

OPEN  ACCESS



# International Journal of Applied Sciences and Biotechnology

A Rapid Publishing Journal

ISSN: 2091-2609

## Indexing and Abstracting

CrossRef, Google Scholar, Global Impact Factor, Genamics, Index Copernicus, Directory of Open Access Journals, WorldCat, Electronic Journals Library (EZB), Universitätsbibliothek Leipzig, Hamburg University, UTS (University of Technology, Sydney): Library, International Society of Universal Research in Sciences (EyeSource), Journal Seeker, WZB, Socolar, BioRes, Indian Science, Jadoun Science, Jour-Informatics, Journal Directory, JournalTOCs, Academic Journals Database, Journal Quality Evaluation Report, PDOAJ, Science Central, Journal Impact Factor, NewJour, Open Science Directory, Directory of Research Journals Indexing, Open Access Library, International Impact Factor Services, SciSeek, Cabell's Directories, Scientific Indexing Services, CiteFactor, UniSA Library, InfoBase Index, Infomine, Getinfo, Open Academic Journals Index, HINARI, etc.

**CODEN (Chemical Abstract Services, USA): IJASKD**

**Vol-4, Issue-1 (March, 2016)**

Available online at:

<http://www.ijasbt.org>

&

<http://www.nepjol.info/index.php/IJASBT/index>



Impact factor\*: 1.422

Scientific Journal Impact factor#: 3.419

Index Copernicus Value: 6.02

\*Impact factor is issued by Universal Impact Factor. Kindly note that this is not the IF of Journal Citation Report (JCR).

#Impact factor is issued by SJIF INNO SPACE; \*\*Impact factor is issued by INFOBASE INDEX.



## Research Article

# SURVEY ON MANAGEMENT OF SPOTTED POD BORER (*Maruca vitrata* Fabricius) ON YARDLONG BEAN IN CHITWAN, NEPAL

Rajendra Regmi<sup>1</sup>, Sundar Tiwari<sup>1</sup>, Resham Bhadur Thapa<sup>1</sup>, Ranju Maharjan<sup>2</sup>, Sujata Poudel<sup>3</sup> and Kapil Paudel<sup>3</sup>

<sup>1</sup>Agriculture and Forestry University, Rampur, Chitwan, Nepal

<sup>2</sup>Department of Agriculture, Harihar bhawan, Lalitpur, Nepal

<sup>3</sup>Nepal Agriculture Research Council, Lalitpur, Nepal

\*Corresponding author email: rajendra.regmi123@gmail.com

## Abstract

A household survey was conducted during January 2012 in Gunjanagar, Dibyanagar and Sukranagar Village Development Committee of Chitwan district to know the socioeconomic status, status of spotted pod borer and its management practice. The survey included purposive random sampling methods in 35 yardlong bean growers. Most of commercial farmers have been growing since 3-7 years. Nearly three fourth of the farmers considered spotted pod borer as a major pest of yardlong bean in Chitwan. Most of them considered more than 60% loss caused by spotted pod borer if no management practice is applied. Almost all sprayed chemical pesticides for management of spotted pod borer and nearly three fourth of them used more than one chemical pesticides alternately for management of spotted pod borer. One third farmers (31.43%) applied chemical pesticides in 4-7 days interval and one third of them (31.43%) applied chemical pesticides in 7-10 days interval after beginning of flowering for management of spotted pod borer. Almost all farmers (94.29%) knew adverse effect of pesticides on human, environment, natural enemies and other animal. Majority (94.29%) of farmers harvested pods after 1-3 day of spray of chemical pesticides and very few (14.29%) of commercial grower of this area get training in insect pest management.

**Key words:** Yardlong bean; spotted pod borer; pesticides; management

## Introduction

Yardlong bean (*Vigna unguiculata* L. subsp. *sesquipedalis* Verdc.) is cultivated subspecies of cowpea, which is also known as Chinese long bean or asparagus bean or snake bean. The production of yardlong bean is 30,977 metric tons from an area of 2,772 ha with productivity of 11 mt/ha in Nepal (MoAD, 2012). It is being attacked by insect pests at flowering and post-flowering stage, which is a major factor to limit the production (Jackai *et al.*, 1992). Among them, spotted pod borer (*Maruca vitrata* Fabricius), pod sucking bug (*Clavigralla gibbosa* Stal.) and thrips (*Megalurothrips sjostedti* Trybom) reduce the productivity significantly. The spotted pod borer, *Maruca vitrata* Fabricius is one of the major pest of cowpea in the tropics (Jackai and Daoust, 1986). The loss due to this pest is estimated 54.4% in yardlong bean in Bangladesh (Ohno and Alam, 1989). The pod borer larvae damage flower buds, flowers, green pods and seeds of cowpea (Singh and Jackai, 1988) thereby reducing production. The spotted pod borer is also important pest of yardlong bean grown in Chitwan. To reduce the crop loss, farmers are using of chemical pesticides indiscriminately. The indiscriminate use of synthetic pesticide increase resistance of pest species, chemical residues in treated food material (Champ and Dyte, 1976; Snelson, 1987; Georghion and Lagumes, 1991) and health hazard to users and livestock. Thus, farmer survey was carried out to know the status of spotted pod borer and trend of using chemical pesticides in major vegetable growing area of Chitwan.

## Material and Methods

A household survey was conducted to know the socioeconomic condition, general information of spotted pod borer and their extent of damage including their management practices. The survey included purposive random sampling methods in 35 yardlong bean growers. Semi structured questionnaire was prepared and necessary information was collected. Sample households were used for pretest survey and necessary improvements were made in questionnaire. Total 35 yardlong bean growing farmers of three VDCs of Chitwan, namely: Gunjanagar, Dibyanagar and Sukranagar were selected. The collected information were tabulated and analyzed using Microsoft Excel and SPSS software and interpreted with the help of relevant literature.

## Results and Discussion

### Farmers' profile

More than half of the respondents (57.15%) were having secondary level of academic qualification. Very few respondents were illiterate (5.71%). Nearly 23% of respondent had primary education and 14% farmer had higher education (Table 1).

Majority (60%) of yardlong bean growers had 5-8 members per household, whereas national average was 4.70 member per household (MoAD, 2012) (Table 2). Similarly, 11.43% of respondents had family size of more

than 8 members and rest respondents (28.57%) had family size of 4 or less than 4 members.

**Table 1:** Education level of the yardlong bean grower in survey

Literacy	Frequency	%
Illiterate	2	5.71
Primary	8	22.85
Secondary	20	57.15
Higher	5	14.29
Total	35	100

**Table 2.** Family size of yardlong bean grower

Family size	Frequency	%
≤ 4	10	28.57
5-8	21	60.00
>8	4	11.43
Total	35	100

About 31.43% of yardlong bean grower cultivated yardlong bean commercially up to in 0.13 ha land (Table 3). Similarly, 28.57% of them cultivated in 0.13-0.23 ha, 17.14% in 0.23-0.33 ha and 22.86% of total respondents grew in more than 0.33 ha of land.

**Table 3.** Yardlong bean area by farmers

Area of cultivation(ha)	Frequency	%
≤ 0.13	11	31.43
0.13-0.23	10	28.57
0.23- 0.33	6	17.14
>0.33	8	22.86
Total	35	100

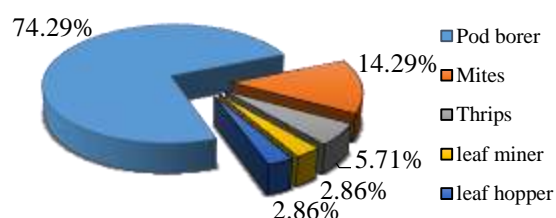
About 37.14% of respondent were growing yardlong bean since 0-3years, 54.29% were growing yardlong bean since 3-7 years, years and few (5.71%) were growing yardlong bean since 7-10 years and very few (2.86%) were growing yardlong bean since 10 years before (Table 4).

**Table 4:** Yardlong bean cultivation history of the respondents

Years	Frequency	%
0-3 years	13	37.14
3-7 years	19	54.29
7-10 years	2	5.71
>10 years	1	2.86
Total	35	100

### Farmers' knowledge on pest, natural enemies and pollinators

Farmers considered spotted pod borer, flower thrips, leaf hopper, mite were the major pests of yardlong bean causing significant yield reduction in Chitwan. Nearly three-fourth of them (74.29%) considered spotted pod borer as major pests (Fig. 1). Sharma (1998) also reported that spotted pod borer; *M.vitrata* Fabricius as major pests of legumes in tropics and subtropics.



**Fig. 1.** Farmers' rating on the major damaging pests of yardlong bean by farmers

More than half of respondents (57.14%) reported more than 60 percent of damage caused by spotted pod borer in normal condition. Ohno and Alam (1989) also reported that *M. vitrata* Fabricius caused 54.4% pod damage in Bangladesh in yardlong bean. Similarly, Vishakantiah and Jagadeesh Babu (1980) observed 9-51% pod infestation at Bangalore. (Table 5)

**Table 5.** Farmers response in pod borer damage

Percent of damage	Frequency	%
0-15%	0	0.00
15-30%	2	5.71
30-45%	4	11.43
45-60%	9	25.72
>60%	20	57.14
Total	35	100

Over two-third (68.58%) of respondents considered high temperature and high rainfall responsible for pod borer infestation. About one fourth (25.71%) considered high temperature and low rainfall as suitable environment for pod borer infestation and very few (5.71%) considered normal temperature and normal rainfall responsible for pod borer infestation (Table 6).

Nearly two-third of farmers (62.86%) considered pod borer infestation begin both in pod formation and flowering stage of yardlong bean. Earlier instars are capable of damaging flowers while older instars are capable of boring into pods and consuming the developing grains (Taylor, 1967). (Table 7)

**Table 6:** Response of farmers on environmental factor influencing pod borer infestation

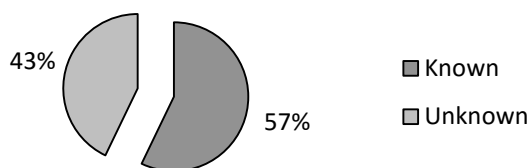
Environment	Frequency	%
High temperature, Low rainfall	9	25.71
High temperature, High rainfall	24	68.58
Low temperature, High rainfall	0	0.00
Low temperature, Low rainfall	0	0.00
Medium temperature Medium rainfall	2	5.71
Total	35	100

**Table 7:** Pod borer damaging stage

Stage of crop	Frequency	%
Flowering	3	8.57
Pod formation	10	28.57
Both flowering and pod formation	22	62.86
Total	35	100

**Fig. 2.** Farmers' knowledge regarding natural enemies

More than one-third of farmers (42.85%) were aware about natural enemies (Figure 2). Similarly, more than half of farmers (57.14%) knew about the role of pollinators in crop production and remaining were unknown about importance of pollinator in crop production (Fig. 3).

**Fig. 3:** Farmers' knowledge regarding role of pollinators

#### **Pest management practices**

More than half of of farmers (51.43%) consulted with agro-vet to manage different pest infestation during

yardlong bean production. Nearly one-third of farmers (31.43%) managed pest with their experience. Some farmers (11.43%) consult with lead farmers for managing the pest during crop production. Few farmers (5.71%) consulted both with Agro-vet and lead farmers for managing the pest. But none of farmers consult with DADO office for insect pest management (Table 8).

**Table 8:** Source of information for pest management of yardlong bean

Source of information	Frequency	%
DADO	0	0.00
Agro-vet	18	51.43
Leader farmers	4	11.43
Self	11	31.43
Both Agro-vet and leader farmers	2	5.71
Total	35	100

More than half of farmers (51.43%) applied pesticides after appearance of pest while 40% of farmers spray chemical before appearance of pests. (Table 9)

**Table 9:** Farmers' response on time of application of pesticides

Application of pesticides	Frequency	Percent (%)
Before appearance of pest	14	40
After appearance of pest	18	51.43
Before appearance of pest & after appearance of pest	3	8.57
Total	35	100

Almost all farmers used chemical pesticides for management of spotted pod borer in yardlong bean. Nearly three-fourth of respondents (74.29%) used more than one pesticide alternately to manage pod borer in yardlong bean i.e. Kingstar (Emamectin benzoate), Fame (Flubendiamide), Noorani (Chlorpyrifos + Cypermethrin), and Jadhu (Triazophos + Deltamethrin). Only 17.14% of respondents spray Kingstar (Emamectin benzoate) alone for management of spotted pod borer and very few (8.57%) of them spray Fame (Flubendiamide) alone for management of spotted pod borer (Table 10). Noorani (Chloropyrifos + Cypermethrin) and Jadhu (Triazophos + Deltamethrin) were never used alone for management of spotted pod borer but used alternately with Kingstar (Emamectin benzoate) or Fame (Flubendiamide).

**Table 10:** Name of pesticides use in management of pod borer

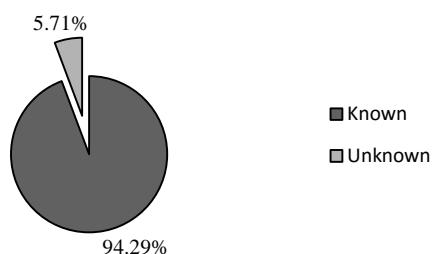
Name of pesticides	Frequency	%
Kingstar (Emamectin Benzoate)	6	17.14
Fame (Flubendiamide)	3	8.57
Noorani (Chlorpyrifos + Cypermethrin)	0	0.00
Jadhu (Triazophos + Deltamethrin)	0	0.00
More than one of above pesticide	26	74.29
Total	35	100

Nearly one-third of farmers (31.43%) sprayed chemical pesticides in 4-7 days interval and about one-third (31.43%) of them sprayed chemical pesticides in 7-10 days interval. 22.89% of farmers sprayed chemical pesticides in 10-15 days interval and 14.28 % of farmers spray in 2-4 days interval (Table 12).

**Table 12:** Farmers’ response on pesticide spray interval to manage spotted pod borer

Interval	Frequency	%
2-4 days	5	14.28
4-7 days	11	31.43
7-10 days	11	31.43
10-15 days	8	22.86
Total	35	100

Almost all farmers (94.29%) knew adverse effect of pesticides on human, environment, natural enemies and other animal but spraying pesticides is urgent to reduce loss due to pod borer. (Fig. 4). Similarly, Atreya (2007) reported almost all respondents were aware of negative impacts of pesticides on human health and environment in his survey in Nepal.



**Fig. 4:** Farmers’ knowledge regarding negative impact of pesticides

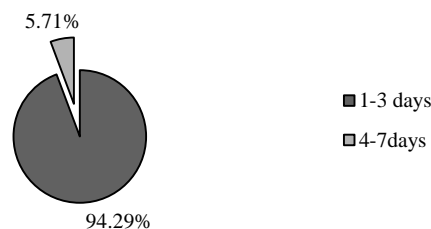
Majority of farmers (54.29%) reported that chemical pesticides reduced more than 50% of loss due to spotted pod borer (Table 13). Muthomi *et al.* (2007) also reported

that chemical pesticides significantly reduced the incidence of insect pests in legumes.

**Table 13:** Farmers’ response on spray of chemical pesticides and reduce percent of loss

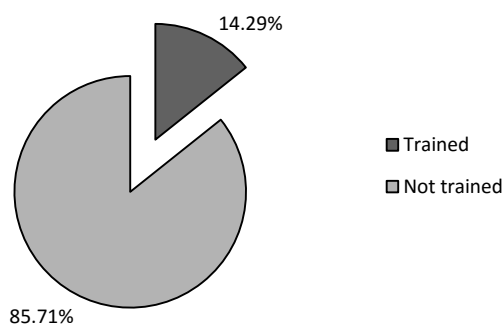
Reduced percent of loss	Frequency	Percent (%)
0-25%	3	8.57
25-50%	13	37.14
>50%	19	54.29
Total	35	100

Majority (94.29%) of respondents harvested pods after 1-3 day of spray of chemical pesticides while 5.71% of respondent harvested 5-7 days after spray (Figure 5). Due to fast growing character of pod they were compelled to harvest soon after few days of spraying of chemical pesticides. Yardlong beans are quick-growing and daily harvesting is often a necessity after beginning of pod production (Rubatzky and Yamaguchi, 1997). In Kathmandu valley, about 14 percent of vegetable had pesticide beyond permissible limit i.e. Rapid Pesticides Residue Analysis Laboratory found 26 out of 187 vegetable samples contaminated with pesticides beyond permissible limit (Kathmandu post, 2014) in market. This may be due to harvesting of vegetable before its waiting period and over use of pesticide in vegetable.



**Fig. 5:** Waiting period for harvest of pods after spraying pesticides

Out of total farmers, 85.71% of farmer did not get any training and remaining few farmers (14.29%) got training regarding crop management (Fig. 6).



**Fig. 6.** Status of training to farmers regarding crop management



Out of total farmers, 74.29% of collected and burned pesticide containers, 11.43% collected and buried, 8.57% threw containers in canal and water bodies and 5.71% sold to kawadi (Table 14).

**Table 14:** Farmer' response regarding disposal of pesticides container

Management of containers of pesticides	Frequency	Percent (%)
Collect and bury	4	11.43
Throw in canal and water bodies	3	8.57
Collect and burning	26	74.29
Sold to kabadi	2	5.71
Total	35	100

## Conclusions

Farmers considered spotted pod borer (*Maruca vitrata* Fabricius) as major pest of yardlong bean causing more than 60 % losses in Chitwan and they used chemical pesticide as sole method of spotted pod borer management. The chemical pesticides were alternately used in very few interval of time in yardlong bean and harvest pod without considering waiting period. The pods are very fast growing and if they are not harvest in time market value will be reduced. But using chemical pesticides repeatedly and alternately caused very high residue in pod and plant and environment thus causing harm to human, natural enemies, environment and other animal. Only very few farmers got training in integrated pest management so government should focused on integrated pest management and also creating the awareness among the consumer.

## Acknowledgements

The authors gratefully acknowledge Institute of Agriculture and Animal Science (IAAS), Rampur, Chitwan for academic career and farmer participated in the present survey.

## References

- Atreya K (2007) Pesticide use knowledge and practices: A gender differences in Nepal. *Environmental Research*, **104**(2): 305–311. DOI: 10.1016/j.envres.2007.01.001
- Champ BR and Dyte CE (1976). Report of the FAO global survey of pesticides susceptibility of stored grain pests. FAO plant production project paper No.5, FAO/UN, Rome. 297p.
- Georghiou GP and Legunes-Tejeda A (1991) The occurrence of resistance to pesticides in arthropods. FAO, Rome. 335p.
- Jackai LEN and Daoust PA (1986) Insect pests of cowpea. *Annual Review of Entomology* **31**: 95-119. DOI: 10.1146/annurev.en.31.010186.000523
- Jackai LEN, Inang EE and Nwobi P (1992) The potential of controlling post flowering pests of cowpea, *Vigna unguiculata* (L) Walp using neem, *Azadirachata indica* A. Juss. *Tropical Pest Management* **38**: 56-60. DOI: 10.1080/09670879209371646
- Kathmandu post (2014-7-21). Hidden health hazards
- MoAD (2012) Statistics information on Nepalese agriculture 2011/2012. Agri-Business Promotion and Statistics Division, Kathmandu, Nepal. 179p. DOI: 10.1007/978-1-4615-6015-9
- Muthomi JW, Otieno PE, Cheminingwa GN and Nderitu JH (2007) Effects of chemical pesticides spray on insect pests and yield of food grain legumes. *African Crop Science Conference Proceeding* **8**: 981-986.
- Ohno K and Alam MZ (1989) Ecological studies on cowpea borers. I. Evaluation of yield loss on cowpea due to the pod borers. In: E. Wajnberg and S. A. Hassan, (ed.) The Legume Pod Borer, *Maruca vitrata* Fabricius: Bionomics and Management. ICRISAT Information Bulletin Patancheru, India: ICRISAT 55: 8-50.
- Rubatzky VE and Yamaguchi M (1997) World vegetable: Principles, production and nutritive values. Chapman and Hall, New York. 572pp.
- Sharma HC (1998) Bionomics, host plant resistance, and management of the legume pod borer, *Maruca vitrata*-a review. *Crop Protection* **17**: 373-386. DOI: 10.1016/S0261-2194(98)00045-3
- Singh J, Kalloo G and Singh KP (2001) Vegetable crops: Nutritional security. Indian Institute of Vegetable Research, Varanasi. 56p.
- Singh SR and Jackai LEN (1988) The legume pod borer *Maruca testulalis* (Geyer): Past, present and future. *Insect Science and its Application* **9**: 1-5. DOI: 10.1017/s1742758400009930
- Snelson JT (1987) Grain protectants. ACIAR. Canberra. 448p.
- Taylor TA (1967) The bionomics of *Maruca testulalis* Geyer (Lepidoptera: Pyralidae), a major pests of cowpeas in Nigeria. *Journal of West African Science Association* **12**: 111-129.
- Vishakantaiah M and Jadadeesh Babu CS (1980) Bionomics of the tur webworm, *Maruca testulalis* (Lepidoptera: Pyralidae). *The Mysore Journal of Agricultural Sciences* **14**: 529-532.