

Original Research Article

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Varietal Reactions of Turmeric towards Leaf Spot and Rhizome Rot Disease in Konkan Region of Maharashtra, India

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ABSTRACT

Turmeric (*Curcuma longa* L.) is well known for its medicinal value, its cultivation is hindered by several diseases viz., leaf spot, anthracnose and rhizome rot. These diseases are managed by using the fungicides, which leads to development of resistant strains besides the environmental pollution and also the residue problem on final produce. Host resistance seems to be most promising means of disease management. Therefore, field screening trial was planned and conducted in Konkan region of Maharashtra at Asond Block, AICRP on Spices, DBSKKV, Dapoli for three years (2015-16, 2016-17 & 2017-18) to identify the disease resistant sources against *Colletotrichum* leaf spot and *Pythium* rhizome rot with high yield potential. Three years average data revealed that, out of 30 turmeric varieties screened, 29 were found moderately resistant (MR) and only one variety Kanti was susceptible (S) to *Colletotrichum* leaf spot. But, on the yield basis amongst all varieties, four varieties viz., Krishna, Sudharsana, Narendra Haldi and Pratibha performed well. Minimum leaf spot intensity was recorded in Pratibha (11.69%), Sudharsana (12.99%), Krishna (13.23%) and Narendra Haldi (13.82%) with high yield of 17.66kg/plot, 18.86kg/plot, 19.46kg/plot and 18.10kg/plot, respectively. Whereas, for rhizome rot, the varieties Pratibha, Sudharsana and Narendra Haldi were tolerant (T) and only one variety Krishna was found moderately resistant (MR). It is concluded from present study that, Krishna, Sudharsana, Narendra Haldi and Pratibha, which may be recommended to farmers for cultivation in Konkan region of Maharashtra.

Keywords

Curcuma longa,
Screening,
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Resistant,
Moderately
Resistant

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Introduction

Haldi or turmeric (*Curcum alonga* L.) is one of the most important condiment and colouring agents of the world. Turmeric is also

a commodity of auspicious religious ceremonies in India. It is being used essentially in curry powder and is a common food preservative. Turmeric is grown in the states of Tamil Nadu, Kerala, Assam, Andhra

Pradesh, West Bengal and Maharashtra. Turmeric belongs to family Zingiberaceae.

It is originated from Tropical South Asia. It is named as “Indian saffron”. Its active ingredient is curcumin. Indian turmeric is considered the best in the world due to presence of high curcumin content. Turmeric contains essential oils up to 5% and curcumin up to 5%, a polyphenol (Anonymous 2012).

Though it is well known for its medicinal value, its cultivation is hindered by several diseases. Turmeric is susceptible to diseases viz., leaf spot, anthracnose and rhizome rot. Leaf spot caused by *Colletotrichum capsici*, was found increasing and occurring regularly every year. It has become as major constraint in successful cultivation of turmeric.

The disease resulted in drastic reduction in rhizome yield. Rhizome rot caused by *Pythium* sp. is a major constraint in all turmeric-growing areas of India (Rathiah, 1987; Nageshwar Rao, 1994; Ramarethinam and Rajagopal, 1999).

Different species of *Pythium* is involved in causing rhizome rot in different parts of the country. Rhizomerot of turmeric incited by *Pythium aphanidermatum* was first reported in Sri Lanka by Park (1934), later it was reported as *P. graminicoloum* from the Krishna district of Andhra Pradesh by Ramakrishnan and Sowmini (1954) and *P. myriotylum* from Assam by Rathiah (1982).

At present the disease was managed by using the fungicides which lead to development of resistant strains besides the environmental pollution and also the residue problem on final produce. Hence, field screening trial was conducted during three years (2015-16, 2016-17 & 2017-18) to identify the disease resistant varieties in the available thirty different varieties against the *Colletotrichum* leaf spot

and *Pythium* rhizome rot. Use of resistant varieties is the most economic and easily adoptable method in integrated disease management. Identification of high yielding turmeric varieties which are relatively resistant or tolerant to major diseases are of utmost importance for increasing the production and productivity of turmeric in konkan region of Maharashtra.

Materials and Methods

Thirty different varieties of turmeric viz., 1) Krishna, 2) Rajpuri, 3) Salem local, 4) Ranga, 5) Pratibha, 6) Roma, 7) Pant Peethabh, 8) Narendra Haldi, 9) Sona, 10) BSR-1, 11) BSR-2, 12) Kedaram, 13) Panjab Haldi-1, 14) Panjab Haldi-2, 15) Sobha, 16) Prabha, 17) Suvarna, 18) Suguna, 19) Sudharshna, 20) Kanti, 21) Sikandarabad, 22) Alleppy Supreme, 23) SB – 10843, 24) RH – 5, 25) Arunachal Local, 26) Cochbet, 27) Tekurpeta, 28) Jalpalguri local, 29) Allam puram and 30) Suranjana, were planted at 37.5 X 30cm spacing at Asond Farm, AICRP on Spices, Dapoli (Dr. B. S. Konkan Krishi Vodyapeeth, Dapoli) during the period of 2015 -16 to 2017-18.

Observations were recorded on Per cent Disease Intensity (1-5 point scale), Per cent Disease Incidence (1-6 point scale). Disease score chart for leaf spot disease and rhizome rot disease are as follows –

Disease Score Chart (leaf spot disease)

Grade	Incidence (%)	Category
1	Upto 5%	Highly Resistant
2	5 – 10%	Resistant
3	11 – 25%	Moderately Resistant
4	26 – 50%	Susceptible
5	> 50%	Highly Susceptible

Disease Score Chart (Rhizome rot disease)

Grade	Incidence (%)	Category
1	0.0	Resistant
2	1.0 – 5.0	Moderately Resistant
3	6.0 – 15.0	Tolerant
4	16.0 – 25.0	Moderately Tolerant
5	26.0 – 40.0	Susceptible
6	Above 40.0	Highly Susceptible

Results and Discussion

The response of the varieties against

Colletotrichum leaf spot are given in Table 1. The results revealed that, out of thirty varieties of turmeric screened, twenty nine varieties were observed moderately resistant.

The severity of the leaf spot showed variation among the turmeric varieties screened in the range of 11.69 to 24.86 PDI. The interest point observed on foliar diseases in the present study is that, no other leaf spot/ blight/ blotch diseases were observed on these varieties.

In present study, only one variety, Kanti was found susceptible (30.74 PDI) against leaf spot disease of turmeric.

Table.1 Reactions of turmeric against *Colletotrichum* leaf spot disease of turmeric

Sr. No	Variety	Per cent Disease Intensity	Reactions	Sr. No	Variety	Per cent Disease Intensity	Reactions
1.	Krishna	13.23	MR	16.	Prabha	19.53	MR
2.	Rajpuri	16.21	MR	17.	Suvarna	13.09	MR
3.	Salem Local	21.12	MR	18.	Suguna	13.01	MR
4.	Ranga	20.59	MR	19.	Sudarsana	12.99	MR
5.	Pratibha	11.69	MR	20.	Kanti	30.74	S
6.	Roma	20.07	MR	21.	Sikandarabad	21.51	MR
7.	Pant Peetabh	16.10	MR	22.	Alleppeysupreme	24.86	MR
8.	NarendraHaldi	13.82	MR	23.	SB-10843	18.49	MR
9.	Sona	12.24	MR	24.	RH-5	18.32	MR
10.	BSR-1	15.13	MR	25.	Arunachal Local	22.38	MR
11.	BSR-2	22.80	MR	26.	Cochbet	16.49	MR
12.	Kedaram	16.72	MR	27.	Tekurpeta	19.61	MR
13.	Punjab Haldi-1	16.30	MR	28.	Jalpalguri Local	19.34	MR
14.	Punjab Haldi-2	15.99	MR	29.	Allampuram	18.69	MR
15.	Sobha	15.90	MR	30.	Suranjana	19.46	MR

Table.2 Reactions of turmeric against *Pythium* rhizome rot of turmeric

Sr. No.	Variety	Per cent Disease Incidence	Reactions	Sr. No.	Variety	Per cent Disease Incidence	Reactions
1.	Krishna	4.92	MR	16.	Prabha	8.86	T
2.	Rajpuri	11.55	T	17.	Suvarna	7.58	T
3.	Salem Local	12.98	T	18.	Suguna	7.25	T
4.	Ranga	11.62	T	19.	Sudarsana	9.58	T
5.	Pratibha	11.07	T	20.	Kanti	5.40	T
6.	Roma	12.08	T	21.	Sikandarabad	7.80	T
7.	Pant Peetabh	10.05	T	22.	Alleppey supreme	9.99	T
8.	NarendraHaldi	8.19	T	23.	SB-10843	10.79	T
9.	Sona	9.89	T	24.	RH-5	8.28	T
10.	BSR-1	8.61	T	25.	Arunachal Local	8.70	T
11.	BSR-2	9.73	T	26.	Cochbet	10.68	T
12.	Kedaram	8.83	T	27.	Tekurpeta	9.82	T
13.	Punjab Haldi-1	9.55	T	28.	Jalpalguri Local	10.68	T
14.	Punjab Haldi-2	9.84	T	29.	Allampuram	8.86	T
15.	Sobha	11.61	T	30.	Suranjana	7.58	T

Table.3 Average yield performance of turmeric varieties

Sr. No.	Variety	Average Yield		Sr. No.	Variety	Average Yield	
		kg/ plot	t/ha			kg/ plot	t/ha
1.	Krishna	19.46	31.14	16.	Prabha	13.36	21.37
2.	Rajpuri	12.24	19.58	17.	Suvarna	12.77	20.44
3.	Salem Local	11.70	18.72	18.	Suguna	12.86	20.58
4.	Ranga	12.77	20.44	19.	Sudarsana	18.86	30.18
5.	Pratibha	17.66	28.26	20.	Kanti	11.20	17.93
6.	Roma	13.27	21.24	21.	Sikandarabad	11.88	19.01
7.	Pant Peetabh	12.38	19.82	22.	Alleppeysupreme	15.23	24.37
8.	NarendraHaldi	18.10	28.97	23.	SB-10843	10.60	16.96
9.	Sona	13.47	21.56	24.	RH-5	12.86	20.58
10.	BSR-1	11.97	19.15	25.	Arunachal Local	10.40	16.65
11.	BSR-2	13.06	20.90	26.	Cochbet	10.37	16.60
12.	Kedaram	13.64	21.83	27.	Tekurpeta	10.78	17.24
13.	Punjab Haldi-1	12.70	20.33	28.	Jalpalguri Local	9.67	15.46
14.	Punjab Haldi-2	11.74	18.78	29.	Allampuram	14.58	23.33
15.	Sobha	11.80	18.88	30.	Suranjana	12.20	19.53

Table.4 Economics of turmeric

Sr. No.	Treatment	Per cent Disease Incidence (PDI)	Yield (t/ha)	Gross value of yield (Rs./ha)	Total cost (Rs./ha)	Cost: Benefit ratio
1	2	3	4	6	7	8
1	Krishna	13.23	31.14	1245733.33	473042	1 : 2.63
2	Rajpuri	16.21	19.58	783200.00	473042	1 : 1.66
3	Salem Local	21.12	18.72	748666.67	473042	1 : 1.58
4	Ranga	20.59	20.44	817600.00	473042	1 : 1.73
5	Pratibha	11.69	28.26	1130266.67	473042	1 : 2.39
6	Roma	20.07	21.24	849466.67	473042	1 : 1.80
7	Pant Peetabh	16.10	19.82	792666.67	473042	1 : 1.68
8	NarendraHaldi	13.82	28.97	1158666.67	473042	1 : 2.45
9	Sona	12.24	21.56	862266.67	473042	1 : 1.82
10	BSR-1	15.13	19.15	766133.33	473042	1 : 1.62
11	BSR-2	22.80	20.90	835866.67	473042	1 : 1.77
12	Kedaram	16.72	21.83	873066.67	473042	1 : 1.85
13	Punjab Haldi-1	16.30	20.33	813066.67	473042	1 : 1.72
14	Punjab Haldi-2	15.99	18.78	751066.67	473042	1 : 1.59
15	Sobha	15.90	18.88	755200.00	473042	1 : 1.60
16	Prabha	19.53	21.37	854933.33	473042	1 : 1.81
17	Suvarna	13.09	20.44	817466.67	473042	1 : 1.73
18	Saguna	13.01	20.58	823066.67	473042	1 : 1.74
19	Sudarsana	12.99	30.18	1207066.67	473042	1 : 2.55
20	Kanti	30.74	17.93	717066.67	473042	1 : 1.52
21	Sikandarabad	21.51	19.01	760266.67	473042	1 : 1.61
22	Alleppey Supreme	24.86	24.37	974666.67	473042	1 : 2.06
23	SB-10843	18.49	16.96	678400.00	473042	1 : 1.43
24	RH-5	18.32	20.58	823200.00	473042	1 : 1.74
25	Arunachal Local	22.38	16.65	665866.67	473042	1 : 1.41
26	Cochbet	16.49	16.60	664133.33	473042	1 : 1.40
27	Tekurpeta	19.61	17.24	689733.33	473042	1 : 1.46
28	Jalpalguri Local	19.34	15.46	618533.33	473042	1 : 1.31
29	Allampuram	18.69	23.33	933200.00	473042	1 : 1.97
30	Suranjana	19.46	19.53	781066.67	473042	1 : 1.65

This study is in accordance with the finding of Mallikarjun (1996), Philip, J. and Nair, P.C. (1981), Gorawar *et al.*, (2006), Singh (2007) and Jagtap *et al.*, (2013).

In turmeric, rhizome rot is another destructive disease that also causes economic damage to the crop. A total of 30 varieties were screened against *Pythium* rhizome rot of turmeric, out of which, only one, Krishna variety was found moderately resistant (4.92 PDI) and rest all twenty nine varieties were tolerant (Table 2). On the yield basis all varieties performed well but on basis of per cent disease intensity incidence of yield the varieties viz., Krishna (31.14 t/ha), Sudharsana (30.18 t/ha), Narendra Haldi (28.97 t/ha) and Pratibha (28.26 t/ha) were found superior over other varieties under study (Table 3).

Table 4, revealed that, highest C:B ratio was recorded in Krishna, Sudharsana, Narendra Haldi and Pratibhaas 1: 2.63, 1: 2.55, 1: 2.45 and 1: 2.39 respectively.

On the yield basis all varieties performed well but on basis of percent disease intensity incidence and yield of the varieties viz., Krishna, Sudharsana, Narendra Haldi and Pratibha were found superior over other varieties under study, which may be recommended to farmers for cultivation in konkan region of Maharashtra.

Out of thirty varieties screened, it is recommended that four varieties viz., Krishna, Sudharsana, Narendra Haldi and Pratibha are moderately resistant to *Colletotrichum* leaf spot and *Pythium* rhizome rot with good yield.

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