

***In Vitro* Evaluation of Plant Extracts on Per Cent Inhibition of Uredospore Germination of *Puccinia helianthi* Casual Agent of Sunflower Rust**

V. B. NARGUND, G. K. SUDARSHAN, ASHOK KUMAR, G. B. SHIVAKUMARA AND B. MANJUNATH

*Department of Plant Pathology, University of Agricultural Sciences
 Raichur, Karnataka, India
 E-mail : manjunathkrishi@gmail.com*

Abstract

In the present investigation 20 commonly available plants were collected and extracted to know the fungitoxicant properties of them on the uredospore germination of *Puccinia helianthi*. The extraction was done in a sterilized pestle and mortar by using distilled water. *Nerium oleander*, *Amaranthus viridis*, *Pongamia glabra*, *Melia azaderach* and *Azadirachta indica* inhibited maximum uredospore germination at 7.0 and 10.0% concentration among the 20 plant extracts evaluated under *in vitro* conditions. Kernel extract of *Azadirachta indica* showed more fungitoxic activity than leaf extract against uredospore germination of *Puccinia helianthi*. Leaf extract of *Bougainvillea spectabilis*, *Ocimum Sanctum*, *Parthenium hysterophorus* and *Vinca rosea* (flower) were also effective in inhibiting >60.0% uredospore germination. *Mimosa pudica* was not effective in inhibiting the uredospore germination.

Key words : Plant extracts, Uredospore germination, *Puccinia helianthi*, Sunflower rust.

Sunflower (*Helianthus annus* L.) is one of the most important sources of vegetable oil next to groundnut in the world. It is rich source of edible oil (40 to 52%), sunflower oil is considered as good quality oil from health point of view due to high concentration of polynusaturated fatty acids which are known to reduce the risk of coronary diseases. Continuous use of chemical fungicides in the management of disease leads to the development of resistance in the pathogen and also cause deleterious effect on existing ecosystem. Hence, screening of plant products for antifungal activity against the pathogen is essentially required to minimize the use of fungicides for consideration of inclusion in the integrated management of the diseases. The use of fungicides is an alternate method of controlling the disease when resistant varieties or resistant sources are not available, or when there is break down of resistance in commercial varieties by the evolution of new virulence of pathogen. Hence an attempt was made to evaluate the fungitoxicant properties of different plant species on the uredospore germination of *Puccinia helianthi*.

Methods

Twenty commonly available plants were collected

and extracted to know the fungitoxicant properties of them on the uredospore germination of *Puccinia helianthi*. The extraction was done in a sterilized pestle and mortar by using distilled water. The extracts were strained through two layers of cheese cloth and finally made up to required concentration viz., 2.5, 5.0, 7.0 and 10.00% by adding distilled water. Thus obtained extracts of different concentrations of each plant species were tested *in vitro* on the germination of uredospores. Concentrations of each plant extract were replicated thrice in cavity slides, one hundred uredospores were observed 24 hours after incubation in moist chamber. A control treatment was also maintained with distilled water. Per cent inhibition of uredospore germination over control was calculated. The list of plant extracts used *in vitro* evaluation against uredospore germination is presented.

$$\text{Per cent inhibition of spore germination} = \frac{C - T}{C} \times 100$$

Where, C = Germination of uredospore in control, T = Germination of uredospore in treatment.

Results and Discussion

Plant derivatives possessing pesticidal proper-

Table 1. List of plant extracts used *in vitro* evaluation against uredospore germination.

	Botanical name	Common name	Family	Plant part used
1	<i>Amaranthus viridis</i> L.	Green amaranth	Amaranthaceae	Leaf
2	<i>Azadirachta indica</i> Juss. (leaf)	Neem tree	Meliaceae	Leaf
3	<i>Azadirachta indica</i> Juss. (NSKE)	Neem tree	Meliaceae	Seed
4	<i>Bougainvillea spectabilis</i> L.	Bougainvillea	Nyctaginaceae	Leaf
5	<i>Cyperus rotundus</i> L.	Common sedge	Cyperaceae	Leaf
6	<i>Delonix regia</i> L.	Red gulmohar	Caesalpiniaceae	Leaf
7	<i>Lawsonia inermis</i> L.	Common lantana	Verbenaceae	Leaf
8	<i>Lantana camera</i> L.	Mehandi	Lythraceae	Leaf
9	<i>Melia azedarach</i> L.	Persian Lilac	Meliaceae	Leaf
10	<i>Mimosa pudica</i> L.	Touch me not	Mimosaceae	Leaf
11	<i>Nerium olender</i> L.	Olender	Apocynaceae	Leaf
12	<i>Ocimum sanctum</i> L.	Holy basil	Lamiaceae	Leaf
13	<i>Parthenium hysterophorus</i> L.	Carrot grass	Asteraceae	Leaf
14	<i>Pongamia glabra</i> Vent.	Karanj tree	Papilionaceae	Leaf
15	<i>Prosopis julifera</i> L.	Bellary jail	Mimosaceae	Leaf
16	<i>Ricinus cummunis</i> L.F.Br.	Castor	Euphorbiaceae	Leaf
17	<i>Thuja orientalis</i> L.	Chinese arporvitae	Cupressaceae	Leaf
18	<i>Tridex procumbens</i> L.	Coat buttons	Asteraceae	Leaf
19	<i>Vinca rosea</i> L. (leaf)	Periwinkle	Apocynaceae	Leaf
20	<i>Vinca rosea</i> L. (flower)	Periwinkle	Apocynaceae	Flower

ties are gaining worldwide interest as an alternative or as supplements for the existing pesticides. The products will help in reducing cost, environmental

hazards, development of resistance by pathogens to fungicides. Keeping this in view, this experiment was conducted to assess the antifungal activity of 20

Table 2. Evaluation of different plant extracts on per cent inhibition of uredospore germination of *Puccinia helianthi*, casual agent of sunflower rust. *Original values, **Arc sine values.

Botanical name	Per cent inhibition at concentration (%)			
	2.0	5.0	7.0	10.0
<i>Amaranthus viridia</i> L.	31.88* (34.36)**	52.96 (46.69)	70.15 (56.89)	76.48 (60.98)
<i>Azadirachta indica</i> Juss. (leaf)	11.59 (19.82)	27.53 (31.62)	40.57 (39.56)	50.72 (45.41)
<i>Azadirachta indica</i> Juss. (NSKE)	31.51 (34.15)	48.48 (44.12)	61.55 (51.67)	72.06 (58.10)
<i>Bougainvillea spectabilis</i> L.	21.05 (27.28)	44.26 (41.69)	51.51 (45.86)	66.20 (54.45)
<i>Cyperus rotundus</i> L.	8.79 (17.24)	23.51 (28.98)	31.22 (34.29)	49.93 (44.95)
<i>Delonix regia</i> L.	11.59 (19.82)	25.02 (29.65)	31.22 (33.96)	44.13 (41.62)
<i>Lawsonia inerma</i> L.	15.14 (22.85)	27.26 (31.42)	44.92 (42.07)	60.60 (51.12)
<i>Lantana camera</i> L.	12.08 (20.26)	24.23 (29.46)	30.29 (33.38)	42.41 (40.62)
<i>Melia azedarach</i> L.	21.20 (27.38)	43.93 (41.50)	62.11 (52.01)	75.23 (59.51)
<i>Mimosa pudica</i> L.	7.30 (15.37)	9.05 (17.14)	15.14 (22.88)	31.81 (34.29)
<i>Nerium Olender</i> L.	34.99 (36.25)	63.63 (52.93)	71.20 (57.56)	78.63 (63.67)
<i>Ocimum Sanctum</i> L.	21.99 (27.90)	41.15 (39.89)	55.92 (48.40)	67.58 (54.64)
<i>Parthenium hysterophorus</i> L.	20.61 (26.96)	45.45 (42.38)	51.51 (45.86)	62.11 (52.01)
<i>Pongamia glabra</i> Vent.	27.92 (31.88)	49.99 (44.99)	57.30 (49.20)	75.03 (60.02)
<i>Prosopis julifera</i> L.	15.94 (23.48)	34.82 (369.15)	45.71 (42.53)	52.89 (46.66)
<i>Ricinus cummunis</i> L.F.Br	13.90 (21.87)	28.25 (32.02)	35.24 (36.39)	47.90 (43.79)
<i>Thuja orientalis</i> L.	11.69 (19.92)	24.96 (29.95)	42.16 (39.90)	50.89 (45.51)
<i>Tridex procumbens</i> L.	8.79 (17.24)	28.38 (32.17)	48.54 (44.16)	48.48 (44.12)
<i>Vinca rosea</i> L. (leaf)	8.79 (17.24)	31.24 (33.97)	45.35 (42.33)	51.46 (45.82)
<i>Vinca rosea</i> L. (flower)	19.37 (26.09)	42.66 (39.90)	49.99 (44.99)	61.33 (51.57)
SE ±	0.231	0.229	0.275	0.352
CD at 1%	0.885	0.879	1.055	1.34

plant extracts and the results are presented in Table 1.

The results indicated that the maximum per cent of inhibition of uredospore germination of *Puccinia helianthi* was recorded in *Nerium olender* (78.63%), *Amaranthus viridis* (76.48%), *Melia azedarach* (75.23%), *Pongamia glabra* (75.03%), *Azadirachta indica* (neem) kernel (72.06%) at 10% concentration. Further, leaf extract of *Bougainvillea spectabilis*, *Lawsonia inermis*, *Ocimum sanctum*, *Parthenium hysterophorus* and *Vinca rosea* (flower) were also effective in inhibiting > 60.0% uredospore germination (Table 2).

At 5.0% concentration two plant extracts namely *Amaranthus viridis* and *Nerium olender* showed more than 50% inhibition of uredospore germination, 14 showed 25—50% inhibition of uredospore germination three plant extracts showed 10—25% inhibition of uredospore germination while only one *Mimosa pudica* showed < 10.0% inhibition of uredospore germination.

Wadhawani et al. (1) reported complete inhibition of uredospore germination of *Puccinia helianthi* in crude leaf extract of *Amaranthus spinosus*, *Lagenaria sicerari* and *Nerium indicum*. Maximum inhibition of uredospore germination was observed in neem seed kernel extract compared to neem leaf extract at all the concentrations tested. The fungi-

cidal spectrum of neem, *Azadirachta indica* has already been investigated by Singh and Pande (2) and reviewed in detail by Parveen and Alam (3). Antifungal properties of *A. indica* was also established by Gherwande (4), Ganapathy and Narayanaswamy (5), Patil (6) and Khadar (7).

References

1. Wadhvani K., N. Mehrotra and S. K. Dudeja. 1986. The effect of some plant extracts on uredospore germination of *Puccinia helianthi*. *J. Poly.* 22 : 133—136.
2. Singh R. S. and K. R. Pande. 1966. Effect of green and mature plant residues and compost on population of *Pythium aphanidermatum* in soil. *Ind. Phytopath.* 19 : 367—371.
3. Parveen G. and M. M. Alam. 1993. Bioactivity against plant pathogens. Pp. 144—153. In H. S. Randhawa and B. S. Parmar (eds). *Neem research and development*. Publ. No. 3. Soc. Pesticide Sci., India.
4. Gherwande M. P. 1989. Management of foliar diseases of groundnut (*Arachis hypogea* L.) using plant extracts. *Ind. J. Agric. Sci.* 59 : 133—134.
5. Ganapathy T. and P. Narayanaswamy. 1990. Effect of plant products on the incidence of major diseases of groundnut. *Int. Arachis News Let.* 7 : 20—21.
6. Patil P. V. 1997. *Studies on sunflower rust caused by Puccinia helianthi Schw.* Ph.D. thesis. Univ. Agric. Sci., Dharwad, India. 238 pp.
7. Khadar S. K. 1999. *Management of foliar disease of groundnut (Arachis hypogea L.) with special reference to botanicals.* M.Sc. (Ag.) thesis. Univ. Agric. Sci., Dharwad, India. 133 pp.