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# EFFICACY OF PLANT EXTRACTS ON SEED-BORNE PATHOGENS OF SUNFLOWER

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**ABSTRACT**

Aqueous leaf extracts (10%) from 22 plant species belonging to 17 families were screened *in vitro* against three seedborne fungal pathogens of sunflower *viz., Alternaria helianthi, Macrophomina phaseolina* and *Fusarium solani*. The results revealed that the leaf extracts from *Delonix regia, Pongamia glabra* and *Acacia nilotica* could significantly inhibit the spore germination, mycelial growth and spore production of all the three seed-borne pathogens.

KEY WORDS : Sunflower, seed-borne pathogens, plant extracts

Sunflower (*Helianthus annuus* L.) crop is attacked by a large number of pathogens which are mostly carried through seed (Saharan and Chand, 1988). Control of seed-borne pathogens of sunflower by manipulation of host nutrition and by using fungicides has been reported (Pineda and Avila, 1991 ; Mahajan and More, 1991). But use of fungicides has its own limitations. The recent strategy of developing environmentally sound methods of disease management led to the identification and use of plant products as alternative sources for the existing fungicide. In this study, the effectiveness of 22 plant extracts belonging to 17 families were evaluated against three seed-borne fungal pathogens of sunflower *viz., Alternaria helianthi* (Hansf.), Tubaki and Nishihara, *Macrophomina phaseolina* (Tassi.) Goid and *Fusarium solani* (Mart.) Sacc.

## MATERIALS AND METHODS

### Preparation of extracts

Fresh plant tissues of various plant species were used for extracting the antifungal principles as per the method of Shekawat and Prasada (1971). The standard plant extract solution was diluted to 10 per cent concentration and tested for the inhibition of spore/sclerotial germination, mycelial growth and production.

Inhibition of spore/sclerotial germination was assessed by normal method (Anon., 1943)

Two replications were maintained for each treatment. The germination count of spore/sclerotial was taken after 72 hr and the per cent germination was recorded.

### Inhibition of mycelial growth by poisoned food technique

The standard plant extracts (100%) was heated to 50° C for 10 min. From this 10 ml of the extract was added to 90 ml of PDA medium for getting 10 per cent concentration. Twenty ml of this mixture was taken in each sterilised petridish. Six mm disc of pure cultures was taken from *A.helianthi, M. phaseolina* and *F.solani* grown on potato dextrose agar medium and inoculated at the centre of potato dextrose agar medium containing the plant extract. Two replications were maintained. The plates were incubated at 29 ± 1°C and the radial growth of the colony was measured seven days after inoculation (Schmitz, 1930).

### Inhibition of spore/sclerotial production

Mycelial disc (6 mm dia) of the fungus was taken from each petridish containing plant products separately. Each was transferred to a test tube containing 10 ml of sterile distilled water. It was shaken for five min to dislodge the conidia of *A.helianthi* and the macro conidia, micro conidia and chlamydospores of *F.solani*. In case of *M.phaseolina* it was stirred for 30 min to separate the sclerotia from the medium, washed in several changes of distilled water and transferred to a glass vial containing 2.5 ml of 2.5 per cent ammonium sulphate. The sclerotia that floated was filtered through a filter paper and rinsed with distilled water. The spores/sclerotia were counted using a

**Table 1. Effect of aqueous plant extracts (10%) on the spore/sclerotial germination and mycelial growth of *A. helianthi*, *M. phaseolina* and *F. solani***

| Plant extracts | Inhibition over control (%) | | | | | |
|---|---|---|---|---|---|---|
| | *A. helianthi* | | *M. phaseolina* | | *F. solani* | |
| | *Spore germination | *Mycelial growth | *Spore germination | *Mycelial growth | *Spore germination | *Mycelial growth |
| *Acacia nilotica* | 69.03 | 69.36 | 59.63 | 64.80 | 50.86 | 85.08 |
| *Acalypha indica* | 52.09 | 53.18 | 19.24 | 45.25 | 43.38 | 81.58 |
| *Aegle marmelos* | 36.92 | 40.46 | 53.26 | 49.61 | 22.15 | 41.81 |
| *Allium cepa* | 52.72 | 50.87 | 49.67 | 54.75 | 32.11 | 15.82 |
| *Aristolochia bracteata* | 15.61 | 20.81 | 25.44 | 21.23 | 22.05 | 49.72 |
| *Azadirachta indica* | 36.63 | 41.04 | 47.02 | 17.88 | 11.33 | 16.95 |
| *Bougainvillea spectabilis* | 14.19 | 19.65 | 26.92 | 2.23 | 4.34 | 4.52 |
| *Calotropis gigantea* | 23.85 | 11.56 | 7.95 | 16.76 | 17.87 | 11.53 |
| *Catharanthus roseus* leaf | 8.50 | 13.87 | 28.85 | 1.12 | 7.18 | 0.0 |
| *Delonix regia* | 73.57 | 75.14 | 62.58 | 89.39 | 48.44 | 81.92 |
| *Eucalyptus globulus* | 14.56 | 20.23 | 7.71 | 0.45 | 4.96 | 11.30 |
| *Lawsonia inermis* | 31.23 | 35.84 | 15.96 | 7.82 | 17.36 | 22.94 |
| *Mentha arvensis* | 30.64 | 35.84 | 52.13 | 59.78 | 33.49 | 49.72 |
| *Mirabilis jalapa* | 14.56 | 19.65 | 6.31 | 1.12 | 3.47 | 5.08 |
| *Nerium oleander* | 13.63 | 20.81 | 43.73 | 35.75 | 5.29 | 7.91 |
| *Ocimum sanctum* | 24.43 | 29.48 | 8.75 | 10.39 | 17.36 | 4.52 |
| *Parthenium hysterophorus* | 3.38 | 6.94 | 22.77 | 1.12 | 0.51 | 1.13 |
| *Piper betle* | 21.55 | 20.20 | 35.26 | 60.33 | 17.49 | 6.78 |
| *Pongamia glabra* | 70.16 | 70.52 | 72.79 | 100.00 | 73.94 | 87.00 |
| *Prosophis spiciegra* | 61.70 | 64.74 | 10.28 | 0.00 | 16.51 | 15.82 |
| *Vitex negundo* | 21.86 | 25.43 | 42.53 | 43.58 | 22.21 | 16.95 |
| *Catharanthus roseus* (flower) | 9.18 | 12.72 | 3.92 | 1.68 | 5.07 | 0.0 |
| Dithane M 45 | 70.96 | 100 | 76.6 | 100.0 | 58.11 | 91.53 |
| Control | - | - | - | - | - | - |

* Mean of two replications.

haemocytometer. Suitable controls were maintained. Each treatment was replicated four times. Dithane M-45 was used for comparison. The inhibition of spore germination, mycelial growth and spore production was calculated using the formula of Vincent (1927).

## RESULTS AND DISCUSSION

### Inhibition of spore/sclerotial germination

Among the 22 aqueous leaf extracts, the extracts from *Pongamia glabra*, *Delonix regia* *Acacia nilotica* showed maximum inhibition of spore germination of all the three seed-borne pathogens to an extent of more than 60 percent (Table 1).

However, among the three extracts, those from *D.regia* and *P.glabra* showed maximum spore inhibition of *A.helianthi* (73.57% and 70.16% respectively), those from *P.glabra* showed maximum inhibition of *M.phaseolina* and *F.solani* (72.79% and 72.79% respectively). The effect of fungicide Dithane M-45 was on par or next effective to that of the plant extracts.

Table 2. Effect of selected leaf extracts (aqueous) on spore/sclerotial production of *A. helianthi*, *M. phaseolina* and *F. solani*

| Leaf extracts | *A. helianthi* | | *M. phaseolina* | | *F. solani* | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Spores* ($X10^2$) | Inhibition over control (%) | Sclerotia* ($X10^2$) | Inhibition over control (%) | Macro* conidia ($X10^2$) | Inhibition over control (%) | Micro* conidia ($X10^2$) | Inhibition over control (%) | Chlamydo spore* ($X10^2$) | Inhibition over control (%) |
| *A. nilotica* | $4.88^c$ (2.3) | 72.16 | $4.64^c$ (2.265) | 54.33 | $4.093^a$ | 80.67 | $3.825^b$ | 56.65 | $1.020^a$ | 53.49 |
| *P. glabra* | $4.78^c$ (2.3) | 72.73 | $0.0^a$ (0.71) | 100.00 | $3.970^a$ | 81.25 | $3.630^b$ | 58.87 | $1.050^a$ | 52.12 |
| *D. regia* | $3.23^b$ (1.92) | 81.57 | $3.23^b$ (1.93) | 68.20 | $5.800^b$ | 72.61 | $4.128^c$ | 53.22 | $1.743^b$ | 20.52 |
| Dithane M 45 | $0.0^a$ (0.71) | 100.00 | $0.0^a$ (0.71) | 100.00 | $5.175^b$ | 75.56 | $2.263^a$ | 74.30 | $1.018^a$ | 53.57 |
| Control | $17.53^d$ | - | $10.16^d$ | - | $21.175^c$ | - | $8.825^d$ | - | $2.193^c$ | - |

* Mean of four replications.
Data in parentheses indicate square root transformed values.
In a column, means followed by a common letter are not significantly different at 5% level by DMRT.

## Inhibition of mycelial growth

The aqueous leaf extracts from *P.glabra*, *D.regia* and *A.nilotica* showed maximum inhibitory effect of more than 64 per cent on the mycelial growth of all the three seed-borne pathogens (Table 1). However, among them maximum inhibition was observed in leaf extract from *D.regia* against *A.helianthi* (75.14%), *P.glabra* against *M.phaseolina* (100%) and *P.glabra* and *A.nilotica* (87% and 85.08% respectively) against *F.solani*. The fungicide Dithane M-45 had the maximum inhibitory effect on the mycelial growth of the pathogens.

## Inhibition of spore/sclerotial production

All the above three leaf extracts significantly reduced the spore production of all the three seed-borne pathogens (Table 2). Maximum inhibition was observed in *D.regia* against *A.helianthi*, in *P.glabra* against *M.phaseolina* and in *P.glabra* and *A.nilotica* against *F.solani*. Dithane M-45 showed maximum reduction in spore production or on par to leaf extracts.

Leaf extracts from *Aegle marmelos*, bulb extract from *Allium sativum* and flower extract from *Catharanthus roseus* were effective against *A. solani* on tomato (Vijayan, 1989). Leaf extract from *A. marmelos* and *Prosophis juliflora* were effective against *A. tenuissima* on onion (Narasimhan *et al.*, 1995) have also been found very effective in inhibiting the growth of the pathogens.

In respect of *M.phaseolina*, earlier reports revealed the effectiveness of onion bulb extract, garlic + pepper + ginger rhizome extract on the mycelial growth and sclerotial production in soybean (Muthusamy, 1989). In respect of *Fusarium* sp. there are reports to show the effectiveness of leaf extracts from *Allemanda cathartica*, *Cassia nodosa*, *Samanea saman* and *Peltophorum pterocarpum* in the inhibition of spore germination (Reddy and Reddy, 1987) and of leaf extracts from *Glyricidia maculata* and *Acacia sp.*, on the mycelial growth of *F.moniliforme* (Ravichandran, 1987). Flavanoids present in the extracts of *P.glabra* were found responsible for the inhibition of spore germination and mycelial growth of *A.solani*, *M.phaseolina* and *F.udum* (Pan *et al.*, 1985). Volatile and nonvolatile components in *Citrus medica*, *Ocimum canum* and *Pinus roxburghii* (Dubey, 1991) or flavanoids and protoanemonin compounds in the leaf extracts from *Clemantis goyrisna* inhibited the growth of *A.tenuissima* and *F.nivale* (Misra and Dixit, 1977). In the present study also presence of similar antimicrobial substances might be responsible for their inhibitory action of the leaf extracts on the seed-borne pathogens.

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# TARGETED YIELD CONCEPT IN A RICE-RICE-RESIDUAL PULSE CROPPING SEQUENCE UNDER IPNS IN TYPIC USTROPEPTS OF LOWER BHAVANI PROJECT AREA OF TAMILNADU

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## ABSTRACT

With a view to assess the extent of fertiliser requirement under Integrated Plant Nutrition System (IPNS) for rice-rice-residual pulse cropping sequence, field experiments were conducted in Typic Ustropept soils of Lower Bhavani Project area in Tamil Nadu. Making use of the data generated from the field experiments conducted on Inceptisol, targeted yield equations were developed for rice in *kharif* and *rabi* seasons. From these equations, the quantity of chemical fertilisers that could be adjusted to the levels and sources of organic manures was evaluated to be 38 kg N, 13 kg $P_2O_5$ and 33 kg $K_2O$/ha for fertilisers with GM ; 10-12 kg $P_2O_5$/ha for fertilisers with PB ; 40 kg N, 26 kg $P_2O_5$ and 33 kg $K_2O$/ha for fertilisers with GM plus PB.

KEY WORDS : Targeted yield concept, IPNS, fertiliser requirement