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## **NOTE**

# **EFFECT OF MULCHING ON SEVERITY OF MULBERRY RUST DISEASE**

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## **ABSTRACT**

The rust epidemic caused by *Peridiopsisora mori* (Barclay) Prasad *et al.* on mulberry (*Morus alba* L.) foliage during August to February of each year results in reduction of biomass by premature defoliation. By mulching and covering of soil surface with green manure crop of *Crotalaria juncea* L. and black polyvinyl sheets of 100 gauge between mulberry rows, the rust disease severity on leaf was significantly reduced. Hence mulching and covering of soil with green manure crop is suggested as an environment friendly method for the control of mulberry rust.

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### اثر مالچ بر شدت بیماری زنگ توت

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### چکیده

اپیدمی زنگ ناشی از *Peridiopsis mori* (Barclay) Prasad et al. روی برگ های توت (*Morus alba* L.) در ماه های اوت تا فوریه هر سال منجر به کاهش زیست توده (biomass) از طریق ریزش پیش از موعد برگ ها می شود. با دادن مالچ و پوشاندن سطح خاک با کود سبز *Crotalaria juncea* L. و صفحات پلی وینیل سیاه (درجه ۱۰۰) در فاصله ردیف های توت، شدت زنگ به طور معنی داری کاهش یافت. بنابراین، مالچ و پوشاندن سطح خاک با کود سبز که از نظر زیست محیطی نیز بی زیان است، برای کنترل زنگ توت پیشنهاد می شود.

## INTRODUCTION

The paradox of sericulture industry is that the favorable cocoon producing seasons happen to be periods of low leaf yield of mulberry due to severity of foliar diseases. Disease severity is quantifiable by directly correlating it with the extent of plant tissue affected by the disease (1).

The rust pathogen *Peridiopsora mori* (Barclay) Prasad *et al.* (2) is an obligate parasite on foliage of *Morus alba* L. This pathogen is prevailing in anamorphic state and produces only urediniospores with thick wall for protection and urediniospores are the only form of inoculum which exists on soil surface associated with mulberry plant debris. Due to unfavorable climatic condition for rust establishment during May to July the inoculum hibernates on debris. During August to February the rust causes severe damage to mulberry leaves and later the severity of disease declines.

Irrigation is one of the principal means of increasing mulberry leaf biomass. The effect of irrigation on disease development depends on the interaction between conditions created by irrigation, weather factors, nature of the pathogen, crop variety and spacing. Not much is known about the effect of rust caused by *P. mori* on mulberry under different agronomic practices including mulching.

Purohit *et al.* (3) studied the effect of mulches on soil moisture, temperature, growth and leaf yield of mulberry plants grown in 60×60 cm spacing during winter season under non-irrigated conditions in West Bengal. However, not much work has been carried out on the effect of different mulching materials on the severity of rust disease under non-irrigated conditions. This study was undertaken to assess the severity of rust disease on mulberry, grown under different mulching systems.

## **MATERIALS AND METHODS**

The assessment of mulberry rust severity under different mulching systems was carried out on *Morus alba* L. variety M-5 at the institute KSSRDI farm, Bangalore, located at 12° 58' N, 77° 35' E and an elevation of 914 meters above sea level with soil containing 1.3% of organic carbon and pH 6.8. The disease severity was assessed during November 1988 to January 1990. The mulberry plants were raised in 120x60 cm spacing by applying farmyard manure and chemical fertilizer as per the recommended dosage given under nonirrigated conditions (4). The regular annual basal

pruning of plants was made during June (onset of monsoon) and the middle pruning carried out during early November to a height of  $45 \pm 2$  cm above soil surface instead of pruning during the month of October. The materials used for mulching were a green manure crop of sunhemp (*Crotalaria juncea* L.) and black polyvinyl sheets of 100 gauge. The experiment was carried out with the following mulching designs with the cessation of rains, that is, during late November. The treatments were as follows:

M0= No mulching (control).

M1= Surface soil removed to a depth of 10 cm between two mulberry rows and the furrow was filled with sunhemp plants to a height of 8 cm and the 2 cm above sunhemp was covered with soil.

M2= Soil surface covered by sunhemp plants to a height of 8 cm.

M3= M1+M2.

M4= Black polyvinyl sheet covered on soil surface between rows.

Leaf harvest was made at an interval of 75 days from the time of middle pruning.

To overcome the discrepancy that will occur due to visual rating assessment of rust severity on mulberry foliage, a modified methodology by counting the number of pustules (young and mature) per  $\text{cm}^2$  leaf area was carried out. The counting of pustules was done at 3 random locations on each leaf from top most glossy leaf (positioned as 1st fully unfurled leaf from shoot apex) to the senescing leaf (last leaf on a shoot which is about to fall) of the same shootlet. Pustules were counted by placing a perspex graticule of  $10 \times 10$  cm engraved with lines of  $1 \text{ cm}^2$  on each leaf. The mean pustule number  $\text{cm}^{-2}$  leaf area, i.e., "x," for each leaf of a shoot was calculated. The "x" of all the leaves of a shoot were summed up and divided by the total number of leaves present on that shoot to obtain the mean severity of rust pustules  $\text{cm}^{-2}$  leaf area of the shoot. Thirty plants were selected for rust severity assessment from each treatment in a completely randomized design excluding border plants. The above procedure of obtaining was repeated for 30 shootlets from 30 plants of a treatment where in one robustly grown shoot was used from each plant. The of all the 30 shootlets of a treatment was considered to calculate the grand mean which depicted the rust severity by number of pustules  $\text{cm}^{-2}$  area of leaf in a treatment. The assessment of

disease severity was carried out at two-week intervals up to 75 days from the date of pruning. However, the 5th assessment was used for comparisons (Table 1) because it had higher pustule numbers.

The severity data recorded in all the treatments were subjected to statistical analysis (ANOVA). The observed difference between the mean number x pustules of the treatments was compared with critical difference (CD) value. Values obtained by Student's least significant difference at  $P=0.05$  was used to test the significance.

The meteorological data on temperature, relative humidity and rainfall (if any) were recorded daily. The mean minimum and mean maximum temperatures and mean relative humidity for each month and total rainfall for each month were calculated and presented in Fig.1.

## **RESULTS AND DISCUSSION**

The rust disease severity during November 1988 to January 1990 showed an average number of 8.05 pustules  $\text{cm}^{-2}$  leaf area in control (M0). The average numbers of pustules  $\text{cm}^{-2}$  leaf area in treatments M1, M2, M3 and M4 were less than in M0 (Table 1). The least number, i.e., an average of 3.95 pustules  $\text{cm}^{-2}$ , was recorded in the treatment M4 with black polyvinyl sheet, followed by M3 which was the combination of M1 and M2 treatments, and showed an average pustule number of 4.75  $\text{cm}^{-2}$  leaf area. The two treatments significantly reduced the rust disease severity.

Decrease in rust severity in polyvinyl mulch may be due to the increase in soil temperature with the absorption of solar radiation by the mulch. This may lead to conditions unfavorable for the survival of rust urediniospores on soil and plant debris. Polyvinyl sheets also restricted the drifting of urediniospores from soil surface on to the leaf.

Purohit *et al.* (3) reported that the average soil temperature in the morning was enhanced up to 2 °C under polyvinyl sheet covering on soil surface in mulberry garden and up to 1.8 °C under paddy straw and dry mulberry twig mulching.

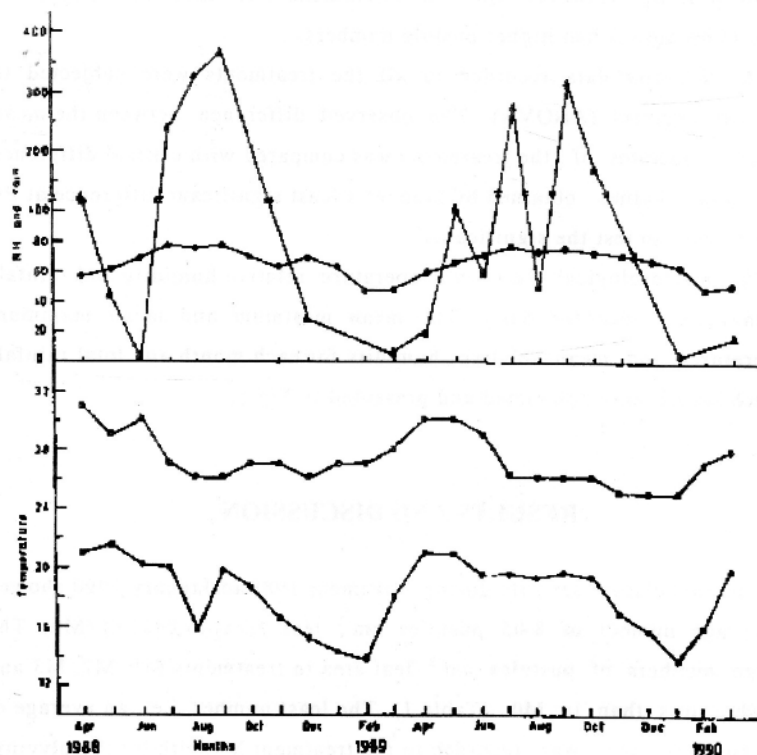


Fig 1. Meteorological data from April 1988 to March 1990.

- Average RH in percent for the month.
- ▲-Total rainfall in mm for the month.
- Average maximum temperature in °C for the month.
- Average minimum temperature in °C for the month.

Although polyvinyl sheets were the most effective in reducing rust severity, their use is restricted because they are expensive and not affordable by the small and marginal farmers. It is quite economical to use low cost mulching material like green manure crop of *Crotalaria juncea* L.

Table 1. Average number of pustules cm<sup>-2</sup> leaf under different mulching designs in mulberry under non-irrigated condition.

Duration	Mulching designs					SE	CD
	M0	M1	M2	M3	M4	DF=149	P=0.05
T-1	8.4	7.0	6.2	4.7 <sup>†</sup>	4.2 <sup>†</sup>	0.07	0.13
T-2	7.7	6.1	5.4	4.8 <sup>†</sup>	3.7 <sup>†</sup>	0.05	0.09

T-1 = November 1988-January 1989.

T-2 = November 1989- January 1990.

M0 to M4 = Various mulching designs (see text).

† = Highly significant.

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*Prasad et al.*

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