

# DISTRIBUTION OF POTATO VIRUS DISEASES IN INNER HIMALAYAS OF WESTERN NEPAL

P.M. Pradhanang<sup>1</sup>, B.K Dhital, T.B. Gurung and A. Manandhar<sup>2</sup>  
Lumle Agricultural Research Centre, P.O. Box 1, Pokhara, Kaski, Nepal

## ABSTRACT

A survey was conducted in Mustang and Manang districts in June 1993 to determine the distribution of potato virus diseases in traditional potato growing areas. A total of 21 and 36 leaf samples, showing virus like symptoms, were collected from different parts of Mustang and Manang respectively to examine the presence of viruses by double antibody sandwich (DAS) ELISA. The suspected samples from Manang did not yield any viruses whereas, 17 samples from Mustang were found affected by potato viruses S, X and M either combinedly or alone. The frequency of PVS was highest (13 samples), followed by PVX (12 samples) and PVM (1 sample). The visual symptoms were not fully reliable for the presence of viruses when they are mild. However, all plants expressing severe mosaic symptom in the field yielded either PVX or PVS. This is the first report of the distribution of potato virus diseases in the inner Himalayan region of Nepal.

Additional Key Words : Manang, Mustang, PVM, PVS, PVX,

## INTRODUCTION

Potato (*Solanum tuberosum* L.) is grown throughout Nepal from the southern plains (<100 m asl), i.e. Terai, to the northern mountains. In the lowlands, below 100 m asl, potato is cultivated mainly to produce ware potatoes and at elevations above 2000 m asl for both ware and seed production purposes. Most of the seed demand is fulfilled by the potatoes produced in the high hills because seed certification system does not exist for potato in Nepal and the seed quality deteriorates faster in the lowlands due to virus infection. Moreover very few cold storage facilities are available and it is not possible to store potatoes even for a season under lowland ambient conditions.

Seed potatoes produced in the high hills are considered relatively free of virus diseases due to the cold climate and low vector population. Nevertheless, most of the important virus diseases have been shown to exist in the hills and Terai of Nepal. Akius and Kloos (1990) showed the presence of PVA, PVM, PVS, PVX, PVY and PLRV in Nepal although they did not give the range of altitudes of the distribution of these diseases. The objective of this paper was to determine the distribution of virus diseases in some of the remote mountains of Mustang and Manang districts of western Nepal which are traditional seed potato source for middle and lowland areas.

## MATERIALS AND METHODS

During a rapid rural appraisal survey of potato production systems made by Dhital *et al.* (1994), leaf samples suspected to be affected by virus were collected purposively from six locations in Manang and eight locations from Mustang district. The altitude of the collection site ranged from 2240 m to 3750 m. A total of 21 and 36 samples from Manang and Mustang districts respectively were analyzed for the presence of the specific viruses. The symptoms

<sup>1</sup> Present address: Potato Research Programme Khumaltar, Lalitpur, Nepal;

<sup>2</sup> National Harbarium Laboratory, Godawari, Lalitpur, Nepal



expressed by each plant was recorded in order to determine whether the visual symptoms can be used to identify for the presence of viruses.

Crude leaf extract was obtained in extracting buffer at a ratio of 1:15 weight by volume respectively as described by Akius *et al.* (1983). Extracts obtained from the homogenized fresh leaves were clarified by sedimentation and 100 µl aliquots were dispensed into six different antiserum precoated individual multiwell plates (Nunc, "Polysorp"). Each extract was tested in duplicate wells. The plates were then incubated overnight at room temperature and washed in the following morning. The antiserum of potato virus X, Y, M, S, A and leaf roll were supplied by BIOREBA AG, Switzerland.

The plates were transported to Potato Research Programme, Kathmandu, to perform further steps of DAS ELISA as described by Clark and Adams (1977), to detect the presence of virus antigens in the plates. Positive controls were known virus infected plants and negative controls were extraction buffer. Control samples were loaded in all plates followed by corresponding enzyme conjugates and results were quantified 2 h after addition of substrate by reading the absorbance in each well at 405 nm on a Titretek-Multiscan microtitre plate reader.

## RESULTS AND DISCUSSION

The leaf samples from Manang did not yield any viruses, whereas out of 31 samples of Mustang, 17 were infected by potato viruses with the high frequency of PVS (13) and PVX (12) and only one sample yielded PVM (Table 1). These viruses were present in most areas of Mustang. Most of the mosaic affected samples were affected both by PVS and PVX. These results agree with those of Akius and Kloos (1990) who found high frequency of PVS and PVX and their association in field trials and tuber indexing samples from seed production plots of different districts of Nepal. This is expected because both of these diseases are mechanically transmitted and conditions are favorable since cut seed tubers are commonly used and there is no seed certification scheme for potato in Nepal. Potato virus Y, A, and Leaf roll were not found.

Farmers in the surveyed areas of Mustang district are not aware of virus diseases and have not realised the serious yield losses in potato due to diseases (Dhital *et al.*, 1994). This may be because combined infection of PVS and PVX may only reduce yield by an estimated 12 % (Beukema and Vander Zaag, 1979). Only local varieties were grown in the visited areas of Manang district, whereas varietal diversification was found in Mustang. Manang is more isolated than Mustang district and this could explain presence of viruses only in Mustang.

The results also showed that visual symptoms are not fully reliable when the symptoms are mild. However, the severe symptoms are reliable for the presence of virus (Table 1). Therefore it is necessary to educate farmers about the symptoms and the mode of virus transmission so that at least negative selection can be done to maintain high seed quality. However, false positive symptoms have to be dealt with carefully. It is not known why some plant samples of Manang expressed virus like symptom in absence of infection.

Aphids were not observed in potato fields of both districts. However, seed crops of broad leaf mustard (*Brassica Juncea*) at Horticultural Station, Marpha (2650 m), in Mustang was heavily infected by aphids (unknown species). This shows the potential of aphid activity during the potato growing period (March to July) in lower Mustang areas such as Marpha. If aphid transmitted viruses are introduced in these areas, the magnitude of the problem can increase tremendously since PVY and PLRV are serious virus diseases.

This is the first report of the distribution of potato virus diseases in the inner Himalayan region of western Nepal. This type of work may be extended to other parts of the country to map and determine the range of viruses present in potatoes grown in high mountains of Nepal since these are the important areas for seed potato.



Table 1. Distribution of potato virus diseases in Manang and Mustang Districts

District	Location	Altitude (m asl)	Symptom	Total samples	Number of samples affected by different viruses		
					PVX	PVM	PVS
Manang	Ghelanchok	2240	Mosaic	4	0	0	0
"	Thanchok	2700	Normal leaf	2	0	0	0
			Crinkled leaf	1	0	0	0
"	Manang	3750	Normal leaf	6	0	0	0
"	Humde	3400	Mosaic	4	0	0	0
"	Talekhu	2810	Mosaic	1	0	0	0
			Leaf roll	1	0	0	0
"	Pisang	3240	Normal leaf	2	0	0	0
Mustang	Chhaingoor	3740	Mosaic	3	0	0	2
			Little leaf	2	1	0	1
"	Jharkot	3600	Mosaic	4	0	0	2
"	Syang	2700	Severe mosaic	11	6	0	6
"	Marpha	2650	Mosaic	2	0	1	0
			Leaf roll	1	0	0	0
"	Kobang	2825	Mosaic	5	3	0	2
"	Kokhe Thanti	2640	Mosaic	3	1	0	0
"	Lete	2600	Normal leaf	4	0	0	0
"	Teeti	2825	Severe mosaic	1	1	0	0

## CONCLUSION

The incidence of mainly the PVX and PVS in most of the potato growing areas of Mustang suggests that these viruses will probably not be a major constraint to potato production. Introduction of more serious potato virus diseases through infected planting materials should therefore be avoided. The conditions in Mustang are suitable for aphid build up, and wide dissemination of virus diseases may occur if PLRV and PVY are introduced. This may upset the high to low hill seed flow system resulting in adverse effect on socioeconomic conditions of the farmers in the high hills and mountains.

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