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Original Research Article

FARMER'S KNOWLEDGE, PERCEPTION AND MANAGEMENT OF KEY PEST'S OF OKRA, *ABELMOSCHUS ESCULENTUS* (L.) MOENCH IN SOUTHERN SIERRA LEONE

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Abstract

Baseline survey was carried out using well-structured questionnaire in five selected communities in Bo City (Njagboima, Kowama, Airfield, Kulanda Town and Moriba Town) in December 2013 to January 2014. A random sample of fifty (50) okra farmers, with ten (10) per community were targeted; including both full-time and part-time growers. The objective of the study was to unravel indigenous knowledge of farmers on okra pests, constraint to okra production and to ascertain the most important pests and indigenous methods of control. Results from the study indicated that all the farmers had the problem of pests on their farms; including insect pests, vertebrate pests, diseases and weeds; with insect pests ranked as the most important. Flea beetle (*Podagrica uniforma*), mole-cricket, grasshopper, aphids and ants were identified as the most important insect pests of okra, with flea beetle (*Podagrica uniforma*) ranked as the most damaging insect pest during the dry season (84%). About 70% of the farmers indicated that they protect their crops against flea beetles. Control measures adopted included traditional method (wood ash and orange peels) and use of chemical insecticides. Loses due to *Podagrica uniforma* was considered high by majority of the farmers. This study underlines the need for regular monitoring of farmers crop fields, updating of data on pests activities and training of farmers on pest control in okra farms, not only in the survey sites, but also in other parts of Sierra Leone.

Keywords: Indigenous knowledge, Perception, Okra, Pest management, *Podagrica uniforma*

Introduction

Okra, *Abelmoschus esculentus* (L.) Moench is an herbaceous annual plant in the family Malvaceae. It is one of the most important vegetable grown in Sierra Leone. The crop is grown principally for its fruits and to a lesser extent for its leaves (Hugues and De Leener, 1990). The mature stem contains crude fibre which is used in paper industries and for making ropes. Okra's flower can be very attractive and sometimes used in decorating the room

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(Schippers, 2000). Chadha and Oluoch, (2003) reported that vegetables are of good nutritional value, with considerable potential as income generating crop and as a supplements to diet consisting mainly of carbohydrates. Okra contains proteins, carbohydrates and vitamin C (Rehn and Espig, 1991; Lamont 1999, Owolarafe and Shotonde 2004, Gopalan *et al.* 2007, Eke *et al.*, 2008; Arapitsas, 2008, Dilruba *et al.*, 2009), and plays a vital role in human diet (Ndunguru and Rajabu 2004; Kahlon *et al.* 2007, Saifullah and Rabbani 2009; Akintoye *et al.* 2011). Both male and female farmers in Sierra Leone grow okra, mainly for market value and home consumption.

Despite the importance of okra and other vegetables, there are numerous production constraints wherever they are grown; which includes high cost of input, transportation, accessibility to market, insect pests, diseases, weeds and use of local varieties (low yielding) (Mohammad and Tasveer, 2008). Ewete (1978) stated that one of the major factors limiting the yield of okra in the tropics was the range of insect pests associated with the crop. These insect pests attack the foliage, stems, buds, flowers, fruits and seeds resulting in substantial losses of marketable yield (Beevi et al, 1992; Youdeowei, 2002). Egwuatu (1982) in his work in Nigeria, noted that *Podagrica uniforma*, Jacoby and *Nisotra sjostedti*, Jacoby (Col.: Chrysomelidae) are the most destructive insect species of okra. Nigel (1980) suggested that 8.7% losses in vegetable production are caused by insects.

Although okra is of great importance to many households in Sierra Leone, little is documented on the cultural practices for growing okra and their implications for key pest's management. Several workers have suggested that in situations where research information on pest management is inadequate, it is advisable to use the existing indigenous knowledge base on the farming community as a guide for further work (Matheson *et al.*, 1984; Schutten, 1989; Alghali, 1991; Smit and Matengo, 1995). It is as a result of this background information that the survey was conducted to unravel farmer's perception of pest's activities as a constraint to okra production and to ascertain the most important pests and indigenous methods of control.

Materials and Methods

The survey was conducted in five okra growing communities (Njagboima, Kowama, Airfield, Kulanda and Moriba Town) within the Bo City, Southern Sierra Leone, from December 2013 to January 2104. The geographical coordinates of Bo City are Latitude 7° 57' 53" North, Longitude 11° 44' 18" West. Like the rest of Sierra Leone, Bo has a tropical climate with a rainy season from May to October and a dry season from November to April. Average annual rainfall is about 5,080 mm (200 inches). Average temperature ranges from 21-31^{o}C all year.

A questionnaire containing open and closed ended questions was designed and used to obtain data through interviews with 50 farmers and on-farm observations during farming activities. Ten (10) farmers were randomly interviewed at each location. Both male and female farmers, and full-time growers and part-time growers were targeted. The questionnaire was pretested using few farmers before being used in the study. This was used to assess farmers' perception on key pests of okra and management practices. The data collected were summarized and then analysed using summation and percentages.

Results and Discussion

Results of the study revealed that both local and introduced/exotic okra varieties are grown by farmers in Bo City, Southern Sierra Leone. The study indicated that 83.4% of the farmers cultivated local varieties, while 17.6% cultivated introduced/exotic varieties (Table 1 and Figure 1). The high percentage of farmers using local varieties is an indication that the local cultivars are the most common cultivated by the farmers, majority of which are smallholders or resource-poor farmers. In addition, these cultivars are highly adaptable, available, accessible and affordableby the resource-poor farmers in the surveyed communities. The lower number of farmers (17.6%) cultivating introduced/exotic okra varieties is an indication of the low supply of this kind of ecotypes in the country. AVRDC

(2008) identified the low availability on the market of improved varieties which are adapted to the hot and humid agro-ecological zone, the cultivation of old varieties and the massive import of seeds that are less adapted to the local conditions as major reasons for insufficient supply of improved cultivars.

Table 1: List of selected popular okra cultivars in Bo City, southern Sierra Leone

Cultivar Type	Name of cultivar
Local	Local Short Pod
	Kenemie
	Kakaya Gbondei
	Duperlo Gbondei
	Selei-Gbondei
	Cocoa
	Komi
	Jigba
	Gbee Gbondei
	Gukpegbe
Introduced/Exotic	Lady's Finger
	Clemson Spineless
	Perkinson
	Red Horn
	White Malaysia
	China White

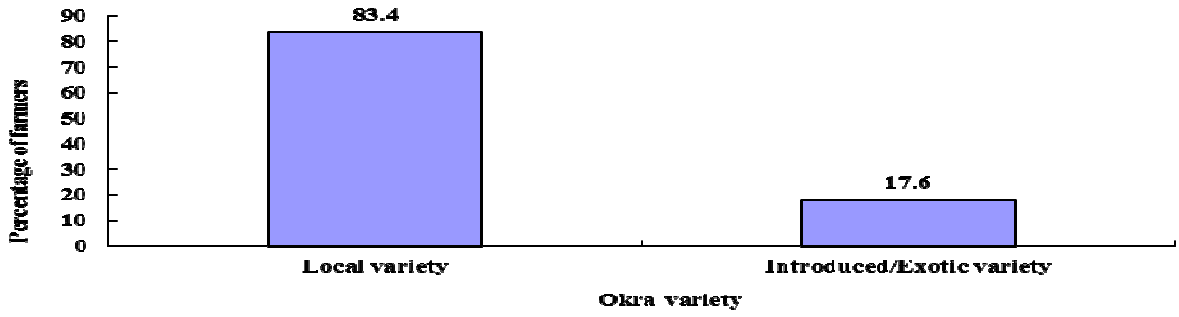

Figure 1: Okra varieties grown by farmers in five communities in Bo City, Southern Sierra Leone

Different sources of seeds were identified by the farmers in Bo City: other farmers, agricultural store, previous harvest and the local market. The result indicates some farmers get planting seeds from one or two or three sources, depending on availability, accessibility and cost. More farmers indicated getting seeds from both agricultural store and previous harvest (22%), while few indicated getting seeds from other farmers (neighbours) and the local market (2%)

(Figure 2). In Cameroon, an investigation led by MINAGRI revealed that 65% of the market gardeners use seeds coming from the previous harvests, and that 12.5% of their seeds are obtained from their neighbours (Nguelieu, 2010).

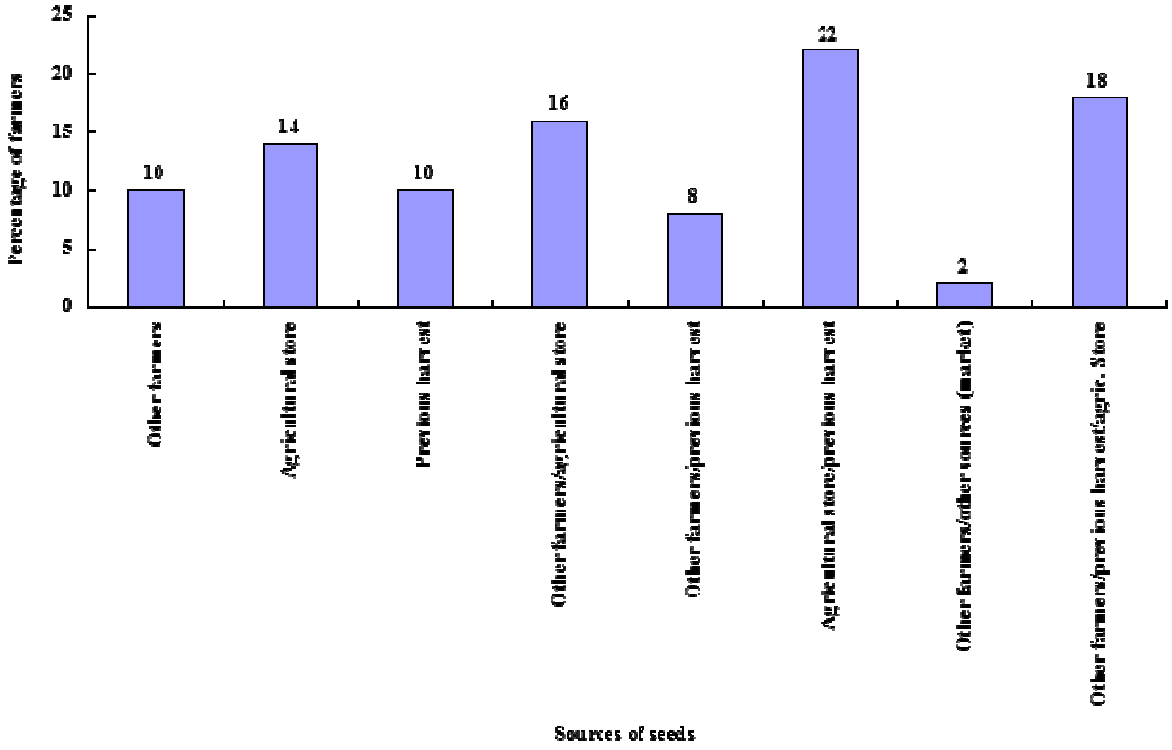

Figure 2: Sources of okra seeds as reported by farmers in Bo City, Southern Sierra Leone

Although majority of the farmers prefer to grow okra as sole crop (75%), it is also common to find some farmers grow mixtures of different vegetables on the same piece of land (25%). Bunting (1979), defined mixed cropping as a method of planting two or more crops in mixtures on the same plot. As reported by Njoku *et al.* (2007), this practice is common among the traditional farmers; and that many of them use it as a means for better utilisation of environmental factors, greater yield stability, soil protection, variability of food supply, increasing the return per unit area and insurance against crop failure (Figure 3).

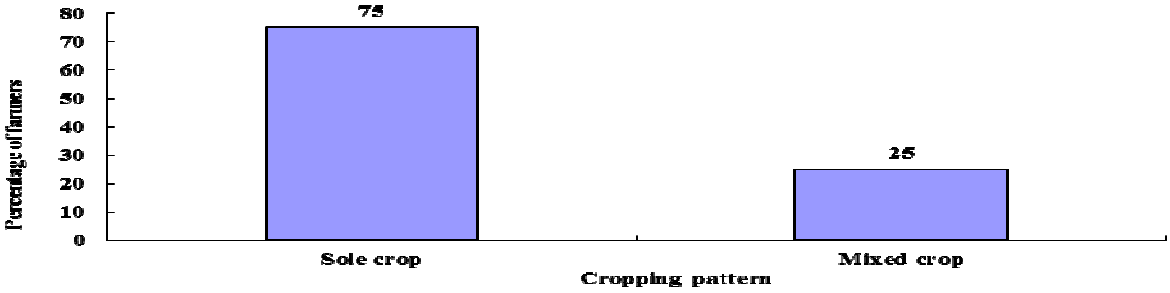

Figure 3: Cropping pattern adopted by okra farmers in Bo City, Southern Sierra Leone

The result as indicated in figure 4, identify the period/season when okra is cultivated in Bo City, southern Sierra Leone.

Fifty percent (50%) of the farmers indicated planting okra in the dry season only; closely followed 42% who indicated planting okra in both dry and rainy season. Few of the farmers interviewed however indicated that they plant okra only in the rainy season (8%). As reported by several workers, sowing time has a great impact on seed production and quality of okra (Singh *et al.*, 1986; Hossain *et al.*, 1999; Yadav and Dhankhar, 2001). Planting during the rainy season is not ideal, as the rains will wash away flowers, reducing the potential for fruit set. This period of planting should be avoided, especially during the months of July and August, the peak rainfall period in Sierra Leone. The farmers interviewed gave several reasons for planting okra in the dry season (usually in lowland ecologies such as swamps). These included; availability of land and irrigation (42%), crops performed very well (24%) and favorable market conditions (34%) (Figure 5).

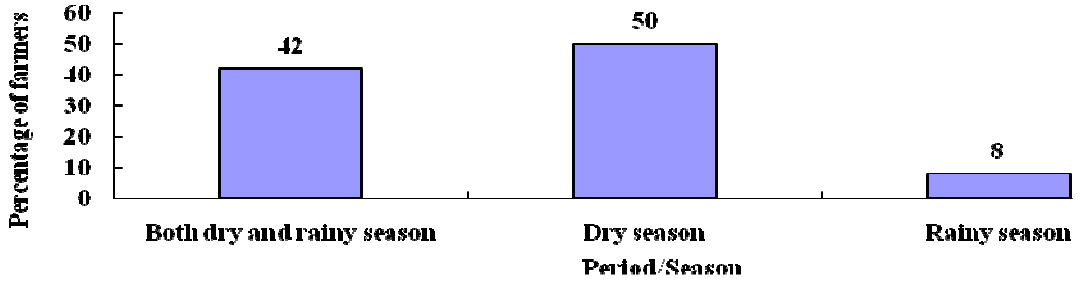

Figure 4: Period during which farmers grow okra in Bo City, Southern Sierra Leone

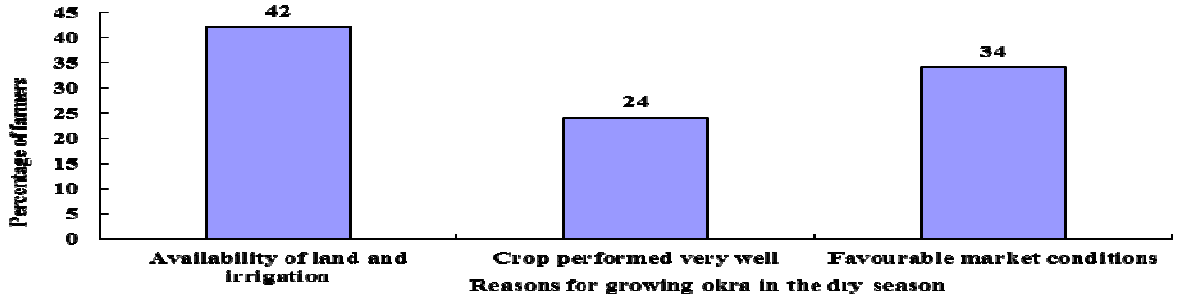

Figure 5: Reasons for growing okra in the dry season in Bo City, Southern Sierra Leone

The results from the study as indicated in figure 6 and 7, respectively confirmed that farmers encounter problem with insect pests, diseases, weeds and vertebrate pests on their okra farms (figure 6), resulting in reduced quantity and quality, and by extension derivable income. Insect pest's problem was ranked high among the other biotic constraints (84%). Only 2% of the respondents identified diseases as major constraint to okra production in the study areas (figure 6). As indicated in figure 14 and 15, majority of the farmers (64%) reported low damage level due to diseases and vertebrate pests. Several authors have identified important diseases of okra; including powdery mildew in dry tropical regions, leaf spots, root-knot nematodes, verticillium wilt and Okra Mosaic Virus (Ndunguru and Rajabu , 2002). Although only 8% of the farmers indicated that weeds are important production constraint, several researchers have reported that uncontrolled weed growth result in yield losses ranging from 35%, 60%, 75% and 80% respectively in a yam/maize/okra/sweet potato intercropping systems (Akobundu, 1987; Orkwor, 1990; Lavabre, 1991; Akobundu, 1993; Olabode *et al.*,

1999). Thus, the need for adequate weed control for good crop yield cannot be over emphasized.

In the dry season, (December-March) flea beetle (*Podagrica spp.*) dominated the okra farm of 38% of the respondents, while 30% and 20% of the respondents asserted that grasshoppers (*Zonocerus spp.*) and aphids (*Aphis spp*.) were respectively major pests on their farm during this same period (figure 7). Some of these insects are known to impact significantly on okra yield (Mohamed-Ahmed, 2000; N deritu *et al.*, 2008). Eighty-four percent (84%) of the farmers interviewed reported high damage level due to insect pests (figure 8). More than fifty percent (56%) of them reported high damage level due to flea beetle infestation, 42% indicated moderate infestation and 2% indicated low infestation (figure 9). This result is in agreement with Odebiyi's (1980) report, who identified *Podagrica uniforma* (Jac.) and *P. sjostedti* (Coleoptera: Chrysomelidae) as two major species of flea beetles that are responsible for heavy defoliation of okra in West Africa. As indicated in figure 10, 58%, 42% and 2% of the farmers respectively indicated high, moderate and low crop loss due to insect pest's infestation on okra. Pitan and Ekoja (2011) in their study on yield response of okra plants to artificial infestation of flea beetle (*Podagrica uniforma* Jac.) reported that increase in beetle density resulted in a significant reduction ($P < 0.05$) in fruit production, fruit length, fruit width, fresh fruit weight, number of seeds per fruit, 100 seed weight and fresh fruit yield. More than 50% reduction in fruit yield was recorded when beetle density increased. Munthali and Tshegofatso (2013) also concluded from their study that insect pest species can cause over 80% pod damage on highly susceptible okra cultivars.

Flea beetle (*Podagrica spp.*) and grasshopper attack the leaves and inflict much injury by making small round holes and pinching off parts of the plants thereby reducing the leaf area which affects plant assimilation and leaf surface for photosynthesis, and consequently economic loss due to reduced yield (Ogbalu and Ekweozor 2002). The adults feed on cotyledons, stems and leaves. They make many small holes on okra leaves, known as "shot-holes". Seedlings may wilt and die under heavy flea beetle attack or may stunt if injury is not severe. When large numbers of flea beetles are present they will also feed on flower buds and pods, causing yield loss by injuring the pods. Damaged pods are not marketable. Larvae of flea beetles live in the soil and feed on okra roots, but the damage caused is not of economic importance. Okra Mosaic Virus (OMV), which is transmitted by insects belonging to Podagrica species, has been reported from Côte d' Ivoire, Kenya, Nigeria and Sierra Leone in Africa (Brunt *et al.*, 1996; Vanlommel *et al.*, 1996; Fajinmi and Fajinmi, 2010). Ndunguru and Rajabu (2002) reported that farmers in Africa ignore such diseases because they lack information on their control.

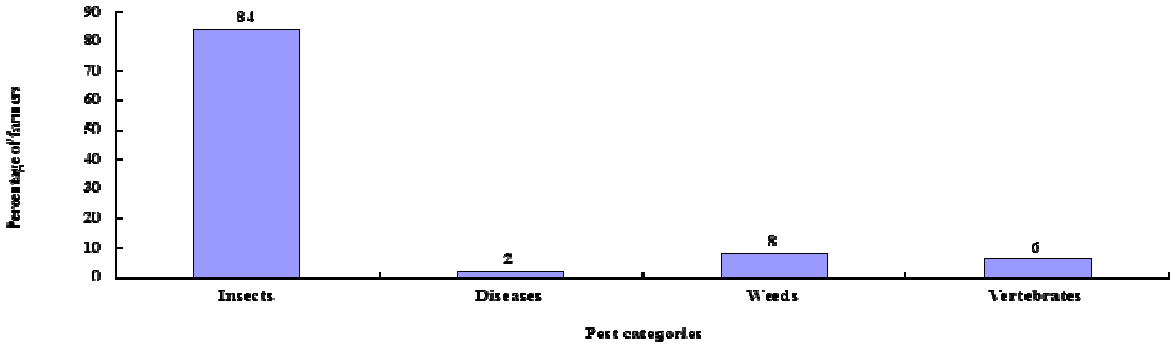

Figure 6: Key pests of okra as identified by farmers in Bo City, Southern Sierra Leone

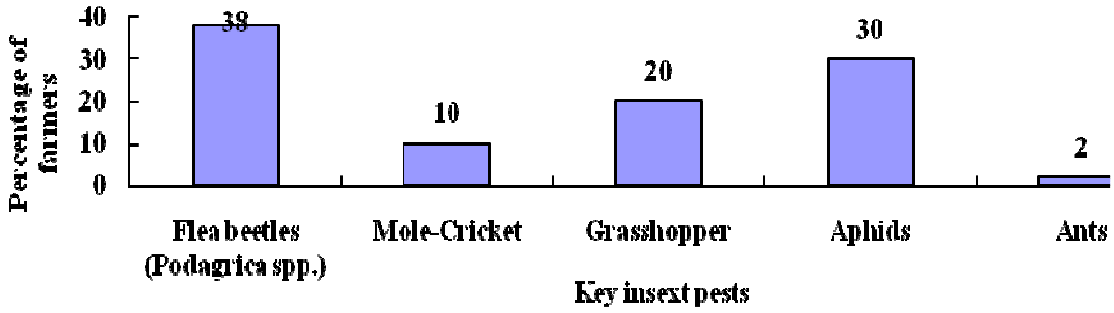

Figure 7: Key insect pests of okra as identified by farmers in Bo City, Southern Sierra Leone

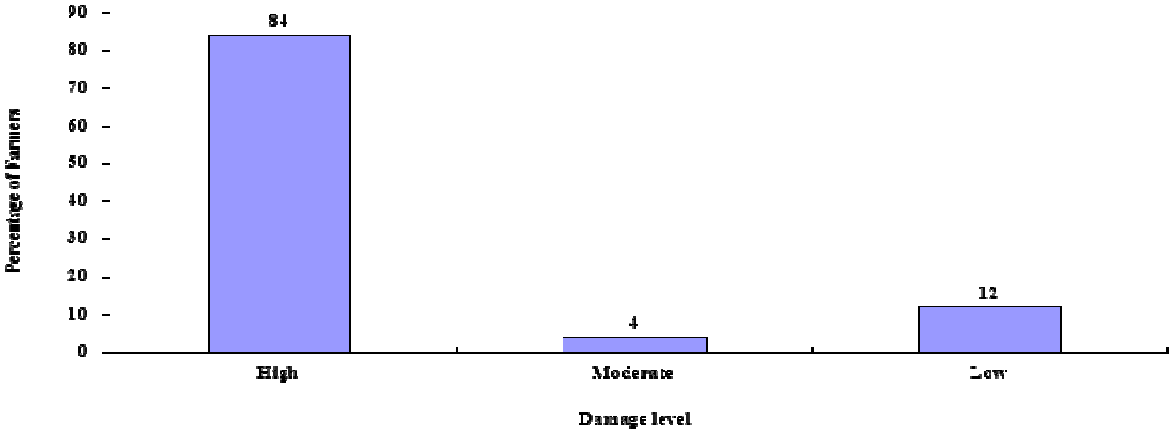

Figure 8: Farmers perception on damage level of insect pests on okra in Bo City, Southern Sierra Leone

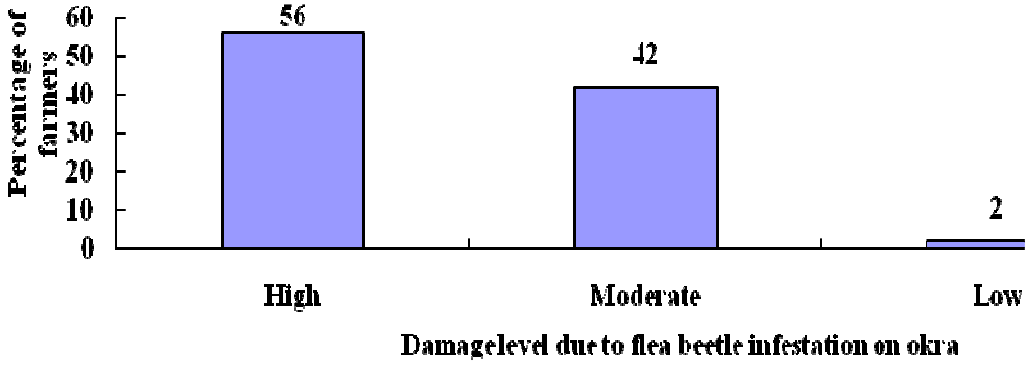

Figure 9: Damage level due to flea beetle infestation on okra as reported by farmers in Bo City, Southern Sierra Leone

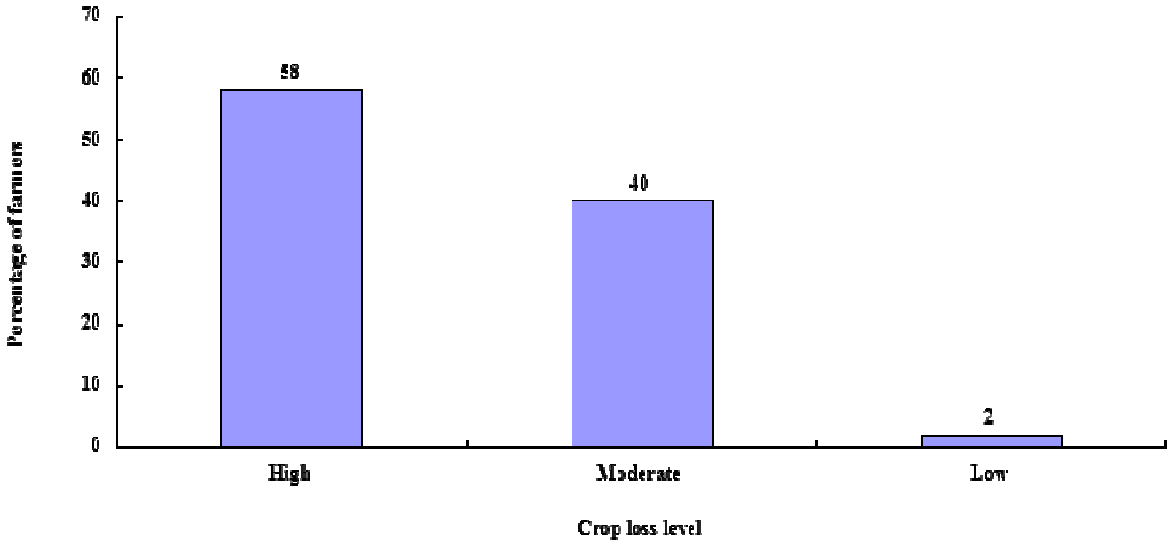

Figure 10: Crop loss from flea beetles on okra as perceived by farmers in Bo City, Southern Sierra Leone

The result from the study as shown in figure 11 indicates that 70% of the farmers protect okra against flea beetle attack, while 30% indicated adopting no control against the insect pest. The higher percentage of farmers indicating attempting to control insect pests is a justification that they are aware of the pest and damages caused. Forty-two percent (42%) of the farmers were aware of indigenous control methods (botanicals: wood ash and orange peels) for the control of insect pests, while 36% of the farmers stated that they were aware of the use of chemical spray. Twenty-two percent (22%) of the farmers indicated they were aware of both indigenous and chemical spray application as measures to combat insect pests, including *Podagrica spp.* (figure 12).This finding reveals that farmers in this part of the country are aware of the benefits of botanicals as a pest management tool. As reported by several scientists, the use of bio-pesticides to control insect pests of vegetables is gaining attention (Obeng-Ofori and Ankrah, 2002; Coulibaly *et al.*, 2007). The botanicals provide alternative means of insect pest management which conserves the ecosystem (Zehnder *et al.*, 1997; Obeng-Ofori and Ankrah, 2002; Dively *et al.*, 2003). Worldwide, the non-pesticide management (NPM) of crops is becoming popular among vegetable growers since it endeavours to keep management of insect pests and crop cultivation costs to a minimum, and avoid dependency on manufactured inputs by utilizing materials that are readily available to farmers, in this case, the adoption and use of orange peels and wood ash.

Reasons given by some of the farmers for not controlling insect pests on okra included; pests damage are not considered important (33.3%), lack of knowledge on control methods (46.7%) and lack of finance to purchase control inputs (20%)(Figure 13). The higher percentage of farmers indicating lack of knowledge on control methods is a major concern that requires serious attention. This information is in agreement with with Ndunguru and Rajabu (2002) report, which indicated that farmers in Africa lack information on disease control, and thus ignore such menace. Alghali *et al.* (1996) working with rice farmers in northern Sierra Leone suggested that emphasis should be put on educating farmers on causal agents, damage symptoms, yield losses, control options, and making inputs available to the farming community as a first step in the design of a pest management package.

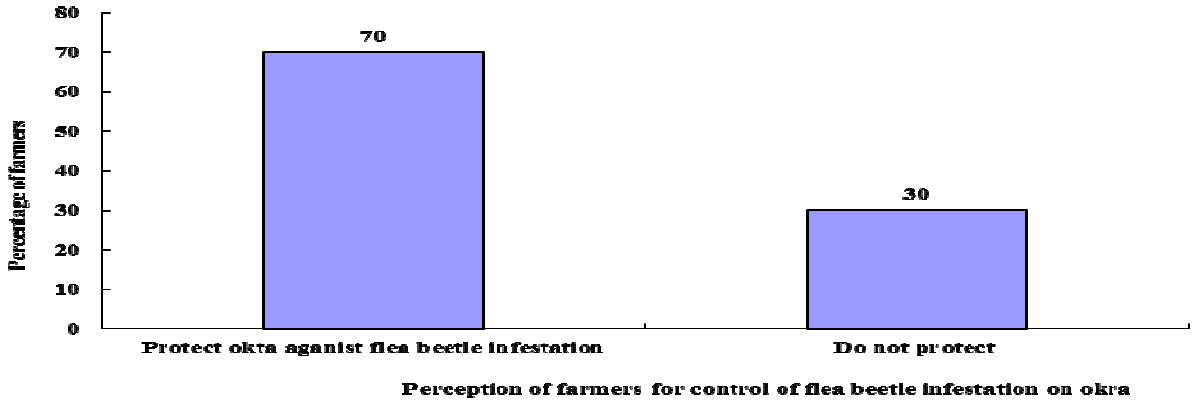

Figure 11: Perception of farmers for control of flea beetle infestation on okra in Bo City, Southern Sierra Leone

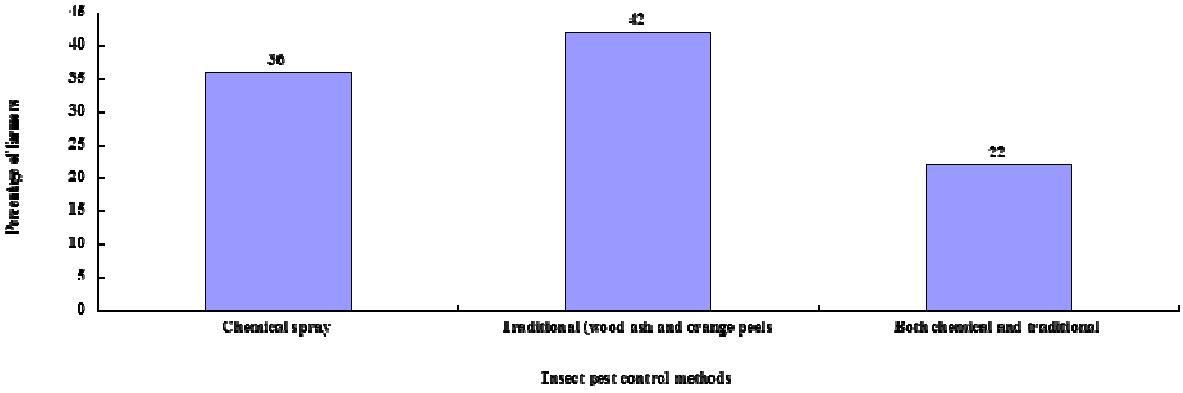

Figure 12: Insect pest control methods as reported by okra farmers in Bo City, Southern Sierra Leone

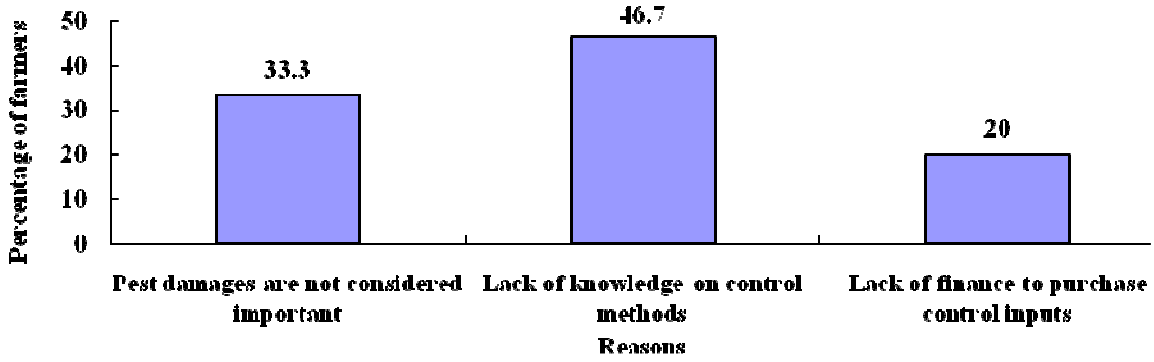

Figure 13: Reasons given by farmers for not controlling insect pest problem in okra farm in Bo City, Southern Sierra Leone

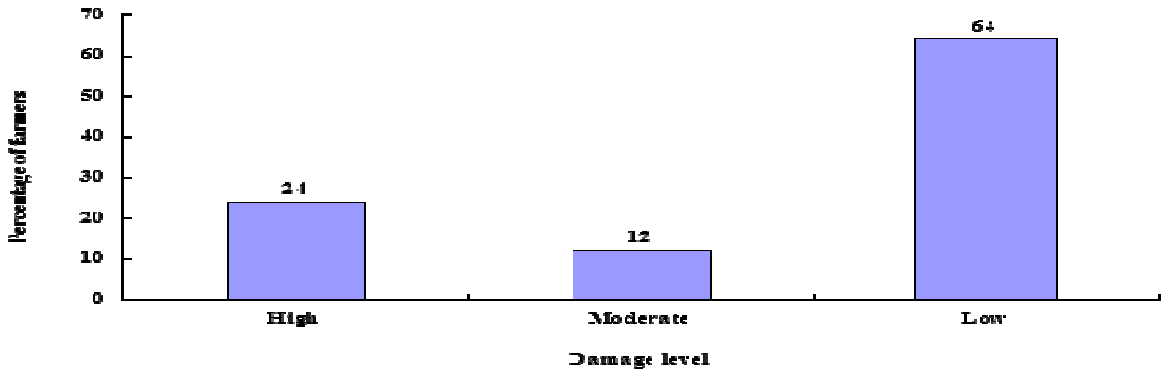

Figure 14: Farmers perception on damage level of diseases on okra in Bo City, Southern Sierra Leone

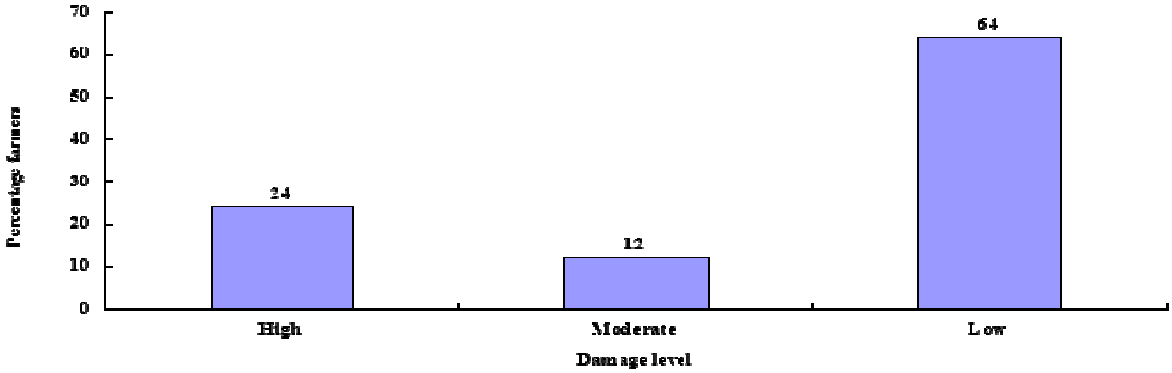

Figure 15: Farmers perception on damage level of vertebrate pests on okra in Bo City, Southern Sierra Leone

Conclusion and Recommendations

Based on the findings of the study, it can be concluded that okra farmers in Bo City, southern Sierra Leone are aware of pest problems as major constraint to quantity and quality of leaves and fruits/pods produced. Among the several biotic constraints identified, insect pests were ranked high in terms of the high damage level recorded. Flea beetle infestation (*Podagrica spp.*) was reported as the most serious in the dry season, and affects the yield of okra directly. It can also be concluded from this study that the farmers make efforts to control pests on okra, and that traditional (wood ash and orange peels) and chemical spray were the most common control methods. It is however important to note that some of the farmers reported lack of knowledge on control measure, indicating their level of ignorance in managing this menace.

Therefore, it is recommended that farmers (majority illiterate and resource-poor) in the study area be trained on pest control measures to prevent serious damage on okra leaves and pods. This will raise their awareness and level of understanding on key pests of okra and how to prevent or managed problems caused by them. The training programme should be based mainly on management strategies that incorporate an integrated approach, adaptability, cost and

availability of inputs. It is also recommended that the efficiency of the traditional methods (wood ash and orange peels) as reported by the farmers be tested in the field under experimental condition to justify their continued use in managing insect pest problems on okra plant. Chemical control, though identified by the farmers as a strategy to control insect pests, must be use cautiously so as prevent harm to the consumer, environment and beneficial organisms. Other options, including use of botanicals, cultural practices such as weeding and planting of resistant varieties should be encouraged as a way to reduce dependence on chemical control, considering the intricacies involved. This will eventually make okra cultivation a profitable business and improve the livelihood of farmers not only in Bo City and its environs, but in Sierra Leone as a whole.

Acknowledgements

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