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Surveillance of *Rhizoctonia solani* in Meerut region of Uttar Pradesh

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Abstract
The potato (*Solanum tuberosum* L.) is widely grown in the world and contributes significantly not only to food security but to nutritional security. It is a vegetable crop characterized by a shallow and superficial root system and has been shown to be a heavier nutrient feeder taking up nutrition until maturity. The underground portion of the stem has buds which give rise to lateral slender underground stems called Stolons. It is the Stolons which enlarge to form tubers.
Four hundred seventy *Rhizoctonia solani* isolates from different leguminous hosts originating from 16 agro-ecological regions of India covering 21 states and 72 districts were collected. The disease incidence caused by R. solani varied from 6.8 to 22.2% in the areas surveyed. Deccan plateau and central highlands, hot sub-humid eco-region followed by northern plain and central highlands and hot semi-arid eco-region showed the highest disease incidence. R. solani isolates were highly variable in growth diameter, number, size and pattern of sclerotia formation as well as hyphal width.

Keywords: Surveillance, *Rhizoctonia solani*, Stolons, potato

Introduction
Black Scurf Disease of Potato caused by *Rhizoctonia solani* has become an important soil and tuber borne disease in plains of Meerut region of Uttar Pradesh, However the disease is prevalent in plains, hills and plateau region of India. Due to Survival of *Rhizoctonia* in soil its affect potato crop and caused different type of symptoms, Black sclerotia on potato tuber surface, Root canker, Aerial tuber appearance and damping off. So that the prevalence of *Rhizoctonia Solani* in soil might pose the potential threat to fast developing seed production program in western region of Meerut, Uttar Pradesh. Therefor a survey was taken up to estimate the prevalence status of Black Scurf disease of potato.

Fig 1: Typical symptoms of black scurf disease on white skin potato tuber

Materials and Methods
Surveys were conducting during 2 Years (2019-2020). A total of 75 fields, 6 regulated markets-Sardhana, Hapur, Meerut, Shamli, Bulanshahr, Ghaziabad, 15 cold storages - Meerut,

Bulandshahr, Hapur, Ghaziabad, Muzaffarnagar and Shamli area were selected for carrying out the survey. Produced of a Commercial Varieties *viz*, Kufri bahar, Kufri Pukhraj, Kufri Chipsona-1, Kufri Pushkar, Kufri Surya, Kufri Frysona, Kufri Anand, Kufri Khiyati, Kufri Mohan and 302 (Local) were examined to record the observations on the incidence and intensity of Black Scurf Disease of Potato. The total Number of a healthy and disease tubers of Black Scurf as per Surface area covered were counted to calculate the disease intensity. The following assessment key grade and formula were used for calculating the disease intensity (Rajpal and Shekhawat 1994) [1].

Assessment key for calculating black scurf disease of potato

Symptoms grade	Rating	% Black scurf area on tuber surface
0	0	Nil
1	5	Trace to 10%
2	15	11-20%
3	25	21-30%
4	40	31-50%
5	75	above 50%

$$\text{Disease Index (DI)} = \frac{\text{No. of tubers x grade}}{\text{Total No. of tubers examined}}$$

Field survey

During the survey, the selected field was divided into four quadrants and 50 plants from each quadrant into cross way to take observations of Black Scurf symptoms above ground and underground stem infection (canker and stolen) were examined.

Regulated market (Mandi)

Fifteen shops were identified and 500 tubers from each counter for each variety were examined.

Cold storage survey

Fifteen bags (50kg each) from lot of 500 bag were selected randomly at the time of produce withdrawal from cold storage were examined for Black Scurf incidence in ware and seed potato to record the infection. 20 kg tubers were examined from each bag.

Fig 2: Typical symptoms of black scurf disease on red skin potato tubers

Fig 3: Infection of *Rhizoctonia solani* of potato sprouts

Fig 4: Rhizoctonia infection on stem, Stolons and roots showing brown lesions called Rhizoctonia stem canker

Results and Discussion

The collected information on the surveillance of Black Scurf disease pathogen as soil and tuber-borne has been compiled and presented in Tables 1, 2 & 3. Black Scurf disease of potato was prevalent vary widely in all the potato growing pockets of each districts of Meerut region of U.P. The Survey observations revealed that Black Scurf disease of potato is the most important disease in western Uttar Pradesh. The incidence of Black Scurf disease was higher in potato varieties - Kufri Anand, Kufri Pukhraj, Kufri Mohan, Kufri bahar,302 (Local) and red round tuber culture (Sindhuri) were found more susceptible by having the incidence of 63.70 - 72.60%. Kufri Mohan, variety was found to have 69.6% (D.I. 11.86) in Bulandshahr area. However Shamli area was found more infested with the prevalence of black scurf. As compared to Meerut, Hapur, Muzaffarnagar & Ghaziabad. In Mandis the survey data dominantly showed that the disease infection on potato tuber & surface in form of sclerotia adhesive was found more than 60% in all the varieties of tubers examined at all the markets (Mandis). More infection of Black Scurf was found in Bulandshahr followed by Shamli, Ghaziabad, Muzaffarnagar, Meerut & Sardhana. Potato varieties Kufri Pukhraj, Kufri Pushkar, Kufri Surya was found more susceptible of Black Scurf disease of potato at all the places in Meerut region. In cold storages, the Black Scurf disease at all the places and in all the varieties, the disease infection pattern was found more or less same as observed in potato in different mandis. The potato produce of all varieties kept in cold storage of Bulandshahr was found more disease

infection percentage and intensity. However the incidence varied from 53 - 66% as compared to observed 45 - 57% in Meerut, 48 - 58% in Hapur, 43 - 56% in Ghaziabad, 39 - 57% in Muzaffarnagar and 53 - 63% in Shamli. In early planting of potato in Shamli area, in addition to Black Scurf symptoms, the *Rhizoctonia* infection was notice on collar region of stem and underground parts of stem, roots and tubers. The infected area of stem and roots look like brown to dark brown dusty. On roots and stolens, reddish brown to brown lesions appeared are called *Rhizoctonia* stem canker. During the month of January at Bulandshahr area during the survey, *Rhizoctonia* plant having the aerial tuber it may be due to the hindrance of translocation of food from leaves to root. *Rhizoctonia* infection on collar region of stem cause deep lesions and form the sclerotia inside the infected stem.

Summary

Surveys were conducted during 2019 and 2020 in regulated market, cold storage and farmers potato growing area of Meerut region- Meerut, Hapur, Ghaziabad, Bulandshahr, Muzaffarnagar and Shamli for accessing the status of Surveillance percent incidence and intensity of Black Scurf disease varied from 59.7 - 66.87% (D.I. 9.3 - 11.56) at farmers field, kufri bahar, kufri pukhraj, kufri mohan and kufri khiyati were found to have maximum percent incidence (53.5 - 70.5%, D.I. 12.8 - 12.36) in farmers field of Bulandshahr district, Meerut region. In mandis and cold storages at all the six places, the disease pattern was observed more or less same. The Bulandshahr and Shamli area was found more infested with Black Scurf disease of potato by having 70.86 - 72.10 incidence.

Fig 5: Developed aerial green tubers on leaf axil, characters of *Rhizoctonia solani* pathogen

Table 1: Percentage incidence of black scurf disease of potato at harvest in Meerut region

Meerut

Variety	Percent incidence	Disease index (DI)
K. Bahar	56.80	9.60
K. Pukhraj	66.87	9.30
K. Anand	63.50	10.60
K. Khiyati	57.60	7.30

Hapur

Variety	Percent incidence	Disease index (DI)
K. Bahar	46.80	7.60
K. Pukhraj	36.37	5.60
K. Mohan	53.40	4.80
K. Khiyati	48.70	6.70

Bulandshahr

Variety	Percent incidence	Disease index (DI)
K Bahar	68.66	11.6
K. Pukhraj	53.50	12.8
K. Mohan	69.60	11.86
K. Khiyati	70.56	12.36

Muzaffarnagar

Variety	Percent incidence	Disease index (DI)
K. Bahar	48.40	7.5
K. Mohan	33.67	4.9
K. Pukhraj	56.80	5.33
K. Khiyati	39.76	5.10

Shamli

Variety	Percent incidence	Disease index (DI)
K. Bahar	67.87	10.60
K. Pukhraj	59.76	11.56
K. Red Round Tuber	70.86	12.46
302 Local Variety	72.60	8.90
K. Frysona	63.70	7.80

Ghaziabad

Variety	Percent incidence	Disease index (DI)
K. Bahar	41.86	7.86
K. Pukhraj	37.35	5.86
K. Khiyati	43.55	6.34
K. Frysona	52.67	8.53
K. Mohan	38.33	5.86

Table 2: Percentage incidence of black scurf disease of potato produce in Mandis (2019-2020)

Sardhana

Variety	Percent incidence	Disease index (DI)
K. Bahar	33.60	3.40
K. Pukhraj	54.80	3.40
K. Pushkar	63.80	10.50
K. Surya	48.66	8.90
K. Frysona	38.50	7.60

Meerut

Variety	Percent incidence	Disease index (DI)
K. Bahar	29.60	2.80
K. Pukhraj	36.40	3.60
K. Mohan	31.86	5.33
K. Anand	41.36	6.80
K. Khiyati	39.56	5.70

Muzaffarnagar

Variety	Percent incidence	Disease index (DI)
K. Bahar	32.80	5.50
K. Pukhraj	48.90	4.90
K. Mohan	56.80	7.60
K. Surya	58.76	7.88
K. Khiyati	53.50	5.60

Bulandshahr

Variety	Percent incidence	Disease index (DI)
K. Bahar	56.33	7.60
K. Mohan	60.56	5.65
K. Khiyati	50.38	8.67
K. Pukhraj	61.81	9.76
K. Pushkar	58.76	10.22

Shamli

Variety	Percent incidence	Disease index (DI)
K. Bahar	54.86	5.33
K. Pukhraj	57.55	6.78
K. Frysona	54.35	9.54
K. Khiyati	59.48	8.34

Ghaziabad

Variety	Percent incidence	Disease index (DI)
K. Bahar	49.56	7.60
K. Frysona	56.50	5.38
K. Chipsona-1	60.87	4.90
K. Mohan	40.86	4.90
K. Khiyati	39.54	4.38

Table 3: Black scurf disease of potato produce kept in cold storage (2019-2020)

Meerut

Variety	Percent incidence	Disease index (DI)
K. Bahar	49.76	6.70
K. Khiyati	51.35	7.23
K. Chipsona-1	57.56	8.33
K. Anand	45.33	6.56

Hapur

Variety	Percent incidence	Disease index (DI)
K. Bahar	48.56	7.35
K. Chipsona-1	56.55	6.33
K. Khiyati	53.45	5.45
K. Frysona	58.35	7.36

Bulandshahr

Variety	Percent incidence	Disease index (DI)
K. Bahar	66.55	8.38
K. Chipsona-1	55.64	7.54
K. Khiyati	53.54	6.90
K. Sindhuri (Seed collected from Punjab)	58.45	5.87

Ghaziabad

Variety	Percent incidence	Disease index (DI)
K. Bahar	51.36	6.80
K. Khiyati	43.54	5.76
K. Mohan	44.76	5.46
K. Chipsona-1	56.67	6.37

Muzaffarnagar

Variety	Percent incidence	Disease index (DI)
K. Bahar	39.86	5.60
K. Pukhraj	49.97	6.54
K. Mohan	58.54	7.34
K. Surya	59.13	6.48
K. Khiyati	54.76	7.56

Shamli

Variety	Percent incidence	Disease index (DI)
K. Bahar	53.17	6.12
K. Pukhraj	58.27	5.33
K. Khiyati	60.37	6.67
K. Frysona	57.54	4.55

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Reference

1. Singh Rajpal, Shekhawat GS. Status of soil and tuber borne diseases of potato in U.P. In: potato present and future (G.S. *Shekhawat et al. Eds*) Indian Potato Association Shimla 1994, P211-215.
2. Liu ZL, Domier LL, Sinclair JB. Polymorphism of genes coding for nuclear 18S rDNA indicates genetic distinctiveness of anastomosis group 10 from other groups in the *Rhizoctonia solani* species complex. Appl Environ Microbiol 1995;61:2659-2664.
3. Abd-Elsalam AK, Moslem MA, Bahkali AH. First morphomolecular identification of *Rhizoctonia solani* AG-7 from potato tuber-borne sclerotium in Saudi Arabia. Afr J Microbiol Res 2009;3:952-956.
4. Saksena HK, Vaartaja O. Taxonomy, morphology and pathogenicity of Rhizoctonia species from forest nurseries. Can J Bot 1961;39:627-647.
5. Carling DE. Grouping in *Rhizoctonia solani* by hyphal anastomosis. In: Sneh B, Jabaji-Hare S, Neate S, Dijst (eds) Rhizoctonia species: taxonomy, molecular biology, ecology, pathology, and disease control. Kluwer, Dordrecht 1996, P37-47.