Research Notes

FIELD SURVEY AND MONITORING OF POTATO TUBER MOTH (*Phthorimaea operculella* (ZELLER) (LEPIDOPTERA: GELECHIIDAE)

D. B. Tiwari[1] , R. B. Thapa[2], S. M. Shrestha[2] and S. L. Joshi[3]
[1]DADO, Bhaktapur, [2]IAAS, Rampur, and [3]NARC, Khumaltar, Nepal

ABSTRACT

Potato tuber moth (PTM), *Phthorimaea operculella* (Zeller) is a major pest of stored potato. Field survey was conducted to know the effect of this pest on potato production and storage under farmers' conditions in the Kathmandu valley and remote district Rolpa during 2005. Ninety farmers (40 in the Kathmandu valley and 50 in Rolpa) were interviewed in semi-structured questionnaires and PTM was also monitored using sex pheromone. Survey and monitoring revealed that PTM (insect pest) and late blight (disease) were the major problems of potato crop in both the areas. Maximum of 69 moths per week were collected in one set of pheromone trap in Kathmandu and 76 moths trapped within five days of trap setting in Rolpa. That was the first record, authentic evidence to clarify farmers' confusion in Rolpa district about the presence of *P. operculella* in potato growing areas. In the Kathmandu valley, 95% of respondent farmers were aware of this pest and 80% farmers relied on chemical pesticides to manage *P. operculella* on stored potato. However, only 4% of the respondent farmers in Rolpa were aware of this pest. Therefore, its management is necessary for healthy potato production in the field and storage under farmers' conditions in Nepal.

Key words : *Phthorimaea operculella*, field survey and monitoring

INTRODUCTION

Potato occupies fifth position in area, fourth in production and first in productivity in Nepal with its cultivation in 143027 ha of land, 1643357 mt production, and 11.48 mt/ha productivity, respectively (MOAC, 2004). Potato is listed as one of the major commodities in the agriculture perspective plan (APP, 1995). Quality seed and plant pests are the major production constraints, of which potato tuber moth (PTM), *Phthorimaea operculella* (Zeller) has delimited potato production and storage in Nepal (NPDP, 1978; Joshi *et al.*, 2004). During early sixties, when potato varieties were imported from India to Kathmandu for adaptive research under Indian Aid Mission program, PTM was introduced in Nepal (Joshi, 2004). The pest was reported for the first time in 1966 in the Kathmandu valley (Anonymous, 1967). In the rainy season of 1973, this pest caused a heavy loss of potato tubers in the storage in Khumaltar, Nepal (Neupane, 1977). Pest severity is reported in various districts of Nepal (PPD, 1999).

Potato harvested during pocket outbreak of *P. operculella*, resulted cent percent loss of crop (Joshi, 1989). Under stored and field condition, the *P. operculella* makes a significant loss on potato crop (Lal, 1987:1998; CIP, 1988; Joshi, 1989; Lagnaoui *et al.*, 2000). Losses range from 30-85% in storage (CIP, 1988; Joshi, 1989; Palacios and Cisneros, 1996; Lal, 1998; Douches *et al.*, 1998). Therefore, the present survey and monitoring was carried out to assess farmers' perception on *P. operculella*, and its management in potato storage.

MATERIALS AND METHODS

Farmers' surveys were carried out in the Kathmandu valley and Rolpa during January–May 2005. The PTM monitoring by pheromone trap was done during August-September 2004 and May 2005 in Kathmandu and Rolpa, respectively.

Household survey was performed in the Kathmandu valley and Rolpa. Purposively, 50 potato farmers in Rolpa district and 40 farmers in the Kathmandu valley were selected. They were interviewed in semi-structured questionnaires. Production influencing factors, diseases and pests of crop, and generally adopted pest control measures in farmer's evaluations, was observed.

The *P. operculella* sex pheromone, a product of Trece, Inc. Salinas, CA. USA, was used to monitor *P. operculella*. One capsule rubber septa of pheromone written as PTM 3137 and 44171734 was set on 20th

August 2004 using delta sticky trap in Sankhu and another set in Mulpani of Kathmandu district before starting potato cultivation in the farmers field. The traps were set in the vicinity of potato field and farmers house, and adult moths trapped were recorded.

Farmers' survey in Rolpa created confusion about the presence of *P. operculella* in the district. To overcome this problem, one set of pheromone trap as described earlier was kept in the potato field of Madichaur of Jankot VDC on 16 May 2005. The potato crop was in the position of harvesting while monitoring. Trapped PTM adult moths were recorded for five days to find the presence of the pest in the locality.

RESULTS AND DISCUSSION

Factors influencing potato production

Quality seed, plant protection techniques and quality fertilizers played significant role in increasing potato production. But, the disease and pests infestation increase cost of production and poor market facility were limitting the potato cultivations in the study sites (Table 1).

Table 1. Factors influencing potato production in the Kathmandu valley and Rolpa, 2005

Particular	Factors	Kathmandu valley (n=40)		Rolpa (n=50)	
		Frequency	Percent	Frequency	Percent
Positive factor	i) Quality seed	16	40	25	50
	ii) Plant Protection techniques	12	30	7	14
	iii) Quality fertilizer	4	10	5	10
	iv) Adequate manure	4	10	10	20
	v) Technical advice	4	10	3	6
Negative factor	i) Diseases and pests	20	50	20	40
	ii) Increased labor and other input cost	12	30	9	18
	iii) Transport difficulty	8	20	17	34
	iv) Small size farm	4	10	3	6
	v) Market problem	8	20	15	30
	vi) Scarcity of litter	-		5	10

Among the major production constraints, about half of the respondents in the Kathmandu valley, and in Rolpa, indicated diseases and pests, another one-fifth of the respondents stressed on quality inputs and production technology in both the study sites. Which was in consistent with the finding of Shakya *et al.* (1990). However, farmers of Rolpa suffered more due to poor market facilities, while low land holding was one of the production constraint in the Kathmandu valley.

Major pests

Late blight and bacterial wilt were the major diseases of potato both in Rolpa and the Kathmandu valley; where as *P. operculella* in the Kathmandu valley and red ant in Rolpa were the major pests of potato known to the respondents (Table 2). In addition, several viral and fungal diseases prevailed in both the study areas. Aphids, white grubs, blister beetles, cutworm and semilooper attacked the potato crops both in the Kathmandu valley and Rolpa. Finding agreed with PPD (1999). In the study sites, 90-95% farmers ranked the late blight in the first number. In the Kathmandu valley, 95% of the farmers ranked *P. operculella* in first order of importance.

Pest management

About half of the farmers in Rolpa and 10% in the Kathmandu valley did not practice any control measures. In the Kathmandu valley, 80% farmers and 26% farmers in Rolpa relied on chemical pesticides application to control the potato pests (Figure 1). The finding is in agreement with DADO (2003) and Joshi *et al.* (2004). However, at least 10% of the farmers in both the study sites used other methods of pest control together with chemical pesticides. Sorting and air cooling, practices were applied by the farmers against PTM in the Kathmandu valley. In natural products and botanicals, farmers used ash, cow urine, sisnoo-pani, surti-pani, soap-water, Chiuri cake for potato pest management.

Table 2. Major diseases and pests of potato in the Kathmandu valley and Rolpa, 2005

Problems	Respondents' priority order											
	Kathmandu valley (n=40)						Rolpa (n=50)					
	I Freq	I (%)	II Freq	II (%)	III Freq	III (%)	I Freq	I (%)	II Freq	II (%)	III Freq	III (%)
Pests												
Potato tuber moth	38	95	2	5	-	-	-	-	2	4	3	6
Red ant	5	12.5	9	22.5	6	15	47	94	3	6	-	-
Aphids	4	10	7	17.5	9	22.5	-	-	7	14	6	12
White grub	6	15	3	7.5	4	10	7	14	15	30	10	20
Blister beetle	-	-	-	-	6	15	12	24	15	30	7	14
Cutworm	-	-	5	12.5	6	15	8	16	7	14	12	24
Semilooper	-	-	6	15	7	17.5	6	12	13	26	9	18
Diseases												
Late blight	38	95	2	5	-	-	45	90	5	10	-	-
Wilt	2	5	30	75	8	20	5	10	25	50	20	40
Mosaic	4	4	6	15	7	17.5	2	4	6	12	9	18
Scab	-	-	-	-	5	12.5	-	-	-	-	5	10
Dry rot	-	-	3	7.5	5	12.5	-	-	4	8)	5	10
Black scurf	-	-	-	-	5	12.5	-	-	-	-	6	12

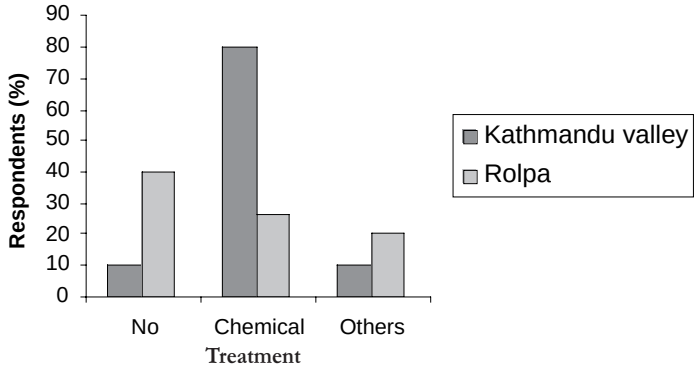

Figure 1. Pest management measures adopted by the respondent farmers

Pheromone trap monitoring

Maximum of 69 moths per week were collected in one set of pheromone trap in Kathmandu (Table 3). Maximum of 15 moths in Mulpani and 11 moths in Sankhu were trapped in a day in the field. Pheromone trap was set in the vicinity of potato field but there were no potato plants in the field during monitoring. Pheromone has been suggested as effective means of PTM monitoring and control in stored potato (Chandla *et al.*, 1994). In Rolpa, 76 moths were trapped during five days of setting. That gave authentic evidence and clarified farmers' confusion in Rolpa district about the presence of *P. operculella* in potato growing areas. This was the first record from the area and considering the RPPL (2004) report based on farmer's response, there is need of detail survey in all VDCs of the district.

Table 3. Number of *P. operculella* moths collected in pheromone traps in Kathmandu and Rolpa 2004/05

Date	Kathmandu		Rolpa
	Sankhu	Mulpani	Madichaur
21.8.2004 – 28.8.2004	69	60	-
29.8.2004 – 5.9.2004	27	36	-
6.9.2004 – 13.9.2004	7	11	-
14.9.2004 – 21.9.2004	4	5	-
16.5.2005 – 20.5.2005	-	-	76

CONCLUSIONS

Quality seed and plant protection measures are the two major factors influencing potato production. The potato pests negatively influenced about 50% of the farmers both in Rolpa and the Kathmandu valley. PTM is spread up to the remote district Rolpa. Late blight is the major disease and PTM and red ant are the major pest of potato as known to the farmers in both the area. Eighty percent of the farmers in the Kathmandu valley relied on chemical pesticides to control the potato pest, whereas 40% of the farmers in Rolpa do not use any control measures for potato pests. Maximum of 76 moths per week in Rolpa and 69 moths in Kathmandu were trapped in a pheromone set per week. Whereas, 95% of the respondents were aware of PTM in the Kathmandu valley, but only 4% farmers in Rolpa diagnosed the PTM. Therefore, PTM is a serious pest of potato and its monitoring in other parts of the country is essential. Altogether, appropriate measures of pest management is need to be developed.

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