Research Article

Management of pea powdery mildew (*Erysiphe polygoni*) by botanicals

■ **G.P. JAGTAP, P.V. KHALIKAR AND UTPAL DEY**

SUMMARY : Pea (*Pisum sativum* L.) occupies a prominent place in the vegetables in India. Powdery mildew disease on pea incited by fungus, *Erysiphe polygoni* DC is an important limiting factor in pea cultivation in Marathwada region of Maharashtra state. In botanical experiment results on the effects of leaf extract clearly showed that treatment Acacia was superior over all other treatments in both the conditions *i.e.* before appearance and after appearance of disease. It was observed that preventive sprays before appearance of disease were more beneficial than sprays after the disease appearance.

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BACKGROUND AND OBJECTIVES

Pea (*Pisum sativum* L.) is a valuable vegetable crop all over the world. Major states growing pea in India are Uttar Pradesh, Assam, West Bengal and Maharashtra. Production and productivity of pea has been very low. The most important constraint is powdery mildew of pea caused by *Erysiphe polygoni*. Amongst the diseases, the powdery mildew alone results into a huge economical loss. In the past few years, disease has been continuously observed to occur in Marathwada region. It becomes severe under dry weather and is responsible for heavy losses. Considering the economic importance of the powdery mildew disease, studies were undertaken with the objective to manage the disease with the help of chemicals and bioagents.

RESOURCES AND METHODS

Effect of leaf extracts on severity of powdery mildew:

An experiment was conducted in Factorial Completely Randomized Design with four replications during *Rabi* season 2006-2007 to observe the effect of various plant extract on severity of powdery mildew.

Treatments-Sixteen (Combination of I and II)

– Factor –I leaf extracts (3 % - 3 g/100 ml water)

T_1- *Azadiracta indica* 3 %, T_2-*Eucalyptus* 3 %, T_3-*Tapioca extract* 3 %, T_4-*Acacia* sp. 3 %,T_5-*Glyricidia* sp. 3 %,T_6-*Datura alba* 3 %, T_7-*Lantana camera* 3 %, T_8- Control

– Factor –II condition

F_1- Before appearance, F_2-After appearance

On observing the initial symptoms of powdery mildew on plants, the plants not showing symptoms of powdery mildew were taken for before appearance treatment while symptoms showing plants were taken for after appearance treatment second spraying was given 10 days after first spraying. Disease severity observations were recorded at interval of 10 days each spray as described earlier. Total three observations were taken. Observations of remaining leaflets per plants were taken at 30 days and 65 days after sowing by actually counting the leaflets.

OBSERVATIONS AND ANALYSIS

The observations of the present study as well as relevant analysis have been summarized

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under the following heads:

Effect of leaf extracts on powdery mildew severity:

Data presented in Table 1 to 5 clearly indicate that, the leaf extracts significantly reduced the disease severity over untreated control. In before appearance of powdery mildew condition, significantly lower disease severity was recorded in *Acacia* sp. (8.46 %) followed by *Datura alba* (9.71 %), *Eucalyptus* (10.23 %), *Glyricidia* (11.21 %), *Azadiracta indica* (13.00), *Tapioca* extract (14.4 %) and *Lantana camera* (16.61 %). The treatment *Eucalyptus* and *Azadiracta indica* were at par with each other. In case of sprays after appearance of powdery mildew condition, lowest disease severity was observed in *Acacia* sp. (33.19 %) followed by *Datura alba* (36.63 %), *Eucalyptus* (38.27 %), *Glyricidia* (40.93 %), *Azardirachta indica* (47.36 %), *Lantana camera* (48.46 %) and *Tapioca* extract (50.60 %). The treatments *Datura* and were at par with each other. Also treatment *Azadiracta indica* and *Lantana camera* were at par with each other. The disease severity in before appearance condition was significantly lower than severity in after appearance condition.

Disease severity (10 days after spraying) at 59 DAS:

All the leaf extracts treatments were significantly superior in reducing disease severity over untreated control (Table 2). In before appearance condition, treatments *Acacia* (11.93 %), *Datura alba* (13.86%) and *Glyricida* (15.80%) were recorded significantly lower disease severity. The next best treatments were *Eucalyptus* (17.33%), *Azadiracta indica* (18.93 %), *Tapioca* extract (20.99%) and *Lantana* camera (22.73). The treatments *Lantana camera*, *Tapioca* extract, *Azadiracta indica* and *Eucalyptus* were statistically similar in their effect. In after appearance condition, treatment of *Acacia* leaf extract recorded lowest severity (38.13 %). The treatments *Datura alba* (44.60 %) and *Eucalyptus* (43.40 %) were at par with each other. The next best treatment was *Glyricida* sp. (47.20 %). After this treatments *Azadiracta indica* (52.93 %) and *Lantana camera* (54.46 %) were effective and at par with each other.

Table 1 : Effect of leaf extract (3 %) of different species on powdery mildew severity of pea cultivar Khaperkheda at 49 DAS

| Sr. No. | Treatments | Condition | | Mean |
		F_1 – before appearance	F_2 – after appearance	
T_1	*Azadiracta indica*	13.00 (21.11)	47.36 (43.48)	30.18 (32.42)
T_2	*Eucalyptus*	10.23 (21.07)	38.27 (38.21)	24.25 (29.47)
T_3	*Tapioca* extract	14.4 (22.29)	50.60 (45.34)	32.50 (34.06)
T_4	*Acacia* spp.	8.46 (16.90)	33.19 (35.18)	20.82 (27.13)
T_5	*Glyricidia* spp.	11.21 (19.54)	40.93 (39.77)	26.07 (30.12)
T_6	*Datura alba*	9.71 (18.15)	36.63 (37.83)	23.17 (28.54)
T_7	*Lantana camera*	16.61 (24.05)	48.46 (44.11)	32.54 (34.11)
T_8	Control	20.95 (27.21)	59.79 (50.64)	40.37 (39.55)
		Treatments	Condition	Interaction
	S.E. $\pm$	0.135	0.271	0.383
	C.D. (P=0.05)	0.375	0.749	1.060

Figures in parenthesis are arcsine transformed values

Table 2 : Effect of leaf extract (3 %) of different species on powdery mildew severity of pea cultivar Khaperkheda at 59 DAS

| Sr. No. | Treatments | Condition | | Mean |
		F_1 – before appearance	F_2 – after appearance	
T_1	*Azadiracta indica*	18.93 (25.78)	52.93 (46.68)	35.93 (36.16)
T_2	*Eucalyptus*	17.33 (25.16)	43.40 (41.20)	30.37 (34.82)
T_3	*Tapioca* extract	20.99 (27.26)	57.33 (49.21)	39.16 (38.98)
T_4	*Acacia* sp.	11.93 (20.20)	38.13 (38.12)	25.03 (31.07)
T_5	*Glyricidia* sp.	15.80 (23.41)	47.20 (43.49)	31.50 (34.04)
T_6	*Datura alba*	13.86 (21.86)	44.60 (41.93)	29.23 (31.74)
T_7	*Lantana camera*	22.73 (28.47)	54.46 (47.56)	38.60 (38.11)
T_8	Control	31.18 (33.90)	67.79 (55.42)	49.49 (45.26)
		Treatments	Condition	Interaction
	S.E. $\pm$	0.164	0.328	0.465
	C.D. (P=0.05)	0.455	0.909	1.286

Figures in parenthesis are arcsine transformed values

Table 3 : Effect of leaf extract (3 %) of different species on powdery mildew severity of pea cultivar Khaperkheda at 69 DAS

Sr. No.	Treatments	Condition		Mean
		F_1 – before appearance	F_2 – after appearance	
T_1	*Azadiracta indica*	27.73 (31.77)	59.86 (50.69)	43.80 (40.87)
T_2	*Eucalyptus*	24.81 (29.81)	49.13 (45.00)	36.97 (37.06)
T_3	*Tapioca* extract	31.46 (34.11)	66.13 (44.50)	48.80 (43.52)
T_4	*Acacia* sp.	16.59 (24.04)	44.31 (41.73)	30.45 (33.67)
T_5	*Glyricidia* sp.	22.91 (28.59)	54.20 (47.40)	38.56 (37.74)
T_6	*Datura alba*	19.93 (26.51)	50.88 (55.00)	35.41 (36.29)
T_7	*Lantana camera*	35.31 (36.46)	61.53 (51.66)	48.42 (44.51)
T_8	Control	63.49 (52.82)	75.73 (60.48)	69.61 (47.27)
		Treatments	Condition	Interaction
	S.E. $\pm$	0.868	1.737	2.457
	C.D. (P=0.05)	2.404	4.808	6.799

Figures in parenthesis are arcsine transformed values

Table 4 : Effect of leaf extract of different plant species remaining leaflets of new cultivar Khaperkheda at 40 DAS

Sr. No.	Treatments	Condition		Mean
		F_1 – before appearance	F_2 – after appearance	
T_1	*Azadiracta indica*	1.20	17.7	14.9
T_2	*Eucalyptus*	12.20	11.2	11.7
T_3	*Tapioca* extract	12.40	12.8	12.6
T_4	*Acacia* sp.	10.60	10.4	10.5
T_5	*Glyricidia* sp.	11.20	10.6	10.9
T_6	*Datura alba*	12.80	12.2	12.5
T_7	*Lantana camera*	12.20	17.8	15.0
T_8	Control	10.60	10.4	10.5
		Treatments	Condition	Interaction
	S.E. $\pm$	0.212	0.425	0.601
	C.D. (P=0.05)	NS	1.176	NS

NS=Non-significance

Table 5 : Effect of leaf extract of different plant species on remaining leaflets of cultivar Khaperkheda at 72 DAS

Sr. No.	Treatments	Condition		Mean
		F_1 – before appearance	F_2 – after appearance	
T_1	*Azadiracta indica*	7.4	4.60	6.00
T_2	*Eucalyptus*	7.8	5.40	6.60
T_3	*Tapioca* extract	9.2	7.60	8.20
T_4	*Acacia* sp.	5.45	3.80	4.63
T_5	*Glyricidia* sp.	8.4	7.40	7.90
T_6	*Datura alba*	6.4	4.80	5.60
T_7	*Lantana camera*	8.8	7.80	8.30
T_8	Control	9.8	5.00	7.40
		Treatments	Condition	Interaction
	S.E. $\pm$	0.197	0.394	0.558
	C.D. (P=0.05)	0.546	1.091	1.543

Highest disease severity was observed in untreated control (67.79 %).The severity in before appearance treatments was significantly lower than that after appearance treatments.

Disease severity (10 days after spraying) at 69 DAS:

In before appearance condition, *Acacia* sp. (16.59%) followed by *Datura alba* (19.93) continued to be the most effective leaf extract which recorded significantly lower

severity. The next best treatments were *Glyricidia* sp. (22.91 %), *Eucalyptus* (24.81 %), *Azardiracta indica* (27.73 %), *Tapioca* extract (31.46 %) and *Lantana camera* (35.31 %). The treatments *Datura alba, Glyricidia and Eucalyptus* were statistically at par with each other. In case of after appearance condition, *Acacia* sp., *Eucalyptus* sp., *Datura alba* and *Glyricidia* significantly reduced the disease severity over control. The difference within condition before and after appearance was significant. Results clearly showed that leaf extracts like *Acacia, Eucalyptus, Datura alba* significantly reduced the disease severity, whereas before appearance condition had significantly lower severity than after appearance condition. However sprays after 60 DAS were of no use in reducing the severity.

Effect of leaf extract on remaining leaflets:

The data on remaining leaflets as influenced by various leaf extracts treatments are presented in Table 4.

Remaining leaflets 40 DAS:

Results showed that remaining leaflets in case of before appearance were more in *Datura alba* (12.80 %) followed by *Tapioca* extract (12.40 %) and other three of same *i.e.* *Eucalyptus* (12.20 %), *Azadiracta indica* (12.20 %) and *Lantana camera* (12.20 %). Treatments *Azardiracta indica, Eucalyptus, Lantana camera* and *Tapioca* extracts were at par with each other.

In case of after appearance, all the treatments were having significantly higher remaining leaflets than control. Highest was observed in *Lantana camera* (17.8 %) followed by *Azadiracta indica* (17.20 %), *Tapioca* extract (12.8 %) and *Datura alba* (12.2 %). Treatments *Acacia* sp., *Glyricida* sp. and *Eucalyptus* were at par with each other. Highest number of leaflets were recorded in *Acacia* sp. (6) followed by *Glyricidia* sp. (5), *Eucalyptus* spp. (5), *Datura alba* (4), *Tapioca* extract (4), *Azadiracta indica* (3) and *Lantana camera* (3), significantly lower number of leaflets were recorded in control (2). Before appearance condition recorded significantly higher number of leaflets than after appearance.

Remaining leaflets 72 DAS:

All the treatments were having 11 to 13 leaflets per plant after 72 days of sowing (Table 5). The difference in remaining leaflets in all treatments were significant. Results showed that in case of before appearance to remaining leaflets were significantly more in *Tapioca* extract (9.2 %), *Lantana camera* (8.8 %), *Glyricidia* sp. (8.4 %) and *Eucalyptus* (7.8 %) followed by *Azadiracta indica* (7.4 %), *Datura alba* (6.4 %) and *Acacia* sp. (5.45 %). In case of after appearance, all the treatment were having significantly higher remaining leaflets than control. Highest number of leaflets were recorded in *Acacia* sp. (7), *Datura alba* (6) and *Azadiracta indica* (5), treatments followed by *Eucalyptus* sp. (5), *Glyricidia* sp. (4), *Lantana camera* (4) and *Tapioca* extract (2) significantly lower number of leaflets were recorded in control (2). Before appearance condition recorded significantly higher number of leaflets than after appearance. Similar observations were reported earlier on powdery mildew (Sindhan *et al.,* 1999, Singh and Prithviraj, 1996, Singh and Prithviraj, 1997 and Rettinassabababy *et al.,* 2000).

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