Antifungal effect of botanicals against Cercospora beticola, the incitant of leaf spot of palak*

Palak (Beta vulgaris var. bengalensis Hort.) is one of the most popular leafy vegetables of tropical and subtropical region. It is widely grown in West Bengal, Uttar Pradesh, Bihar, Gujarat and Rajasthan. However, this crop is now gaining popularity in southern states like Karnataka. Since leaves are the edible parts in palak, so the foliar diseases play an important role. Among different fungal diseases, leaf spot caused by Cercospora beticola causes severe loss in case of palak. The disease mainly affects the leaves resulting in reduced market value. Since leaves are directly used for consumption, the application of fungicides causes harmful effects on human beings. So there is need to devise the non chemical methods of control to reduce the adverse effect of toxic chemical on health of human beings. Hence, an attempt was made to manage the disease through use of plant extracts. The fungitoxicity of eight plant extracts at three concentrations (10, 15 and 20%) under in vitro and six plant extracts at 20% under in vivo was assayed against Cercospora beticola. This study was conducted during 2010.

For *in vitro* evaluation; the plant extracts used were *Allium* sativum, Azadirachta indica, Chromoleana odoratum, Duranta repens, Lantana camera, Ocimum sanctum, Tridax procumbens, *Vinca rosea*. For the preparation of cold aqueous extract, leaves were used for all the plants except garlic for which cloves were used. Fresh plant materials were collected and washed first in tap water and then in distilled water. Hundred grams of fresh samples were chopped and then crushed in a surface sterilized pestle and mortar by adding 100 ml sterile distilled water (1: 1 w/ v). The extract was filtered through two layers of muslin cloth. Finally, filtrate thus obtained was used as stock solution. To study the antifungal potential of plant extracts, the poisoned food technique was used (Nene and Thapliyal, 1973). Ten, fifteen and twenty ml of stock solution was mixed with 90, 85 and 80 ml of sterilized molten potato dextrose agar (PDA) media, respectively so as to get 10, 15 and 20 per cent concentrations. The medium was thoroughly shaken for uniform mixing of extract. Twenty ml of medium was poured in the sterile Petriplates. Five mm size discs from periphery of actively growing culture were cut out by sterile cork borer and one such disc was placed at the centre of each Petriplate. Controls were also maintained by growing the pathogen on PDA plates. Then such plates were incubated at 25°C temperature for thirty days and radial growth was taken when maximum growth occurred in the control plates.

The efficacy of plant products or botanicals was expressed as per cent inhibition of radial growth over the control which was calculated by using the following formula (Vincent, 1947):

$$I = \frac{C - T \times 100}{C}$$

I: Per cent inhibition

C: Radial growth in control

T: Radial growth in treatment

The per cent values were converted to angular transformed values for statistical analysis.

For in vivo evaluation of botanicals: the palak seedlings

were grown in earthern pots. The effective botanicals evaluated under *in vitro* studies were further evaluated under pot culture. Each treatment was replicated thrice. The mycelial bits were smeared on the leaf surface to create the disease. After initiation of symptoms the botanicals like *Tridax procumbens*, *Chromoleana odoratum*, *Allium sativum*, *Azadirachta indica*, *Lantana camera*, *Durantha repens* were sprayed individually to respective sets of pots. Palak plants smeared with mycelial bits without botanical treatment were served as control.

Observations were recorded on severity of disease by using 0-5 scale and per cent disease index was calculated by using the following formula given by (Wheeler, 1969)

in vitro evaluation of among different botanicals, *Tridax* procumbense was found effective (40.04%) in inhibiting mycelial growth, (Table 1), *Chromoleana odoratum* (33.46%) *Allium sativum* (30.66%) were next best treatments followed by *Duranta repens* (26.5%), *Lantana camera* (24.88%) and *Azadirachta indica* (24.52%). Least inhibition was observed with *Vinca rosea* (19.04%) followed by *Ocimum sanctum* (19.67%).

The plant extracts at 20 per cent were significantly superior over 10 per cent concentration. *Tridax procumbens* (64.4%) at 20 per cent was the best treatment and significantly superior to

Table 1. Effect of plant extracts on inhibition of mycelial growth of *Cercospora beticola*

Plant extract	Per cent inhibition of			Mean
	mycelial g	rowth at		
	concentra	ition (%)		
	10	15	20	
Allium sativum	16.33	37.7	38.06	30.66
	(23.74)	(37.86)	(38.12)	(33.24)*
Azadirachta indica	22.2	21.06	30.30	24.52
	(27.58)	(27.29)	(33.29)	(29.38)
Duranta repens	20.7	21.1	37.70	26.5
	(27.06)	(27.31)	(37.86)	(31.09)
Chromoleana odoratum	22.93	32.5	44.96	33.46
	(28.59)	(34.78)	(42.09)	(35.31)
Lantana camera	22.2	25.5	26.96	24.88
	(28.09)	(30.31)	(31.26)	(29.88)
Ocimum sanctum	17.8	21.26	19.96	19.67
	(24.94)	(26.94)	(26.52)	(26.13)
Tridax procumbens	25.4	30.33	64.4	40.04
	(30.29)	(33.29)	(53.32)	(38.96)
Vinca rosea	18.4	20.33	18.4	19.04
	(25.37)	(26.77)	(25.42)	(25.85)
Mean	20.74	26.2	35.09	
	(26.95)	(30.56)	(35.98)	
	В	С	ВхС	
S.Em±	0.38	0.23	0.66	
CD at 1%	1.01	0.616	1.76	

* Figures in parenthesis indicate angular transformed value

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all other treatments. Next best were *Chromoleana odoratum* (44.96%) and *Allium sativum* (38.06%) @ 20%. At 10 per cent concentration, *Allium sativum* (16.33%) was least effective in inhibiting mycelial growth and was at par with *Ocimum sanctum* (17.8%).

In vivo evaluation of botanicals revealed that All the botanicals reduced the leaf spot incidence compared to untreated control. (Table 2). Among the various treatments tested, Allium sativum has given good result with least per cent disease index (7.26%) followed by Azadirachta indica (7.83%), Chromoleana odoratum (8.4%), Tridax procumbens (9.95%) and were found to be on par with each other. Duranta repens (11.41%) and Lantana camera (10.76%) were found less effective. Similarly, Benagi(1995) reported the efficacy of extracts of garlic, neem and Tridax in inhibiting the mycelial growth of *Phaeoisariopsis* personata under in vitro conditions. The fungicidal spectrum of Azadirachta indica was also investigated by Singh and Pande (1966). The fungicidal property in the neem plant part is due to presence of terpenoids (Jones et al., 1989). Benagi (1995) reported that Azadirachta indica was found effective in controlling late leaf spot of groundnut caused by *P. personata*. Bdliya and Alkali (2010) reported that neem seed and garlic extracts reduced the disease severity of Cercospora leaf spot of ground nut under in vivo condition.

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Table 2. Effect of botanicals on leaf spot disease of palak

Botanicals	Per cent disease index	
	(PDI)	
Allium sativum	7.26 (15.6)*	
Azadirachta indica	7.83 (16.2)	
Duranta repens	11.41 (19.7)	
Chromoleana odoratum	8.4 (16.7)	
Lantana camera	10.76 (19.1)	
Tridax procumbens	9.95 (18.3)	
Control	30.82 (33.7)	
S.Em ±	1.01	
CD at 1%	3.08	
CV	8.83	

^{*} Figures in parenthesis indicate angular transformed value

Present study, clearly indicated the higher fungitoxicity of *Tridax*, *Chromoleana* and garlic in inhibiting the mycelial growth of the pathogen at 20 per cent, whereas, garlic and tulsi were least effective at 10 per cent concentration under *in vitro* condition. In *in vivo* condition *Allium sativum*, *Azadirachta indica* at 20% were found most effective in reducing the leaf spot disease of palak.

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