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Screening for *Alternaria* Blight in Clonal Progenies of Potato (*Solanum tuberosum* L.)

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A B S T R A C T

18 clonal bulk population, 43 F_1C_2 and 90 F_1C_3clonal progenies of potato were screened for resistance against *Alternaria solani* under natural and artificial conditions in IGKV, Raipur (C.G.). In present study, all the genotypes of clonal bulks, F_1C_2 and F_1C_3 progenies showed moderate resistance reaction against blight incidence and most of the genotypes of clonal bulks, F_1C_2 and F_1C_3 clonal progenies showed moderate resistance against blight severity. Among artificial inoculated genotypes of clonal bulks and progenies, the genotype CIP 398201 of clonal bulk, four genotypes (CIP 302024-11-2, CIP 398201-19-1, CIP 398201-19-2 and CIP 398201-20-1) of F_1C_2 progenies and five genotypes (CIP 398201-7-2-1, CIP 398201-15-4-1, CIP 398201-5-3-1, CIP 398201-11-6-1 and CIP 398201-2-2-1) of F_1C_3 progenies were found moderately resistant against blight incidence. Most of the remaining genotypes showed moderately susceptible reaction.

Introduction

Potato (*Solanum tuberosum* L.) belongs to Solanaceae family. It is world's leading vegetable crop by virtue of its inherent potential for tonnage production, remunerative income and food values. It encounters a number of serious diseases, with one of the most significant being early blight.

It has been reported that early blight is on the increase in potato growing areas of Europe (Runno-Paurson *et al*., 2015; Kapsa and Osowski, 2012; Leiminger and Hausladen, 2012). Early blight infections have also been detected with increasing frequency in potato fields in the northern countries of Europe (Edin and Andersson, 2014). Early blight of potato caused by *Alternaria solani* (Ellis and Mar.) Jones and Grout, is an important fungal disease, which is widely distributed and damaging.

This pathogen is also known to attack tomatoes, chilies and eggplant. *Alternaria* blight is potentially a destructive disease of potato (Stuart, 1923) and when present in epiphytotic form can cause defoliation and severe reduction in yield (Whetzel, 1923). It becomes more serious on early-planted crop and becomes a production-limiting factor in some years (Malik and Khan, 1967). So, present studies were designed to screen clonal bulks and progenies of potato against *Alternaria* blight disease under natural and artificial conditions.

Materials and Methods

The experiment were consisted of 18 clonal bulks,43 F_1C_2 and 90 F_1C_3 clonal progenies obtained from genetic stock of AICRP on potato, Department of Genetics and Plant Breeding, COA, IGKV, Raipur (C.G.) (Table 1).

All potato entries were screened against *Alternaria* blight under natural (uninoculated) and artificial (inoculated) conditions.

Following observations were recorded on disease incidence under natural condition using following formula.

$$\text{Disease incidence (\%)} = \frac{\text{Total number of infected leaves plant}^{-1}}{\text{Total number of leaves plant}^{-1}} \times 100$$

Ten random leaves plant^{-1} were selected to record the disease severity and it was calculated on the basis of per cent leaf area infected.

In addition, three plant of each entries were inoculated artificially by spore suspension of eight days old culture of *Alternaria solani*, which was first isolated from blight infected plants and identified according to the morphological characteristics of the fungus and then proved the pathogenicity on the potato plants and multiplied on PDA medium and maintained and stored in BOD incubator at 27± 2° C.

Inoculated plants were covered with polyethylene bags to create favourable conditions for disease development. Observations were taken just after initiation of disease and recorded the disease incidence and severity.

Results and Discussion

Screening of clonal progenies of potato against *Alternaria* blight disease

Evaluation of bulks, F_1C_2 and F_1C_3 clonal progenies against *Alternaria* blight disease under natural conditions

Result of potato bulks are presented in Table 2 indicated that the minimum *Alternaria* blight incidence was observed in CIP 302431 (1.70%) and Kufri Surya (1.70%) followed by KufriPukhraj (2.10%), CIP 398203 (2.20%), CIP 303405 (2.20%), KufriJawahar (2.20%), KufriAshoka (3.03%), CIP 303408 (3.70%) and CIP 303139 (3.70%). *Alternaria* blight incidence was recorded maximum in CIP 302024 (7.70%) followed by CIP 304146 (7.40%) and CIP 304124 (6.30%).

However, in F_1C_2 clonal progenies (Table 3) the minimum per cent early blight incidence was observed in KufriPukhraj (1.70%) followed by CIP 302431-8-1 (2.60%), KufriJawahar (2.60%), Kufri Surya (2.70%), CIP 3980201-20-1 (2.80%) and CIP 304124-14-1(3.00%) whereas, the maximum blight incidence was found in CIP 304146-1-1 (7.80%) followed by CIP 398203-2-1 (7.50%), CIP 304146-2-1 (7.30%), CIP 304146-3-1 (6.70%) and CIP 302024-10-1 (6.50%).

Similarly, the blight incidence in F_1C_3 progenies (Table 4) was ranged from 1.00 to 7.70 per cent with the minimum in CIP 303405-5-3-1 (1.00%) followed by 1.60 per cent incidence was noticed in CIP 304012-6-2-3 and CIP 303405-6-2-1, 1.80 per cent incidence in CIP 302431-2-1-1 and 1.90 per cent incidence in CIP 303405-3-1-1 and CIP 303405-7-4-1 whereas, maximum per cent incidence was recorded in CIP 304146-2-2-1 (7.70%) followed by CIP 304124-7-2-1 (7.50%), CIP 304146-12-4-1 (7.30%), CIP

304146-11-2-2 (7.20%) and CIP 304102-7-1-1 (7.10%).

Based on data per cent disease severity (Table 2). The *Alternaria* blight disease severity in potato bulks ranged from 3.30 to 15.30 per cent in material studied with a minimum disease severity in CIP 304014 (3.30%) followed by CIP 302431 (4.60%), CIP 303405 (5.30%), CIP 303408 (5.30%), CIP 398181 (5.30%), CIP 303139 (5.30%), KufriJawahar (5.30%) and Kufri Surya (5.30%). Similarly, disease severity was maximum in CIP 304012 (15.30%) followed by CIP 304102 (12.60%), CIP 304124 (12.60%), CIP 302024 (10.60%), CIP 304146 (10.60%) and CIP 398068 (10.0%). In F_1C_2 clonal progenies of potato the blight severity (Table 3) revealed that, the minimum per cent severity was found in entries CIP 303408-10-1 (2.80%) followed by CIP 303405-11-1 (3.30%) and CIP 398201-20-1 (3.30%). However, it was recorded maximum in CIP 304146-2-1 (12.60%) followed by CIP 304014-2-1 (10.0%) and CIP 303405-13-1, CIP 304014-1-1 and CIP 304124-14-1 (9.30% in all).

Data on disease severity in F_1C_3 clonal progenies ranged from 2.60 to 17.30 per cent (Table 4) in potato. The minimum blight severity percent was noticed in entry CIP 302024-3-1-1 (2.60%) followed by 3.30 per cent severity recorded in entries *viz*., CIP 303405-3-1-1, CIP 303405-5-3-1 and CIP 398201-7-2-1 whereas, the entries CIP 398203-4-1-1, CIP 304012-6-2-3, CIP 304014-2-6-1 and CIP 303139-10-3-1 recorded with 4.80 per cent disease severity. Similarly, the per cent of blight severity was recorded the maximum observed in CIP 304146-11-3-1 (17.30%) followed by CIP 304102-9-3-1 (16.60%) CIP 304012-1-4-1 (14.60%) and CIP 303408-2-1-1 (14.0%).

In present investigation, all the progenies of bulks, F_1C_2 and F_1C_3 showed moderate resistant reaction against blight incidence (Kang *et al*., 2007; Kumar *et al*., 2009). Disease severity in bulks of potato was showed moderate resistant reaction in 13 genotypes and moderate susceptible reaction in five genotypes against blight (Christ and Haynes, 2001; Pandey *et al*., 2006). Similarly, 42 F_1C_2 clonal progenies showed moderately resistance reaction and one showed moderately susceptible resistance against blight. Out of all F_1C_3 clonal progenies, 73 progenies exhibited moderate resistant reaction and 17 progenies showed moderate susceptible reaction against *Alternaria* blight.

Table.1 The *Alternaria* blight score in per cent was grouped into 1-5 scale (AICRP, Potato)

Per cent infection	**Category**
Above 50.1	Highly susceptible
25.1-50.0	Susceptible
10.1-25.0	Moderately susceptible
0.1-10.0	Moderately resistant
0.0	Resistant

Table.2 Summary of disease reaction of potato bulks against Alternaria blight diseases

S. No.	Entries	*Alternaria* blight incidence (%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
1	CIP 398203	2.20 (1.64)	MR	6.00 (2.55)	MR	22.90 (28.60)	MS
2	CIP 302024	7.70 (2.86)	MR	10.60 (3.33)	MS	11.60 (19.86)	MS
3	CIP 302431	1.70 (1.48)	MR	4.60 (2.26)	MR	13.20 (21.24)	MS
4	CIP 304012	4.00 (2.12)	MR	15.30 (3.97)	MS	10.80 (19.16)	MS
5	CIP 303405	2.20 (1.64)	MR	5.30 (2.41)	MR	22.10 (27.99)	MS
6	CIP 303408	3.70 (2.05)	MR	5.30 (2.41)	MR	15.50 (23.12)	MS
7	CIP 304102	4.90 (2.32)	MR	12.00 (3.54)	MS	18.40 (25.31)	MS
8	CIP 304146	7.40 (2.81)	MR	10.60 (3.33)	MS	20.90 (27.19)	MS
9	CIP 398201	4.40 (2.21)	MR	6.60 (2.66)	MR	7.60 (15.93)	MR
10	CIP 304014	4.30 (2.19)	MR	3.30 (1.95)	MR	26.60 (31.05)	S
11	CIP 398181	4.90 (2.32)	MR	5.30 (2.41)	MR	12.90 (21.00)	MS
12	CIP 304124	6.30 (2.61)	MR	12.60 (3.62)	MS	20.20 (26.67)	MS
13	CIP 303139	3.70 (2.05)	MR	5.30 (2.41)	MR	21.90 (27.92)	MS
14	CIP 398068	4.80 (2.30)	MR	10.00 (3.24)	MR	21.70 (27.69)	S
15	KufriJawahar	2.20 (1.64)	MR	5.30 (2.41)	MR	36.70 (37.23)	MS
16	KufriAshoka	3.03 (1.88)	MR	8.00 (2.92)	MR	23.70 (29.14)	MS
17	KufriPukhraj	2.10 (1.61)	MR	7.30 (2.79)	MR	16.60 (23.99)	MS
18	Kufri Surya	1.70 (1.48)	MR	5.30 (2.41)	MR	24.70 (29.77)	MS
	SEm±	0.186		0.253		1.134	
	C.D. (at 5%)	0.54		0.73		3.26	

Average of three replications (Data in parenthesis are transformed value)

MR= Moderately resistant MS=Moderately susceptible HR= Highly resistant
SR= Slightly resistant S= Susceptible ScR= Scarcely resistant

Table.3 Summary of disease reaction of F_1C_2 clonal progenies against Alternaria blight diseases

S. No.	Entries	*Alternaria* blight incidence (%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
1	CIP 398203-2-1	7.50 (2.83)	MR	6.60 (2.66)	MR	22.90 (28.60)	MS
2	CIP 398203-2-2	5.90 (2.44)	MR	6.00 (2.46)	MR	21.00 (27.19)	MS
3	CIP 398203-3-1	5.10 (2.37)	MR	4.60 (2.26)	MR	22.20 (28.06)	MS
4	CIP 302024-10-1	6.50 (2.65)	MR	8.00 (2.92)	MR	11.90 (20.19)	MS
5	CIP 302024-11-1	4.40 (2.21)	MR	4.60 (2.26)	MR	12.30 (20.48)	MS
6	CIP 302024-11-2	5.80 (2.51)	MR	8.00 (2.92)	MR	10.00 (18.29)	MR
7	CIP 302431-8-1	2.60 (1.76)	MR	4.00 (2.12)	MR	12.70 (20.79)	MS
8	CIP 302431-9-1	4.20 (2.17)	MR	7.30 (2.79)	MR	11.70 (19.85)	MS
9	CIP 304012-1-1	3.70 (2.05)	MR	6.00 (2.55)	MR	12.60 (20.75)	MS
10	CIP 304012-1-2	4.10 (2.14)	MR	4.60 (2.26)	MR	10.60 (18.92)	MS
11	CIP 303405-11-1	3.20 (1.92)	MR	3.30 (1.95)	MR	22.00 (27.91)	MS
12	CIP 303405-13-1	3.20 (1.92)	MR	9.30 (3.13)	MR	21.90 (27.88)	MS
13	CIP 303405-15-1	3.30 (1.95)	MR	6.00 (2.55)	MR	22.60 (28.32)	MS
14	CIP 303408-9-1	4.50 (2.24)	MR	4.60 (2.26)	MR	14.80 (22.56)	MS
15	CIP 303408-9-2	4.10 (2.14)	MR	7.30 (2.79)	MR	15.60 (23.10)	MS
16	CIP 303408-10-1	4.20 (2.17)	MR	2.80 (1.82)	MR	15.90 (23.52)	MS
17	CIP 304102-15-1	4.10 (2.14)	MR	6.00 (2.55)	MR	20.40 (26.77)	MS
18	CIP 304102-16-1	5.20 (2.39)	MR	7.30 (2.79)	MR	21.80 (27.79)	MS
19	CIP 304102-17-1	3.90 (2.10)	MR	4.60 (2.26)	MR	19.50 (26.90)	MS
20	CIP 304146-1-1	7.80 (2.88)	MR	8.00 (2.92)	MR	23.20 (28.72)	MS

S. No.	Entries	*Alternaria* blight incidence (%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
21	CIP 304146-2-1	7.30 (2.79)	MR	12.60 (3.62)	MR	21.60 (27.66)	MS
22	CIP 304146-3-1	6.70 (2.68)	MR	8.60 (3.02)	MR	21.40 (27.49)	MS
23	CIP 398201-19-1	4.50 (2.24)	MR	5.30 (2.41)	MR	7.90 (16.13)	MR
24	CIP 398201-19-2	3.30 (1.95)	MR	4.00 (2.12)	MR	8.40 (16.81)	MR
25	CIP 398201-20-1	2.80 (1.82)	MR	3.30 (1.95)	MR	8.70 (17.06)	MR
26	CIP 398201-22-1	3.50 (2.00)	MR	6.60 (2.66)	MR	10.30 (18.67)	MS
27	CIP 304014-1-1	5.40 (2.43)	MR	9.30 (3.13)	MR	26.60 (30.90)	S
28	CIP 304014-2-1	5.20 (2.39)	MR	10.00 (3.24)	MR	25.20 (30.09)	S
29	CIP 398181-1-1	5.20 (2.39)	MR	7.30 (2.79)	MR	12.90 (20.97)	MS
30	CIP 398181-2-1	5.50 (2.45)	MR	8.00 (2.92)	MR	15.20 (22.90)	MS
31	CIP 304124-14-1	3.00 (1.87)	MR	9.30 (3.13)	MR	22.20 (28.07)	MS
32	CIP 304124-15-1	5.60 (2.47)	MR	8.00 (2.92)	MR	24.40 (29.58)	MS
33	CIP 303139-11-1	3.60 (2.02)	MR	5.30 (2.41)	MR	22.20 (28.06)	MS
34	CIP 303139-12-1	3.80 (2.07)	MR	6.00 (2.55)	MR	21.50 (27.54)	MS
35	CIP 303139-13-1	4.50 (2.24)	MR	4.60 (2.26)	MR	20.00 (26.52)	MS
36	CIP 398068-19-1	4.70 (2.28)	MR	6.60 (2.66)	MR	24.70 (29.76)	MS
37	CIP 398068-21-1	5.10 (2.37)	MR	7.30 (2.79)	MR	27.80 (31.79)	S
38	CIP 398068-21-2	4.60 (2.26)	MR	5.30 (2.41)	MR	24.50 (29.62)	MS
39	CIP 398068-22-1	5.20 (2.39)	MR	4.60 (2.26)	MR	22.80 (28.49)	MS
40	KufriJawahar	2.60 (1.76)	MR	7.30 (2.79)	MR	33.90 (26.71)	S
41	KufriAshoka	3.50 (2.00)	MR	6.00 (2.55)	MR	21.60 (27.40)	MS

S. No.	Entries	*Alternaria* blight incidence (%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
42	KufriPukhraj	1.70 (1.48)	MR	6.00 (2.55)	MR	15.40 (23.05)	MS
43	Kufri Surya	2.70 (1.79)	MR	4.00 (2.12)	MR	25.10 (30.02)	S
	SEm±	0.232		0.220		1.876	
	C.D. (at 5%)	0.65		0.79		5.27	

Average of three replications; (Data in parenthesis are transformed value)
MR= Moderately resistant MS=Moderately susceptible HR= Highly resistant
SR= Slightly resistant S= Susceptible ScR= Scarcely resistant

Table.4 Summary of disease reaction of F_1C_3 clonal progenies against Alternaria blight diseases

S. No.	Entries	*Alternaria* blight incidence(%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
1	CIP 398203-2-2-1	2.30 (1.67)	MR	6.60 (2.66)	MR	21.90 (27.81)	MS
2	CIP 398203-4-1-1	2.70 (1.79)	MR	4.00 (2.12)	MR	24.60 (29.69)	MS
3	CIP 398203-4-1-2	2.90 (1.84)	MR	6.00 (2.55)	MR	23.60 (29.04)	MS
4	CIP 398203-5-3-1	3.50 (2.00)	MR	5.30 (2.41)	MR	23.50 (28.95)	MS
5	CIP 398203-6-1-3	3.10 (1.90)	MR	6.60 (2.66)	MR	22.00 (27.86)	MS
6	CIP 398203-7-4-1	2.40 (1.70)	MR	4.60 (2.26)	MR	22.40 (28.21)	MS
7	CIP 398203-8-2-2	2.50 (1.73)	MR	6.00 (2.55)	MR	24.30 (29.47)	MS
8	CIP 302024-2-3-1	2.40 (1.70)	MR	2.60 (1.76)	MR	12.10 (20.29)	MS
9	CIP 302024-3-3-1	3.20 (1.92)	MR	4.60 (2.26)	MR	13.40 (21.44)	MS
10	CIP 302024-3-4-2	3.70 (2.05)	MR	8.60 (3.02)	MR	11.80 (20.12)	MS
11	CIP 302024-5-1-1	5.50 (2.45)	MR	7.30 (2.79)	MR	13.10 (21.07)	MS
12	CIP 302024-6-2-1	5.40 (2.43)	MR	8.00 (2.92)	MR	11.50 (19.77)	MS
13	CIP 302431-2-1-1	1.80 (1.52)	MR	5.30 (2.41)	MR	13.00 (20.96)	MS
14	CIP 302431-2-3-2	2.50	MR	6.60	MR	13.40	MS

S. No.	Entries	*Alternaria* blight incidence(%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
		(1.73)		(2.66)		(21.19)	
15	CIP 302431-3-2-1	3.60	MR	5.30	MR	13.60	MS
		(2.02)		(2.41)		(21.52)	
16	CIP 302431-4-1-1	2.30	MR	6.60	MR	15.20	MS
		(1.67)		(2.66)		(22.86)	
17	CIP 302431-5-3-2	4.40	MR	8.00	MR	13.80	MS
		(2.21)		(2.92)		(12.60)	
18	CIP 302431-6-4-1	4.60	MR	7.30	MR	15.60	MS
		(2.26)		(2.79)		(23.18)	
19	CIP 304012-1-4-1	5.10	MR	14.60	MS	12.70	MS
		(2.37)		(3.89)		(20.79)	
20	CIP 304012-6-1-1	3.40	MR	6.60	MR	13.00	MS
		(1.97)		(2.66)		(20.99)	
21	CIP 304012-6-2-3	1.60	MR	4.00	MR	10.80	MS
		(1.45)		(2.12)		(19.16)	
22	CIP 304012-7-3-1	3.60	MR	7.30	MR	15.40	MS
		(2.02)		(2.79)		(23.09)	
23	CIP 304012-12-4-1	4.80	MR	13.30	MS	13.00	MS
		(2.30)		(3.71)		(20.91)	
24	CIP 304012-9-2-1	4.30	MR	10.00	MR	14.10	MS
		(2.19)		(3.24)		(21.89)	
25	CIP 303405-4-2-2	3.10	MR	7.30	MR	23.50	MS
		(1.90)		(2.79)		(28.99)	
26	CIP 303405-3-1-1	1.90	MR	3.30	MR	21.20	MS
		(1.55)		(1.95)		(27.31)	
27	CIP 303405-3-1-2	3.40	MR	5.30	MR	22.20	MS
		(1.97)		(2.41)		(28.06)	
28	CIP 303405-8-3-1	5.80	MR	12.00	MS	23.00	MS
		(2.51)		(3.54)		(29.07)	
29	CIP 303405-6-2-1	1.60	MR	7.30	MR	23.10	MS
		(1.45)		(2.79)		(28.64)	
30	CIP 303405-7-4-1	1.90	MR	6.00	MR	25.60	S
		(1.55)		(2.55)		(30.38)	
31	CIP 303405-9-1-1	3.10	MR	5.30	MR	23.30	MS
		(1.90)		(2.41)		(28.72)	
32	CIP 303405-5-3-1	1.00	MR	3.30	MR	25.40	S
		(1.22)		(1.95)		(30.22)	
33	CIP 303408-6-3-1	2.90	MR	8.00	MR	13.60	MS
		(1.84)		(2.92)		(21.53)	
34	CIP 303408-8-2-2	2.50	MR	5.30	MR	16.90	MS
		(1.73)		(2.41)		(24.22)	

S. No.	Entries	*Alternaria* blight incidence(%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
35	CIP 303408-8-3-1	4.70 (2.28)	MR	10.00 (3.24)	MR	15.30 (22.96)	MS
36	CIP 303408-4-5-1	4.00 (2.12)	MR	10.60 (3.33)	MS	15.40 (23.06)	MS
37	CIP 303408-2-1-1	4.10 (2.14)	MR	14.00 (3.81)	MS	16.40 (23.83)	MS
38	CIP 303408-7-3-1	2.90 (1.84)	MR	12.00 (3.54)	MS	19.00 (25.78)	MS
39	CIP 303408-3-2-1	2.40 (1.70)	MR	8.00 (2.92)	MR	16.40 (23.80)	MS
40	CIP 304102-11-1-2	4.90 (2.32)	MR	12.60 (3.62)	MS	18.20 (25.10)	MS
41	CIP 304102-9-3-1	6.60 (2.66)	MR	16.60 (4.14)	MS	12.70 (20.81)	MS
42	CIP 304102-4-2-1	6.90 (2.72)	MR	8.00 (2.92)	MR	13.90 (21.81)	MS
43	CIP 304102-4-5-1	5.10 (2.37)	MR	11.30 (3.44)	MS	19.80 (26.36)	MS
44	CIP 304102-7-1-1	7.10 (2.76)	MR	10.00 (3.24)	MR	18.30 (25.29)	MS
45	CIP 304146-12-4-1	7.30 (2.79)	MR	6.60 (2.66)	MR	25.10 (29.95)	S
46	CIP 304146-11-2-2	7.20 (2.77)	MR	8.60 (3.02)	MR	24.80 (29.83)	MS
47	CIP 304146-11-3-1	5.50 (2.45)	MR	17.30 (4.22)	MS	22.20 (28.04)	MS
48	CIP 304146-1-4-1	6.50 (2.65)	MR	13.30 (3.71)	MS	25.40 (30.23)	S
49	CIP 304146-2-2-1	7.70 (2.86)	MR	9.30 (3.13)	MR	24.40 (29.59)	MS
50	CIP 398201-3-3-1	4.50 (2.24)	MR	6.60 (2.66)	MR	11.50 (19.78)	MS
51	CIP 398201-3-3-2	5.60 (2.47)	MR	9.30 (3.13)	MR	12.80 (20.88)	MS
52	CIP 398201-7-2-1	4.00 (2.12)	MR	3.30 (1.95)	MR	9.60 (17.96)	MR
53	CIP 398201-15-4-1	5.00 (2.35)	MR	8.00 (2.92)	MR	8.30 (16.71)	MR
54	CIP 398201-5-3-1	3.60 (2.02)	MR	7.30 (2.79)	MR	9.50 (17.89)	MR
55	CIP 398201-11-6-1	5.30	MR	8.00	MR	9.50	MR

S. No.	Entries	*Alternaria* blight incidence(%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
56	CIP 398201-2-2-1	(2.41) 5.60	MR	(2.92) 7.30	MR	(17.78) 8.40	MR
57	CIP 304014-8-4-2	(2.47) 5.20	MR	(2.79) 6.00	MR	(16.77) 28.30	S
58	CIP 304014-2-6-1	(2.39) 4.60	MR	(2.55) 4.00	MR	(32.09) 22.70	MS
59	CIP 304014-1-3-1	(2.26) 5.00	MR	(2.12) 6.60	MR	(28.41) 23.00	MS
60	CIP 304014-12-2-1	(2.35) 4.20	MR	(2.66) 5.30	MR	(28.63) 24.00	MS
61	CIP 304014-5-4-1	(2.17) 4.20	MR	(2.41) 6.00	MR	(29.32) 23.00	MS
62	CIP 304014-9-2-1	(2.17) 5.60	MR	(2.55) 8.60	MR	(28.64) 28.00	S
63	CIP 398181-9-3-1	(2.47) 4.90	MR	(3.02) 8.60	MR	(31.91) 15.50	MS
64	CIP 398181-17-2-1	(2.32) 5.50	MR	(3.02) 8.60	MR	(23.19) 16.70	MS
65	CIP 398181-14-5-1	(2.45) 5.60	MR	(3.02) 7.30	MR	(24.05) 14.60	MS
66	CIP 398181-7-4-1	(2.47) 4.60	MR	(2.79) 8.60	MR	(22.35) 17.70	MS
67	CIP 398181-10-1-1	(2.26) 4.70	MR	(3.02) 8.00	MR	(24.88) 14.80	MS
68	CIP 398181-16-5-1	(2.28) 3.00	MR	(2.92) 7.30	MR	(22.61) 16.00	MS
69	CIP 304124-2-5-1	(1.87) 6.80	MR	(2.79) 9.30	MR	(23.47) 21.90	MS
70	CIP 304124-7-2-1	(2.70) 7.50	MR	(3.13) 12.00	MS	(27.84) 25.50	S
71	CIP 304124-8-3-1	(2.83) 5.60	MR	(3.54) 13.30	MS	(30.33) 23.50	MS
72	CIP 304124-1-4-1	(2.47) 6.20	MR	(3.71) 12.00	MS	(28.89) 22.10	MS
73	CIP 304124-4-3-1	(2.59) 5.40	MR	(3.54) 12.00	MS	(27.97) 21.90	MS
74	CIP 303139-4-4-1	(2.43) 3.80	MR	(3.54) 5.30	MR	(27.83) 18.40	MS
75	CIP 303139-9-2-1	(2.07) 4.80	MR	(2.41) 4.60	MR	(25.38) 21.90	MS
		(2.30)		(2.26)		(27.87)	

S. No.	Entries	*Alternaria* blight incidence(%)	Summary	*Alternaria* blight severity (%)	Summary	*Alternaria* blight incidence (%) (with inoculation)	Summary
76	CIP 303139-9-4-1	5.20 (2.39)	MR	5.30 (2.41)	MR	20.30 (26.71)	MS
77	CIP 303139-2-2-1	5.10 (2.37)	MR	6.00 (2.55)	MR	21.80 (27.78)	MS
78	CIP 303139-8-3-1	5.60 (2.47)	MR	5.30 (2.41)	MR	21.20 (27.24)	MS
79	CIP 303139-10-3-1	4.80 (2.30)	MR	4.00 (2.12)	MR	25.40 (30.21)	S
80	CIP 398068-15-3-1	4.20 (2.17)	MR	4.60 (2.26)	MR	26.10 (30.72)	S
81	CIP 398068-15-3-2	5.50 (2.45)	MR	6.60 (2.66)	MR	23.20 (28.78)	MS
82	CIP 398068-3-2-1	5.00 (2.35)	MR	0.30 (0.89)	MR	20.40 (26.77)	MS
83	CIP 398068-9-4-1	5.50 (2.45)	MR	12.60 (3.62)	MS	21.70 (27.67)	MS
84	CIP 398068-1-5-1	6.60 (2.66)	MR	13.30 (3.71)	MS	21.80 (27.77)	MS
85	CIP 398068-4-2-1	5.50 (2.45)	MR	7.30 (2.79)	MR	23.50 (28.99)	MS
86	CIP 398068-7-3-1	5.60 (2.47)	MR	4.60 (2.26)	MR	22.20 (28.05)	MS
87	KufriJawahar	2.40 (1.70)	MR	6.00 (2.55)	MR	23.70 (29.07)	MS
88	KufriAshoka	2.40 (1.70)	MR	7.30 (2.79)	MR	30.30 (33.38)	S
89	KufriPukhraj	2.00 (1.58)	MR	4.60 (2.26)	MR	16.60 (24.02)	MS
90	Kufri Surya	2.50 (1.73)	MR	7.30 (2.79)	MR	23.90 (29.26)	MS
	SEm±	0.257		0.326		1.422	
	C.D. (at 5%)	0.71		0.91		3.94	

Average of three replications; (Data in parenthesis are transformed value)
MR= Moderately resistant MS=Moderately susceptible HR= Highly resistant
SR= Slightly resistant S= Susceptible ScR= Scarcely resistant

a) Evaluation of bulks, F_1C_2 and F_1C_3 clonal progenies against *Alternaria* blight disease with artificial inoculation

Per cent disease incidence under artificial inoculation condition were recorded and presented in Table 1 for potato bulks, the minimum blight incidence was observed in CIP 398201 (7.60%) followed by CIP 304012 (10.80%), CIP 302024 (11.60%), CIP 398181 (12.90%) and CIP 302431 (13.20%). The maximum disease incidence was recorded in

KufriJawahar (36.70%) followed by CIP 304014 (26.60%), Kufri Surya (24.70%), KufriAshoka (23.70%), CIP 398203 (22.90%), CIP 303405 (22.10%), CIP 303139 (21.90%) and CIP 398068 (21.70%).

Similarly, the entries of F_1C_2 clonal progenies (Table 2) recorded minimum per cent incidence in CIP 398201-19-1 (7.90%) followed by CIP 398201-19-2 (8.40%), CIP 398201-20-1 (8.70%) and CIP 302024-11-2 (10.0%) whereas the maximum incidence was observed in entry KufriJawahar (33.90%) followed by CIP 398068-21-1 (27.80%), CIP 304014-1-1 (26.60%), CIP 304014-2-1 (25.20%), Kufri Surya (25.10%), CIP 398068-19-1 (24.70%), CIP 398068-21-2 (24.50%) and CIP 304124-15-1 (24.40%).

Whereas, the incidence of *Alternaria* blight in F_1C_3 clonal progenies (Table 3) of potato ranged from 8.30 per cent to 30.30 per cent and minimum incidence was observed in CIP 398201-15-4-1 (8.30%) followed by CIP 398201-2-2-1 (8.40%), CIP 398201-5-3-1 (9.50%), CIP 898201-11-6-1 (9.50%) and CIP 398201-7-2-1 (9.60%). The maximum disease incidence of 30.30 per cent was recorded in KufriAshoka, followed by CIP 304014-8-4-2 (28.30%) and CIP 304014-9-2-1 (28.0%). The rest of the entries were recorded to be statistically at par.

Various levels of reactions were observed among the artificial inoculated genotypes. The genotype CIP 398201 was found moderately resistant and two genotypes *viz*., CIP 304014 and KufriJawahar were susceptible against blight resistance and rest of the progenies showed moderate susceptible reaction. In F_1C_2 clonal progenies the genotype CIP 302024-11-2, CIP 398201-19-1, CIP 398201-19-2 and CIP 398201-20-1 showed moderately resistant reaction and rest of the progenies were found moderately susceptible (34 progenies) and susceptible (5) against blight. Similarly, in F_1C_3 clonal progenies, genotypes CIP 398201-7-2-1, CIP 398201-15-4-1, CIP 398201-5-3-1, CIP 398201-11-6-1 and CIP 398201-2-2-1 were found moderately resistant .While, 12 progenies showed susceptible reaction and rest of the 73 progenies showed moderately susceptible reaction against blight resistance (Tiwari *et al*., 2004; Kang *et al*., 2007; Kumar *et al*., 2009).

It can be concluded, on the basis of screening, all the genotypes of clonal bulks, F_1C_2 and F_1C_3 progenies showed moderate resistance reaction against blight incidence and most of the genotypes of clonal bulks, F_1C_2 and F_1C_3 clonal progenies showed moderate resistance against blight severity. Among artificial inoculated genotypes of clonal bulks and progenies the genotype CIP 398201 of clonal bulk, four genotypes (CIP 302024-11-2, CIP 398201-19-1, CIP 398201-19-2 and CIP 398201-20-1) of F_1C_2 progenies and five genotypes (CIP 398201-7-2-1, CIP 398201-15-4-1, CIP 398201-5-3-1, CIP 398201-11-6-1 and CIP 398201-2-2-1) of F_1C_3 progenies were found moderately resistant against blight incidence. Most of the remaining genotypes showed moderately susceptible reaction.

Screening against *Alternaria* blight revealed that most of the genotypes showed moderate resistance against blight incidence and blight severity. But among artificially inoculated genotypes most of them showed moderately susceptible reaction against blight incidence.

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