

PRESENT STATUS OF WART DISEASE OF POTATO IN DARJEELING AND KALIMPONG DISTRICTS OF WEST BENGAL

Sanjeev Sharma^{1*} and SK Chakrabarti¹

Potato wart (*Synchytrium endobioticum*) is under domestic quarantine in India (in the hills of West Bengal). Since the imposition of domestic quarantine, joint surveys at regular interval have been conducted till 2002 to know the status of prevalence and distribution of the disease in the quarantined developmental blocks. Recent survey conducted during 2018 revealed the presence of wart in 11 out of 17 localities in Bijanbari block and in one locality in Sukhiapokhri block. Though standing crop was not found in other areas but few wart infected tubers were observed in the harvested lots and in the market thereby indicating the presence of wart in these areas too and warrants more regular surveys in the years to come to know the exact prevalence of the disease.

KEYWORDS: *Synchytrium endobioticum*, prevalence of disease, varietal response

Potato wart is a quarantined disease of cultivated potato (*Solanum tuberosum* L.) caused by the soil-borne obligate biotrophic fungus *Synchytrium endobioticum* (Schilb.) Perc. The origin of *S. endobioticum* is in the Andean mountains of Latin America, where it co-evolved with potato (Przetakiewicz, 2008). The pathogen is believed to have been introduced to Europe through potato breeding materials from its centre of origin during the aftermath of the 1840s potato late blight havoc but was first reported in 1896 from Hornany (now located in Slovakia) by Schilberszky (1896). The disease is known by various names like black wart, black scab, potato tumor, potato cancer or canker, cauliflower disease, warty disease and many other descriptive terms in diverse languages and cultural backgrounds where potato is grown and the disease is present (Frank, 2007). The disease is widely distributed in Europe, Asia, North America, South America and Africa (Obidiegwu *et al.*, 2014).

In India, potato wart was introduced in 1953 in Darjeeling hills of West Bengal from

Denmark (Ganguly and Paul, 1953; Mehta, 1963). Immediate steps were taken to destroy the infected plants and tubers and to sterilize the soil with 5% formalin; however, in 1958 the disease was again noticed in many localities of Darjeeling hills and, therefore, the Govt. of India under Section 4A of DIP Act 1914 (Notification No.F.6-11/59-PPS, dated 8 Oct., 1959) imposed a legal ban on the movement of potatoes from the state of West Bengal to other parts of the country in 1959. However, Govt. of India made partial amendments in the original notification vide G.S.R. 451 (E) dated 5 August, 1997 lifting the ban on transport or export of potato tubers from the State of West Bengal except from seven developmental blocks of Darjeeling district *viz.*, Bijanbari, Mirik, Kurseong, Takdah, Kalimpong, Algarh and Sukhiapokhri. Since the imposition of domestic quarantine, joint surveys have been conducted every three to six years by the Directorate of Plant Protection, Quarantine & Storage (DPPQS), GOI; Department of Agriculture, West Bengal and ICAR-Central

¹ICAR-Central Potato Research Institute, Shimla-171001, HP, India

*Corresponding author: sanjeevsharma.cpri@gmail.com

Potato Research Institute, Shimla to know the status of prevalence and distribution of wart in the above-mentioned developmental blocks. The last survey in this series was conducted during 2002 which showed that wart disease still exists in Darjeeling district of West Bengal (Singh and Garg, 2003). The present paper reports the latest status of wart disease in Darjeeling and Kalimpong districts, based on surveys conducted during June, 2018.

Joint survey was conducted by Directorate of Plant Protection, Quarantine & Storage, GOI; Department of Agriculture, Govt. of West Bengal; ICAR (including ICAR-CPRI, Shimla), New Delhi and SAUs of West Bengal during June, 2018. In all, 17 localities of Bijanbari development block, 07 localities of Sukhiapokhri development block, 09 localities of Kurseong development block, 02 localities of Mirik development block, 04 localities of Gorubathan block and 08 localities of Kalimpong-II development block were surveyed. However, standing crop was observed only in Bijanbari and Sukhiapokhri blocks and in few localities of Kurseong block. In all other blocks (Mirik, Kalimpong I & II, Gorubathan and Takdah development blocks) no standing crop was observed as potato was either already harvested or the crop is raised during winters. Altogether 517 plants from 129 terraces of Bijanbari, Sukhiapokhri and Kurseong block were uprooted and examined. Wart infection from 23.33 to 80.00% was recorded in 11 out of 17 localities of Bijanbari block. Highest infection was observed in Palmazoa (80%) followed by Upper Shepi (75.56%). Moderate infection was observed in Lower Shepi (32%), Middle Shepi (30.56%), Rammam (30.61%), Bhangyang (23.33%), Srikhola (22%) and Lingsaybong (20%); while three localities *viz.*, Bichgaon (18.67%), Lake Kharka (10%) and Piplidara (8.33%) had light infection

(Table 1). No infection was observed in Shepi, Basisaky, Daragaon, Rimbick, Upper Rimbick and Manayadra localities. Wart was

Table 1. Prevalence of wart in Darjeeling and Kalimpong districts of West Bengal during 2018

Development Block/Localities surveyed	Varieties under cultivation	Fields infested (%)	Plants infested (%)
Bijanbari block			
Palmazoa	-	66.67	80.00
Bichgaon	B-2, Neela Thosey	33.33	18.67
Srikhola	B-2, Neela Thosey, Holland	78.57	22.00
Shepi	B-2	0.00	0.00
Lake Kharka	Neela Thosey, Holland, Hangeythang	50.00	10.00
Rammam	Neela Thosey, Holland	40.00	30.61
Basisaky	Neela Thosey	0.00	0.00
Daragaon	Neela Thosey	0.00	0.00
Bhangyang	B-2, Neela Thosey	80.00	23.33
Lower Shepi	B-2, Neela Thosey	66.67	32.00
Middle Shepi	B-2	50.00	30.56
Upper Shepi	B-2, Neela Thosey	100.00	75.56
Upper Rimbick	B-2, Neela Thosey	0.00	0.00
Rimbick	B-2, Neela Thosey	0.00	0.00
Manayadra	B-2, Neela Thosey	0.00	0.00
Lingsaybong	Neela Thosey	100.00	20.00
Piplidara	Neela Thosey, Kufri Naveen	25.00	8.33
Sukhiapokhri block			
Sanada Nayabasti	B-2, Neela Thosey, Holland	0.00	0.00
Prasanti Gram Sananda	B-2	0.00	0.00
Prasanti Gram	B-2	0.00	0.00
Upper Tiffin Sakhia	B-2	0.00	0.00
Upper Tiffin	B-2	50.00	5.00
Tiffin Dare Upper	B-2	0.00	0.00
Ranbony Forest Basti	B-2	0.00	0.00
Kurseong block			
Upper Chaitiry Kuneang	Bhutani	0.00	0.00
Chimney	-	0.00	0.00

observed only at one location i.e., Upper Tiffin (5%) in Sukhiapokhri block, whereas not observed in any locality of Kurseong block. It is evident from the present survey that though standing crop of potato was not there in Kalimpong I, Kalimpong II, Gorubathan, Mirik and Takdah blocks/localities but few wart infected tubers were found in the harvested lots inspected in storage and during market survey, thereby indicating the presence of wart in these areas too. The most predominant varieties under cultivation were B-2 and Neela Thosey but at few locations Holland, Hangeything, Kufri Naveen and Bhutani were also cultivated.

A comparison of the wart disease status in important localities since 1958 is presented in **Table 2**. No infection has been recorded in Daragaon locality after 1995. The locality-Akhre where disease was noticed in 1958, was not surveyed thereafter, had shown infection in 2018 even after 60 years. Similarly, localities- Bichgaon, which was last surveyed in 1979 and Lekherka, last surveyed in 1995, had shown infection in 2018 even after 39 and 23 years, respectively. But unfortunately, some localities, *viz.* Gorkhey, Gurudung and Samaden where disease was detected in almost each survey up to 1981 or 1985, had not surveyed further. Wart has been continuously observed since 2000, the year of its first detection, in Palmazoa locality. In Lingsaybong locality, first wart infection was detected in 1971 and again in 2002, had shown infection in 2018 too. Similarly, in Shepi wart was first observed in 1979 and again detected in 2002, was also found infested in 2018. Besides, wart was also observed in some other localities, *viz.* Bhangyang, Piplidara, Upper Tiffin, Tiffin Dare Upper (data not shown), which were not surveyed earlier.

It was shocking to note that farmers are still growing susceptible varieties like

B-2 and few new varieties namely Holland, Neela Thosey, Bhutani and Hangeything have also been introduced in the districts without ascertaining their wart immunity status. Nowhere in the districts varieties like Kufri Jyoti and Pimpernel (resistant) and Darjeeling Red Round (susceptible), were found. Varieties i.e., Kufri Jyoti, Pimpernel and Darjeeling Red Round which had earlier highest acreage after B-2 (Singh and Garg, 2003) have been completely replaced with new varieties. The studies also indicated that farmers are still continuing with cultivation of only wart susceptible varieties and even a single farmer was found to have wart immune varieties. Most of the farmers were using red skinned varieties (B-2, Holland, Hangeything) and the incidence of the disease was more on red skinned varieties than white skinned (Neela Thosey, Kufri Naveen).

CONCLUSION

It is evident from the present study that farmers are using only wart susceptible varieties; hence there is urgent need to put a legal ban on cultivation of wart susceptible varieties and on movement of seed across borders if further spread of the disease is to be checked. Further, seed supply chain mechanism is to be developed to promote wart immune varieties in the districts. Besides, there is need to test newly developed hybrids for wart resistance.

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Table 2. Wart status in various localities of Darjeeling & Kalimpong hills in various surveys

Localities	1958	1962	1968	1971	1976*	1979	1981**	1985	1991***	1993	1995	2000	2002	2018
Daragaon	+	NS	NS	+	-	+	+	+	NS	-	+	-	-	-
Gorkhey	+	+	+	NS	NS	+	+	NS	NS	NS	NS	NS	NS	NS
Gurudung	+	NS	NS	NS	NS	+	+	NS	NS	NS	NS	NS	NS	NS
Lekherka	+	+	NS	NS	NS	+	+	+	NS	-	+	NS	NS	+
Majua	+	NS	NS	NS	NS	NS	NS	-	NS	NS	NS	-	+	NS
Musakherka	+	-	NS	NS	NS	-	+	+	NS	+	+	+	NS	NS
Ramam	+	-	+	NS	NS	+	+	+	NS	+	-	NS	-	+
Rimbick	+	-	+	NS	NS	+	+	+	NS	-	-	+	-	-
Rimbick Forest	NS	-	+	NS	NS	+	+	+	NS	+	-	+	+	NS
Samanden	+	+	+	NS	NS	+	+	+	NS	NS	NS	NS	NS	NS
Srikhola	+	+	+	NS	NS	+	+	+	NS	-	-	+	-	+
Palmazoa	NS	NS	NS	-	NS	-	-	-	NS	NS	NS	+	+	+
Manaydara	NS	NS	NS	NS	NS	NS	-	-	NS	-	-	+	+	-
Namla	NS	NS	NS	-	NS	NS	-	-	NS	+	-	+	+	NS
Dhotrey	NS	NS	NS	NS	NS	-	-	-	NS	NS	NS	+	+	NS
Sangbogaon	NS	NS	NS	+	-	-	-	-	NS	-	-	+	-	NS
Gairigaon	NS	NS	NS	+	-	+	+	+	NS	+	-	-	+	NS
Lingsaybong	NS	NS	-	+	-	-	-	-	NS	-	-	-	+	+
Shepi	NS	NS	NS	-	-	+	-	-	NS	-	-	-	+	+
Barahatta	NS	NS	NS	-	NS	-	-	-	NS	NS	NS	-	+	NS
Dilpa	NS	NS	NS	-	NS	NS	-	-	NS	-	-	-	+	NS
Jaubari	NS	NS	NS	-	NS	NS	-	-	NS	-	-	-	+	NS
Akhre	+	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	+
Bichgaon	+	-	NS	NS	NS	+	NS	NS	NS	NS	NS	NS	NS	+
Basisaky	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Bhangyang	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	+
Peeplidara	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	+
Sanada Nayabasti	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Prasanti Gram Sananda	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Prasanti Gram	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Upper Tiffin Sakhia	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Upper Tiffin	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	+
Tiffin Dare Upper	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	+
Ranbony Forest Basti	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Upper Chaitiry Kuneang	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-
Chimney	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	-

+ = Disease present; - = Disease absent; NS = Not surveyed

* = Disease was not observed at the time of joint survey in June 1976 in any of the locality. In addition to joint survey, ICAR-CPRI surveyed Bijanbari area in the month of August, 1976 and recorded wart disease in stores at Shepi, Daragaon, Lekherka, Ramam, Samanden, Gorkhey, Bichgaon, Namla and Srikhola

** = Survey was conducted by ICAR-CPRI alone

*** = Localities mentioned in the table were not surveyed due to some administrative problems.

Source: Singh and Garg, 2003; Journal of Indian Potato Association 30(3&4): 335-339

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