with a total of 60 respondents involved. In general, this study revealed unsustainable farming practices that resulted in notable insect-pests and diseases infestation within the farms across Dodoma Municipality, Kongwa, Babati, and Kiteto districts. Proper control and management practices were therefore recommended through training, use of improved varieties and proper agronomic practices for enhanced production.

Key words: Insect-pests, Diseases, Management Practices, Vegetable Crops

A. INTRODUCTION

Vegetable crops are rich in health-promoting phytochemicals that provide good sources of nutrients and minerals, vitamins and other healthy dietary components (Liu, 2013). Vegetable production is significant source of income to smallholder farmers that creates more jobs to farming communities (AVRDC 2006). Tomato, onion, cabbage, hot pepper, carrot, cauliflower, garden pea, amaranth, okra, and eggplant are vegetable crops commonly grown in Africa (Brown et al., 2005). According to FAO (2004), vegetable consumption in most African countries is about 50 kg year^{-1} that makes only 43% of a minimum recommendation rate of 200 g day^{-1} (73 kg year^{-1}) for a single person. The optimal productivity of vegetable is limited by poor seed quality, climatic and environmental stresses, and insect-pests and diseases which have been associated with low productivity in tropical compared to temperate regions (FAO, 2006; de la Peña and Hughes, 2007). Economic impact from these constraints is great at household levels where productivity is highly limited (Opeña and Kyomo, 1990). The most important financial constraint in vegetable production is that associated with insect-pests and diseases (Ellis-Jones et al., 2008). Improper management practices among farmers contribute significantly to this problem of insect-pests and disease (Salau and Shehu, 2015). Improper agronomic practices such as un-recommended uses of seeds, fertilization and manure, pesticides, and irrigated water result into pathogens contamination to vegetable crops and diseases development (Ibeyessie, 2007; Shehu et al., 2014b). Vegetable crops contribute to a source of income to a majority of smallholder farmers in central and northern Tanzania. However, less was known about management practices by farmers to control insect-pest and diseases. This study was therefore taken to assess farmers' management practices of insect-pests and diseases of common vegetable crops of selected districts of Central and Northern Tanzania to enhance production.

B. MATERIAL AND METHODS

Study area

The study was carried out in selected administrative wards and villages of Dodoma Municipality, Kongwa, Babati and Kiteto districts as main vegetable growing areas in the central and northern districts of Tanzania (Table. 1).

Table 1. *Distribution of selected villages of study by districts and wards in Dodoma and Manyara regions*

Region	District	Wards	Villages
Dodoma	Dodoma Municipality	Mpunguzi	Mpunguzi
			Matumbulu
		Makotopola	Veyula
			Msalato
	Kongwa	Mlali	Mlali Iyegu
			Mlali bondeni
		Pandambili	Moleti
		Chamkoroma	Chamkoroma
			Tubugwe juu
Manyara	Babati	Riroda	Sangara
			Mawemairo
		Magugu	Matufa
			Gichameda
		Mwada	Shaurimoyo
		Gallapo	Gallapo
		Quash	Endodash
	Kiteto	Kibaya	Kibaya
		Partimbo	Nalangtomony
		Matui	Matui
			Bwawani
			Chapakazi
		Sunya	Sunya

(***Source:*** *Districts Agricultural and Co-operative Offices)*

Field data collection

Tools used to obtain information about farmers' knowledge and skills related to management practices of different insect-pests and diseases of vegetable were open-ended questions administered in a semi structured questionnaire allowing data gathering in the farmers' cultural context. Ten farmers participated in the pilot study to insure farmers' comprehension of typical questions and the ability of enumerators to administer them. Their responses were used to improve the final copy. A total 60 respondents through questionnaires were assessed during this survey. Data were recorded between 2014/15 - 2016/17 production seasons by investigators who are scientists with long experience in vegetable related research. The data obtained were imported into Statistical Package for Social Sciences software (SPSS, Version. 20) for editing and analysis and descriptive statistics used to determine frequencies of responses. Microsoft excel, 2010 was finally used to produce Tables.

C. RESULTS

Condition of vegetable fields' along the selected districts

General conditions of vegetable fields surveyed along the selected districts are presented in Table 2. Almost half of the farmers' fields (43.3 %) were highly invaded by diseases. This was accelerated by infestation of insect-pests and weed problem by 21.7 and 20.0 % respectively and therefore a wide range of crop losses. During this study, only 6.6 % of farmers' fields were well irrigated with less diseases and insect-pests. 6.6 % were found at harvesting time.

Table 2. *Overview of vegetables fields' along the selected districts (n = 60)*

Fields' conditions	Response (N)	Frequency %
Highly disease infestation	26	43.3
Affected insect-pests	13	21.7
Affected by weeds	12	20.0
Well irrigated with less disease & insect-pests	4	6.6
At harvesting time	4	6.6
Producing in more than one season	1	1.6

The smallest percent of the fields (1.6 %) was reported producing in more than one season.

Management of insect-pests and diseases across the selected districts

Table 3 shows methods used by farmers in management of insect-pests and diseases across the selected districts.

Table 3. *Methods used in management of insect-pests and diseases across the selected districts (n = 60)*

Method	Response (N)	Frequency %
Physical and local mechanical control	7	11.7
Deviating in land uses	7	11.7
Intercropping	7	11.7
Botanical pesticides	6	10.0
Weeding	6	10.0
Mulching	5	8.3
Crop rotation	5	8.3
Chemical control	4	6.7
Phytosanitary practices	4	6.7
Pruning	4	6.7
Biological control	2	3.3
Combination of all (IPM)	3	5.0

Physical and local mechanical practices such as uprooting and burning; deviating particular field for sometimes; intercropping with other commonly cultivated crops; use of botanical pesticides; hand-hoe weeding; mulching; crop rotation; chemical control; phytosanitary practices such as picking up infected material; pruning; biological control and combination of methodologies (IPM) were being applied by farmers to manage insect-pests and diseases by 11.7, 11.7, 11.7, 10.0, 10.0 8.3, 8.3, 6.7, 6.7, 6.7, 3.3 and 5.0 % respectively.

Fertilizer uses in farmers' fields in the selected districts

The use of fertilizers in vegetable production especially in tomatoes and sweet pepper along the selected districts was very limited. From FGD with farmers and field observation, farmyard manure was the mostly used fertilizer with high variability both between and within the districts while Kiteto recorded as the highest user due to high number of livestock especially cattle. The use of industrial fertilizers was very minimal. Booster and Urea were the mostly used fertilizers; while DAP (Diammonium Phosphate); NPK, MRP (mainly Minjingu Rock Phosphate and the N-enriched Minjingu Mazao®) and CAN were rarely used.

Sources of seeds to farmers along the selected districts

Sources of seeds to farmers along the selected districts is presented in Table 4.

Table 4. *Sources of seeds to farmers along the selected districts (n = 60)*

Sources of information	Response (N)	Frequency %
Obtained from previous seasons	18	30.0
Shared among farmers	15	25.0
Local markets/shops	11	18.3
Agro-dealers	11	18.3
Agric. research institutes	5	8.3

30 % of the farmers were obtaining seeds from their own sources especially from previous harvests. Shared among farmers, local markets and shops, agro-dealers and agricultural research institutes were also sources of seeds by 30.0, 25.0, 18.3, 18.3 and 8.3 % respectively.

The most and less preferred tomato varieties along the selected districts

The most and less preferred tomato varieties along the selected districts are presented in Table 5.

Table 5. *The most and less preferred tomato varieties study area (n = 60)*

Variety	Response (N)	Frequency %
Tanya	33*	29.7
Caljvf	27*	24.5
Tengeru	12*	10.4
Onex	11*	9.9
Mwanga	10*	9.0
Rio-grand	3*	2.7
Moyo	3*	2.7
Kibo	2*	1.8
Victoria	2*	1.8
Glory	2*	1.8
Alpha	2*	1.8
Tomato Anna	2*	1.8
Dumudumu	2*	1.8

** indicates multiple response*

Majority of farmers were in favour of Tanya, Caljvf, Tengeru, Onex and Mwanga by 29.7, 24.3, 10.4 and 9.0 % respectively. Onex was mentioned to have high extended shelf life up to three weeks after harvest. The survey team revealed other tomatoes varieties as second choice to farmers and this included Rio-grand, Moyo, Kibo, Victoria, Glory, Alpha, Tomato Anna, and Dumudumu that were less preferred by farmers by 2 - 3 % only.

The preferred sweet pepper varieties along the selected districts

The preferred sweet pepper varieties in the study areas are shown in Table 6. Farmers preferred all the varieties; Yellow Wonder, Holland, Dubai and Hybrid seeds by 48.3, 21.7, 15.0 and 15.0 % respectively.

Table 6. *The most preferred sweet pepper varieties along the selected districts (n = 60)*

Variety	Response (N)	Frequency %
Yellow wonder	39*	48.3
Holland	23*	21.7
Dubai	19*	15.0
Hybrid seeds	15*	15.0

** indicates multiple response*

Sources of information for enhanced management of insect-pests and diseases

Table 7 shows sources of information used on insect-pest and diseases management from the selected districts of study.

Table 7. *Sources of information used on insect-pests and diseases control management (n = 60)*

Sources of information	Response (N)	Frequency %
Shared among farmers	10	16.7
Knowledge by experience	10	16.7
Agro-dealers	9	15.0
Agric. extension officers and agric. research institutes	9	15.0
Exhibitions & farmers' shows	9	15.0
Leaflets and fliers	5	8.3
Radio	4	6.7
Magazines & news-papers	2	3.3
Television	2	3.3

Major sources of information were sharing information among farmers, knowledge gain through their experience, agro-dealers, agriculture extension officers and agricultural research institutes, exhibitions and farmers show by 16.7, 16.7, 15.0, 15.0, and 15.0 % respectively. Leaflets and fliers, radio, magazines and newspapers, and television were minor sources by 8.3, 6.7, 3.3 and 3.3 % respectively.

Farmers visits to agricultural extension services

Table 8 shows farmers' frequency of visits to farmers' extension services for consultation on enhanced vegetable production mainly management of insect-pests and disease within their vegetable production fields.

Table 8 *Frequency of agricultural extension services along the selected districts (n = 60)*

Frequency of visits	Response (N)	Frequency %
None (no consultation)	35	58.3
Once in a season	8	13.3
2-3 times per season	4	6.7
Once in year	4	6.7
2-3 times in a year	3	5.0
Once in a month	2	3.3
2-3 times in a month	2	3.3
Regularly (1 per week)	2	3.3

Majority of the responses from the surveyed farmers (58.3 %) showed they had no agricultural advisory services from extension services. They had no or rare visit to the nearby extension services. Farmers with single visit in a season, 2-3 per season, once in year, 2-3 in a year, once in a month, 2-3 in a month and regular visits (1 per week) were 13.3, 6.7, 6.7, 5.0, 3.3, 3.3 and 3.3 % respectively.

D. DISCUSSION

Vegetable production is an important economic activity in rural and peri-urban agriculture of semi-arid and sub-humid Tanzania where smallholder farmers rely on for income generation (Kahimba et al., 2015). This was the case of this study where many vegetable farms were focused a far from the urban areas to support local farmers with income generation. According to Hovorka, (2005), vegetable production faces a serious problem of insect-pests and diseases due to fact that many farmers have limited knowledge and skills on their management especially in the tropics and sub-tropics. It was also as discovered in this study, where insect-pests and diseases infestation was the major problem to farmers due to their limited knowledge and skills on control and management. The farmers were lacking enough field management skills which are very crucial foundation in management of insect-pests and diseases in developing countries (Hatibu et al., 2000). Majority of farmers were practising physical and mechanical control methods e.g. uprooting, burning and deviating land uses for sometimes which were unsuitable management protocols in control of insect-pests and diseases. These reported methods were leading into late intervention and therefore many crop losses. Farmers were also lacking simple diseases control techniques such as regular hand-hoe weeding to discourage insect-pests and diseases harbouring. Because many insect-pests and weeds are vectors of disease and host of pathogens (Meyer, 2003), their management is very necessary to avoid spread of the diseases (AVRDC, 1998). Most of the field were infested with insect-pests and weeds because of engagement of farmers to many

other subsistence farming activities. Households was the most prominent source of labour in most small-scale farming operations. Chemical application was not done much by farmers due to reason that, they had limited skills in application and majority of them being unavailable to farmers at manageable prices. According to Ngowi et al., (2007) lack of knowledge on proper protocol of pesticide formulation and frequency of application is a reason for low uses of chemicals in many areas in the country. Formulations of many insecticides were mainly based on trial and errors as it was revealed by a wide range of farmers during this assessment work. For instance, control of white flies and red spider mites, the common insect-pests in the study area was partly made difficulty because many farmers were using wrong pesticides formulations in wrong time of spraying. Even seeds were not appropriately managed by farmers because of their high cost and less accessibility. This affordability and availability of seeds had also an impact on farmers' choice to varieties. High farmers' preference to the noted varieties were due to their accessibility at their cheap prices. Extended shelf life was another important factor mentioned to assist farmers in securing markets and promising prices during dry season when demand of most vegetable is low. Less preference to the remarked varieties was due to their availability at manageable prices especially hybrid seeds which were sold at high prices. Hybrid seeds of sweet pepper were easily available at manageable price compared to that of tomatoes. Other important reasons; field performance attributes by a given variety such as high yielding, drought tolerance, stability to withstand post-harvest losses, agronomic experiences, and resistance to insect-pests and diseases were less scored by farmers. Majority of farmers were relying on their previous harvested seeds which was also contributing to seeds and field contamination. This was partially contributed by few or none farmers' visits to extension services to learn on proper management practices in control of insect-pests and diseases. In previous studies on farmers' control of insect-pests and diseases in the country by Ngowi, (2003), it was noted that farmers were not receiving agricultural extension service and in response they were struggling with other means due to lack of knowledge and skills.

Conclusion

This study discovered limited farmers' knowledge and skills on management of insect-pests and diseases in many farmers' fields that resulted into their high infestation. This was partly attributed by several unsustainable managed practices such as use of unrecommended seeds obtained from previous farmers' harvests, and little farmers' visits to seek for extension services. Majority of farmers relied on their shared information and experience to control insect-pests and diseases. Therefore proper control and management strategies should be enhanced among farmers to enhance production for sustainable food security.

Recommendation

This research work recommends enhanced farmers' training on IPM which is very important tool in disease management of vegetable production. The use of unsafe seeds from previous farmers' fields should be discouraged among farmers through reviewing of the prices to meet farmers' accessibility as they are sources of diseases contamination. There should be an establishment of laws and bylaws and quarantines to avoid spreading of diseases within and outside of the studied areas. Furthermore, enhanced productivity of vegetable crops in the Central and Northern Tanzania needs varieties that are resistant to insect-pests and diseases and able to offer high yields.

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