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Incidence of major virus diseases of strawberry in north western Himalayan region of India

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Abstract

Strawberries are unique with highly desirable taste and flavour and are also an excellent source of vitamins, potassium, fiber and sugars. Field surveys were conducted to record the incidence of strawberry viruses in Shimla and Solan districts of Himachal Pradesh during 2017-18. Around 77 entries were surveyed from Shimla and Solan districts. Results revealed that the incidence of virus diseases ranged between 6.00 percent to 34.32 percent in strawberry germplasm. The characteristic symptoms observed were puckering, necrotic rings, ring spots, marginal necrosis, reddening of leaves, oak leaf pattern, leaf deformation and small sized misshapen fruits.

Keywords: Incidence, major virus diseases, strawberry, north western Himalayan

Introduction

The most popularly cultivated strawberry is a hybrid of two Native American species, North American *Fragaria x chiloensis* and South American *Fragaria x virginiana* (Hancock *et al.* 1999) [1]. The state of California in the United States is the largest strawberry producer in the world, providing approximately 27 percent of the world's strawberries (USDA, 2003) [2]. In India, it is cultivated commercially in Jammu and Kashmir, Himachal Pradesh, Maharashtra, West Bengal, Nilgiri Hills, Haryana, Punjab, and some parts of Delhi. With the introduction of low chilling and day neutral cultivars, strawberry cultivation is gaining more popularity in the plains of Punjab and northern states due to high yield and remunerative returns.

In the last decade, there has been a coordinated effort to develop detection protocols for all strawberry viruses. These efforts have yielded sensitive protocols for all major strawberry viruses including those transmitted by aphids, nematodes and pollen (Tzanetakis and Martin, 2014) [3]. The virus can have a significant impact on strawberry production, reducing yield by up to 15 percent and runner production by up to 75 percent (Martin and Tzanetakis, 2006) [4].

Materials and Methods

Surveys were conducted during the growing season of crop of 2017-18 at different locations of Solan and Shimla districts of Himachal Pradesh to record the occurrence, distribution and incidence of viral diseases in strawberry. Percent disease incidence was recorded based on the observations on symptoms as per the formula given below:

$$\text{Per cent disease incidence} = \frac{\text{Number of diseased plants}}{\text{Total number of plants observed}} \times 100$$

Plants were critically observed for recording the symptoms on each cultivar. Symptomatic plants of different cultivars were marked for recording the observations on the basis of symptoms produced by each of them. During surveys true to type, good quality, apparently healthy plants of important cultivars namely Sea Scape, Sweet Charlie, Etna, Dana, Belrubi, Larsan, Phenamenal, Torrey, No. -5, Jutog Special, Shimla Delicious, Addie, Gorella, Selva, NR Round Head, No-A, Majestic, North West, Dilpasand, Red Coat, Katrain Sweet, SI, Fern, Canfitura, Brightan, Dajara, Chandler, Tioga, Douglas, Missionary, Fair Fox, Florida -90, VL, Howard -17, Black More, Sheta, Ofra, EC-362601, Royal Round IC399111, Lesson, Mechehancher, IC-319116, CH-40 IC319120, VL-13 IC -319119, Red Ground IC31940, CH-111-14, Wied IC -319130, Red Guart, IC319132, EC-439590, Pusa Early Dwarf, Swiss IC-319144, Pear Gourd, EC-362602, Afrena, IC-319137, EC-362589, EC-439591, Cat Skill, Douglas, Fern, Brighten, IC3191315, EC-431388, IC-319133, IC-319105, EC-439587, IC-319114, IC-319173, EC-349586, IC-319152, IC-319129, IC-319107, IC-319093, IC-319149, IC-319134, IC-319128, IC-319115 and IC-319141 were marked in the selected field for visual indexing.

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Results and Discussion

Surveys of different strawberry growing locations in Solan and Shimla districts of Himachal Pradesh were conducted during the cropping season of 2017-18 to determine the occurrence and distribution of different virus diseases of strawberry. The data on the disease incidence are presented in Table 1. Most predominant symptoms ranged from cupping, leaf deformation, savoying, ring spots to misshapening of fruits (Fig. 1).

The disease incidence ranged from 6.00 percent to 34.32 percent in different cultivars/varieties/lines. Maximum disease incidence of 34.32 percent was registered in cultivar Chandler growing at IARI Regional Station Experimental Farms,

Dhanda, Shimla whereas minimum disease incidence of 6.00 percent was recorded in cultivar Jutog Special at the same location. Incidence of virus diseases at HRTS & KVK Kandaghat ranged between 28.27 percent to 34.12 percent whereas a disease incidence between 22.27 percent and 31.27 percent was recorded at two locations at the main campus of Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan. Varying level of incidence of virus diseases ranging from 30-80 percent in strawberry has also been reported by a number of workers from different parts of the world (Thompson and Jelkmann 2003 ^[5]; Martin and Tzanetakis, 2006 ^[4]; Sharma, 2018 ^[6]).

Table 1: Incidence of virus disease in strawberry

District	Locality	Cultivars/Varieties/Lines	Percent Incidence
Shimla	IARI Regional Station, Experiment farm, Dhanda, Shimla	Sea Scape	10.22
		Sweet Charlie	33.3
		ETNA	22.85
		Dana	24
		Belrubi	20
		Larsan	16.66
		Phenamenal	30
		Torrey	12.22
		No. -5	10
		Jutog Special	6
		Shimla Delicious	21.73
		Addie	30
		Gorella	28.46
		Selva	35.29
		NR Round Head	26
		No-A	23.33
		Majestic	20
		North West	25
		Dilpasand	31.5
		Red Coat	16.1
		Katrain Sweet	23.46
		SI	14.4
		Fern	19.16
		Canfitura	27.27
		Brightan	9.43
		Dajara	17.77
		Chandler	34.32
		Tioga	29.41
		Douglas	16.78
		Missionary	11.81
		Fair Fox	11.25
		Forida -90	17.27
		VL	18.33
		Howard -17	22.2
		Black More	9.09
		Sheta	14
Ofra	18.8		
EC-362601	19.33		
Royal Round IC399111	11.33		
Lesson	16.08		
Mechehancher IC-319116	19.28		
CH-40 IC319120	18.57		
VL-13 IC -319119	18.88		
Red Ground IC31940	10.83		
CH-111-14	18.88		
Wied IC -319130	19.09		
Red Guart	11.53		
IC319132	15.5		
Sweet Charlie	30.83		
EC-439590	15.88		
Pusa Early Dwarf	14.61		
Swiss IC-319144	18.57		

		Pear Gourd	25.55
		EC-362602	21.66
		Afrena IC-319137	7.33
		EC-362589	13
		EC-439591	20
		Cat Skill	12.5
		Douglas	16.66
		Fern	20.76
		Brighten	12.5
		IC3191315	25
		EC-431388	12.5
		IC-319133	32.72
		IC-319105	26.36
		EC-439587	17.77
		IC-319114	33.7
		IC-319173	27.58
		EC-349586	12.5
		IC-319152	16.66
		IC-319129	24.16
		IC-319107	22.35
		IC-319093	22.06
		IC-319149	10.66
		IC-319134	25.71
		IC-319128	27.77
		IC-319115	15.58
		IC-319141	12.76
Solan	HRTS & KVK, Kandaghat	Chandler	34.12
		Sweet Charlie	28.27
	Experimental Farm of department of Plant Pathology, Nauni	Chandler	22.27
	Experimental Farm of department of fruit science, Nauni	Chandler	31.27



Cupping and Leaf deformation



Necrotic ringspots



Savoying



Typical ringspots

Fig 1: Leaf symptoms on infected strawberry plants

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