

**EFFICACY OF VARIOUS BOTANICAL EXTRACTS ON TWIG BLIGHT OF MULBERRY CAUSED BY *Fusarium pallidroseum* (Cooke) Sacc.**

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Mulberry plant yields deciduous leaves which are the sole food for silkworm *Bombyx mori*. Among the several diseases affecting mulberry, twig blight caused by *Fusarium pallidroseum* (Cooke) Sacc. is prevalent in all mulberry growing areas and attacks all types of mulberry plants (Gunasekhar and Govindaiah, 1994). The disease causes blight of twigs, leaves, saplings and seedlings, besides causing die-back, basal rot and cutting rot, and severely damages plants and affects the quality and quantity of folia (Govindaiah *et al.*, 1990). The affected twigs show dark brown lesions and the leaves above infected portions either turn yellow or dry up leading to severe defoliation. A number of fungicides have been used to control the disease but some of these adversely affect silkworm health and cocoon quality (Gangawar *et al.*, 2000). Some plant extracts possess anti-microbial properties and among these pepper and onion reportedly exhibit broad spectrum activity against various fungal phytopathogens (Greyer and Harborne, 1994). Arya *et al.* (1995) reported inhibitory effect of the extracts of garlic bulbs and bignonia leaves on mycelial growth of *F. pallidroseum*. Gupta *et al.* (1996) found leaf extracts of *Pongamia pinnata* highly fungitoxic to *F. pallidroseum*. Seed treatment with clove extract of *A. sativum* was found effective against *F. oxysporium* f. sp. *udum* by Kumar *et al.* (2002). In present study, the efficacy of various plant extracts, observed effective under *in vitro* conditions against *F. pallidroseum*, were evaluated *in vivo* to manage twig blight disease in mulberry.

Locally collected fresh leaves of datura (*Datura stramonium*) and matricaria (*Matricaria chamomille*), cloves of garlic (*Allium sativum*), rhizome of ginger (*Zingiber officinale*) and roots of hemlock (*Conium maculatum*) were thoroughly washed with water and dried under shade. The material was chopped, homogenized in sterile water @ 10 g tissue in 100 mL water and filtered through double layered muslin cloth. The filtrate formed standard aqueous plant extract. The ethanolic extract was prepared by homogenizing the material in 80% ethanol for 48 h, then filtered and taken as stock solution. The aqueous and ethanolic extracts were evaluated at 50% level, the most effective level under *in vitro* studies (Parveez *et al.*, 2009, 2013). The experiment was laid at Mulberry Farm, TSRI, Mirgund (Kashmir) in a completely randomized design using mulberry saplings cv. 'Chinese White'. Each treatment was replicated thrice. The saplings were inoculated with *F. pallidroseum* culture (1×10^5 spores mL⁻¹) by removing small portion of twig bark and applying the inoculum on it. Three sprays of extracts were conducted; the 1st spray at the appearance of disease. Two controls were also maintained, one sprayed with fungitoxicant copper oxychloride (0.2%) and other water sprayed only. Observations were recorded 15 days after last spray. For disease severity assessment, branches were taken as assessment unit and percent blighted portion calculated as per James (1983):

$$\text{Percentage of blighted portion} = \frac{\text{Length of blighted portion of assessment units} \times 100}{\text{Total length of assessment units}}$$

The disease intensity was recorded using 0-9 grade scale of FAO (1967). wherein 0 = no disease, 1, 2, 3, 4, 5, 6, 7, 8 and 9 depict 1-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, 71-80 and 81-100% blighted portion, respectively. The disease intensity was calculated as per the formula:

$$\text{Percent disease intensity} = \frac{\sum \text{Numerical values} \times \text{grades} \times 100}{\text{Total number of observations}}$$

The data was analyzed using analysis of variance as per Gomez and Gomez (1984).

All the treatments significantly reduced disease under field conditions as compared to check (inoculated only which showed 31.8% disease intensity (Table 1). With aqueous plant extracts maximum disease control was observed due to *D. stramonium* and *A. sativum* both showing 54.7% disease control, followed by *M. chamomille* and *C. maculatum* with 52.3 and 51.2% disease control, respectively. Among ethanolic extracts tested, *D. stramonium* was highly effective and gave 51.2% disease control followed by *M. chamomile* and *A. sativum* with 49.5 and 47.7% disease control. *Z. officinale* was least effective with only 25.6% disease control. All botanical extracts were effective but proved inferior to fungitoxicant copper oxychloride (62.8% disease control). The findings support the *in vitro* finding

Table 1: Efficacy of various botanicals against twig blight (*Fusarium pallidoroseum*) of mulberry under field conditions

Treatments	Disease intensity (%)	Disease control (%)
<u>Aqueous extract</u>		
<i>Conium maculatum</i> 50%	15.55 (4.06) ^{bc}	51.2
<i>Datura stramonium</i> 50%	14.44 (3.90) ^b	54.7
<i>Matricaria chamomile</i> 50%	15.18 (4.01) ^b	52.3
<i>Allium sativum</i> 50%	14.44 (3.92) ^b	54.7
<u>Ethanolic extract</u>		
<i>Zingiber officinale</i> 50%	23.70 (4.96) ^d	25.6
<i>Datura stramonium</i> 50%	15.55 (4.03) ^b	51.2
<i>Matricaria chamomile</i> 50%	16.09 (4.15) ^c	49.5
<i>Allium sativum</i> 50%	16.66 (4.19) ^c	47.7
Copper oxychloride 0.2%	11.85 (3.57) ^a	62.8
Control	31.85 (5.72)	-

of Parveez *et al.* (2009, 2013) wherein aqueous and ethanolic extracts of *D. stramonium* and *A. sativum* were significantly effective in reducing the disease. Kumar *et al.* (2002) have reported aqueous extract of *A. sativum* effective against *F. oxysporium* f. sp. *udum*. Similarly, Prasad and Barnwal (2004) found 20% datura leaf extract effective in reducing Stemphylium blight in onion.

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