INTERNATIONAL JOURNAL OF ADVANCED BIOLOGICAL RESEARCH

www.scienceandnature.org

EVALUATION OF TURMERIC GENOTYPES FOR QUALITY, YIELD AND DISEASE RESISTANT

R. S. Mishra
Department of Plant Pathology, N.D. University of Agriculture and Technology, Kumarganj -224229, UP, India
*Corresponding author: drramsumanmishra@gmail.com

ABSTRACT
Turmeric (*Curcuma longa* L.) is one of the important spice crop cultivated in tropical and subtropical countries of the world. India is the world's largest producer of turmeric and accounted 80 percent of the world's production; it occupies 6 percent area under turmeric cultivation. Productivity of this crop is low due to its cultivation on marginal lands with low fertile level, lack of improved varieties, production and protection technology. Among various diseases attacking to turmeric crop, Taphrina leaf blotch (*Taphrina maculans*) and *Colletotrichum* leaf spot (*Colletotrichum capaci*) are the most destructive disease. Out of 37 evaluated genotype three genotypes *viz;* NDH-136, CL-32 and ACC-79 were found moderately resistant for both *Colletotrichum* leaf spot and *Taphrina* leaf blotch disease. The percent disease intensity of leaf spot was 17.93-21.40, leaf blotch 17.30 - 23.80, curcumin 3.6- 4.8%, essential oil 6.0 – 6.8% and oleoresin 10.09 – 12.72%. Nine genotypes NDH-8, NDH-11, NDH-68, NDH-74, NDH-79, Pratibha, CSTH-9, MEDUKAR, and CL-34 were found moderately resistant for leaf spot with curcumin content 4.1-4.6%, essential oil 6.0 – 6.8% and oleoresin 10.56 - 11.90%.

KEYWARDS: Turmeric, Genotypes, Foliar diseases, Yield, Curcumin, Oleoresin, Essential oil.

INTRODUCTION

Turmeric (*Curcuma longa* L.*)* is one of the most important spice crops cultivated in India. It is a rhizomatous herbaceous perennial plant of the family Zingiberaceae. Turmeric is used in flavoring, dye making, drug preparation, cosmetics and medicine (Jagtap *et al.,* 2013). The annual production of turmeric in India is about 1062.5 thousands metric tonnes on area 199.0 thousands hectare. In Uttar Pradesh, the area covered under turmeric cultivation is 1828 ha with production of 5149 mt tonnes (Anonymous, 2012). This crop is highly prone to several fungal diseases (Naidu, 1988; Purthi, 2000). The serious foliar diseases on turmeric reported in UP are leaf spot caused by *Colletotrichum capsici* (Syd.) Butler & Bisby and leaf blotch caused by *Taphrina maculans* Butler. The foliar destruction due to leaf blotch reduces the yield considerably when the disease starts in its early stages of crop growth. Leaf spot incited by *Colletotrichum capsici* reduces the yield in tune of 15-60% (Pruthi, 1998) and dry rhizome yield 62%. The farmers are growing local clones for their desirable aroma, colour and palatability. These clones are susceptible to the disease. The experiments were conducted to evaluate the promising genotypes of turmeric to find out the effective management tools for overcome of yield losses due to *Taphrina* leaf blotch and *Colletotrichum* leaf spot disease of turmeric. The drug yielding qualitative traits of turmeric were also studied to find out the promising elite genotypes in terms of high curcumin, oleoresin and essential oil content.

MATERIALS AND METHODS

The field experiments were conducted at Vegetable Research Farm, N.D. University of Agriculture & Technology, Kumarganj, Faizabad from 2015-2017 in sandy loam soil with leaf spot disease susceptible NDH-1 variety. The trial was laid out in randomized block design with 37 genotypes and three replications for evaluation against foliar diseases quality and yield. Rhizomes were planted on raised beds of 3 x 1 M size at spacing of 30 x 20cm in the first forty night of June. The other normal agronomical practices were adopted to raise the crop as and when necessary. The observation of leaf spot and leaf blotch intensity were recorded at 105 DAP on 10 randomly selected plants in each replication for disease scoring. The disease rating was recorded by adopting 0-6 scale (Palarpawar and Ghurde, 1989), where 0= No infection (Healthy plants), 1= 0.1 to 10 percent leaf area infected, 2= 10.1 to 20 percent leaf area infected, 3= 20.1 to 30 percent leaf area infected, 4= 30.1 to 40 percent leaf area infected, 5= 40.1 to 50 percent leaf area infected, 5= More than 50 percent leaf area infected. The percent disease intensity (PDI) was calculated according to the formula suggested by Datar and Mayee (1981) given as below:-

$$PDI = \frac{\text{Sum of rating of infected leaves in plant}}{\text{Total no. of leaves observed x maximum disease score}} \times 100$$

The yield and quality of each turmeric genotype were recorded after the harvest. The dried rhizome was powdered to uniformed mesh and used for extract curcumin, essential oil and oleoresin. It was estimated from the powdered and sieved sample by ASTA procedure (American spice trade Association, 1968 a,b)

RESULTS AND DISCUSSION

Out of 37 genotype three genotypes *viz;* NDH-136, CL-32 and ACC-79 were found moderately resistant for both Colletotrichum leaf spot and *Taphrina* leaf blotch disease. The percent disease intensity of leaf spot was 17.93-21.40, leaf blotch 17.30-23.80, curcumin 3.6-4.8%, essential oil 6.0– 6.8% and oleoresin 10.09–12.72% (Table-1).

TABLE 1: Evaluation of turmeric genotype for source of quality, yield and disease resistant

S.No.	Variety	Percent Disease Intensity		Curcumin (%)	Essential Oil (%)	Oleoresin (%)	Yield(q/ha)
		Leaf spot	Leaf bloch				
1.	NDH-8	25.00	46.03	4.2	6.7	10.54	265
2.	NDH-10	14.07	28.57	4.7	6.8	11.77	220
3.	NDH-11	24.44	29.67	4.4	6.4	11.54	230
4.	NDH-16	34.81	42.85	4.2	6.5	11.12	234
5.	NDH-40	28.14	45.7	4.3	6.2	11.38	220
6.	NDH-45	34.85	44.64	4.0	6.7	10.94	235
7.	NDH-68	14.01	41.55	4.5	6.0	11.11	230
8.	NDH-74	21.78	28.95	4.3	6.2	11.35	260
9.	NDH-79	20.83	28.57	4.1	6.0	11.54	259
10.	NDH-98	33.33	46.74	4.9	7.1	11.92	315
11.	NDH-114	28.88	36.78	4.4	6.0	10.25	230
12.	NDH-115	37.24	47.7	4.0	6.3	11.65	222
13.	NDH-116	53.10	49.52	4.0	5.9	10.11	235
14.	NDH-128	37.93	21.95	4.8	6.5	11.27	227
15.	NDH-129	30.34	26.05	4.0	6.1	11.56	234
16.	NDH-130	38.34	64.4	4.2	6.2	11.33	229
17.	NDH-136	17.93	23.80	4.1	6.8	11.52	245
18.	NDH-1(CH)	37.87	48.5	4.7	6.7	11.84	210
19.	Pratibha	19.40	50.5	4.6	6.8	11.90	207
20.	CSTH-9	20.98	26.05	4.0	6.0	10.56	233
21.	ACC-79	25.23	21.44	4.8	6.5	12.72	253
22.	SLP-398/1	32.86	39.64	4.2	6.4	11.35	237
23.	ACC-48	37.7	23.14	4.4	6.5	11.47	245
24.	PTS-12	30.56	34.21	4.4	6.6	11.30	225
25.	PTS-55	37.24	18.92	4.7	6.1	10.49	188
26.	PIS-8	30.3	28.92	4.4	6.5	12.05	251
27.	TCP-64	32.5	14.7	4.3	6.2	11.65	283
28.	TCP-14	37.0	32.14	4.1	6.1	11.57	355
29.	CL-54	37.85	34.1	4.2	6.5	11.35	247
30.	PRABHA	41.42	41.78	4.9	6.8	11.81	110
31.	MEDUKAR	25.76	35.29	4.1	6.1	10.85	396
32.	IT-36	36.93	38.92	4.3	6.1	11.45	338
33.	CL-32	21.40	17.3	3.6	6.0	10.09	234
34.	CL-34	22.25	19.2	4.1	6.5	11.25	263
35.	TCP-161	32.12	46.07	4.2	6.3	11.73	270
36.	TCP-129	25.0	36.79	4.3	6.4	11.71	234
37.	RH-407	40.00	25.7	4.3	6.2	11.33	371
38.	C D at 5%	0.623	1.037	-	-	-	54.14

Nine genotypes NDH-8, NDH-11, NDH-68, NDH-74, NDH-79, Pratibha, CSTH-9, MEDUKAR, and CL-34 were found moderately resistant for leaf spot with curcumin content 4.1-4.6%, essential oil 6.0 – 6.8% and oleoresin 10.56 -11.90%. Whereas five genotypes NDH-128, ACC-48. PTS-55, TCP-64, CL-34 was found moderately resistant for leaf blotch disease with curcumin content 4.1 –4.7, essential oil 6.0- 6.5 and oleoresin 10.49-11.65.The fresh rhizome yield was highest in Medukar (396q/ha) followed by RH-407 (371q/ha), TCP-14 (355q/ha), IT-36 (338q/ha) and NDH-98 (315q/ha). Rest of genotypes was found susceptible or highly susceptible for both foliar diseases. Although NDH-98, NDH-128 and NDH-10 have good curcumin content (4.7-4.9%), essential oil 6.5 -7.1% and oleoresin 11.27-11.77%. Existence of wide variability among the cultivars were supported by various workers (Ratnambal,1986, Chandra et al 1993, Kumar and Jain, 1996, Nirmal Babu *et al*., 1993). Singh *et al.* (2013) reported that curcumin content of turmeric varies from place to place due to genetic, influence of

environment and agro-climatic condition. The use of resistant variety is beneficial not only in reducing the losses due to diseases but these sources are also useful to improved the rhizome quality and yield of turmeric (Granger and Horne, 1924; Parey *et al*., 2013 and Manu *et al.*, 2014).

REFERENCES

American Spice Trade Association (ASTA) 1968a Official analytical methods, second, ASTA, New York, PP-8-9.

American Spice Trade Association (ASTA) 1968b Official analytical methods, second, ASTA, New York, PP-21.

Anonymous (2012) Annual report of National Horticulture Board. Pp 8-10.

Chandra, R., Desai, A.R., Govind, S., Gupta, P.N. (1997) Metroglph analysis in turmeric germplasm in India. Sci. Hortic 70, 211-222.

Datar, V.V. & Mayee, C.D. (1981) Assessment losses in tomato yield due to early blight. Indian Phytopath: 191-195.

Dator, V.V. and Mayee, C.D. (1981) *Phytopathometry*, Marathwad Agricultural University, Parabhani, pp. 95.

Granger, K. and Horne, A.S. (1924) A method of inoculating the apples. Ann Bot., 38: 212.

Jagtap, G.P., Mali, A.K. and Utpal Dev (2013) Bio-efficacy of fungicides, bio- control agents and botanicals against leaf spot of turmeric incited by *Colletotrichum capsici*. *Afr. J. Microbial. Res.* 7(18), 1865-1873

Kumar, R. and Jain, B.P. (1996) Growth and rhizome characters of some turmeric cultivars. J.Res. Birsa Agric. Univ. 8: 131-133

Manu, D.G.,Tembhurne, B.V., Kisan, B., Aswath narayana, D.S. and Diwan, J.R. (2014) Inheritance of Fusarium wilt and qualitative and quantitative characters in chilli (*Capsicum annuum* L). J. Agric. & Environ. Sci., 3: 433-444.

Naidu, M.R. (1988) Price spreads of turmeric and chillies regulated marketing in Guntur district, Andhra Pradesh-A comparative study. Ind. J. Agric. Market. 2(1): 117-119.

Nirmal Babu, K., Sasikumar, V., Ratnambal, M.J., George, J.K. and Ravindran, P.N. (1993) Genetic variability in turmeric Indian J Genet. Plant Breed. 53, 91-93

Palarpawar, M. Y. & Ghurde, V.R. (1989) Fungicidal control of leaf spot of turmeric incited by *Colletotrichum curcumae*. Indian Phytopath. 42: 576-578.

Parey, M.A., Razdan V.K. and Sofi, T.A. (2013) Comparative study of different fungi associated with fruit rot of chilli and screening of chilli germplasm against *Colletotrichum capsici.* Internat. J. Agric. & Crop Sci.,5: 723-730

Pruthi, J.S. (2000) Quality assurance in spice and spice products, modern methods of analysis. Allied Publ. Ltd. New Delhi.

Pruthi, J.S. (1998) Major spices of India Crop management, post-harvest technology. Publ. Publication and Information Div., ICAR, New Delhi.

Ratnambal, M. Z. (1986) Evaluation of turmeric accession for quality. Quality Plantarum 36.243-252

Singh, S. Joshi, R.K., Nayak, S. (2013) Identification of elite genotypes of turmeric through agroclimatic zone based evaluation of important drug yielding traits. Ind.Crop Prod. 43. 165-171.