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AD Saykar

Senior Research Fellow,
Directorate of Plant Protection,
Quarantine and Storage,
Faridabad (Central Integrated
Pest Management Centre,
Ranchi, Jharkhand, India

PG Borkar

Assistant Professor, of Plant
Pathology, Dr. BSKKV, Dapoli,
Maharashtra, India

Abdul Naim

M.Sc. Student, Department of
Plant Pathology, College of
Agriculture, Dr. BSKKV,
Dapoli, Maharashtra, India

HT Valvi

Senior Research Fellow, IPM
Division, Directorate of Plant
Protection, Quarantine and
Storage, Faridabad, Haryana,
India

Correspondence**AD Saykar**

Senior Research Fellow,
Directorate of Plant Protection,
Quarantine and Storage,
Faridabad (Central Integrated
Pest Management Centre,
Ranchi, Jharkhand, India

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In vitro screening of colocasia varieties or genotypes for their reaction against the *Phytophthora colocasiae* Racib

AD Saykar, PG Borkar, Abdul Naim and HT Valvi

Abstract

Colocasia (*Colocasia esculalanta* (L.) Schott.) is an important tropical tuber crop for millions of people in developing countries. Leaf blight caused by *Phytophthora colocasiae* Racib. Is the most destructive diseases of colocasia causing a 25-50% loss in yield. In India pathogen is reported at Andhra Pradesh, Bengal, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra (Konkan region), Tamil Nadu, Uttar Pradesh and West Bengal. The pathogen is surviving in the soil and in tuber during off season. Secondary spread of the pathogen is through rain splash and irrigation water. The ability to cause disease symptoms across the varieties/ genotype was interpreted as virulence. The disease reaction of 9 varieties showed differences in resistance to *P. colocasiae*. Among the 9 varieties none of the variety showing immune and resistance reaction to *P. colocasiae*. Among the 9 variety/genotype of colocasia were screened against the reaction of leaf blight viz. TCbl 12-2, TCbl 12-5 and TCbl 12-7 were the moderately resistance, and TCbl 12-1, TCbl 12-4, TCbl 12-6, Muktakeshi were moderately susceptible also TCbl 12-3 and Telia were susceptible genotype.

Keywords: *Colocasia esculalanta*, *P. colocasiae*, screening, variety/genotype

Introduction

Colocasia (*Colocasia esculenta* (L.) Schott.) is commonly known as Arvi or Aalu in Maharashtra. It is one of the major tuber crops belonging to Araceae family. It has its origin in South East Asia and is grown in several countries such as South Africa, India, Central Africa, West Indies and the islands of the Caribbean and Central America (Chandra, 1984) [6] for its edible corms and leaves (Kuruville and Singh, 1981, Coates *et al.*, 1988) [13, 7]. The tubers are rich in starch and used almost everywhere as vegetable, leaves and petiole are also cooked and eaten as vegetable. Besides, this crop is of great medicinal value and is included in many ayurvedic preparations. Colocasia tubers contain more protein, minerals, phosphorus and iron compared to other tuber crops. It is cultivated an area of 2 M h with 9.1 M t of production all over the world. In India, two taro types viz., *Colocasia esculenta* var. *antiquorum* was commonly cultivated throughout the country in an area of 80,000 ha with a production of about 0.8 million tonnes. In India, it is grown in Andhra Pradesh, Uttar Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra (Konkan region), Tamil Nadu and West Bengal. It grows well in lowland and upland areas. During the year 2012, the area under colocasia was 52000 ha with a production of 654000 tons with productivity of 13.0 tons ha⁻¹ (Lakshmi, 2012) [14]. The soil and climatic conditions of Konkan region of Maharashtra are favorable for extensive cultivation of colocasia. In Konkan region of Maharashtra this crop is cultivated in Kharif seasons i.e. June - December under rainfed conditions with a duration of about 150-210 days. It is cultivated as sole crop in wide range of soils and climatic conditions in most of the districts of konkan region.

Colocasia production is highly affected by many biotic and abiotic factors and is susceptible to attack by a minimum of twenty-three pathogens viz., *Phytophthora* leaf blight, *Pythium* rot, *Phyllosticta* leaf spot, *Cladosporium* leaf spot, Spongy black rot, Black rot, *Rhizopus* rot, *Fusarium* dry rot, Dasheen mosaic, Bacterial soft rot, Bacterial leaf spot. From which *Phytophthora* leaf blight caused by *Phytophthora colocasiae* Racib. is the most devastating disease which occurs regularly and causes heavy yield losses. In India the disease was recorded for the first time by Butler and Kulkarni (1913) [1] and the disease occurs regularly in moderate to severe form causing a loss of 25 to 50% (Misra, 1997; Misra and Choudhury, 1997; Gadre and Joshi, 2003) [15, 16, 9].

But when it occurs in severe form, this disease is reported to have destroyed entire taro plantings in Papua New Guinea (Packard, 1975) [5]. Leaf blight has become a limiting factor for colocasia production in Solomon Islands, Ponape, Hawaii and India causing yield loss of 25-50% (Gollifer and Brown, 1974; Jackson *et al.*, 1979) [4, 9]. Colocasia leaf blight symptoms appear as small water soaked spots, which increase in size and number leading to complete destruction of leaf lamina. During morning hour's whitish, thread like fungal mycelium surrounding the diseased spots with orange droplets can be seen with naked eye. Petiole infection is more damaging as it leads to quick collapse of the leaves. Cloudy weather with intermittent rains and a temperature of about 28oC is favorable for the disease which quickly spreads in the field giving them a blighted appearance and devastated within few weeks under favorable weather (Misra, 2007) [17]. Reasonable degree of resistance has not been found in various colocasia growing areas in other countries (Jackson and Gollifer, 1975) [11].

Materials and Methods

Screening of some colocasia varieties for their reaction to *Phytophthora* leaf blight

Nine entries of colocasia available with All India Co-ordinated Research Programme on tubers at Central Experimental Station, Wakawali, were screened under natural conditions during *khariif* 2015-16. Recommended dose of FYM (10 t ha⁻¹) and NPK (80:60:80 kg ha⁻¹) was given. The details are mentioned below.

Plan of layout

Season	<i>Khariif</i> , 2015
Date of planting	17/06/2015
Design	RBD
Replications	3
Plants per replication	15
Plot size	3.0 X 1.35 m
Spacing	60 X 45 cm
Treatments	9 entries i.e. T1 :TCBL-12-1, T2:TCBL-12-2, T3: TCBL-12-3, T4: TCBL-12-4, T5: TCBL-12-5, T6: TCBL-12-6, T7: TCBL-12-7, T8: Muktakeshi, T9: Telia.

Method of recording observations on disease incidence

In each replication, 5 plants were randomly selected to record the disease incidence. The selected plants were tagged and observations on disease incidence were recorded on the same plants, twice, at an interval of 1 month. The disease rating scale proposed by Little and Hills (1978) [3], was followed to record the observations.

Score/grade	Disease rating
0	No disease
1	1-7 % leaf area affected
2	7-25 % leaf area affected
3	25-50 % leaf area affected
4	50-75 % leaf area affected
5	75-90 % leaf area affected
6	90-100 % leaf area affected

Per cent disease intensity (PDI) was calculated by the formula given by Mckinney (1923) [4],

$$PDI = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaves examined} \times \text{Maximum rating}} \times 100$$

Table 1: Varietal reaction to colocasia leaf blight was classified as follows

Disease Rating Scale	Terminal disease severity (%)	Reaction
0	0	I
1	1-10%	R
2	11-25%	MR
3	26-50%	MS
4	51-75%	S
5	Above 75	HS

Where,

- I - Immune
- R - Resistance
- MR - Moderately resistance
- MS - Moderately susceptible
- S - Susceptible
- HS - Highly susceptible

Statistical analysis

The data obtained in all the experiments were statistically analyzed using methods suggested by Gomez and Gomez (1986) [2]. Randomized Block Design (RBD) was used for field experiments. The standard error (S. Em.) and critical difference (C.D.) at level P = 0.05 in field experiments. Results obtained in all the experiments were compared statistically.

Results and Discussion

Screening of some colocasia varieties/genotypes for their reaction to the disease

All the colocasia genotypes available with the AICRP on tuber crop center, Wakawali, were screened for natural disease incidence. The results are presented in Table 2.

Table 2: Screening of some colocasia varieties/genotypes for their reaction to the disease.

T. No.	Genotype /Varieties	Terminal Per cent disease infection	Disease score
T ₁	TCbl 12-1	43.67(41.36)*	3
T ₂	TCbl 12-2	23.00(28.65)	2
T ₃	TCbl 12-3	51.33(45.76)	4
T ₄	TCbl 12-4	31.67(34.24)	3
T ₅	TCbl 12-5	24.33(29.55)	2
T ₆	TCbl 12-6	48.67(44.24)	3
T ₇	TCbl 12-7	15.33(23.04)	2
T ₈	Muktakeshi	32.00(34.45)	3
T ₉	Telia	59.00(50.19)	4
S Em± CD at 5%		0.40:1.20	

(*Figures in parentheses are arcsine values)

The results presented in table 3 indicate that, the genotype TCbl 12-7 recorded the least terminal per cent disease infection (15.33 %) and was significantly superior to rest of the genotypes/varieties. It was followed by TCbl 12-2 and TCbl 12-5. Among the 9 genotypes/varieties screened, the variety Telia recorded maximum PDI.

Table 3: Terminal disease severity and their reaction to different genotype

Disease Rating Scale	Terminal disease severity (%)	PDI	Name of genotype	Reaction
0	0	-	-	I
1	1-10%	-	-	R
2	11-25%	23.00 24.33 15.33	TCbl 12-2 TCbl 12-5 TCbl 12-7	MR
3	26-50%	43.67 31.67 48.67 32.00	TCbl 12-1 TCbl 12-4 TCbl 12-6 Muktakeshi	MS
4	51-75%	51.33 59.00	TCbl 12-3 Telia	S
5	Above 75	-	-	HS

In screening experiment it was observed that out of 9 genotypes/ varieties screened in the field, the genotypes TCbl 12-7 recorded the least terminal per cent disease infection (15.33 %).

Kumar *et al.* (1996) [12] screened 15 genotypes/varieties for resistance to leaf blight of colocasia. The varieties Kadma Local, and Muktakeshi (Nadia Local) were found to be immune to the disease. In the present study Muktakeshi was found to be moderately susceptible to the disease. The varieties screened by the earlier workers are different than those used in present study hence the comparison on this aspect cannot be concluded.

References

- Butler EJ, Kulkarni GS. Colocasia blight caused by *Phytophthora colocasiae* Racib. *Memoirs: Department of Agriculture. India.* 1913; 5:223-259.
- Gollifer DE, Brown JF. *Phytophthora leaf blight of Colocasia esculenta in the British Solomon Islands.* Papua New Guinea Journal of Agriculture, Forestry and Fisheries. 1974; 25:6-11.
- Little TM, Hills FJ. *Agricultural experimentation: design and analysis.* Somerset, NJ: John Wiley & Sons Inc, 1978.
- Mackinney. A new system of grading plant disease. *Journal of Agricultural Research.* 1923; 26:195-218.
- Packard JC. The Bouganinville Taro blight. Pacific Islands study program, University of Hawaii, Honolulu, 1975, 144.
- Chandra S. *Edible Aroids.* Clarendon Press, Oxford, 1984, 252.
- Coates DJ, Yen DE, Gaffey PM. Chromosome variation in Taro, *Colocasia esculenta*: implantations for the origin in the Pacific. *Cytologia.* 1988; 53:551-560.
- Food and Agriculture Organization Estimates. <http://faostat.fao.org>.
- Gadre UA, Joshi MS. Influence of weather factors on the incidence of leaf blight of Colocasia. *Annals of Plant Protection Science.* 2003; 11:168-170.
- Gollifer DE, Jackson GVH. *Disease and pest problems of Taro Colocasia,* 1975.
- Jackson GVH, Gollifer DE, Newhook FJ. Survival of inoculums of the leaf blight fungus *Phytophthora colocasiae* infecting Taro, *Colocasia esculenta*, in the Solomon Islands. *Annals of Applied Biology.* 1979; 94:379-390.
- Kumar R, Dubey SC, Kurup GT, Palaniswami MS, Potty VP, Padmaja G *et al.* Screening of Colocasia genotypes for resistance to *Phytophthora leaf blight.* Tropical tuber crops: Problems, Prospects and Future strategies, 1996, 388-390.
- Kuruvilla KM, Singh A. Karyotypic and electrophoretic studies on Taro and its origin. *Euphytica.* 1981; 30:405-413.
- Lakshmi BKM, Reddy RVSK, Dilip Babu J. Impact of weather parameters on the incidence of leaf blight disease in Taro (*Colocasia esculenta* (L.) Schott.) *Journal of Root Crops.* 2012; 38(1):93-96.
- Misra RS. *Diseases of tuber crops in Northern and Eastern India,* CTCRI Technical Bulletin Series. 1997; 22:27.
- Misra RS, Choudhury SR. *Phytophthora leaf blight disease of Taro,* CTCRI, 1997.
- Misra RS, Maheshwari SK, Sriram S, Sharma K, Sahu AK. *Integrated Technical Bulletin Series.* 2007; 21:32.