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Screening of germplasm lines against Potato apical leaf curl virus disease in potato crop

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ABSTRACT: *Potato (Solanum tuberosum L.) is one of the most important vegetable crops. In potato crop, the sporadic incidence of potato apical leaf curl disease was observed first time in early October sown potato crop at Hisar during Dec. 1996 that affect the crop growth and production. The fast spread of this disease under high vector population whitefly (Bemisia tabaci) has been noticed in early sown susceptible varieties of potato. Three hundred ten germplasm lines of potato were screened against potato apical leaf curl virus disease under field conditions. Infector row of Kufri Khyati after every 5th test row and around the field was maintained to create congenial conditions for Bemisia tabaci attack. The number of infected plants was recorded at 20 days after planting and thereafter at ten days interval until 80 days after planting to identify the resistant sources to potato apical leaf-curl virus disease. The percent potato apical leaf-curl virus disease incidence (Percentage of total number of diseased plants divided by total number of plants observed) was calculated.*

Key Words: *Bemisia tabaci, Germplasm lines, PALCVD, Resistant*

INTRODUCTION

Potato (*Solanum tuberosum L.*) is one of the most important vegetable crops and ranks third among food crops after rice and wheat in the world as well as India from human consumption point of view. Potato belongs to the family Solanaceae and is one of the most important vegetable crops grown throughout India. India is the 3rd largest producer of Potato in the world after China and Russia and during 2012-13 potato crop occupied 19.99 lakh hectares with a production of 45.24 lakh tonnes tubers [2]. Potato is one of the most important vegetable crops grown through Haryana in a wide variety of soil. It ranks first in production and third in area among vegetable crops in Haryana. It shares 7.73% of the total area under vegetables in the state; however, its production share is 12.87% of the total vegetable production. During 2012-13, the area and production of potato were 29473 hectares and 676016 tonne, respectively [1]. The productivity (22.94 t/ha) of potato crop in the state is better than the national yield, however, lower than the potential yield (35 t/ha). There are number of factors, which play important role in deciding the productivity and quality of potato tubers, and disease is one of the most important factors. Potato crop is attacked by many diseases, which are widely spread and others are localized, which affect the crop growth and production. In potato crop, the sporadic incidence of potato apical leaf curl disease was observed first time in early October sown potato crop at Hisar during Dec. 1996 that affect the crop growth and production [4]. The experiment was carried at research area of the Department of Vegetable Science, CCSHAU, Hisar. The fast spread of this disease under high vector population whitefly (*Bemisia tabaci)* has been noticed in early sown susceptible varieties of potato. Three hundred ten germplasm lines of potato were screened against potato apical leaf curl virus disease under field conditions. The germplasm was planted in single row having 3-meter row length, row-to-row distance at 60 cm and plant-to-plant at 20 cm in two replication with five tubers in each row. Infector row of Kufri Khyati after every 5th test row and around the field was maintained to create congenial conditions for *Bemisia tabaci* attack. The number of infected plants was recorded at 20 days after planting and thereafter at ten days interval until 80 days after planting to

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identify the resistant sources to potato apical leaf-curl virus disease. The percent potato apical leaf-curl virus disease incidence (Percentage of total number of diseased plants divided by total number of plants observed) was calculated. In present study, out of three hundred ten-potato germplasm lines, none of germplasm line showed disease at 20 days after planting. Three lines namely, Kufri Bahar, CP 1458, and HIS 98-55 were resistant (<10 % disease incidence) to the disease and 137 genotypes were moderately resident (10.1-20% disease incidence), while 96 genotypes were moderately susceptible (20.1-40% disease incidence), 42 genotypes were categorized under susceptible (40.1-60% disease incidence) and 32 genotypes highly susceptible group (>60% disease incidence).

MATERIAL AND METHODS

The experiment was carried at research area of the Department of Vegetable Sciences, CCS Haryana Agriculture University, Hisar during Rabi season of 2013-14. Three hundred ten germplasm lines of potato were screened against potato apical leaf curl virus disease under field conditions. The germplasm was planted in single row having 3-meter row length, row-to-row distance at 60 cm and plant-to-plant at 20 cm in two replication with five tubers in each row. Infector row of Kufri Khyati after every 5th test row and around the field was maintained to create congenial conditions for *Bemisia tabaci* attack. The number of infected plants was recorded at 20 days after planting and thereafter at ten days interval until 80 days after planting to identify the resistant sources to potato apical leaf-curl virus disease.

Disease incidence was calculated by using the following formula:

$$Disease\ Incidence = \frac{Total\ number\ of\ diseased\ plants}{Total\ number\ of\ plants\ observed} \times 100$$

Scale used for screening of resistance

Disease Reaction	*Disease Incidence (%)*
Resistant	<10
Moderately Resistant	10.1-20
Moderately Susceptible	20.1-40
Susceptible	40.1-60
Highly Susceptible	>60

RESULTS AND DISCUSSION

Three hundred ten genotypes were evaluated against potato apical leaf curl disease under field conditions. The cultivars along with per cent disease incidence are presented in Table 1. The disease incidence was recorded 20 days after planting (DAP) at 10 days interval. No disease was recorded at 20 days after planting in all the genotypes under field conditions and the reactions of different genotypes are presented in Table 1.

Three hundred ten potato germplasm lines were evaluated for their resistance to potato apical leaf curl virus disease (PALCVD) under field conditions. Infector row of variety Kufri Khyati at every five test cultivars and all around the plot was sown to create congenial conditions after whitefly attack in the crop. The incidence of potato apical leaf curl virus disease was recorded at 20, 30, 40, 50, 60, 70 and 80 days after planting. Three Lines namely, Kufri Bahar, CP 1458, and HIS 98-55 were resistant to the disease and 137 genotypes were moderately resident, while 32 were categorized under highly susceptible group.

Table 1
Diseased reaction of potato genotypes screened under potato apical leaf curl virus disease condition during 2013

Sr. No.	*Disease Reaction*	*Disease Incidence*	*No. of Germplasm Lines*
1.	Resistant	<10	3
2.	Moderately Resistant	10.1-20	137
3.	Moderately Susceptible	20.1-40	96
4.	Susceptible	40.1-60	42
5.	Highly Susceptible	>60	32

In present study, three hundred ten potato germplasm lines were evaluated for their resistance to potato apical leaf curl virus disease (PALCVD) under field conditions. Three Lines Kufri Bahar, CP 1458 and HIS 98-55 were resistant to the disease. Similarly, Lakra [5] evaluated 266 germplasm lines and 15 cultivars and found that Kufri Bahar and CP 1246 were resistant to PALCVD. Baswana *et al.* [3] conducted a similar trend on screening of 180 accessions of potato against potato apical leaf curl disease, which reported one accession CP-1716 and cultivar Kufri Bahar as resistant, while three accessions namely, CP 1813, CP 1818 and CP 1859 exhibited disease incidence <20% and were categorized under moderately resistant group.

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