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SHORT COMMUNICATION

Chemical management of Phytophthora blight of colocasia in mid hills of Himachal Pradesh

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Colocasia leaf blight, caused by *Phytophthora colocasiae* Rac., is the most destructive and globally distributed disease, which is favoured by a temperature of 20-22^{0}C and high relative humidity (≥ 90%)(3,10,4). In Himachal Pradesh, crop growth and appearance of disease coincides 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 to cause 25-50 per cent losses in crop yield (6) which may exceed 60 per cent under epiphytotic conditions. Therefore, present investigations were conducted to evaluate the commonly used and new fungicides for their efficacy against the disease and to develop an effective and economic disease management spray schedule.

All the experiments were conducted on susceptible 'Mandi Local' cultivar of colocasia with recommended package of practices for the crop (1) in randomized block design in the farm of Hill Agriculture Research & Extension Centre, Bajaura. The corms were sown 10 cm deep with row to row and plant to plant distance of 60×45 cm, respectively. Each plot of 3m^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 and disease index calculated as per Mckinney (5).

Five fungicides *viz.* Ridomil MZ (metalaxyl 8 + mancozeb 64 WP), Blitox (copper oxychloride 50 WP), Dithane M-45 (mancozeb 75 WP), Kavach (chlorothalonil 75 WP) and Antracol (propineb 70WP) were evaluated for two years (2007, 2008). Three sprays of the fungicides were given at an interval of 10 days for protectant and 15 days for systemic with the first spray given at the appearance of the disease. Spreader- sticker (Superwit AG) was added to improve tenacity of each fungicide. Efforts were also made to develop the spray schedule by evaluating different combinations of these fungicides. The gap between two sprays were kept 15 days after systemic fungicide and 10 days after non systemic fungicide and 10 such schedules were evaluated.

The crop was harvested at physiological maturity and net plot yield was recorded. Data were converted on hectare basis and analyzed using standard procedures. The cost benefit ratio for each schedule was calculated by taking into consideration cost of fungicides prevailing in the local market (Ridomil MZ Rs.1300/kg, Blitox Rs.400/kg, Dithane M-45 Rs. 240/kg, Kavach Rs.900/kg and Antracol Rs. 430/kg) and casual labour involved for spraying (10 men days/ha @ Rs 100/-). All other factors such as cost of seed, fertilizers and field preparation etc. were kept constant. The colocasia crop was sold @ Rs. 10/ kg.

The analysis of variance of data over the years of experimentation showed that all the fungicides significantly reduced the disease as compared to the control (Table 1). Individually Ridomil MZ (Metalaxyl + mancozeb) @ 0.25% was the best treatment as its application resulted in only 7.36 (15.67) per cent disease index (PDI) and provided 84.27 per cent disease control (PDC). Its efficacy in controlling the disease during both the years of experimentation was also significantly higher than all other fungicides. However, Blitox (copper oxychloride) and Kavach (Chlorothalonil) gave PDC of 63.85 and 62.74 per cent, respectively, but found to be statistically at par with Dithane M-45 and Antracol. Different fungicides viz. metalaxyl, mancozeb, blitox and bordeux mixture have been reported effective against phytophthora blight (8,9). Sanjeev *et al.* (7) reported that Ridomil MZ was significantly superior over the control and other fungicides resulting in the lowest leaf blight incidence and highest yield. Therefore, two years data suggest that metalaxyl+ mancozeb is highly effective followed by blitox and dithane M-45 when applied thrice at an interval of 15 and 10 days, respectively.

Amongst the different spray schedules schedule IX (Ridomil MZ- Ridomil MZ- Ridomil MZ) was found highly effective as indicated by low PDI (6.40) and high PDC (86.03) values (Table 2) followed by schedule I (Ridomil–Blitox–Blitox) and schedule II (Ridomil–Dithane–Dithane) with PDI 12.90 and 14.00, PDC 71.83 and 69.43, respectively.The per cent disease index and per cent disease control observed under schedule I and II were statistically at par with each other indicating thereby the importance of application of combination of systemic and proctectant fungicide at the initiation of the disease. Data presented in the table also revealed that sequencing of curative+protective - curative+protective - curative+protective at 15 days interval followed by curative+protective- protective – protective fungicides at 15 (2nd spray) and 10 (3rd spray) days interval found to give maximum control as compared to other schedules which indicated that combination of curative and

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Table 1. Effect of different fungicides on Phytophthora blight of colocasia

Fungicide/dose	Percent Disease Index (PDI)*		Average	Percent Disease control (PDC)		Average
	2007	2008	PDI	2007	2008	PDC
Ridomil MZ- 0.25%	6.73 (15.03)	7.99 (16.32)	7.36 (15.67)	85.75	82.8	84.27
Blitox- 0.25%	15.40 (23.10)	18.50 (25.47)	16.95 (24.28)	67.41	60.3	63.85
Dithane M-45- 0.25%	16.73 (24.14)	20.77 (27.06)	18.75 (25.60)	64.60	55.4	60.00
Chlorothalonil -0.20%	17.40 (24.64)	17.57 (24.75)	17.48 (24.69)	63.18	62.3	62.74
Antracol- 0.20%	18.33 (25.34)	20.49 (26.92)	19.41 (26.13)	61.21	56.1	58.65
Control	47.26 (43.47)	46.64 (43.07)	46.95 (43.27)	-	-	-
CD (0.05)	1.75	2.68	-	-	-	-

* Transformed values in the parentheses.

Table 2. Comparative efficacy and cost benefit ratio of different spray schedules on Phytophthora blight of colocasia

Spray Schedule No.	Description of Spray Schedule	Percent Disease Index (PDI)*	Percent Disease control (PDC)	Yield (q/ha)	Cost benefit Ratio
I	Ridomil – Blitox - Blitox	12.90 (21.05)	71.83	160.04	6.80
II	Ridomil – Dithane - Dithane	14.00 (21.95)	69.43	148.16	7.45
III	Ridomil – Chlorothalonil - Chlorothalonil	16.32 (23.81)	64.36	137.96	3.31
IV	Ridomil – Antracol - Antracol	17.10 (24.35)	62.66	131.92	5.04
V	Blitox - Ridomil – Blitox	18.04 (25.10)	60.61	114.99	3.92
VI	Dithane - Ridomil – Dithane	17.72 (24.88)	61.31	117.92	2.98
VII	Chlorothalonil - Ridomil – Chlorothalonil	16.02 (23.56)	65.02	134.89	3.20
VIII	Antracol – Ridomil - Antracol	20.47 (26.51)	55.30	118.20	2.45
IX	Ridomil – Ridomil - Ridomil	6.40 (14.65)	86.03	201.40	6.05
X	Ditahne – Dithane - Dithane	21.50 (27.62)	53.05	114.86	5.71
XI	Control	45.80 (42.59)	-	83.31	-
CD (0.05)		2.21	-	16.79	

* Transformed values in the parentheses.

protective fungicide viz Ridomil MZ if applied as first spray is able to provide desirable disease control. This may be due to the curative as well as protective action of this fungicide. The disease appeared during July in Himachal Pradesh when environmental conditions for disease development are favourable and disease pressure used to be very high when curative+protective fungicides are applied during this period provide better control of the disease. The schedule X, which commonly followed by the farmers, was found to be least effective as their application provided only 53.05 per cent disease control. There is no literature available on the scheduling of fungicides for the control of phytophthora blight in colocasia, however, three sprays of metalaxyl+mancozeb were reported effective in the management of colocasia blight (2).

High corm yields under schedules IX (201.40 q/ha), I (160.04 q/ha) and II (148.16 q/ha) showed their better efficiency, which was further supported by their high cost: benefit ratio (1: 6.05, 1: 6.80 and 1:7.45, respectively). The cost: benefit ratio was higher in schedule II and I as compared to schedule IX, but yield and PDI were significantly lower than schedule IX. The schedule X (farmer's practice have shown low yield (114.86 q/ha) and cost benefit ratio of 1: 5.71 (Table 2).

Therefore, it can be concluded that foliar spray of Ridomil MZ @ 0.25% at 15 days interval is the most effective in managing phytophthora blight of colocasia under field conditions followed by Blitox @ 0.20% and Dithane M-45 @ 0.25%.Out of 10 spray schedules tested for their comparative efficacy, the schedules IX (Ridomil–Ridomil–Ridomil) followed by schedules I (Ridomil–Blitox–Blitox) and II (Ridomil–Dithane M-45–Dithane M-45) were found most effective in the management of Phytopthora blight of colocasia.

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