Influence of time of sowing and groundnut varieties on the incidence and severity of late leaf spot (Phaeoisariopsis personata) of groundnut

ABSTRACT: The field experiment was conducted to study the influence of sowing dates on the incidence and severity of late leaf spot on groundnut. The study on incidence, severity, corresponding defoliation, frequency and size of the leaf spot revealed that all these aspects were significantly influenced by the sowing dates and crop varieties which directly affected the pod yield and test weight. The crop sown early on 25th June exhibited maximum late leaf spot disease incidence (range 46.45-56.25%), disease severity (range 40.12-49.58%), defoliation (range, 13.18-18.36%), frequency (range, 1.38-1.76/mm²) and size (range, 1.44-1.52/mm²) followed by the crop sown on 10th June and 25th July. Among the groundnut cultivars, susceptible cv. JL-24 exhibited maximum disease incidence (range, 35.83-56.25%), disease severity (range, 31.07-49.58%), defoliation (range, 7.70-18.36%), frequency (range, 1.21-1.76/mm²) and size (range, 1.29-1.52/mm²), followed by TAG-24, TG-26 and LGN-1. The late leaf spot disease incidence, severity and corresponding defoliation recorded at various intervals were found to be increased with the age of the crop and both were found maximum at the physiological maturity of the crop. The results obtained in respect of the influence of sowing dates and crop varieties on pod yield and test weight indicated that the crop sown early (25th June) was affected severely with the disease and thereby gave reduced pod yield (range, 1197-1679 kg/ha) and test weight (25.19-29.40 g) followed by the crop sown on 10th July and 25th July. The epidemiological implications of the disease occurring simultaneously are important because the establishment of the disease management strategies depends on the disease interactions.

Key words: Arachis hypogaea, defoliation, PDI, Phaeoisariopsis personata, severity, sowing dates

MATERIALS AND METHODS

The experiment was conducted in Research Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during Kharif 2012 with three sowing dates (25th June, 10th July and 25th July) using four groundnut varieties, viz. JL-24 (Phule Pragati), LGN-1, TAG-24 and TG-26. The experiment conducted applying Split Plot Design with three replications. The gross plot size was 4.0 x 1.8 m². Recommended agronomical practices were followed for growing of the crops. The protective irrigations were given especially at the time of sowing and the time when water stress conditions prevailed during the growing period.

Three blanket sprays of the fungicides Tridemorph (@ 0.2%) was given, beginning first spray at 30 days after sowing (DAS) of each crop and subsequent sprays at 15 days interval to inhibit rust (P. arachidis) infection and maintain the crop free from rust.

For recording observations, five groundnut plants/treatment/replication was selected randomly and tagged for the crops sown at different dates. Three quadruplate leaves (bottom, middle and top) on main branch of each observation plant was selected for recording the observations on late leaf spot. A total of four observations i.e. at first appearance and subsequent three observations at 10 days interval was recorded applying modified 9 point disease rating scale (Subba Rao et al., 1990).

Percent disease incidence (PDI) and percent disease control (PDC) was calculated using standard method (Mayee and Datar, 1986; Mc Kinney, 1923).
Observations on defoliation were recorded on five selected randomly plants at 60, 75 and 90 DAS and percent defoliation was worked out (Naab et al., 2005).

At physiological maturity, crop was harvested and observations on dry pod yield, 100 seed weight (test weight) per treatment per replication was recorded and pod yield data was calculated on hectare basis.

Statistical analysis
The data obtained from the experiment was statistically analyzed (Panse and Sukhatme, 1978). The percentage values were transformed into arcsine values. The standard error (SE±) and critical difference (C.D.) at level P = 0.05 were worked out and results obtained were compared statistically. All the statistical analysis was done using MAU-STAT statistical programme at Central Computer Laboratory, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra.

RESULTS AND DISCUSSION
The field experiment was conducted using four groundnut varieties, viz. JL-24, LGN-1, TAG-24 and TG-26 sown at three different dates (25th June, 10th July and 25th July) during Kharif, 2012. The disease appears at 45-50 DAS of groundnut crop under field conditions. Typical symptoms includes small, almost circular, necrotic pin head size, dark brown coloured lesion first appeared on the lower leaves and usually do not have yellow hallow. At later stage lesions may appear on stem also. Under favourable conditions, carbon black slightly rough appearance symptoms (high sporulation) appeared on abaxial surface of leaf and the leaf spot coalesce together leading to defoliation. The result obtained in respect of effect of sowing dates and varieties on the late leaf spot disease incidence, severity, defoliation, leaf spot frequency and diameter, pod yield and test weight are being presented herein the following paragraphs.

Sowing dates and late leaf spot incidence
The results (Table 1) indicated that per cent of late leaf spot incidence was significantly influenced by the time of sowing in all groundnut varieties, however maximum late leaf spot disease incidence (range 46.45-56.25%) was observed in the crop sown 25th June followed by crop sown on 10th July (range, 34.59-39.65%) and 25th July (ranges 26.86-35.83%). Late leaf spot disease incidence was found to be increased steadily from its first appearance (50 DAS) to the harvest of the crop sown at various dates.

In the crop sown on 25th June, the late leaf spot disease incidence irrespective of varieties observed at 50 DAS (first appearance) was ranged from 18.25-24.50% (Av. 21.35%) and it was increased with the age of the crop. The disease incidence observed at 60, 70 and 80 DAS were ranged from 41.09-49.07 (Av. 44.94), 49.50-61.87 (Av. 56.12) and 76.95-89.55 (Av. 83.05), respectively.

The crop sown on 25th July exhibited comparatively least disease incidence at various intervals and it was ranged from 13.80-18.76 (Av. 16.41), 19.38-29.18 (Av. 23.19), 31.01-40.95 (Av. 36.27) and 43.23-54.42 (Av. 50.01) per cent, respectively at 50, 60, 70 and 80 DAS. Thus, the crop sown early (25th June) experienced the highest average disease (range, 21.35-83.05%) incidence compared to the crops sown later on 10th July, 25th July, which exhibited moderate average disease incidence (range, 18.31-58.10%) and the least average disease incidence (range, 16.41-50.01%), respectively.

Effect of varieties on incidence of late leaf spot
The average late leaf spot disease incidence (Table 1) observed in all cultivars/varieties of groundnut irrespective of sowing dates was found to vary among the cultivars and it was increased with age of the crop. The disease incidence observed in the test varieties irrespective of sowing dates was ranged from 26.86 to 56.25%. The highest disease incidence in the range of 35.83-56.25% (Av. 43.91%) was observed in the susceptible cv. JL-24 and followed by cv. TAG-24 (range, 32.87-52.51% and Av. 41.24%), TG-26 (range, 30.34-50.22% and Av. 39.27%), and LGN-1 (range, 26.86-46.45% and Av. 35.97%).

The late leaf spot disease incidence observed at first appearance of the disease (50 DAS) in various varieties irrespective of sowing dates was ranged from 13.80-24.50%. It was ranged from 19.38-49.07%, 31.01-61.87% and 43.23-89.55%, respectively at 50, 60, 70 and 80 DAS. The disease incidence observed at various intervals in the susceptible cv. JL-24 was also found to be maximum and it was ranged from 18.76-24.50% (Av. 20.84) at 50 DAS (first appearance) and it was further increased with the crop age. At 50 DAS the disease incidence exhibited by cv. TG-26 (range, 15.75-21.10% and Av. 18.33%), TAG-24 (range, 17.34-21.53% and Av. 19.25%), and LGN-1 (range, 13.80-18.25% and Av. 16.27%).

The cv. JL-24, at 50 (first appearance), 60, 70 and 80 DAS exhibited the disease incidence in the range of 18.76-24.50% (Av. 20.84%), 29.18-49.07% (Av. 36.99%), 40.95-61.87% (Av. 49.11%), and 54.42-89.55% (Av. 68.69%) respectively. The cv. LGN-1, at 50, 60, 70 and 80 DAS exhibited the disease incidence in the range of 13.80-18.25% (Av. 16.27%), 19.38-41.09% (Av. 29.44%), 31.01-49.50% (Av. 40.38%), and 43.23-76.95% (Av. 57.76%) respectively.

Thus the results obtained in respect of effect of sowing dates and groundnut varieties on per cent late leaf spot disease incidence revealed that the disease incidence was significantly influenced by the time of sowing and crop varieties. The disease incidence was found to be maximum (46.45-56.25%) in the crop sown on 25th June. It was found to be reduced thereafter in the crop sown on 10th July (34.59-39.65%), 25th July (26.86-35.83%). Among the four cultivars of groundnut, cv. JL-24 was found most susceptible with maximum incidence in the range of 35.83-56.25%, followed by TAG-24
(incidence, 32.87-52.51%), TG-26 (incidence, 30.34-50.22) and LGN-1 (incidence, 26.86-46.45).

**Sowing dates and late leaf spot severity**

The results (Table 2) indicated that percent of late leaf spot severity was significantly influenced by the time of sowing in all groundnut varieties, however maximum late leaf spot disease severity (range 40.12-49.58%) was observed in the crop sown 25th June followed by crop sown on 10th July (range, 30.67-35.73%) and 25th July (ranges 22.10-31.07%). Late leaf spot disease severity was found to be increased steadily from its first appearance (50 DAS) to the harvest of the crop sown at various dates.

In the crop sown on 25th June, the late leaf spot disease severity irrespective of varieties observed at 50 DAS (first appearance) was ranged from 11.58-17.83% (Av. 15.96%) and it was increased with the age of the crop. The disease severity observed at 60, 70 and 80 DAS were ranged from 34.42-42.40 (Av. 38.95), 43.63-55.20 (Av. 50.13) and 70.28-82.88 (Av. 77.07), respectively.

The crop sown on 25th July exhibited comparatively at least disease severity at various intervals and it was ranged from 9.04-14.00 (Av. 11.86), 14.62-24.42 (Av. 18.64), 26.25-36.19 (Av. 31.72) and 38.47-49.66 (Av. 45.46) per cent, respectively at 50, 60, 70 and 80 DAS. Thus, the crop sown early (25th June) experienced highest average disease (range, 15.96-77.07%) severity compared to the crops sown later on 10th July, 25th July, which exhibited moderate average disease severity (range, 14.34-54.12%) and least average disease severity (range, 11.86-45.46%), respectively.

**Table 1. Effect of sowing dates on incidence of late leaf spot on different varieties during Kharif, 2012**

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*Average of replications, DAS = Days after sowing
Figures in parentheses are angular transformed values
Table 2. Effect of sowing dates and groundnut varieties on late leaf spot severity during Kharif, 2012

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<td></td>
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*Average of replications; **Av. = Average
Figures in parentheses are angular transformed values, DAS = Days after sowing

Groundnut cultivars and late leaf spot severity

The average late leaf spot disease severity observed in all cultivars/varieties of groundnut irrespective of sowing dates was found to differ among the cultivars and it was increased with age of the crop. The disease severity observed in the test varieties irrespective of sowing dates was ranged from 22.10-49.58%. The highest disease severity in the range of 31.07-49.58% (Av. 38.79%) was observed in the susceptible cv. JL-24. This was followed by cv. TAG-24 (range, 28.10-46.11% and Av. 36.12%), TG-26 (range, 26.41-46.30% and Av. 35.28%), and LGN-1 (range, 22.10-40.12% and Av. 30.85%).

The late leaf spot disease severity observed at first appearance of the disease (50 DAS) in various varieties irrespective of sowing dates was ranged from 9.04-17.83%. It was ranged from 14.62-42.40%, 26.25-55.20% and 38.47-82.88%, respectively at 50, 60, 70 and 80 DAS.

The disease severity observed at various intervals in the susceptible cv. JL-24 was also found to be maximum and it was ranged from 14.00-17.83% (Av. 15.72%), at 50 DAS (first appearance) and it was further increased in the crop age. At 50 DAS the disease severity exhibited by cv. TG-26 (range, 11.82-17.18% and Av. 14.34%), TAG-24 (range, 12.58-15.86% and Av. 14.21%), and LGN-1 (range, 9.04-12.98% and Av. 11.15%).

The cv. JL-24, at 50, 60, 70 and 80 DAS exhibited the disease severity in the range of 14.00-17.83% (Av. 15.72%), 24.42-42.40% (Av. 31.88%), 36.19-55.20% (Av. 43.99%), and 49.66-82.88% (Av. 63.57%) respectively. The cv. LGN-1, at 50, 60, 70 and 80 DAS exhibited the...
disease severity in the range of 9.04-12.98% (Av. 11.62%), 14.62-34.42% (Av. 24.33%), 26.25-42.83% (Av. 35.27%), and 38.47-70.28% (Av. 52.64%) respectively.

Thus, the results obtained in respect of effect of sowing dates for groundnut varieties on per cent late leaf spot disease severity revealed that the disease severity was significantly influenced by the time of sowing and crop varieties. The disease severity was maximum (40.12-49.58%) in the crop sown on 25th June. It was found to be reduced thereafter in the crop sown on 10th July (30.67-35.73%), 25th July (22.10-31.07%). Among the four cultivars of groundnut, cv. JL-24 was found most susceptible with maximum severity in the range of 31.07-49.58%, followed by TAG-24 (severity 28.11-46.11%), TG-26 (severity 26.41-46.30) and LGN-1 (severity 22.10-40.12). The interaction effect of sowing dates x cultivars in respect of severity, pod yield and test weight were also found significant. Thus, late leaf spot severity was significantly influenced by the time of sowing and cultivars, which directly affected the pod yield and test weight in groundnut.

Sowing dates and defoliation

The results (Table 3) revealed that percentage defoliation by *P. personata* in groundnut was directly proportional to the incidence of late leaf spot disease. The process of defoliation caused due to leaf spot incidence and severity was begun approximately 10-12 days after the first appearance of the disease in the crop sown at different dates. Defoliation observed in the crops sown at various dates was ranged from 4.58-18.36%. It was found maximum (range, 13.18-18.36%), moderate (range, 6.58-9.97%), and least (range, 4.58-7.70%), in the crops sown on 25th June, 10th July and 25th July, respectively.

Average defoliation irrespective of varieties observed in the crop sown on 25th June at 60, 75 and 90 DAS was 5.88, 8.53%, respectively. This was followed by the crop sown on 10th July which recorded average defoliation of 4.92, 7.68% and 11.80%, respectively at 60, 75 and 90 DAS. The crop sown on 25th July recorded least average defoliation of 3.90, 6.27% and 8.41%, respectively at 60, 75 and 90 DAS. Maximum average defoliation of 31.85, 11.80 and 35.23% was observed at 90 DAS of the crop on 25th June, 10th July and 25th July, respectively. This was followed by the defoliation at 75 DAS which recorded the average defoliation 8.53, 7.92 and 6.27%, respectively in the crop on 25th June, 10th July and 25th July. Comparatively minimum average defoliation of 5.88, 4.92 and 3.90% was observed in the crop on 25th June, 10th July and 25th July, respectively.

Groundnut cultivars and defoliation

All test varieties exhibited variable degree of defoliation induced by late leaf spot disease and it was found to be increased with the age of crop (Table 3). Defoliation irrespective of sowing dates recorded in all four cultivars was ranged from 4.58-18.36%. Maximum defoliation in the range of 7.70-18.36% (Av. 12.01%) was observed in the cv. JL-24. This was followed by TAG-24 (range, 6.72-16.06 % and Av. 10.47%), TG-26 (range, 5.79-14.09% and Av. 9.04%) and LGN-1 (range, 4.58-13.18% and Av. 8.11%).

Data obtained on per cent defoliation at various intervals indicated that amount of defoliation in all varieties increased with the age of crop. Minimum defoliation (range, 2.81-8.47%) was observed at 60 DAS, moderate (range, 4.70-11.38%) at 75 DAS and maximum (range, 6.23-35.23%) at 90 DAS.

Among the four cultivars, cv. LGN-1 exhibited minimum defoliation in the range of 2.81-3.82, 4.70-6.70

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*Average of replications, DAS = Days after sowing Figures in parentheses are angular transformed values
and 6.23-29.02%, respectively at 60, 75 and 90 DAS. Maximum defoliation in the range of 4.88-8.47, 8.23-
6.23-29.02%, respectively at 60, 75 and 90 DAS, was recorded in cv. JL-24. This was followed by the cv. TAG-24 which recorded the defoliation in the range of 4.12-6.52, 6.63-9.12 and 9.42-
6.63-9.12 and 9.42-32.53%, respectively at 60, 75 and 90 DAS and the cv. TG-26 with the defoliation in the range of 3.82-4.72, 5.55-
4.12-6.52, 6.63-9.12 and 9.42-32.53%, respectively at 60, 75 and 90
DAS.

Thus, results (Table 3) revealed that sowing dates and crop varieties significantly influenced the percentage defoliation induced by late leaf spot disease in groundnut. Further, percentage defoliation was found to increase with increase in the disease incidence and severity as well as age of the crop and was directly proportional to the disease incidence and severity. Maximum defoliation in the range of 13.18-18.36% was observed in the crop sown on 25th June followed by the crop sown on 10th July (range, 6.58-9.97%) and 25th July (range, 4.58-7.70%). Among the four cultivars maximum defoliation in the range of 7.70-18.36% was observed in cv. JL-24, followed by cv. TAG-24 (range, 6.72-16.06%), TG-26 (range, 5.79-
6.72-16.06%), and LGN-1 (range, 4.58-13.18%). The interaction effects of sowing dates X cultivars in respect to defoliation observed at various intervals were also found significant.

Sowing dates and late leaf spot frequency and size

The results (Table 4) indicated that both frequency and size of the late leaf spot on foliage were significantly influenced by the sowing time of the crop. The crop sown on 25th June exhibited maximum frequency in the range of 1.38-1.76/mm² (Av. 1.56/mm²) and increased size (range, 1.52-1.58/mm² and Av. 1.55/mm²) of the late leaf spot. This was followed by the crop sown on 10th July (range, 1.25-1.59/mm² and Av. 1.44/mm²) and size (range, 1.44-1.52/mm² and Av. 1.48/mm²) of the late leaf spot. The crop sown on 25th July exhibited least frequency (range, 1.05-1.21/mm² and Av. 1.13/mm²) and size (range, 1.22-1.29/mm² and Av. 1.25/mm²) of the late leaf spot.

Groundnut cultivars and late leaf spots frequency and size

The results (Table 4) indicated that the frequency and size of leaf spots were significantly influenced with the crop varieties. Moderately resistant cultivars, viz. LGN-1 exhibited comparatively reduced leaf spot frequency in the range of 1.05-1.38/mm² and leaf spot size 1.22-
1.22-1.52/mm². Susceptible cv. JL-24, TAG-24 and TG-26 exhibited comparatively reduced leaf spot frequency in the range of 1.21-1.76/mm², 1.18-1.68/mm² and1.11-
1.58/mm², respectively and late leaf spot size 1.29-1.58/
1.26-1.58/mm² and1.23-1.54/mm², respectively. The interaction affects of sowing dates X cultivars in respect to late leaf spot frequency and size were found significant.

Thus, results of the present studies revealed that late leaf spot frequency and size were significantly influenced by the sowing dates and crop varieties. Both were maximum in the crop sown early (25th June) and maximum in the crop sown late (25th July). Susceptible cultivar (JL-24) exhibited high frequency and size of the late leaf spot compared to moderately resistant cultivars. These results are in consonance with those who reported that the reduced frequency and size of leaf spot, longer incubation period and reduced sporulation as the components of late leaf spot resistance in groundnut (Mayee and Suryawanshi, 1995; Chandra et al., 2004).

Pod yield and test weight

The results (Table 5) indicated that sowing dates and groundnut cultivars significantly influenced the late leaf spot disease incidence, severity and defoliation both of which directly and significantly affected the pod yield and test weight. Crop sown on 25th June gave least pod yield (range, 1197-1679 kg/ha) and test weight (25.19-29.40 g) with maximum incidence (range, 46.45-56.25%), severity (range, 40.12-49.58%) and defoliation (range, 13.18-18.36%). Significantly highest pod yield (range, 1655-2287 kg/ha) and test weight (range, 29.30-35.00 g) were obtained in the crop sown on 25th July with least incidence (range, 26.86-35.83%), severity (range, 22.10-31.07%) and defoliation (range, 4.58-7.70%). This was followed by the crop sown on 10th July with pod yield in

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<th>Sowing dates Varieties</th>
<th>Mean late leaf spot*</th>
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<td>Average</td>
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<tr>
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<td>C D</td>
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<td>D x V</td>
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* Average of three replications
the range of 1451-2085 kg/ha and test weight of 26.62-
32.30 g with the moderate incidence (range, 34.59-
39.65%), severity (range, 30.67-35.73%) and defoliation
(range, 6.58-9.97%).

Among the cultivars, cv. LGN-1 gave highest pod
yield (ranges, 1679-2287 kg/ha) and test weight (ranges,
29.40-35.00 g) with minimum incidence (range, 26.66-
46.45%), severity (range, 22.10-40.12%) and defoliation
(range, 4.58-13.18%). Susceptible cv. JL-24 and TAG-
24 gave lowest pod yield (ranges, 1197-1655 kg/ha),
(ranges, 1398-1853 kg/ha), respectively and test weight
(ranges, 25.19-29.30), (ranges, 25.24-30.68), respectively with maximum incidence (range, 35.83-
56.25%), severity (range, 31.07-49.58%), defoliation
(range, 7.70-18.36%) and incidence (range, 32.87-
52.51%), severity (range, 28.11-46.11%), defoliation
(range, 6.72-14.09%), respectively. The interaction effect
of sowing dates x cultivars in respect of incidence,
severity, defoliation, pod yield and test weight were also
found significant. Thus late leaf spot severity was
significantly influenced by the time of sowing and
cultivars, which directly affected the pod yield and test
weight in groundnut.

Thus, late leaf spot disease severity and corresponding defoliation, leaf spot frequency and size were significantly influenced by the sowing dates and cultivars which directly affected the pod yield and test weight in groundnut. Further, the crop sown late (25th July) and mid-late (10th July) yielded better with least late leaf spot incidence, severity, defoliation and reduced frequency and size of late leaf spot than the crop sown early (25th June).

Similar effects of sowing dates and crop varieties
on the intensity/severity of late leaf spot and their effect
on pod yield and test weight in groundnut were also
reported earlier by several workers (Dandnaik et al.,
1996; Hazarika et al., 2000; Galgunde and Kurundkar,
2002; Tiwari et al., 2005; Gawade et al., 2008;
Subasinghe et al., 2009; Gadhave et al., 2011; Rashid
et al., 2013). Dandnaik et al. (1996), reported that all the
four cultivars (JL-24, SB-XI, LGN-2 and ICGS-44)
showed decreasing trend of leaf spots and rust with
successive delay in the sowing dates. The leaf spots and
rust severity was highest in the crop sown early on the
15th September and lowest on the crop sown on 15th
October. Galgunde and Kurundkar (2002) studied the

Table 5. Effect of sowing dates and groundnut varieties on per cent disease incidence, severity, defoliation, pod yield and test weight
during Kharif, 2012

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<th>Sowing dates</th>
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<th>Incidence</th>
<th>Severity</th>
<th>Defoliation (%)</th>
<th>Pod yield* (kg/ha)</th>
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*Average of replications
**Figures in parentheses are angular transformed values
effect of two sowing dates (9th and 24th October, 1998) and nine genotypes of groundnut on the incidence and intensity of leaf spots and rust diseases. They reported that incidence and intensity of both the diseases were steadily increased up to the maturity of the crop. Least intensity of both the diseases was recorded in the crop sown on 24th October than the crop sown on 9th October. Gawade et al. (2008) reported that sowing dates and soybean cultivars significantly influenced the percentage foliage anthracnose intensity, corresponding defoliation, seed yield and test weight. However, least foliage anthracnose intensity (9.10-11.73%), corresponding defoliation (18.1-23.47%) and pod blight intensity (6.43-14.09%) with highest grain yield (24.92-29.85 kg/ha) and test weight (13.50-15.66 g) were recorded in the crop sown on 25th July. The crop sown on 25th June recorded increased intensity of foliage anthracnose (20.36-26.07%), corresponding defoliation (28.40-36.83%) and pod blight (10.98-22.48%).

Crop management practices such as date of sowing and cultivar may influence the severity of late leaf spot and pod yield of groundnut caused by P. personata. Sowing when environmental conditions are less favorable for disease incidence and/or progress can provide partial management of the disease (Smith, 1984). This disease can be control by the application of agrochemicals. However, the worldwide trend towards environmentally safe methods of plant disease control in sustainable agriculture calls for reducing the use of these synthetic chemical fungicides. In an attempt to modify this condition, some alternative methods of the control have been adopted. The disease development is dependent on the weather factors and inoculums. The present study indicates that late sowing (July) of crop is most vulnerable to the disease as compare to early sowing (June) since the late leaf spot may appear in epiphytotics and thereby reducing pod yield drastically. It may be because of favourable conditions like temperature, relative humidity and abundant spore load in the atmosphere coupled with intermittent rainfall.

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REFERENCES


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