

## Adjustment of date of sowing and resistance screening for managing Cercospora leaf spot of sesame

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Cercospora leaf spot, an important fungal disease of sesame can cause defoliation of plant and bring about significant reduction in crop yield under suitable environmental conditions. Synthetic chemicals which are in use for managing crop diseases and other pests have been the cause of concern of our health and environment. In the present investigation alternative ways of managing Cercospora leaf spot disease in sesame were investigated. The different planting dates significantly affected the incidence and severity of the disease. The result showed lower disease incidence (72.5 %) and intensity (63.9 %) with higher yield (10.07 g/plant) from early sowing i.e. in the month of May while those sown in July gave maximum disease incidence (95.82 %) and intensity (96.82 %) with no yield. In a separate field trial conducted with nine sesame cultivars comprising of four commercial varieties and five local cultivars collected from various parts of Nagaland for disease resistance, none of the cultivars showed immune reaction to Cercospora leaf spot disease. However, among the cultivars, Local-5 collected from Changki village of Mokokchung district in Nagaland recorded the lowest disease intensity (69.99 %).

**Key words :** Sesame, Sowing date, Cercospora leaf spot

### INTRODUCTION

Sesame (*Sesamum indicum* L) known variously as til, tila, khasa etc. is a flowering annual plant belonging to the family Pedaliaceae. It is also called as 'Queen of edible oils' because of its rich content of oil (50%), protein (21%) (Bennett *et al.*, 2003), Mn, Cu, Ca, Vit-B<sub>1</sub>, Vit-E and phytoestrogens that have anti-oxidant and anti-cancer properties. Over 57% of world sesame production comes from Asia while India with largest area (2.0 million ha) under sesame cultivation (USDA, 1999) produce 0.65 million tonne of sesame.

In Nagaland, cultivation of this crop is done on a small scale. It is cultivated on an area of 4.2 thousand ha with production of 3.5 thousand tonne and productivity of 838 kg per ha (agricoop.nic.in./Agristatistics.htm). It is used mainly for culinary and confectionary purposes in the state.

The crop is attacked by several diseases of which leaf spots caused by *Cercospora sesami* are widespread and economically serious. Cercospora leaf spot which is also known as 'white spot' reduces the seed yield by 20% under Indian conditions. Under high humidity (more than 60%), complete defoliation takes place which ultimately results in reduced yield and seed quality (Bhale *et al.*, 2001). Control of this disease is becoming difficult as most of the cultivars are susceptible and no variety is absolutely resistant to the disease. The present work has been undertaken to study the effect of adjustment of sowing dates and to screen locally available sesamum cultivars in Nagaland for resistance.

### MATERIALS AND METHODS

#### *Adjustment of dates of sowing*

The field experiment was carried out in the Re-

search Farm, SASRD, Nagaland University, Medziphema in the year 2008. The seeds of sesame variety AST-1 were sown in plots of size 3.6 x 2 m<sup>2</sup> in the month of May to July 2008. The whole experiment was laid out in RBD with 4 replications and 5 treatments consisting of different dates of sowing. Standard agronomic practices were followed to raise the crop.

**Treatment Combination:** The treatments for the field methods are given below:

	Date of sowing
T <sub>1</sub>	: 15 <sup>th</sup> May 2008
T <sub>2</sub>	: 30 <sup>th</sup> May 2008
T <sub>3</sub>	: 15 <sup>th</sup> June 2008
T <sub>4</sub>	: 30 <sup>th</sup> June 2008
T <sub>5</sub>	: 15 <sup>th</sup> July 2008

Disease symptoms from seedling to ripening stages were observed. Identification of the pathogen was done from diseased samples on the basis of morphological characters of the pathogen as seen under microscope. Observations on disease incidence and intensity were recorded from 5 randomly selected plants from each plot at 15 days interval starting from appearance of the disease. Disease incidence was calculated using the following formula.

$$\text{Disease incidence (\%)} = \frac{\text{No. of infected plants}}{\text{Total no. of plant assessed}} \times 100$$

However, the disease intensity was recorded by using 0 to 9 scale given by Mayee and Datar (1986) and disease intensity was calculated using the following formula.

$$\% \text{ Disease intensity} = \frac{\text{Sum of all disease ratings}}{\text{Total no. of leaves assessed}} \times 100$$

x  
Maximum disease rating observed

The crop was harvested in the month of August. The yield of sesame seed was recorded and the data was expressed in kg/h as per the following formula :

$$\text{Yield (kg/ha)} = \frac{\text{Yield per plot}}{\text{Area of plot}} \times 10000$$

### Screening of sesame cultivars

The field experiment was carried out in the Research Farm, SASRD, NU, Medziphema in the year

2008. The seeds of nine sesame cultivar, viz. AST-1, RT-1, Gowri, Pd Til-1, Local-1, Local-2, Local-3, Local-4 and Local-5 were sown in plots of size 4.5 x 4 m<sup>2</sup> in the month of May '08. The whole experiment was laid out in RBD with 3 replications and 9 treatments. Standard agronomic practices were followed to raise the crop. Observations and calculations on disease incidence and intensity were made as described earlier.

## RESULTS AND DISCUSSION

### Effect of date of sowing on disease incidence, disease intensity and yield

The effect of date of sowing on disease incidence, disease intensity and yield is shown in Table 1. Observation from the table showed that the disease incidence and intensity recorded to be lowest i.e., 72.5% and 63.95% respectively on 15<sup>th</sup> May '08 compared to 95.82% and 96.82% respectively on 15<sup>th</sup> July, '08 sowing. The maximum yield (10.07 g per plant) was recorded by 15<sup>th</sup> May '08. However, the lowest (1.15 g per plant) was recorded by 30<sup>th</sup> June '08 sowing where the disease incidence was 94.32% and disease intensity 95.55%. There was no yield record with 15<sup>th</sup> July 08 showing the maximum disease incidence (95.82%) and disease intensity (96.82%).

Arunchalam (1989) reported that in a field trial at Coimbatore in 1980-83 (*kharif* season), cv. TC-25, TMV3 and CO1 were sown on 4 dates between mid July and mid-September. Seed yield was highest in all the early sowing immediately after the onset of monsoon and decreased with later sowing dates. Suryavanshi *et al.* (1993) reported that in 5 sesame cultivars, delay in sowing from 10 June to 25 June, 10 July to 25 July decreased seed yields from 1.31 to 0.79, and 0.28 to 0.10 t/ha respectively and also decreased the number of capsule/plant and 1000 seed weight. CV 2-30 sown on 10<sup>th</sup> June gave the highest yield of 1.61 t/ha. Enikuomihin *et al.* (2004) also reported the incidence of the *Cercospora* leaf spot disease caused by *Cercospora sesami* on sesame cultivars E-8 and Yandev 55 sown at different planting dates in South-Western Nigeria. The different planting dates significantly affected the incidence and severity of the disease. Disease incidence and severity were lowest in plants sown in early July as well as higher grain yield, weight of the seed per plant, weight of capsule per plant and number of branches per plant. Therefore, sowing of sesame in early July

**Table 1:** Effect of different date of sowing on disease incidence, disease intensity and yield of sesame cultivar AST – 1.

Date of sowing (Treatments)	Disease incidence % (Mean value)	Disease intensity % (Mean value)	Yield/plant in g (Mean value)
T <sub>1</sub> : 15 <sup>th</sup> May 08	72.5 (64.14)	63.95 (54.42)	10.07
T <sub>2</sub> : 30 <sup>th</sup> May 08	78.12 (68.33)	69.55 (58.79)	5.00
T <sub>3</sub> : 15 <sup>th</sup> June 08	89.37 (75.79)	89.08 (76.48)	2.17
T <sub>4</sub> : 30 <sup>th</sup> June 08	94.32 (79.38)	95.55 (79.84)	1.15
T <sub>5</sub> : 15 <sup>th</sup> July 08	95.82 (81.05)	96.82 (81.68)	0
CD at 5%			4.21

Figures in parentheses are ARC SINE transformed values.

reduced the incidence and severity of *Cercospora* leaf spot disease as well as enhanced higher crop performance.

However, findings from the present experiment showed the maximum per cent disease incidence and intensity from 15<sup>th</sup> July '08 date of sowing with no yield.

The least disease incidence and intensity of *Cercospora* disease was observed from 15<sup>th</sup> May '08 date of sowing with the maximum yield among the five different dates of sowing at 15 days interval i.e. 15<sup>th</sup> May '08, 30<sup>th</sup> May '08, 15<sup>th</sup> June '08 and 15<sup>th</sup> July '08. This finding has been found in confirmation with the findings of Arunachalam (1989), Suryavanshi *et al.* (1993) and Enikuomihin *et al.* (2004) who had also reported decreased yield with the delay in sowing along with higher disease incidence and intensity. However under the climatic condition of Medziphema, early sowing in the month of May resulting lower disease incidence and intensity with higher yield has been found to be the best.

### Screening of Sesame Cultivars

#### Morphological characters of sesame cultivars

Altogether 9 numbers of sesame cultivars including 4 commercial varieties and 5 local cultivars were studied. The morphological characters along with the name and source of collection and the duration taken up for crop maturity is given in Table 2.

Observations recorded from Table 2 showed that cultivars viz., Gowri, Pd Til-1 and Local-2 showed

no branching while maximum number of branching (7 nos.) were recorded with AST-1 cultivar. The test cultivars showed variation in colour of seeds which was black in case of AST-1 and Pd Til-1, while RT-1, Gowri and Local-2 seeds were brownish black in colour. Local-1 and Local-2 seeds were grey while Local-4 was brownish grey and Local-5 greyish brown in colour.

Maximum height of the plant (166.26 cm) was recorded from cultivar Local-2, followed by Local-3 (162.13 cm) where the crop duration was also maximum (90-120 days). RT-1 cultivar showed the minimum height (130.60 cm) with 85-90 days crop duration and the rest of the cultivars height ranged from 134.53-153.80 cms. The shortest crop duration was recorded with Pd Til-1 (80-85 days).

#### Infection of plant parts

The different plant parts infected along with the first incidence of disease on sesame cultivar is shown in Table 3.

Observation from Table 3 revealed earliest disease incidence (19 DAS) from RT-1 followed by Gowri and Pd Til-1 (20 DAS) and AST-1 (26 DAS). In the rest of the cultivars, it was at 30 DAS. All the cultivars showed symptoms on leaf, stem and petiole however, only AST-1 and RT-1 showed infection on pods also.

#### Disease incidence on different sesame cultivars

The disease incidence on different sesame cultivars is presented in Table 4. From the observation recorded, the maximum disease incidence was

**Table 2:** Morphological characters of sesame cultivars.

Cultivar	Name and source of seed collection	Colour of seed	1000 seed weight (g) *	Plant height (cm) after 75 DAS**	No. of branches per plant **	Duration of crop (days)
CV <sub>1</sub>	AST-1 (Jorhat)	Black	2.57	134.53	7.00	85 – 90
CV <sub>2</sub>	RT-1 (Jorhat)	Brownish black	2.52	130.60	6.33	85 – 90
CV <sub>3</sub>	Gowri (ICAR, Jharnapani)	Brownish black	1.68	144.46	0.00	95 – 100
CV <sub>4</sub>	Pd til-1 (ICAR, Jharnapani)	Black	1.55	142.06	0.00	80 – 85
CV <sub>5</sub>	Local-1 (Wokha)	Grey	1.30	141.93	1.93	90 – 120
CV <sub>6</sub>	Local-2 (Mopungchuket)	Brownish black	1.32	166.26	0.00	90 – 120
CV <sub>7</sub>	Local-3 (Chumukedima)	Grey	1.35	162.13	0.93	90 – 120
CV <sub>8</sub>	Local-4 (Mokokchung)	Brownish grey	1.40	153.80	0.20	90 – 120
CV <sub>9</sub>	Local-5 (Changki)	Greyish brown	1.43	151.66	1.53	90 – 120

\* Average of 3 Replications

\*\* Average of 5 Plants from each Replication

**Table 3:** Symptoms of *Cercospora* leaf spot disease of sesame on different plant parts

Cultivars	1 <sup>st</sup> disease incidence (DAS)	Leaf	Petiole	Stem	Pods
AST-1	26	✓	✓	✓	✓
RT-1	19	✓	✓	✓	✓
Gowri	20	✓	✓	✓	X
Pd til-1	20	✓	✓	✓	X
Local-1	30	✓	✓	✓	X
Local-2	30	✓	✓	✓	X
Local-3	30	✓	✓	✓	X
Local-4	30	✓	✓	✓	X
Local 5	30	✓	✓	✓	X

shown by AST-1, RT-1 and Gowri (100%) with the lowest incidence in Local-5 (80%). The maximum disease incidence (99.26%) was shown at 75 DAS. An increase in disease incidence was recorded on Local-1 at uniform rate (63.33, 76.67, 96.67 and 96.67) with a mean value of 83.33% disease incidence while the same pattern was observed in Local-4 (60.0, 73.33, 93.33, 96.67) per cent disease incidence at 30, 45, 60 and 75 DAS having a mean value of 80.83%. However, AST-1, Gowri and RT-1 cultivars showed maximum (100%) disease incidence from the first observation at 30 DAS till 75 DAS.

#### Disease intensity on different sesame cultivars

Observations recorded in Table 5 showed maximum disease intensity (85.99%) from Local-2 cultivar followed by RT-1 (84.55%). Cultivar AST-1 with 83.62% and Local-4 with 83.55% were found to be *at par*. The lowest mean percentage disease intensity was recorded in Local-5 (69.99%) and the maximum per cent disease intensity (84.05%) was recorded at 45 DAS. Tripathi *et al.* (1996) reported that sesame genotypes were evaluated for stability of resistance to leaf spot caused by *Cercospora sesami* in Madhya Pradesh, India. BIC 7-2, Sidhi

**Table 4:** Disease incidence on different sesame Cultivars

Cultivars	Disease incidence (%) at different DAS				Mean
	30	45	60	75	
AST-1	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)
RT-1	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)
Gowri	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)	100 (85.94)
Pd til-1	86.67 (74.22)	86.67 (74.22)	100 (85.94)	100 (85.94)	93.33 (80.08)
Local-1	63.33 (53.86)	76.67 (62.71)	96.67 (81.15)	96.67 (81.15)	83.33 (69.72)
Local-2	63.33 (53.07)	80.00 (63.93)	96.67 (81.15)	100.00 (85.94)	85.00 (71.02)
Local-3	76.66 (61.71)	90.00 (73.65)	100.00 (85.94)	100 (85.94)	91.66 (76.81)
Local-4	60.00 (51.14)	73.33 (59.71)	93.33 (78.44)	96.67 (81.15)	80.83 (67.61)
Local-5	43.00 (41.07)	80.00 (63.93)	96.67 (81.15)	100 (85.94)	80.00 (63.93)
Mean	77.04 (65.88)	87.41 (72.88)	98.14 (83.51)	99.26 (84.87)	
CD value at 5%	17.45	16.80	NS	6.56	

Figures in parentheses are ARC SINE transformed values

**Table 5:** Disease intensity on different sesame cultivars

Cultivars	Disease intensity (%) at different DAS				Mean
	30	45	60	75	
AST-1	100 (85.94)	84.89 (70.02)	77.56 (61.80)	72.06 (58.16)	83.62 (68.83)
RT-1	100 (85.94)	86.67 (71.69)	70.57 (57.15)	80.95 (64.17)	84.55 (69.74)
Gowri	64.44 (53.48)	100.00 (85.94)	80.95 (64.17)	80.95 (64.17)	81.58 (68.44)
Pd til-1	71.11 (61.21)	88.89 (75.54)	73.14 (59.08)	79.05 (62.84)	78.05 (64.66)
Local-1	57.77 (50.29)	71.55 (61.53)	80.57 (64.72)	78.28 (63.05)	72.04 (59.89)
Local-2	73.33 (59.21)	86.66 (71.14)	92.00 (73.31)	92.00 (75.31)	85.99 (70.24)
Local-3	62.22 (52.43)	82.22 (68.04)	84.00 (70.09)	82.86 (68.36)	77.82 (64.73)
Local-4	73.33 (62.49)	82.22 (68.04)	81.33 (67.39)	97.33 (81.82)	83.55 (70.03)
Local-5	60.00 (51.14)	73.33 (62.65)	73.33 (59.01)	73.33 (59.01)	69.99 (57.80)
Mean	73.58 (62.46)	84.05 (70.55)	79.27 (64.64)	81.87 (66.65)	
CD value at 5%	23.28	NS	NS	14.47	

Figures in parentheses are ARC SINE transformed values

54, Rewe 114 and Seoni Malwa showed stable resistance to the disease, whereas Rewa 100, B-16 and IC 360 exhibited stable moderate resistance. But it was reported by Rangaswami and Mahadevan (2001) that nothing is known about the

resistance of sesame varieties to the serious *Cercospora* leaf spot disease caused by the *Cercospora sesami*. However, the experimental findings on screening for disease resistance elucidated in Table 3 and 4 showed that all the cultivars

were susceptible to *Cercospora* leaf spot disease and none showed disease resistance reaction. The disease incidence (80%) and intensity (69.99%) was recorded to be the lowest in Local-5. This is in confirmation with the report given by Rangaswami and Mahadevan (2001) indicating that none of the sesame varieties are resistant to *Cercospora* leaf spot disease.

*Cercospora* leaf spot disease with its heavy disease intensity under the climatic conditions of Medziphema, Nagaland was found to cause great loss in yield. None of the cultivars under study showed resistance to leaf spot disease. However, among the cultivars, Local-5 with lowest disease incidence and disease intensity was found the best.

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