

Some Local Potato Cultivars and their Reaction to Viruses

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ABSTRACT

Potato Research Programme (PRP) started initial studies of local potato cultivars since 1988/89 in Nepal, to understand the plant and yield characteristics of these cultivars and to explore potato cultivars diversity in the country. More activities on germplasm collection, characterization and performance evaluation were carried out at Khumaltar. Twenty-one local cultivars collected from different parts of the country were evaluated and compared with check varieties. The studies were carried out in the laboratory of PRP, Khumaltar for identification and rating of these cultivars for virus diseases. The presence of different viruses was observed in almost all cultivars tested. However, the degree of infection was different. The tuber yields of almost all tested stocks were found infected by virus diseases and as a result, a large number of small sized tubers per plant were produced. However, combined results of tuber characteristics showed that cultivars Farse White, Rosita, Khumbule and Lumle Red were superior to Kufri Jyoti in tuber yields over the years.

Key words: Local cultivars, potato, tuber yield, virus diseases

INTRODUCTION

Potato is not an indigenous crop of Nepal. Local cultivars, cover around 80 percent of the total potato growing area and are in highly degenerated condition. Rhodes (1985) recorded 18 land races only from eastern hills. Several local cultivars traditionally grown all over the country possess different desirable characters (Shrestha 1996). Due to these desirable characteristics, cultivars like Ilam Blue, Chisapani Red, Khumbule, Bhotange, Tharu Local, Kathmandu Local, Jumli Local and Sarkari Seto are still popular among farmers (Khatri et al 1998). Since potatoes are propagated vegetatively, the seed tubers are the major source of survival of different diseases (Akius and Kloos 1990). Farmer's practices further accelerated infection of seed stocks as they generally used smaller (Bhomi and Kloos 1991) and leftover tubers as seed.

Due to these reasons and severe degeneration on it, the so-called local cultivars are giving lesser yields but have greater scope of improvement. Based on tuber yields, farmers' preference, area coverage and distribution pattern of these specific

cultivars, Jumli Local, Kathmandu Local, Sarkari Seto, Syang Dorje and Tharu Local were selected and recommended for general cultivation and were cleaned against six potato viruses (A, X, M, Y, S and leaf roll) at Khumaltar (Khatri and Rai 2000). Yield performance of some of the important local cultivars cultivated in the country, the status of viral disease in those cultivars and status of degeneration are described and presented in this paper.

MATERIALS AND METHODS

Twenty-one different local cultivars collected from different parts of the country (Table 1) were evaluated and compared with the check varieties Cardinal and Kufri Jyoti at the Potato Research Farm, Hattiban, Lalitpur during 1996/97 and 1997/98. Most of the cultivars evaluated were of unknown origin but they were cultivated continuously in different parts of the country.

Potato cultivars including check cultivars were planted in 3.6 m² plot size in three replications. Chemical fertilizers were applied at the rate of 100:100:60 kg ha⁻¹ NPK and the compost at the

rate of 20 t ha⁻¹. Spacing was maintained at 60 cm as row to row and 25 cm as plant to plant. Observations were made and the data on maturity days, tuber size, tuber shape, tuber color, eye depth, skin surface and tuber yield were recorded.

Fresh leaf samples were collected from each cultivar grown in the field for virus testing. Samples for this purpose were prepared according to the standard procedure (Ranjit et al 1994). The crude extract was obtained using buffer in the ratio of 1:15 w/v and tested against six potato viruses (PV), A, M, S, X, Y and potato leaf roll (PLR) by double antibody sand-witch enzyme-linked immunosorbent assay (DAS-ELISA) technique. For the purpose of virus identification, samples containing A₄₀₅ values of more than 0.200 were considered as positive and A₄₀₅ values of less than 0.136 was not registered in any of the samples showing negative for virus presence.

RESULTS AND DISCUSSION

Among 21 cultivars evaluated in the studies, 19 were collected from the hills and 2 were from terai of Nepal (Table 1). In the agronomic studies, all cultivars except Farse White, Musa and Kalo were found medium to late maturing type. Most of the cultivars except Sarkari Seto and Lamjunge had round to oval tuber shape. There was a clear diversity in skin color from white to purple black in the tubers. Cultivars, Khumbule and Kathmandu Local were found to have red-skin. Nepalese consumers prefer shallow-eyed tubers and most of the cultivars have tubers with shallow to medium eye depth. Cultivars Kal Aankhe, Farse Red, Morange, Ilam Blue, and Kalo have deep eyes and seven have shallow and nine medium types. Skin surface of all harvested tubers were categorized either as rough or smooth type.

Highly significant differences were observed on potato tuber yields among landraces. Yield ranged from 6.6 t ha⁻¹ in Khodpeli Local to 30.4 t ha⁻¹ in Farse White. Rosita yielded 25.1 t ha⁻¹ and Lumle Red 23.5 t ha⁻¹. Result shows that most of the cultivars collected from the hills were high

yielder as compared to the cultivars collected from terai or mid-hills. Combined results of tuber characteristics and yield over the years showed that cultivars Farse White, Rosita, Khumbule and Lumle Red were superior to Kufri Jyoti (Table 1). Cultivar Lamjunge, Musa, Morange, Dolpa Local, Bhotange and Khodpeli were the lowest yielder. In both the years, cultivars Farse White, Musa and Kalo were found early maturing and eight cultivars were late maturing and the rest were medium maturing type.

In the plant samples, virus PVA was not detected in any of the tested cultivars. Surprisingly, insect transmitted potato leaf roll virus was also not observed in any of the samples except in Bhotange and Kathmandu Local but PVS was in almost all cultivars. Cultivar Bhotange was highly infected with PVM and PVX showing the A₄₀₅ value of 0.959 and 0.640, respectively. PVY value was also found higher in almost all tested cultivars. Virus testing results showed that there were no any virus free cultivars obtained in the study. The mean absorbance at 405 nm corresponding to different potato viruses is presented in Table 2.

Results revealed the presence of viruses PVS, PVX, PVY in cultivar Khodpeli, whereas PVX and PVS in Thakali red, Lamjunge and Bhotange. PVS was found positive in almost all the local cultivars tested and PVY occurred relatively at high frequency in the samples. The result shows that there was a severe infection of PVY, PVS (mild) and PVX viruses. This was the case even in visually healthy looking plants in the fields. The test showed absence of PVA in all the tested cultivars. Although PVM was less common than PVS, PVX or PVY, it is also perpetuated in infected tubers and transmitted by physical contact and by aphids. PLRV, the most important aphid transmitted potato virus was found in cultivars Bhotange and Kathmandu Local only. Tuber yield in some local cultivars in the trials was equal or superior to check varieties. Majority of local cultivars had high percentages of virus infection. However, the yields of these cultivars could be increased significantly through the use of better quality seed materials and improved cultural practices. These results further

indicate that there are some high yielding virus resistant local cultivars. Diverse plant and tuber characteristics available in these cultivars might be the sources for further improvement of potato cultivars of desired characters.

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