

Screening of Potato (*Solanum Tuberosum* L.) cultivars for resistance against Potato apical leaf curl virus

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ABSTRACT

A field experiment was conducted at Potato Research Station, S. D. Agricultural University, Deesa during 2012-13, 2013-14 and 2014-15 to assess thirteen potato cultivars for resistance against potato apical leaf curl virus. The potato cultivars viz. Kufri Badshah, K. Pukhraj, K. Chipsona-3, K. Bahar, K. Anand, K. Sadabahar, K. Himsona, K. Surya, K. Khyati, K. Sutlej, K. Pushkar, K. Jyoti and K. Laukar were planted in randomized block design in the second week of November keeping inter and intra row spacing of 50 cm and 20 cm, respectively in three replication. The observations on per cent disease incidence, population of white fly and total tuber yield were recorded. All the varieties were affected by the apical leaf curl virus. However minimum incidence 2.64 per cent was recorded in K. Badshah followed by K. Anand (7.90%), K. sutlej (8.23%) and K. khyati (9.63%). On the other hand highest disease incidence (25.33%) was observed in K. Bahar. The numbers of whiteflies were also found lowest in K. Badshah at 60 days after planting (DAP).

Key words: Potato, Apical leaf curl virus, Screening, Resistance

Potato (*Solanum tuberosum* L.) belongs to family *Solanaceae* and is one of the most important vegetable crops grown in all climatic zones of the world and is next only to wheat, rice and corn in terms of total food production. On the basis of potato production, India stands second in the world after china. In India, the area under potato cultivation is 2179 thousand ha with average production of 22.31 tonnes per hectares while Gujarat produce 3797816 MT potatoes from the cultivated area and occupy first rank in productivity (31.00 tonnes/ha) in India (Anonymous, 2018).

Potato is suffering from many viral diseases among them potato apical leaf curl virus disease (PALCVD) is an important disease in early planted potato crop. It is transmitted through whitefly (*Bemisia tabaci*) in a persistent manner. Potato apical leaf curl virus showed chlorotic blotching, crinkling, mosaic, apical leaf curling and stunting symptoms (Grag *et. al.*, 2001). Annual loss due to potato viruses with an average of 30-40 per cent incidence is about 25- 30 per cent yield reduction (Khurana, 1999). Lakra, (2002) reported more than 50 per cent loss in yield in early planted potato cultivar Kufri Ashoka. The most

deleterious effect observed was reduction in leaf area, chlorophyll content, plant height, number of tubers per plant and weight of tubers per plant (Lakra, 2003). The disease incidence has positive correlation with whitefly population and whitefly infestation period (Baswaraj *et. al.*, 2015).

The genetic resistance is more safe, stable and economical in comparison to pesticides use. The prerequisite for the development of disease resistant varieties is the availability of efficient and reliable screening techniques and the identification of resistant sources.

MATERIALS AND METHODS

A field experiment was conducted at Potato Research Station, SDAU, Deesa (Gujarat) during *Rabi* season of 2012-13, 2013-14 and 2014-15 to evaluate thirteen different potato varieties released by the Central Potato Research Institute, Shimla (Himachal Pradesh) against potato apical leaf curl virus. The potato varieties viz. Kufri Badshah, K. Pukhraj, K. Chipsona-3, K. Bahar, K. Anand, K. Sadabahar, K. Himsona, K. Surya, K. Khyati, K. Sutlej, K. Pushkar, K. Jyoti and K. Laukar were planted in randomized block design

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Table 1 Field screening of potato varieties against Potato Apical Leaf Curl Virus (Pooled Data of Three years)

S.N.	Variety	PDI	No. of Whiteflies 40 DAP	No. of Whiteflies 50 DAP	No. of Whiteflies 60 DAP	Yield (t/ha)
1.	Kufri Badshah	2.64 (9.63)*	4.89 (2.26)**	5.22 (2.36)**	6.11 (2.53)**	38.62
2.	Kufri Pukhraj	13.01 (20.37)	4.22 (2.13)	5.67 (2.44)	7.56 (2.81)	37.35
3.	Kufri Chipsona 3	12.88 (21.08)	4.44 (2.22)	5.22 (2.37)	7.89 (2.85)	32.92
4.	Kufri Bahar	25.33 (29.75)	6.78 (2.67)	8.89 (3.03)	11.56 (3.44)	30.27
5.	Kufri Anand	5.71 (14.27)	5.56 (2.38)	7.00 (2.68)	9.00 (2.99)	28.75
6.	Kufri Sadabahar	16.36 (23.68)	5.44 (2.41)	6.33 (2.60)	7.89 (2.88)	30.54
7.	Kufri Himsona	11.34 (19.70)	6.11 (2.45)	6.00 (2.49)	7.78 (2.82)	33.30
8.	Kufri Surya	11.21 (19.72)	7.44 (2.78)	8.11 (2.91)	10.33 (3.27)	34.35
9.	Kufri Khyati	9.63 (17.97)	7.89 (2.87)	9.56 (3.12)	10.67 (3.28)	39.76
10.	Kufri Sutlej	8.23 (15.35)	6.33 (2.58)	7.89 (2.86)	9.33 (3.09)	31.80
11.	Kufri Pushkar	12.31 (20.37)	4.44 (2.21)	5.67 (2.47)	6.78 (2.66)	28.53
12.	Kufri Jyoti	22.98 (28.51)	4.33 (2.18)	6.89 (2.70)	10.00 (3.19)	19.07
13.	Kufri Laukar	21.19 (27.40)	6.89 (2.71)	7.78 (2.87)	11.44 (3.42)	24.30
	S.E.M	2.90	0.147	0.163	0.271	4.19
	CD	8.48	0.43	0.48	NS	NS
	CV	25.30	13.77	11.26	12.09	22.02

Data in parentheses are arc sine transformed values, **Data in parentheses are square root transformed values

Table 2 Resistant reaction of potato varieties against potato apical leaf curl virus

Reaction	Name of Varieties
Resistant	K. Khyati, K. Badshah, K. Anand, and K. Sutlej
Moderately Resistant	K. Pukhraj, K. Chipsona-3, K. Sadabahar, K. Himsona, K. Surya and K. Pushkar
Moderately Susceptible	K. Bahar, K. Jyoti and K. Laukar
Susceptible	-
Highly Susceptible	-

in the second week of November by keeping inter and intra row spacing of 50 cm and 20 cm, respectively in three replications. The observations on per cent disease incidence, population of white fly and total tuber yield were recorded. The population of whitefly was recorded from 3 plants per replication at 40, 50 and 60 DAP. Number of whitefly was counted on three compound leaves at different positions, *i.e.*, bottom, middle and top of the plant and then worked out whitefly per plant. Counting of whitefly was carried out early morning hours, as they are comparatively less active before sunrise. Number of plants showing apical leaf curl symptoms were counted in each replication/variety at 60 DAP and percent disease incidence was calculated as followed by Maan *et al.*, 2017.

$$\text{Percent disease Incidence} = \frac{\text{Total number of disease plant}}{\text{Total number of plants observed}} \times 100$$

Scale used for screening of resistance (Kumar *et al.*, 2015):

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

The pooled data of three years of per cent disease incidence, population of whiteflies at 40, 50 and 60 DAP and total tuber yield are presented in Table 1. The lowest percent disease incidence was recorded in K. Badshah (2.64%) followed by K. Anand (5.71%), K. Sutlej (8.23%) and K. Khyati (9.63%) which showed resistant reaction according to Kumar *et al.*, 2015 resistance scale whereas the more disease incidence was recorded in K. Bahar (25.33%), K. Jyoti (22.98%) and K. Laukar (21.19%) which showed moderately susceptible reaction against potato apical leaf curl virus disease in north Gujarat conditions. The result found was contradicting with the result of Lakra (2008) and Baswana *et al.*, (2009). Lakra evaluated 266 germplasm lines and 15 cultivars at Hisar and found that K. Bahar and CP 1246 were resistant to potato apical leaf curl virus. In north Gujarat condition K. Bahar found moderately susceptible which may be due environmental conditions. The results found

were similar cum contradicting with Mann *et al.*, (2017). Mann *et al.*, (2017) screened 20 varieties/ genotypes at Haryana Agricultural University, Hisar and found lowest percent disease incidence of potato leaf curl virus in K. Badshah (6.66%) and K. Pushkar (6.66%), while in case of contradicting they found zero per cent disease incidence in K. Bahar.

The data on number of whiteflies (Table 1) revealed that number of whiteflies were lower at 40 DAP and which were accumulate with crop maturity. The number of whiteflies were recorded lowest in K. Badshah *i.e.* 6.1, while highest number of whiteflies were recorded in K. Bahar (11.56). Whitefly population at 60 DAP had positive correlation with per cent disease incidence of potato leaf curl virus. Mann *et al.*, (2017) also found that whitefly population had significantly positive correlation with per cent disease incidence of potato leaf curl virus. The statistically highest tuber yield was recorded in K. Khyati (39.76 tonnes/ha) as it has shown resistance reaction against potato apical leaf curl virus and also have high yielding and early bulking attributes. Kufri Badshah and Kufri Pukhraj recorded tuber yield 38.62 and 37.50 tonnes/ha respectively.

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