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Management of black scurf disease of potato using chemicals Penflufen and Boric acid

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Abstract

Black scurf (*Rhizoctonia solani*) diseases of potato are becoming prominent in many potatoes growing state resulting in economic losses, since a decade. An experiment was conducted to find out more effective management approaches through chemicals, taking cv. Kufri Bahar with five treatments involving chemicals i. e. Penflufen 240 F S and Boric acid, application before planting. Based on 2 years pooled data revealed that all the treatments were significant over control in terms of yield. Maximum total tuber yield was obtained from treatment T-3(27.69t/h) and minimum (24.03t/h) was in treatment T-1(Control). However, minimum percent incidence of disease and disease severity at harvest was observed in treatment T-3(Tuber dip treatment with Penflufen (0.083 %) for 10 min. before planting) followed by treatment T-2 (Tuber dip treatment with Penflufen (0.062 %) for 10 min. before planting)

Keywords: Black scurf, management, potato, *Rhizoctonia solani*, Penflufen 240 F S, boric acid

1. Introduction

Potato (*Solanum tuberosum* L.) is an annual, herbaceous, dicotyledonous plant of family *Solanaceae*. Potato is commonly known as disease oriented problematic crop throughout the world. The management of *R. solani* is difficult due to its soil-borne nature. The fungus is present in most of the soils [5]. Once it becomes established in a field, it remains viable there indefinitely [4]. Dry sclerotia of the pathogen are reported to survive up to six years when stored at room temperature [7].

Soil-borne inoculum of *R. solani* is the main cause of black scurf on potato tubers and also contributes to eyes germination inhibition, sprouts killing, stem, stolon and root damage [9, 10]. Pioneer studies on the prevalence, incidence, severity and biology of black scurf disease pathogen in Pakistan have been reported by [12]. He reported that *R. solani* anastomosis group 3 is the primary cause of black scurf in Rajasthan, like in most parts of the world.

As black scurf is soil and seedborne disease, so the inoculum of *R. solani* is carried through seed tubers from this zone to all potato production zones in Rajasthan, thus adding more to existing inoculum load. This continuous addition in inoculum may ultimately lead to epidemics of disease in future. Although, the diseases do not affect the yield quantitatively but deteriorate the quality and acceptability of tubers for seed adversely affecting the market price of the table potatoes.

Tuber spray treatment with Tuber dip treatment with Penflufen (0.062 % and 0.083%) for 10 min. before planting and tuber dip treatment with 3 per cent boric acid has been identified as a safe chemical which can replace hazardous organomercurials for controlling black scurf (*Rhizoctonia solani*), common scab (*Streptomyces scabies*), dry rots (*Fusarium* spp.) and soft rots (*Erwinia* spp.) of potato [1].

Fungicide Penflufen is known to exhibit high and specific activity against *Rhizoctonia solani* and have been reported to very effective for control of black scurf. Boric acid and Penflufen are the two chemicals which are frequently used by Indian farmers to control black scurf. In the present study efforts have been made to manage these diseases with chemicals i.e. Penflufen (0.062 % and 0.083%) before planting alone followed by tuber dip treatment with 3 % boric acid or 10 min. These treatments can provide an effective management of potato tuber diseases. Accordingly, the objective of the present studies was; to explore the efficacy of Penflufen and Boric acid effective chemicals in the management of soil-borne inoculum of *R. solani*.

Experimental

Materials and methods

A field experiment was conducted at ARS Kota (Agricultural University, Kota (Rajasthan), during 2 consecutive winter (rabi) season of 2013-14 to 2014-15 and find out the effective management of black scurf disease of potato.

Maintenance and Multiplication of Inoculum

Fungus culture of *Rhizoctonia solani*, was multiplied on potato dextrose agar (PDA) medium (potato starch: 20 g, dextrose: 20 g, agar: 20 g per liter of distilled water. PDA was sterilized in a gas operated autoclave at 121 °C temperature or 15 PSI for 20 min. Mass inoculum of fungus was prepared following [11].

Preparation of the Plots

The experiment was conducted using black scurf infested seed potatoes (40-60 gm) of cv. Kufri Bahar having 100 per cent disease incidence (I), with average disease index (DI) 1.0-2.0. In the treatments T₂ and T₃, application of Penflufen (0.062% and 0.083%) tuber dip for 10 min. before planting and tuber dip treatment with 3 % boric acid (T₂) for 10 min. before planting respectively. Planting was done in the afternoon hrs in the third week of November in both the years. The seed tubers after the treatments were planted at 60 x 20 cm spacing in 3 x 2 m plots (5 rows with 10 tubers each). Each treatment was replicated five times in a randomized block design. All other recommended practices required for cultivation of the crop were followed. The crop was harvested 100 days after planting (DAP). After washing the tubers, black scurf disease incidence and intensity were recorded separately. Disease

incidence and index were recorded after harvest on 100 tubers selected at random from each replication. Observations on per cent disease incidence were recorded as per the formula given by [13]. Disease was measured on a scale of 0-5 and Disease index (DI) was calculated by using formula described by [6].

Results and Discussion

All the treatments significantly checked black scurf incidence and index over untreated control during both the years (Table I and Fig-1). Minimum disease incidence (19.00%), Disease severity at harvest (8.40%) and tuber yield (27.69 t/ha) was recorded in the treatment (T₃) Tuber dip treatment with Penflufen (0.083 %) for 10 min. before planting followed by treatment (T₂) Tuber dip treatment with Penflufen (0.062 %) for 10 min. before planting. The maximum disease incidence (72.3%), Disease severity at harvest (54.50%) and tuber yield (24.03 t/ha) were recorded in treatment T₁ Untreated diseases tuber (Control). The results confirmed these finding earlier reported by [3, 14, 15].

The results obtained in the present study are more encouraging with respect to the management of the economically important disease. Chemical Penflufen 240 FS or boric acid (3%) used as tuber treatment prior to planting found significantly effective to reduced disease incidence of black scurf [2].

Boric acid in our studies has shown good control of black scurf at 3 per cent concentration while earlier workers [16] have also shown its activity at 3 per cent. To conclude we can say that the Penflufen 240 FS and 3 % boric acid have potential to manage of black scurf disease of potato and are non- hazardous.

Table 1: Efficacy of Penflufen 240 F S and 3% boric acid against Black scurf of potato. (Two year pooled data) (2013-14, 2014-15)

Treatment	*Percent incidence of tuber at harvest	*Disease severity at harvest	*Total yield t/ha
T1 – Untreated diseased tuber (control)	72.3	54.50	24.03
T2- Tuber dip treatment with Penflufen (0.062 %) for 10 min. before planting	20.1	9.50	26.53
T3 -Tuber dip treatment with Penflufen (0.083 %) for 10 min. before planting	19.0	8.40	27.69
T4-Tuber dip treatment with boric acid 3% for 10 min. before planting	25.1	13.90	25.85
CD at 5%	2.16	6.67	1.28
Sem ±	0.74	2.39	0.44
CV (%)	6.87	34.99	5.33

*Average of five replications

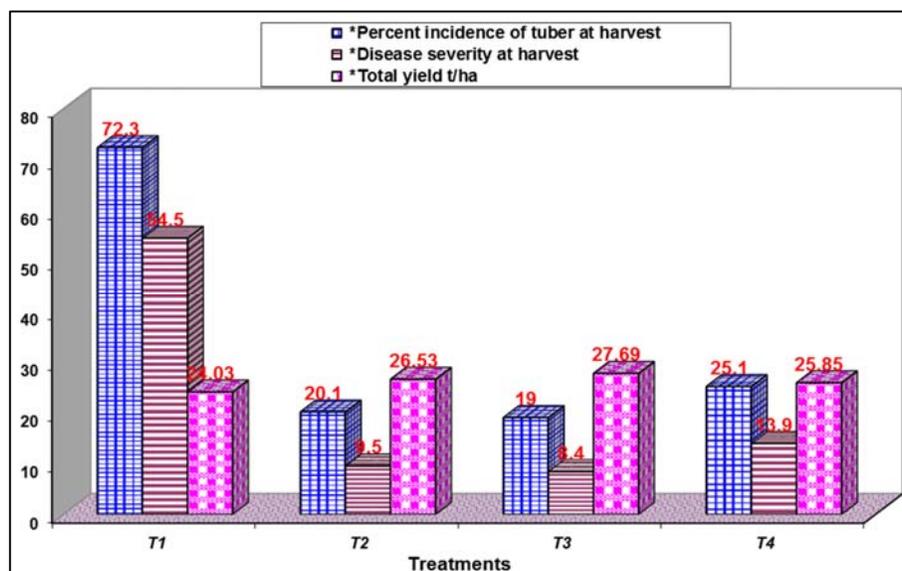


Fig 1: Efficacy of Penflufen 240 F S and 3% boric acid against Black scurf of potato. (Two year pooled data) (2013-14, 2014-15)**Conclusion**

Chemicals Penflufen (0.062 % and 0.083%) and 3 % boric acid tuber dip for 10 min. before planting were found significantly effective to protect the eyes from the fungal attack, leading to better crop stand and increased yield as compared to inoculated control and other treatments.

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