Research Paper :

Effect of plant extracts on the growth and spore germination of *Alternaria porri*

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SUMMARY

The results revealed that all the plant extracts *viz., Azadirachta indica* (Neem), *Clerodendron inerme* (Clerodendron) and *Pongamia pinnata* (Pongamia) were significantly effective in inhibiting the growth and spore germination of *A. porri* except the extract of *Sitaphal*. Irrespective of the concentrations, neem leaf extract was observed to be the most effective botanical recording the highest reduction of growth (56 %). The next best treatments were the extract of pongamia (54 %) and clerodendron (51.10%). Sitaphal was least effective in reducing the fungal growth (12 %). The plant extracts (leaf) irrespective of the species were found to be most effective at 15 per cent concentration. Maximum reduction of mycelial growth (74 %) was observed at 15 per cent concentration which was significantly superior to 41 per cent reduction in the mycelial growth at 5 per cent concentration and 53.00 % reduction in the mycelial growth at 10 per cent concentration. Similarly, all the plant extracts were significantly effective in inhibiting the spore germination of *A. porri*. Irrespective of the concentrations, neem leaf extract proved to be the most effective botanical and recorded the highest spore inhibition (56 %) followed by the extracts of pongamia (67.70%) and clerodendron (58.40%). Sitaphal was least effective in inhibiting the spore germination (14.40%). The plants extracts irrespective of the species were found to be most effective at 15 per cent concentration. Maximum inhibition of spore germination (92.30%) was observed at 15 per cent concentration which was significantly superior over 5 per cent (48.60%) and 10 per cent (71.60%).

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Onion (*Allium cepa* L.) is an important bulb crop of India belonging to the family Alliaceae. In India, the onion crop occupies an area of 0.4546 million hectares with a total production of 6034.25 million tonnes (Anonymous, 2005-06). Several factors contribute to the low productivity of onion. Diseases like purple blotch, downy mildew, *Stemphylium* blight, basal rot and storage rot are known to be more significant in reducing the production of the crop. Of these, purple blotch is the most destructive disease, prevalent in almost all onion growing areas of the world causing heavy losses under field conditions. In Guntur district the disease has become prevalent causing heavy losses to onion farmers in recent times.

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MATERIALS AND METHODS

Plant extracts with antimicrobial property are relatively cheaper, safer and non-hazardous and can be used successfully against the plant pathogenic fungi. The present investigation was aimed to study the antifungal effects of certain plant extracts on the *Alternaria porri*. The following plant extracts were selected for the study:

Preparation of plant extract:

Fresh plant materials were collected and washed first in tap water and then in distilled water. One hundred gram of fresh sample was chopped and then crushed in a surface sterilized pestle and mortar by adding 100 ml of sterile distilled water (1:1 w/v). The extracts were filtered through two layers of muslin cloth and then through Whatman No. 2 filter paper. Finally filtrate thus obtained was used as stock solution. The stock solution of each plant species was diluted with required amount of

Sr. No.	Botanical name	Common name	Family	Plant parts used
1.	*Azadirachta indica*	Neem	Meliaceae	Leaf
3.	*Pongamia pinnata*	Honge	Simarubaceae	Leaf
2.	*Clerodendron inerme*	Kashmir bouquet	Verbenaceae	Leaf
4.	*Annona squamosa*	Sitaphal	Anacadiaceae	Leaf

sterile water to obtain extracts of 5, 10 and 15 per cent concentrations separately.

To study the antifungal mechanism of plant extracts, extract of each plant species at three concentrations *viz.,* 5%, 10% and 15% was tested separately for its effect against the growth of *Alternaria porri* by using poisoned food technique as suggested by Nene and Thapliyal (1982). Potato dextrose agar medium was prepared and sterilized in an autoclave as described earlier. To the melted and cooled Potato dextrose agar at 45°C, required quantity of the plant extract was added so as to get a required concentration. The plant extract was homogenously mixed with the Potato dextrose agar medium. The medium was then poured into Petri dishes and allowed to solidify. Discs of 5 mm size cut from the colony of *Alternaria porri* were transferred on to the Potato dextrose agar medium containing the plant extracts. Agar plates without any plant extract but inoculated with *Alternaria porri* served as control. Each plant extract at each concentration replicated four times. All the Petri dishes were incubated at room temperature (28±1°C) for nine days. Observations on the growth of *Alternaria porri* were made in the case of all plant extracts and control and expressed as per cent growth inhibition of *Alternaria porri* over control using the following formula as suggested by Nene and Thapliyal (1982):

$$I\,(\%) = \frac{C - T}{C} \times 100$$

I – Per cent growth inhibition

C – Radial growth in control

T – Radial growth in treatment

The effect of above plant extracts at different concentrations on spore germination of *Alternaria porri* was studied by using cavity slides. In the well of a cavity slide, 0.2 to 0.5 ml of each concentration of each plant extract was placed and dried at room temperature. The same amount of conidial suspension (2.8×10^2 spores/ml) of *Alternaria porri*, prepared in sterile water was added over the dried plant extract and the slides were incubated in a humid chamber at 28±1°C. Cavity slide having only spore suspension without plant extracts was taken as control. Each plant extract at each concentration replicated four times with one cavity slide as one replication. After 24 h, observation on the number of spores germinated was recorded and per cent inhibition of spore germination was calculated by using the formula as suggested by Nene and Thapliyal (1982).

RESULTS AND DISCUSSION

The results (Table 1) revealed that *Trichoderma viride* (88.65%) and *Trichoderma harzianum* (86.85%) were highly effective in inhibiting the growth of *A. porri in vitro* followed by *Trichoderma koningii* (76.58%) and *Pseudomonas fluorescens* (72.55%). Least inhibition (68.50%) was noticed with *Trichoderma resei***.**

Table 1 : Effect of plant extracts on the inhibition of mycelial growth of *Alternaria porri* on Potato dextrose agar medium

Sr. No.	Plant extracts	Inhibition of mycelial growth (%)
1.	*Trichoderma viride*	88.65 (70.27)
2.	*Trichoderma harzianum*	86.85 (68.70)
3.	*Trichoderma koningii*	76.58 (61.00)
4.	*Trichoderma resei*	68.50 (55.86)
5.	*Pseudomonas fluorescens*	72.55 (58.37)
6.	Check *(Alternaria porri* alone)	00.00 (00.00)
S.E ±		0.27
C.D. (P=0.01)		1.13

Values in Arc sine are transformed values

Similarly highest reduction in spore germination was observed by *Trichoderma viride* (81.65%) which was significantly superior to all other bio-control agents tested. Next best was *Trichoderma harzianum* (76.72%) followed by *Trichoderma koningii* (68.50%) and *Pseudomonas fluorescens* (57.33%). Least inhibition (41.50%) was noticed with *Trichoderma resei***.**

Similar studies on the efficacy of *Trichoderma* spp. and *P. fluorescens* against *Alternaria* species were previously reported by Deshmukh and Raut (1992), Leifort *et al*. (1992), Rukmani and Mariappan (1994), Kota (2003), Savitha (2004) and Rao (2006). Dennies and Webster (1971) expressed that the antagonism of *Trichoderma* spp. against many fungal plant pathogens might be due to the production of acetaldehyde, which is

Table 2 : Effect of plant extracts on the inhibition of spore germination of *Alternaria porri*

Sr. No.	Plant extracts	Inhibition of spore germination (%)
1.	*Trichoderma viride*	81.65 (64.60)
2.	*Trichoderma harzianum*	76.72 (61.14)
3.	*Trichoderma koningii*	68.50 (55.86)
4.	*Trichoderma resei*	41.65 (40.16)
5.	*Pseudomonas fluorescens*	57.33 (49.20)
6.	Check (*Alternaria porri* alone)	00.00 (00.00)
S.E. ±		0.25
C.D. (P=0.01)		1.04

Values in Arc sine are transformed values

a carbonyl compound.

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