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Impact of sowing periods on incidence of sucking pest on summer mungbean

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Abstract
Study the impact of sowing periods on incidence of sucking pest revealed that the sucking pests whitefly, jassids and thrips population was significantly high during the crop sown on 1st week of February (early sown) and recorded 0.68, 0.58 and 0.54 population per leaf, respectively, while significant lowest population recorded on crop sown during 3rd week of February (mid late sown) and it was recorded 0.49, 0.39 and 0.38 respectively. Significant lowest population of stink bug (0.12 bugs per plant) was recorded on 4th week of February (late sown). The interaction effect of sowing dates and varieties had no significant influence on sucking pests. Whereas, highest per cent mungbean yellow mosaic virus (MYMV) disease incidences found in early sowing as compared to late sowing and it was significant positively correlated with whitefly population.

Keywords: Mungbean, whitefly, jassids, thrips, stink bug, MYMV**,** sowing periods

Introduction
Pulses, the food legumes, have been constitute an excellent supplement of protein in the vegetarian diet of human beings and play a significant role in balanced food to the people of India (Nene, 2006) [5] and many other countries in the world. There are various constraints for low production in mungbean. Though having high production potential than productivity in general low as they are cultivated on poor lands with little inputs and susceptible at several biotic and abiotic stresses, out of these insect pests on green gram play a major role in low production. The most serious insect pest attacking on mungbean includes the whitefly (*Bemisia tabaci* Gennadius), bean thrips (*Megalurothrips distalis* Karny), gram pod borer (*Helicoverpa armigera* Hubner) and legume pod borer (*Maruca vitrata* Geyer) (Kooner *et al.*, 2006) [2]. Among them white fly not only suck the sap of plant but also transmit Yellow Mosaic Virus which causes 30-70% yield loss (Marimuthu *et al.*, 1981) [3]. Whitefly, a potential vector of Mungbean Yellow Mosaic Virus (MYMV) can cause loss ranging from 30-70 per cent (Swaminathan *et al.*, 2012) [10]. Pest appearance and crop yield are very much dependent on sowing time. Most of the farmers usually, sown mungbean just after harvesting the *rabi* crops without considering optimum sowing dates. As a result crop growth affected by unfavourable prevailing climatic condition and also crop received higher pest infestation and accordingly yield becomes reduced. Therefore, the present study was undertaken.

Materials and Methods
To study the impact of sowing date on incidence of sucking pest the mungbean varieties/genotypes (Meha, NKM-15-08 and NKM-15-12) were sown in a plot size 2.7 m x 4.0 m with a spacing 45 cm × 10 cm in different sowing periods *i.e.* 1st week of February, 2nd week of February, 3rd Week of February and 4th week of February during *Summer* 2017 at College farm, N.A.U, Navsari. The experiment was laid out in a Factorial Randomized Block Design (FRBD) with three replications. All the recommended agronomical practices were followed to raising the crop. Experimental area was kept free from insecticidal spray throughout the season. Observations on sucking Pests *viz*. jassids, whitefly, thrips, stink bugs were recorded at weekly interval. For this purpose stink bugs were counted on whole plant basis by visual search method on five plants per net plot. The whitefly, thrips and jassids counts were taken at weekly interval by selecting five plants from each net plot and from each plant three leaves representing top, middle and bottom part. Mean population of sucking pest per leaf were worked out and the mean population of sucking pests was subject to square root transformation prior to statistical analysis.

Mungbean yellow mosaic virus (MYMV)

Disease incidence was recorded periodically and percentage disease incidence was worked out by using the following formula (Mohan *et al*., 2014) [4]:

$$\text{Percentage Disease Incidence (PDI)} = \frac{\text{Number of plants infected in a plot}}{\text{Total number of plants in a plot}} \times 100$$

With a view to evaluate the effect of different period of sowing on the yield, the plants of net plot area were harvested treatment wise. The yield thus obtained was converted into hectare basis for each treatment.

Results and discussion

Whitefly, *Bemisia tabaci* Gennadius

The data on whitefly infestation are presented in Table 1. The data on impact of sowing period on infestation was found significant. Number of whitefly per leaf significantly varied under different sowing dates. The highest number of whitefly (0.68 per leaf) was found in crop sown on 1st week of February (early sown) while, lower number of whitefly (0.49 per leaf) recorded on crop sown on 3rd week of February (mid late), which was significantly similar with late sown crop *i.e.* 4th week of February (0.53 per leaf). Tamang *et al*., (2017) [11] was noted that whitefly was found most abundant up to first two week of February. The present finding accordance with them. While present finding was differ from earlier finding of Nitharwal (2009) [6] according to him minimum incidence of whitefly on early sown crop (1st July). The variation in present finding might be due to variation in climatic factors during growing season. Similar to sowing dates, varieties also had significant effect on whitefly infestation on mungbean crop. The variety Meha show the highest number of whitefly (0.67 per leaf) while, lower number of whitefly were observed in genotype NKM 15-12 (0.50 per leaf).

Jassids, *Empoasca kerri* Pruthi

Number of jassids per leaf significantly varied under different sowing dates (Table 1). The highest number of jassids (0.58 per leaf) was found in crop sown on 1st week of February (early sown) while, lower number of jassids (0.39 per leaf) was recorded on crop sown on 3rd week of February (mid late sown), which was significantly similar with 4th week of February sown crop (0.41 per leaf). Thus, late sowing of mungbean cause lower incidence of jassids. Earlier Nitharwal (2009) [6] reported that minimum jassids incidence observed in early sown crop of mungbean in 1st July. The present finding may varied with earlier finding variation might be due to difference on climatic condition in different location. Similar to variety also had significant effect on jassids infestation on mungbean crop. The variety Meha show the highest number of jassids (0.57 per leaf) while, lower number of jassids were observed in NKM 15-12(0.40 per leaf).

Thrips, *Megalurothrips distalis* Karny

Data of sowing exhibited significant influence on thrips population (Table 1). The crop sown on 1st week of February (Early sowing) has founded the maximum infestation of thrips (0.54 thrips per leaf). The lowest infestation of thrips was observation crop sown on 3rd week of February *i.e*. mid late sown (0.38 thrips per leaf). Thus, mid late sowing (3rd week of February) of mungbean crop had minimum infestation of thrips. The present studies was in conformity with Sreekanth *et al*., (2002) [9] and Prodhan *et al*., (2008) [7] they found that the early and late sowing of mungbean crop contain more incidence of thrips. Varietal influences on thrips population varied significantly indicating there by that the incidence of pest had a direct relation on different varieties being tested. Genotype NKM 15-12 was recorded with lowest mean thrips population as show in Table 1. While highest incidence of thrips population was recorded in cultivar Meha (0.55 thrips per leaf).

Stink bug, *Nezara viridula* Linnaeus

The intensity of infestation varied from 0.12 to 0.24 stink bug per plant. The result indicated that the significant lowest population was observed during crop sown on 4th week of February (0.12 bug per plant) *i.e.* late sowing while, the highest population (0.24 bug per plant) was recorded during crop sown on 1st week of February (early sowing).Varieties had no significant influence on the stink bug population (Table 1). However, variety NKM 15-12 and NKM 15-08 had lower the incidence of stink bug.

Interaction effect of sowing dates and varieties of mungbean on incidence of sucking pest

The interaction of sowing dates and varieties had no significant influence on the white fly, jassid, thrips and stink bug population (Table 2).

Mungbean Yellow Mosaic Virus (MYMV)

Disease incidence was recorded during different crop growth stage like as vegetative stage, flowering and pod formation stage and harvesting time and counts percentage disease incidence (Table 3). Based on per cent disease incidence, at vegetative, flowering and pod formation stage highest MYMV incidence (13.33%, 26.67%) recorded in variety Meha sown at 1st week of February (early sown) while, lower per cent incidence was observed in genotype NKM 15-12 (0.00%, 6.67%) sown on third week of February (late sown) respectively. While at harvesting stage, highest per cent disease incidence (40.00%) was recorded in variety Meha sown on first week of February (early sown) while, lower per cent disease incidence was recorded in genotype NKM 15-12 (6.67%) sown at 3rd week of February (mid late sown). These finding are almost in line with the present findings while, the present finding are differ from earlier studies of (Sesha Mahalakshmi *et al.,* 2013) [8] according to him delay sowing not only increase severity but also decline the grain yield of blackgram. The variation in present findings might be due to variation of physiological and morphological characters of particular crop.

The significant positive correlation observed between MYMV and whitefly population at different growth stage of crops indicating that increasing whitefly population cause increase MYMV and vice versa (Table 4).

Effect of sowing dates and varieties on the grain yield of mungbean

Grain yield of mungbean significantly varied to the different sowing dates and insect pest infection (Table 1).The data indicated that 3rd week February (mid late sown) sown crop recorded significantly higher grain yield (703 kg per ha) as compared to subsequent sowing, while, the lowest yield was noticed in early sowing *i.e.* 1st week February sowing (623 kg per ha). The present study is in accordance with those of Hossian *et al*., (2009) [1] they found that early and late sown

mungbean crop received higher infestation of insect pest and less grain yield. Similar to sowing dates, varieties also had significant effect on grain yield. The variety NKM 15-12 showed the significant highest grain yield (692 kg per ha), while variety Meha showed lowest grain yield (625 kg per ha).

Interaction effect of sowing dates and varieties on grain yield

The interaction effect of sowing dates and variety on grain yield was found no significant (Table 2). The data indicated that timely crop sown on 3rd week of February (mid late sown) with variety NKM 15-12 had higher grain (736 kg per ha.).

Table 1: Effect of sowing dates and varieties on incidence of sucking pest

Factor	Treatments	Population of sucking pest per leaf			Stink bugs/plant	Grain yield (Kg/ha)
		Whitefly	Jassids	Thrips		
Sowing Date (D)	D1- 1st week February	1.09 (0.68)	1.04 (0.58)	1.02 (0.54)	0.86 (0.24)	623
	D2- 2nd week February	1.07 (0.65)	1.02 (0.54)	1.00 (0.51)	0.84 (0.21)	643
	D3- 3rd week February	0.99 (0.49)	0.94 (0.39)	0.93 (0.38)	0.82 (0.18)	703
	D4- 4th week February	1.01 (0.53)	0.95 (0.41)	0.95 (0.41)	0.78 (0.12)	664
	S.Em ±	0.024	0.024	0.023	0.018	16.18
	C.D. at 5%	0.07	0.07	0.06	0.052	47.32
Varieties (V)	V1- Meha	1.09 (0.67)	1.02 (0.57)	1.02 (0.55)	0.84 (0.21)	625
	V2- NKM-15-08	1.07 (0.59)	0.98 (0.47)	0.97 (0.45)	0.81 (0.17)	658
	V3- NKM-15-12	0.99 (0.50)	0.94 (0.40)	0.93 (0.38)	0.82 (0.18)	692
	S.Em ±	0.02	0.02	0.020	0.015	14.04
	C.D. at 5%	0.06	0.06	0.059	NS	40.98

Figure in parentheses are original value whereas, those outside are √x + 0.5 transformed value

Table 2: Interaction effect of sowing dates and varieties on incidence of sucking pest

Date of sowing	Variety	Population of sucking pest per leaf			Stink bug/plant	Grain yield (Kg/ha)
		Whitefly	Jassids	Thrips		
D1	Meha	1.13 (0.78)	1.09 (0.68)	1.07 (0.65)	0.87 (0.27)	590
	NKM 15-08	1.08 (0.67)	1.03 (0.56)	1.02 (0.54)	0.86 (0.23)	625
	NKM 15-12	1.04 (0.60)	1.00 (0.51)	0.97 (0.45)	0.85 (0.22)	655
D2	Meha	1.10 (0.71)	1.09 (0.69)	1.05 (0.61)	0.86 (0.24)	621
	NKM 15-08	1.08 (0.67)	1.01 (0.53)	1.01 (0.52)	0.82 (0.18)	649
	NKM 15-12	1.03 (0.57)	0.95 (0.41)	0.96 (0.42)	0.85 (0.22)	657
D3	Meha	1.03 (0.56)	0.96 (0.43)	0.98 (0.46)	0.85 (0.23)	672
	NKM 15-08	0.99 (0.49)	0.94 (0.39)	0.93 (0.37)	0.80 (0.14)	699
	NKM 15-12	0.96 (0.42)	0.92 (0.35)	0.90 (0.32)	0.81 (0.17)	736
D4	Meha	1.05 (0.62)	0.98 (0.46)	0.99 (0.49)	0.79 (0.12)	616
	NKM 15-08	1.01 (0.53)	0.97 (0.44)	0.94 (0.40)	0.79 (0.13)	657
	NKM 15-12	0.97 (0.43)	0.92 (0.34)	0.91 (0.34)	0.77 (0.10)	719
S. Em±		0.04	0.042	0.04	0.03	28.03
C.D. at 5%		NS	NS	NS	NS	NS
C.V.%		7.03	7.46	7.23	6.51	7.38

Figure in parentheses are original value whereas, those outside are √x + 0.5 transformed Value

Table 3: Mean per cent disease incidences of Mungbean Yellow Mosaic Virus (MYMV) on mungbean crop at different stage

Mungbean Yellow Mosaic Virus (MYMV)				
Date of Sowing	Variety	Vegetative stage	Flowering and pod formation stage	Harvesting stage
		PDI (%)	PDI (%)	PDI (%)
D1	Meha	13.33	26.67	40.00
	NKM 15-08	0.00	13.33	26.67
	NKM 15-12	6.67	6.67	20.0
D2	Meha	13.33	20.00	33.33
	NKM 15-08	13.33	13.33	20.0
	NKM 15-12	0.00	13.33	13.33
D3	Meha	6.67	20.00	26.67
	NKM 15-08	6.67	13.33	13.33
	NKM 15-12	0.00	6.67	6.67
D4	Meha	13.33	20.0	33.33
	NKM 15-08	6.67	20.0	26.67
	NKM 15-12	0.00	13.33	13.33

Table 4: Correlation between Mungbean Yellow Mosaic Virus (MYMV) and whitefly population at different growth stage

MYMV	Vegetative stage	Flowering and pod formation stage	Harvesting stage
Whitefly	0.668**	0.600**	0.839**

*Significant at 5% level r = 0.576 Significant at 5 per cent level (r = ±0.578)

Conclusion

Thus, results of above findings is indicated that the mid late sowing *i.e.* 3rd week of February is the best sowing time for all the three mungbean varieties/genotype to gave less pest and diseases incidence and higher yield. The genotype NKM 15-12 has least infestation of whitefly, jassids, thrips, stinkbug and disease and gave higher yield therefore they, should be used were to these pests prevailing as major pest.

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