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Role of cultural practices in the management of colocasia blight

U. RANA AND S.K. SUGHA

Department of Plant Pathology, CSKHPKV Palampur (H.P) 176062

ABSTRACT

Role of cultural practices like mulch, sowing dates and intercrop was ascertained in the management of colocasia blight during 2003 and 2004 cropping seasons. Early sown crop developed more disease than late sown one. Mulching colocasia with eupatorium, oat straw, wheat straw, persian liliac and eucalyptus significantly reduced the severity of blight and delayed the disease appearance by 5-6 days. Eupatorium (*Chromolaena odorata*) was found to be the most effective mulch with significant increase in yield and decrease in disease severity. Intercropping colocasia with maize proved highly effective in reducing disease severity but reduced the crop yields significantly.

Key words: Eupatorium, colocasia blight, mulching, intercropping

Colocasia leaf blight, caused by *Phytophthora colocasiae* Rac., is the most destructive and globally distributed disease (Gollifer and Brown, 1974; Ooka, 1990 ; Hunter *et al.*, 1998). The disease is favoured by a temperature of 20-22°C and a high relative humidity (>90%). In Himachal Pradesh, crop growth and appearance of disease coincide with the onset of monsoon making the conditions adverse for successful cultivation of the crop. The disease assumes severe form in areas with high relative humidity and frequent rainfall and reported to cause 25-50 per cent losses in crop yield (Misra *et al.*, 1996; Gurung, 2001) which may exceed 60 per cent under epiphytotic conditions. Cultural practices like mulching and intercropping have been successfully employed for the control of various soil borne and foliar diseases. Huber and Watson (1970) reported the effectiveness of mulching and organic amendments in reducing seed and soil borne diseases. Paiki (1996) reported that disease intensity in monoculture of colocasia was higher than mix cropping systems. Keeping these points in view, the present studies have been conducted to manage colocasia blight by the use of different cultural practices.

MATERIALS AND METHODS

Effect of dates of sowing

Effect of five different sowing dates *viz.*, 1st May, 15th May, 30th May, 15th June and 30th June was evaluated for disease development. Each treatment was replicated four times.

Effect of population densities of intercrop

Effect of maize as intercrop (1:1) was evaluated against the disease. Different spacings of 15 cm, 30 cm, 45 cm and 60 cm were maintained between maize plants so that different densities of maize plants were maintained. Three rows of pure crop of colocasia served as check.

Effect of mulch

Leaves and twigs of eucalyptus (*Eucalyptus longifolia* Link.), eupatorium (*Chromolaena odorata* L.), persian liliac (*Melia azadirach* L.), oat straw (*Avena sativa* L.) and wheat straw (*Triticum aestivum* L.) were used as mulch. A 10 cm thick layer of test plants was put on each plot to study the effect of different mulches on disease. Uncovered plots served as check. Each treatment was replicated four times.

All the field trials were conducted with 'Una Local' cultivar of colocasia with recommended package of practices for the crop (Anonymous, 2003) in randomized block design. The corms were sown 10 cm deep with row to row and plant to plant distance of 60 x 45 cm, respectively. Each plot of 3 m^2 consisted of three rows of five plants each. Data on disease were recorded at weekly intervals, starting from the appearance of disease and that of yield (q/ ha) at harvest. The disease was scored on 1-9 scale (Vasquez, 1990) and disease index calculated as per Mckinney (1923).

RESULTS AND DISCUSSION

Effect of sowing dates

The data revealed that earlier the sowing date, higher were the infection values (Table1). During 2003 crop season maximum disease severity of 49.1% was recorded in early sown crop (1st May). However with fortnightly delay in sowing, corresponding decrease was observed in disease severity as well as yield. Although 30th June sown crop developed minimum disease severity (25.7%), yet it adversely affected the crop yield. Similar trends were observed during 2004 cropping season. Analysis of two years data revealed that there was 43.5% variation in the disease severity of 30th June sown crop and crop sown on 1st May. Sowing date had a significant effect on the disease severity and yield of Colocasia.

The crop sown earlier attained sufficient growth at the time of infection thereby account for less yield loss in spite of more disease while late sown crop being in developing stage at the time of infection led to less yield. Results on the effect of date of sowing on disease severity and yield are in confirmity with Misra (1995).

Effect of maize as an intercrop

Data revealed that intercropped colocasia had significantly less disease compared to a pure crop (Table2). Closely spaced maize plants with higher population density led to less development of disease in colocasia as compared to widely spaced maize plants with less number of plants per row. The average disease severity was minimum (27.2%) in plots in which plant to plant distance of intercrop was 15 cm. Maximum average disease severity (48.4%) was noticed in check plots. Widely spaced maize plants (60 cm) decreased the disease significantly over check but disease control achieved was less as compared to closely spaced plants. Intercropping with maize though decreased the disease significantly but affected the crop yield adversely. Maximum crop yield (5.9 t/ha) was recorded in check plots whereas in intercropped plants yields ranged between 2.9-4.3 t/ha.

One row of maize intercropped alternately with one row of colocasia provided effective barrier to the lateral spread of disease and reduced disease severity. Sar *et al.* (1998) suggested intercropping as

Table 1. Effect of sowing dates on the severity of colocasia blight during *kharif* 2003 and 2004 crop seasons

Sowing dates	Per cent disease severity		Average disease severity (%)	Per cent decrease in disease over check		Average decrease in disease (%)	Yield (t/ha)
	2003	2004		2003	2004		
1st May	49.1 (44.5)	52.7 (46.6)	50.9 (45.8)	-	-	-	6.5
15th May	40.2 (39.3)	44 7 (41.9)	42.5 (40.7)	18 1	15.2	16.6	5.4
30th May	32.9 (35.0)	39.6 (38.9)	36.3 (37.0)	32.8	24.8	28.8	4.8
15th June	28.2 (32.1)	34.1 (35.7)	31.1 (33 9)	42.5	35.4	38.9	3.8
30th June	25.7 (30.4)	32.0 (34.4)	28.8 (32 4)	47.7	39.3	43.5	3.5
CD (P = 0.05)	(2.2)	(1.9)					1.0

Arc sine transformed values in parentheses

Table 2. Effect of different population densities of maize as inter crop on the severity of colocasia blight during *kharif* 2003 and 2004 crop seasons

Number of maize plants/row	Per cent disease severity		Average disease severity (%)	Disease control over check (%)		Average disease control (%)	Yield (t/ha)
	2003	2004		2003	2004		
13 (15)*	25.5 (30.3)	29.0 (32.6)	27.2 (31.4)	42.3	44.7	43.5	2.9
7 (30)	27.1 (31.4)	30.9 (33.7)	29.0 (32.6)	38.9	40.9	39.9	3.0
5 (45)	31.0 (33.8)	34.4 (35.9)	32.7 (34.9)	30.1	34.2	32.2	3.6
4 (60)	34.2 (35.8)	35.8 (36.8)	35.0 (36.3)	22.9	32.5	27.7	4.3
Control	44.4 (41.7)	52.4 (46.3)	48.4 (44.0)	-	-	-	5.9
CD ($P \leq 0.05$)	(2.0)	(2.0)					0.9

*Intercrop spacing(cm)
Figures in parentheses are arc sine transformed values

Table 3. Effect of different types of mulches on the severity of colocasia blight during *kharif* 2003 and 2004 crop seasons

Mulch type	Per cent disease severity		Average disease severity (%)	Disease control over unmulched (%)		Average disease control (%)	Yield (t/ha)
	2003	2004		2003	2004		
Wheat straw	32.0 (34.4)	43.8 (41.2)	37.9 (37.8)	31.4	14.5	23.0	5.8
Oat straw	30.4 (33.4)	41.3 (40.0)	35.8 (36.7)	34.9	19.4	27.1	6.3
Eupatorium	27.7 (31.7)	38.7 (38.4)	33.2 (35.1)	40.6	24.6	32.6	7.2
Eucalyptus	32.7 (34.9)	43.9 (41.5)	38.3 (38.2)	29.8	14.4	22.1	5.3
Persian liliac	31.7 (34.2)	44.6 (41.9)	38.2 (37.8)	31.9	12.9	22.4	6.0
Control (Un mulched)	46.6 (43.0)	51 3 (45.7)	48.9 (44.4)	-	-	-	4.8
CD ($P \leq 0.05$)	(1.9)	(1.1)					1.0

Arc sine transformed values in parentheses

one of the management strategy for sustainable production of taro in Papua New Guinea. Results of present study are in agreement with Gurung (2001) who reported less disease in intercropped colocasia. Various workers (Kumar and Sugha, 2000 and Tripathi and Rathi, 2000) have also advocated the effectiveness of intercropping with non-host crops in the management of diseases.

Effect of mulch

Mulching had significant effect in reducing disease severity and increasing corm yield (Table3). The appearance of disease was delayed by 5-6 days with mulches of test plants over the unmulched plots where disease appeared earlier. Among different mulches, crop mulching with eupatorium leaves and twigs was most efficacious giving maximum average disease control and crop yield to the tune of 32.6% and 7.2 t/ha, respectively followed by oat straw with 27.1% disease control over check plots. Disease control achieved due to mulching resulted in increase in corm yield over check plots and yield ranged between 5.3 to 7.2 t/ha in mulched plots.

Significant increase in yield and decrease in disease severity in mulched over unmulched plots could be due to improved soil moisture conservation,

increased germination of corms, suppression of germination of dormant structures of pathogen and suppression of weeds. Data on the effect of eupatorium mulch corroborates the findings of Gurung (2001) who reported significant reduction in colocasia blight severity due to mulching with eupatorium leaves and twigs. Miyasaka *et al.* (2001) reported that yield in mulched plots of Colocasia was higher than unmulched plots. Lyimo *et al.* (1998) advocated the role of mulching in the control of early and late blight diseases of tomato.

Thus early sown colocasia mulched with eupatorium and intercropped with maize significantly reduced the severity of disease and increased the crop yield besides being economical and ecofriendly. Colocasia crop should be sown in the first week of May especially in Himachal Pradesh for higher returns inspite of disease.

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