

Original Research Article

Effect of Date of Sowing on Anthracnose of Rajmah

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ABSTRACT

The Rajmah anthracnose (*C. lindemuthianum*) emerged out as a threat to the successful cultivation of crop and reported as most destructive disease of rajmah causing 30 to 70 per cent losses throughout the world including India. The anthracnose incidence was reported from the states of Maharashtra, Haryana, Uttar pradesh and some parts of Nilgiri hills in North India. Therefore, the present studies on rajmah anthracnose were undertaken during *Kharif*, 2013 on the effect of sowing dates and varieties on disease incidence and intensity. The result obtained in respect of sowing dates and varieties on disease incidence, intensity, and yield indicated that the crop sown late (1st Aug) exhibited minimum mean disease incidence (19.43%), and intensity (18.08%) with maximum yield (15.74q/ha). While maximum mean disease incidence (25.99%), and intensity (36.58%) was reported in the early sown crop (15th June). However, least yield (11.31q/ha) were recorded in crop sown on 15th June. Among the different varieties, variety Latur local recorded least disease incidence, intensity and severity with yield (12.3 q/ha) as compared to variety Varun. The results on correlation study indicated that, correlation between temperature (Maximum & Minimum) and anthracnose incidence was significant but negative

Keywords

Rajmah
anthracnose,
Date of Sowing,
Incidence,
Intensity,
Weather
Parameter

Introduction

Rajmah is most important pulse crop grown in North India. Rajmah successfully cultivated in both *kharif* and *rabi* seasons in India. Rajmah is known by various names *viz.* French bean, Haricot bean, kidney bean, Snap bean, Navy bean, Field bean, Dry bean, Pole bean and common bean etc. It belongs to family *Leguminosae*. In India, both bushy and trailing types of rajmah are cultivated. Rajmah is nutritious and potential source of protein, carbohydrates, and minerals. It contains about 1.0% to 2.5% protein in green pods. Among several diseases affecting rajmah, Anthracnose caused by *Colletotrichum lindemuthianum* is most serious disease and cause losses both

in terms of yield and quality in dry and vegetable type of beans. Yield losses due to anthracnose in susceptible cultivars have been reported to vary from 38% to 100% under different situations. Considering economic importance of the crop present investigation was undertaken

Materials and Methods

A field experiment was laid out in Factorial Randomized Block Design (FRBD) with five dates of sowing *viz.* 1st June (D₁), 15th June (D₂), 1st July (D₃), 15th July (D₄) and 1st August (D₅) replicated thrice. Rajmah, Variety varun and Latur Local was sown at

spacing – 45cm x 15cm during, kharif 2013 at College of Agriculture, Latur

Observations on disease incidence and intensity of anthracnose were recorded at 7 days interval after appearance of the disease.

The disease incidence was calculated by using the following formula.

$$\text{Per cent disease incidence} = \frac{\text{No. of plants infected}}{\text{No. of plants observed}} \times 100$$

The disease intensity was recorded on five randomly selected plants using a rating scale 0 to 9 given by Mayee and Datar (1986). The intensity of this disease was calculated by following formula.

$$\text{Per cent Disease intensity} = \frac{\text{Summation of grades observed}}{\text{No. of leaves taken} \times \text{Max. grade}} \times 100$$

The meteorological data for the experimental period was collected and correlated with anthracnose severity.

Results and Discussion

Effect of sowing dates and varieties on rajmah anthracnose disease incidence a different growth stages

The results obtained were depicted in Table.1 and graphically in fig.1a and 1b. The results indicated that, among the varieties Varun recorded highest disease incidence in all the stages of growth i.e. 25 DAS, 32 DAS, 39 DAS, 46 DAS, 53 DAS, 60 DAS and 67 DAS and it was 8.8%, 14.99%, 23.33%, 35.06%, 41.73%, 46.53%, and 51.07%, respectively and recorded highest mean disease incidence of 31.64%, where as in var. Latur local it was lowest at all stages of growth i.e. 25 DAS, 32 DAS,

39 DAS, 46 DAS, 53 DAS, 60 DAS and 67 DAS and it was 4.8%, 8.53%, 12.8%, 19.06%, 24.67%, 27.07% and 28.93%, respectively and mean incidence was 17.98 %. In different dates of sowing, 1st Aug sowing recorded minimum disease incidence at all the stages of growth i.e. 25 DAS, 32 DAS, 39 DAS, 46 DAS, 53 DAS, 60 DAS and 67 DAS and it was 5.00%, 10.67%, 17.00%, 23.67%, 24.67%, 26.33%, and 28.67%, respectively and also least mean disease incidence 19.43%. Whereas, maximum disease incidence was recorded in 1st June sowing in all the stages i.e. 25 DAS, 32 DAS, 39 DAS, 46 DAS, 53 DAS, 60 DAS and 67 DAS and it was 6.66%, 11.00%, 17.66%, 31.00%, 44.33%, 49.00%, and 54.00%, respectively and recorded highest mean disease incidence i.e. 30.52%.

The interaction effect between dates of sowing and varieties was studied. In all, dates of sowings and all growth stages i.e. 25DAS, 32DAS, 39DAS, 46DAS, 53DAS and 67DAS were significant except 60DAS and results are depicted in Table.7. Interaction effect indicates that var. Latur local and Varun when sown at 1st Aug. recorded minimum disease incidence. Maximum disease incidence was recorded in 1st June and 15th July in both the varieties i.e. Varun and Latur local. It indicates that late sowing at 1st Aug. minimizes the disease incidence than the early sown crop. Similar result on incidence was reported by Mittal (1998) in black gram.

Effect of sowing dates and varieties on rajmah anthracnose disease intensity at different growth stages

Results of effect of sowing dates on anthracnose intensity in Varun and Latur local at different growth stages presented in Table.2 and graphically presented in fig.2a and 2b.

Table.1 Effect of sowing dates and varieties on rajmah anthracnose disease incidence at different growth stages

Varieties	Disease incidence %							Mean
	25DAS	32DAS	39DAS	46DAS	53DAS	60DAS	67DAS	
Varun (V₁)	8.8 (5.05)	14.99 (8.60)	23.33 (13.54)	35.06 (20.62)	41.73 (24.79)	46.53 (27.92)	51.07 (30.92)	31.64 (18.77)
Latur Local (V₂)	4.8 (2.75)	8.53 (4.89)	12.8 (7.36)	19.06 (11.03)	24.67 (14.37)	27.07 (15.80)	28.93 (16.95)	17.98 (10.45)
SE±	1.00	0.866	1.50	1.78	1.63	1.78	1.74	1.47
CD at 5%	3.00	2.59	4.49	5.33	4.90	5.33	5.23	4.41
Sowing dates								
D₁ (1st June)	6.66 (3.82)	11.00 (6.32)	17.66 (10.19)	31.00 (18.10)	44.33 (26.37)	49.00 (29.45)	54.00 (32.83)	30.52 (18.12)
D₂ (15th June)	8.33 (4.78)	12.33 (7.10)	18.00 (10.42)	29.33 (13.55)	33.33 (19.67)	38.33 (22.73)	42.33 (25.25)	25.99 (15.31)
D₃ (1st July)	6.66 (3.82)	8.66 (4.97)	15.67 (9.02)	23.33 (13.55)	30.33 (17.79)	34.67 (20.50)	38.33 (22.89)	22.52 (13.22)
D₄ (15th July)	7.33 (4.21)	16.00 (9.24)	22.00 (12.82)	28.00 (16.47)	33.33 (19.72)	35.67 (21.27)	36.67 (21.95)	25.57 (15.09)
D₅ (1st Aug)	5.00 (2.86)	10.67 (6.12)	17.00 (9.82)	23.67 (13.76)	24.67 (14.34)	26.33 (15.36)	28.67 (16.76)	19.43 (11.28)
SE±	1.58	1.36	2.37	2.81	2.59	2.81	2.76	2.16
CD at 5%	4.44	4.09	6.64	7.88	7.75	8.44	8.2	6.45
V×D (Interaction effect)								
SE±	2.24	1.93	3.33	3.98	3.66	2.81	3.90	3.42
CD at 5%	6.28	5.79	10.05	11.92	10.96	NS	10.94	9.32

*Figures in parentheses are arcsine transformed values

Table.2 Effect of sowing date and varieties on rajmah anthracnose disease intensity at different growth stages

Varieties	Disease intensity %							Mean
	25DAS	32DAS	39DAS	46DAS	53DAS	60DAS	67DAS	
Varun (V₁)	8.14 (4.67)	12.29 (7.06)	22.66 (13.12)	33.62 (19.74)	46.21 (27.83)	57.62 (35.76)	67.92 (43.28)	35.49 (21.63)
Latur Local (V₂)	5.03 (2.88)	8.43 (4.84)	12.73 (7.32)	24.11 (13.99)	33.32 (19.58)	43.09 (25.82)	54.07 (29.77)	25.82 (14.88)
SE±	0.52	0.69	1.19	1.67	1.73	1.96	1.79	1.36
CD at 5%	1.56	2.07	3.58	5.02	5.20	5.88	5.38	4.09
Sowing dates								
D₁ (1st June)	7.77 (4.46)	10.36 (5.95)	15.18 (8.75)	27.40 (15.92)	37.03 (21.78)	50.36 (30.32)	59.99 (37.05)	29.72 (17.70)
D₂ (15th Jun)	7.03 (4.03)	9.62 (5.52)	17.77 (10.25)	35.47 (20.79)	51.85 (31.33)	63.69 (39.73)	72.58 (46.77)	36.85 (22.63)
D₃ (1st Jul)	7.03 (4.03)	8.51 (4.88)	20.73 (12.00)	31.10 (18.24)	44.07 (26.49)	57.03 (35.30)	69.99 (45.44)	34.06 (20.91)
D₄ (15th Jul)	6.29 (3.6)	14.07 (8.1)	21.47 (12.43)	32.58 (19.14)	42.95 (25.60)	52.55 (32.18)	56.99 (35.55)	32.41 (19.51)
D₅ (1st Aug)	4.81 (2.75)	9.25 (5.30)	13.32 (7.67)	17.77 (10.25)	22.95 (13.32)	28.14 (16.42)	30.36 (17.80)	18.08 (10.50)
SE±	0.82	1.09	1.89	2.65	2.75	3.10	2.84	2.16
CD at 5%	2.31	3.27	5.66	7.93	8.23	9.29	8.51	6.45
V×D (Interaction effect)								
SE±	1.16	1.54	2.67	3.74	3.88	4.39	4.02	3.05
CD at 5%	3.26	4.33	7.49	10.49	10.88	12.38	11.26	8.57

*Figures in parentheses are arcsine transformed values

Table.3 Effect of sowing dates and varieties on anthracnose disease incidence, intensity and yield of rajmah

Varieties	Mean Incidence (%)	Mean Intensity (%)	Yield (q/ha)
Varun (V₁)	31.64 (18.77)	35.49 (21.63)	14.91
Local-1 (V₂)	17.98 (10.45)	25.82 (14.88)	12.31
S.E. ±	1.47	1.36	0.53
C.D. at 5%	4.41	4.098	1.59
Sowing dates			
1st June (D₁)	30.52 (18.15)	29.72 (17.74)	14.12
15th June(D₂)	25.99 (15.31)	36.85 (22.63)	12.96
1st July (D₃)	22.52 (13.22)	34.06 (20.91)	11.31
15th July (D₄)	25.57 (15.09)	32.41 (19.51)	13.68
1st Aug (D₅)	19.43 (11.28)	18.08 (10.50)	15.74
S.E. ±	2.32	2.16	1.23
C.D. at 5%	6.77	6.45	NS
V×D (Interaction effect)			
S.E. ±	3.42	3.05	4.31
C.D. at 5%	9.32	8.57	NS

* Figures in parentheses are arcsine transformed values.

Table.4 Correlation coefficient between rajmah anthracnose incidence and weather parameters

Weather parameters	Correlation co-efficient (r)	
	Varun (V ₁)	Latur local(V ₂)
Temperature (Max)	-0.629*	-0.626*
Temperature (Min)	-0.262	-0.275
Relative Humidity (%)	-0.176	0.365
Total rainfall (mm)	0.369	0.402
Rainy days	0.455	0.449

*=significant at 1%

Fig.1a Effect of rajmah varieties on anthracnose disease incidence

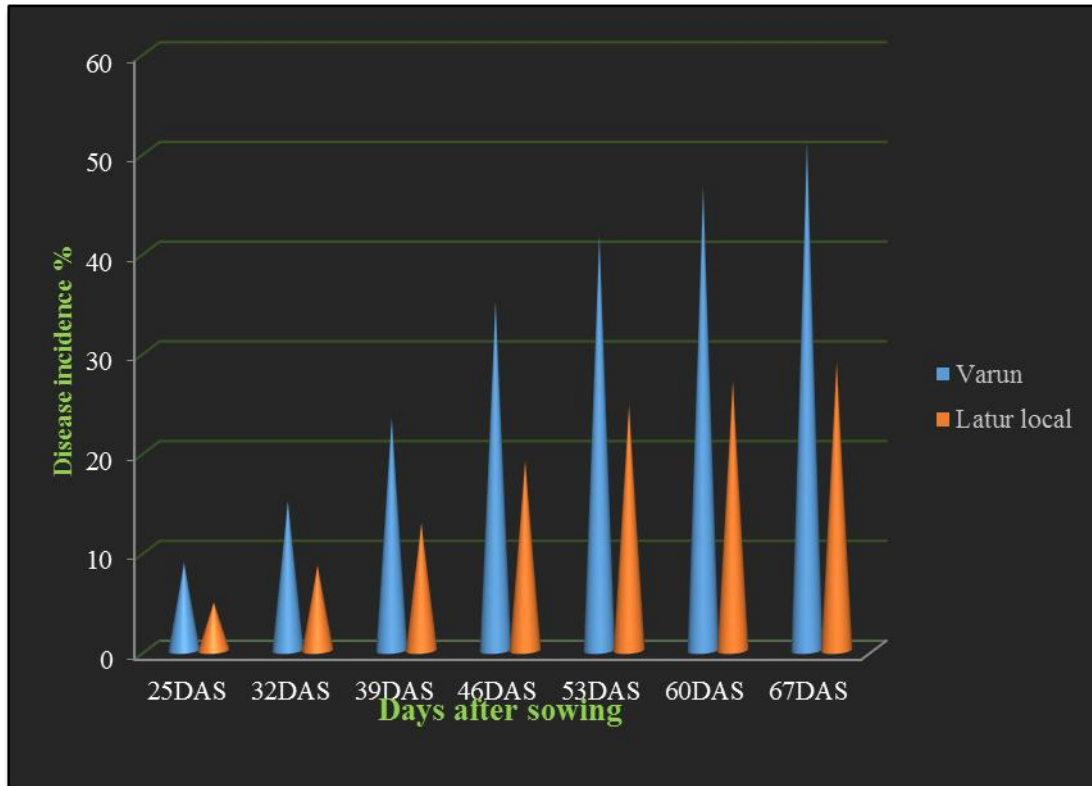


Fig.1b Effect of sowing dates on rajmah anthracnose disease incidence

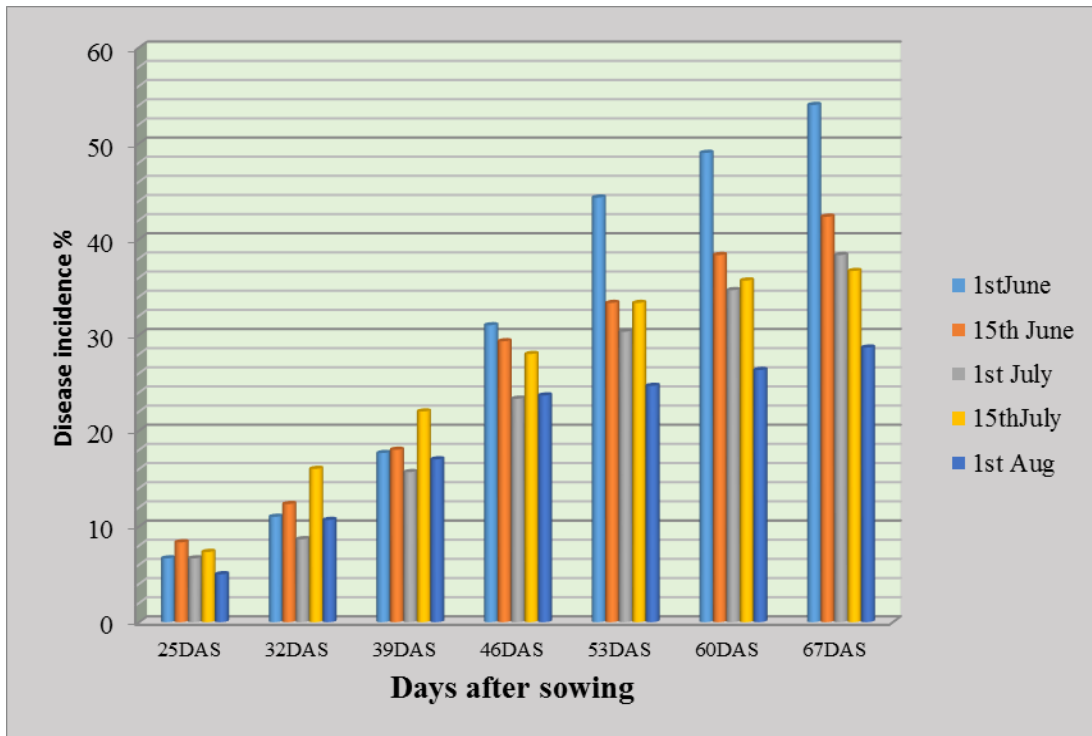


Fig.2a Effect of rajmah varieties on anthracnose disease intensity

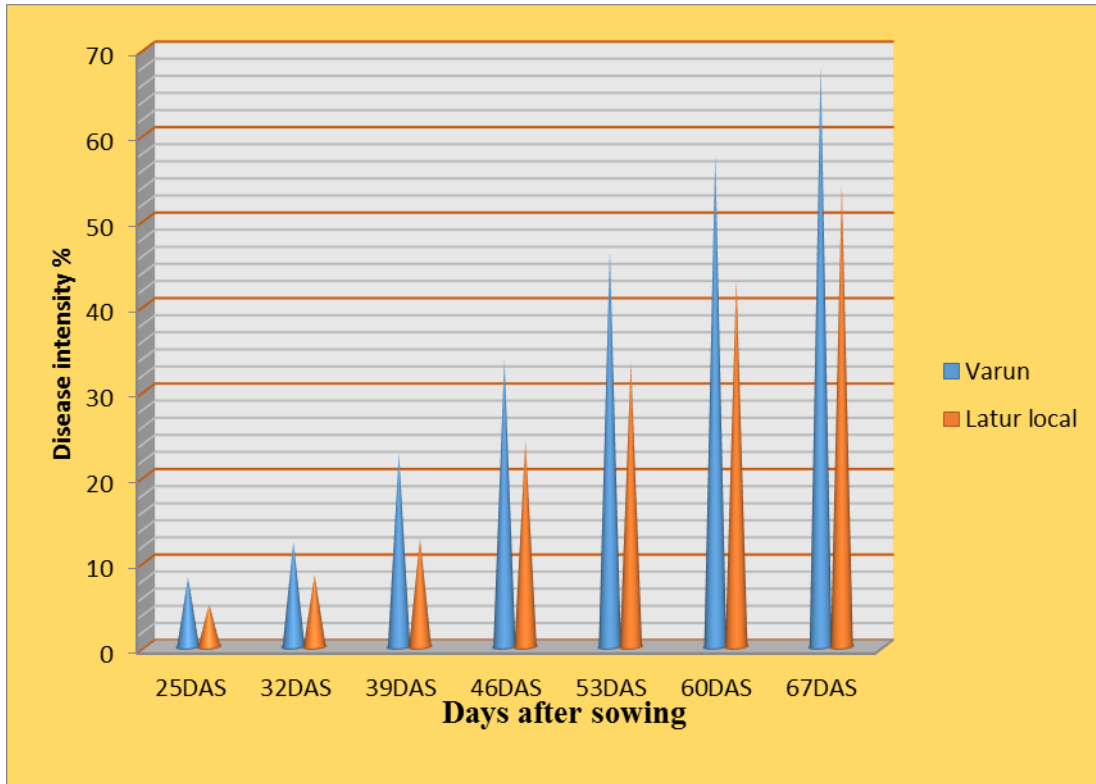


Fig.2b Effect of sowing dates on rajmah anthracnose disease intensity

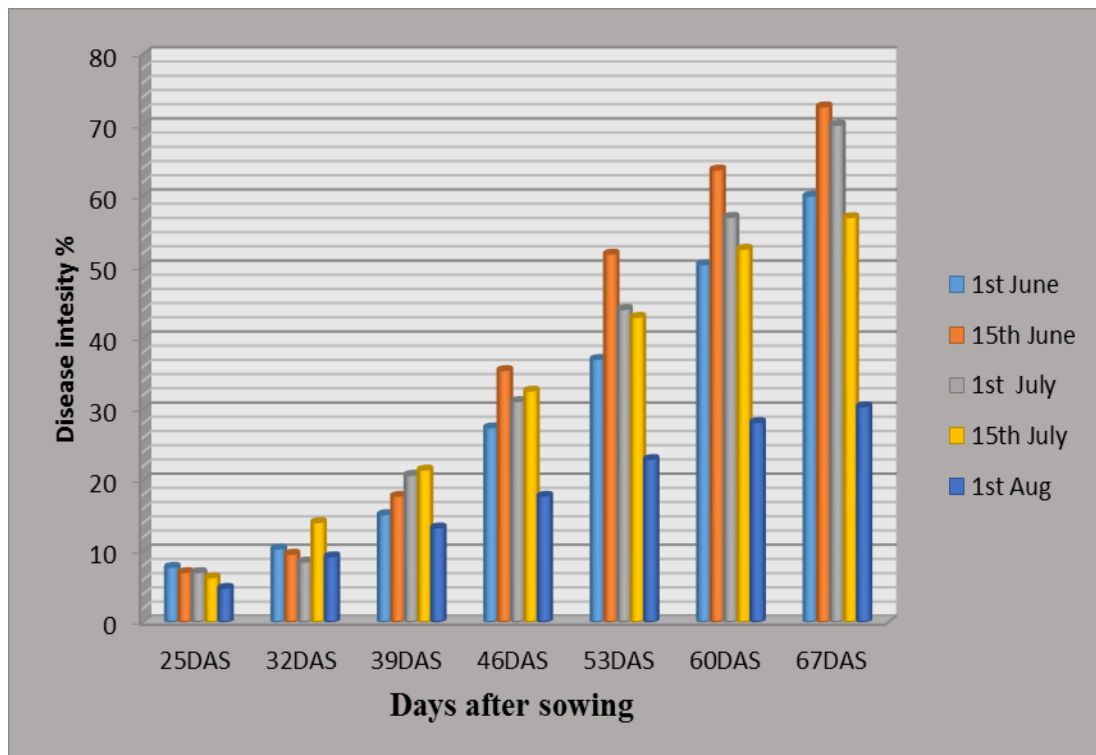
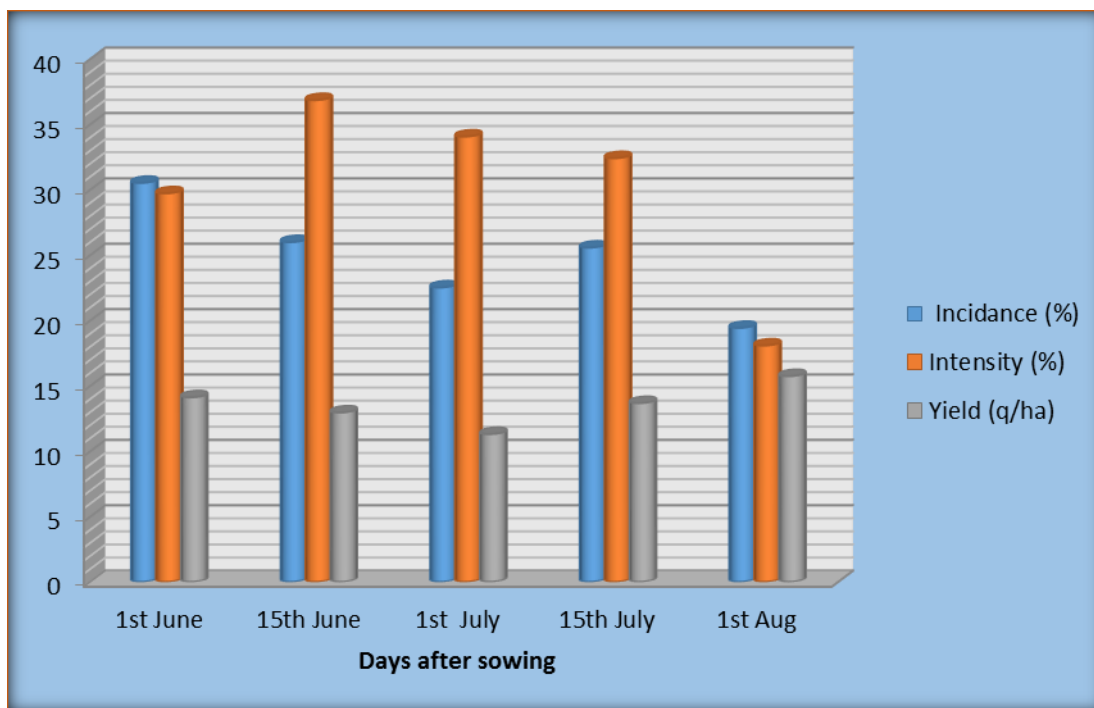


Fig.3 Effect of rajmah varieties on anthracnose disease incidence, intensity and yield



It indicates that the minimum disease intensity was observed in all the stages i.e. 25 DAS (5.03%), 32 DAS (8.43%), 39 DAS (12.73%), 46 DAS (24.11%), 53 DAS (33.32%), 60 DAS (43.09%) and 67 DAS (54.07%), respectively in Latur local with least mean disease intensity i.e. 25.82%. Maximum disease intensity was observed in variety Varun in all the stages i.e. 25 DAS (8.14%), 32 DAS (12.29%), 39 DAS (26.66%), 46 DAS (33.62%), 53 DAS (46.21%), 60 DAS (57.52%) and 67 DAS (67.92%) respectively and with maximum mean disease intensity of 35.49%.

In different sowing dates highest disease intensity was observed at 15th June sowing including all the stages of growth i.e. 7.03% at 25DAS, 9.62% at 32 DAS, 17.77% at 39DAS, 35.47% at 46 DAS, 51.85% at 53 DAS and 63.69% at 60 DAS and 72.58% at 67DAS with 36.85% average intensity, than other treatments. Minimum disease intensity was observed at 1st Aug. sowing including

all stages of growth i.e. 4.81% at 25DAS, 9.25% at 32 DAS, 13.32% at 39DAS, 17.77% at 46 DAS, 22.95% at 53 DAS and 28.14% at 60 DAS and 30.36% at 67DAS with 18.08% average intensity than other treatments.

The interaction effects between dates of sowing and varieties were also studied. Both varieties i.e. Varun and Latur local in all dates of sowing and at all the growth stages i.e. 25 DAS, 32 DAS, 39 DAS, 46 DAS, 53 DAS, 60 DAS and 67 DAS were significant and results are depicted Table 9. Interaction effect indicates that var. Latur local and Varun when sown on 1st Aug recorded minimum disease intensity.

Maximum disease intensity was recorded in 15th June and 1st July sowing in both the varieties i.e. Varun and Latur local, respectively. It indicates that late sowing at 1st Aug minimizes the disease intensity as compared with early sown crop in both

varieties. Variety Latur local sown on 1st August recorded least disease intensity (22.95%). Similar result on incidence was reported by Mittal (1998) in black gram.

Effect of sowing dates and varieties on anthracnose disease incidence, intensity and yield of rajmah

Result on effect of sowing dates and varieties on disease incidence, intensity and yield an experiment was carried out and results obtained are depicted in Table.3 and graphically in fig.3.

Results indicate that, in varieties there is no significant difference in seed yield (q/ha). The variety Varun recorded highest disease intensity (35.49%) and incidence (31.64%) with yield (14.91 q/ha) as compared with var. Latur local which recorded disease intensity (25.82%) and incidence (17.98%) with yield (12.31 q/ha).

In different sowing dates, the sowing on 1st August recorded the highest yield (15.74 q/ha) and least disease intensity (18.08%) and incidence (19.43%) followed by 1st June and 15th July sowings which recorded disease intensity (29.72%) and (32.41%) and disease incidence (30.52%) and (25.57%) respectively with the yield 14.12 and 13.68 q/ha, respectively. Similar result on incidence was reported by Mittal (1998) in black gram.

The interaction effect of varieties and dates of sowing on yield (q/ha) was non-significant. Results of variety and sowing dates indicate that the variety Varun is best for cultivation.

Effect of weather parameters on rajmah anthracnose incidence

To study the effect of weather parameters viz., maximum and minimum temperatures (⁰c), relative humidity (per cent), rainfall (mm) and number of rainy days on disease incidence of anthracnose of rajmah, correlation coefficient was worked out and results obtained are depicted in Table.4.

The results indicated that, correlation between temperature (Maximum & Minimum) and anthracnose incidence was significant but negative; it means as temperature (Max. and Min.) increases, there is decrease in disease incidence and as the temperature (Max. and Min.) decreases, there is increase in disease incidence. The correlation between relative humidity, Total rainfall, rainy days and anthracnose incidence was positive but non-significant. Similar results reported by Kumar *et al.*, in 1999.

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