Int.J.Curr.Microbiol.App.Sci (2020) *9*(7): 2137-2146

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 9 Number 7 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.907.249

Impact of Sowing Period and Variety on Pod Borer, *Helicoverpa armigera* Hubner in Pigeonpea

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Keywords

Helicoverpa armigera, Variety, Pigeonpea, sowing period

Article Info

Accepted:
17 June 2020
Available Online:
10 July 2020

A B S T R A C T

A field experiment was conducted to study the impact of sowing period [24th, 26th, 28th, 31st and 33rdStandard Meteorological Week (SMW)] and variety (AGT-2, BDN-2 and Vaishali) on pod borer, *Helicoverpa armigera* in pigeonpea at Agricultural Research Station, Anand Agricultural University, Derol, Dist. Panchmahal, Gujarat, India during *Kharif*, 2014-15, 2015-16, 2017-18 and 2018-19. Results of the study revealed that late sown (31st and 33rd SMW) pigeonpeacrop had significantly lower population of *H. armigera*and significantly lower per cent pod damage recorded at green pod as well as harvest stage. The effect of variety on per cent pod damage at green pod and harvest stage was non-significant. Grain yield was also not affected significantly by sowing period and variety.

Introduction

Pigeonpea [*Cajanus cajan* (L.) Millsp.], commonly known as redgram, *Tur*, *Arhar* etc., is an erect and short-lived perennial shrub legume (Sharma *et al.*, 2010). India is the world's largest producer and consumer of pulses including pigeonpea. India accounts for about 75 % of world production (Sharma *et al.*, 2010). In India pigeonpea is cultivated in area of 44.38 lakh hectare, while its production is 42.89 lakh tonne and productivity is 967 kg/ hectare (Anonymous, 2017-18). Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Gujarat, Andhra Pradesh, Tamilnadu and Bihar are the major pigeonpea growing states. The area under pigeonpea cultivation in Gujarat is 2.71 lakh hectare, whereas its production is 3.37 lakh tonne with productivity of 1243 kg/ hectare (Anonymous, 2017-18). More than 90 insect species were reported to feed on pigeonpea crop in India (Davis and Lateef, 1975). Amongst them, some are important and a few are the considered as "key pest". The important pests of pigeonpea in central zone of India are *Helicoverpa armigera*, *Maruca vitrata*, *Melangromy zaobtusa*, *Lampides boeticus* and *Clavigralla gibbosa*. Among these *H.armigera*, *M. obtusa* and *M. Vitrata*

are key pests. Pod borer, *H.armigera* is the most dreaded and polyphagous pest of pigeonpea worldwide (Patel, 2019). Its preference for flowering and fruiting parts results in heavy loss up to 60% or more under subsistence agriculture in the tropics. The annual monetary losses were estimated at US $ 400 in pigeonpea per hectare(Anonymous, 2007).

Farmers rely heavily on chemical insecticides to manage insect pest. Chemical insecticides cause many side effects. To overcome the problem of the indiscriminate use of pesticides, eco-friendly techniques such as agronomic practices can be utilized. One such method is altering the sowing dates in order to escape the peak activity of the insect by the crop. Date of sowing has a great impact on the incidence of the pest which may be attributed to the difference in weather condition (Deka *et al.,* 1989, Yadava *et al*., 1991, Cumming, 2011). Hence, it is essential to find out optimum sowing periodwhich help the crop to escape damage of insect pests. Certain varieties are less damaged by insect pests. Therefore, the present study was conducted to study the impact of sowing period and variety on pod borer, *H.armigera* in pigeonpea.

Materials and Methods

The study on impact of sowing period and variety on pod borer, *H. armigera* in pigeonpea was carried out at Agricultural Research Station, Anand Agricultural University, Derol, Dist. Panchmahal, Gujarat, India during *Kharif*, 2014-15, 2015-16, 2017-18 and 2018-19. The experiment was laid out in split plot design with three replications; sowing period was taken as main plot treatment, whereas variety was taken as sub plot treatments. There were five sowing periods viz., 24th, 26th, 28th, 31st and 33rd Standard Meteorological Week (SMW). Three varieties viz., BDN-2, AGT-2 and Vaishali were evaluated as sub plot treatment. Pigeonpea crop was sown as per the decided period of sowing and variety with a spacing 90 x 20 cm. The gross plot size was 4.5 x 5 m, whereas net plot size was 2.7 x 4.6 m. All agronomic practices were followed to raise the crop. All the plots were kept free from application of any insecticide.

For recording the observations of *H. armigera*, 5 plants were selected randomly from each net plot area and number of larvae of *H. armigera* was counted from whole plant at weekly interval starting from bud formation stage to harvest. In order to record the pod damage at green pod stage and at harvest stage, 100 pods were randomly plucked from each net plot area and pods were segregated into healthy and damaged. Based on this per cent pod damage was calculated. At harvest, grain yield was record from each net plot and it was converted into kg/ha. The data on larval population of *H. armigera*, per cent pod damage and grain yield were subjected to ANOVA to draw the conclusion.

Results and Discussion

Impact of sowing period and varietyon larval population of *H. armigera*

Impact of sowing period

The data on the impact of sowing period on larval population of *H. armigera* are given in Table 1. Results show that during the year 2014-15, sowing period significantly affected the larval population of *H. armigera*. Significantly lowest larval population was recorded in 33rd SMW (0.48 larva/plant) and significantly highest population was recorded in 24th SMW (1.79 larvae/plant).

In the year 2015-16, larval population of *H. armigera* was significantly affected by

sowing period. Significantly lowest larval population was recorded in 31st SMW (0.19 larva/plant) and highest population was recorded in 24th SMW (0.88 larva/plant).

During the year 2016-17, significantly lowest larval population was observed in the crop sown in 31st SMW (0.39 larva/plant) and it was at par with 33rd SMW (0.51 larva/plant). During the year 2017-18, sowing period had no significant influence on larval population of *H. armigera*.

Pooled analysis of four years' data indicated that sowing period significantly affected larval population of pod borer, *H. armigera* in pigeonpea. Overall, there was significant decrease in larval population with delay in sowing period from 28th SMW (1.06 larva/plant) to 33rd SMW (0.43 larva/plant). Significantly lowest larval population was observed in 33rd SMW and it was at par with 31st SMW (0.46 larva/plant).

Patel*et al.,* (2019) while studying the effect of sowing period and variety on pod borer, *H. armigera* recorded the significantly lowest larval population (1.86 larvae/plant) in pigeonpea crop sown in 33rd SMW as compared to early sowing (24th SMW).

Impact of variety

The data on the impact of variety on larval population of *H. armigera*are given in Table 1. Results show that during the year 2014-15significantly lowest larval population was recorded in AGT-2 (1.06 larvae/plant) and it was at par with BDN-2 (1.09 larvae/plant). Significantly highest population of *H. armigera* was recorded in Vaishali (1.34 larvae/plant). Almost similar trend was observed during the year 2015-16.

In the year 2016-17, BDN-2 (0.54 larva/plant) recorded significantly lowest larval population as compared to AGT-2 (0.72 larva/plant) and BDN-2 (0.75 larva/plant). During the year 2017-18, larval population *H. armigera* was not significantly affected by variety. Pooled analysis also showed non-significant effect of variety on larval population *H. armigera*.

Impact of sowing period and variety on pod damage

Impact of sowing period and variety on pod damage at green pod stage

Impact of sowing period

The data on per cent pod damage by *H. armigera* recorded at the time of the green pod stage of pigeonpea crop are presented in Table 2. During year 2014-15, significantly lowest pod damage (2.56%) was observed at 33rd SMW and it was at par with 31st SMW (2.76%). Significantly highest pod damage (5.25%) was recorded in 24th SMW.

In the year 2015-16, significantly lowest per cent pod damage (4.26%) was recorded in 33rd SMW and it was at par with 31st SMW (4.31%) and 26th SMW (5.32%). Significantly highest grain damage was recorded in 24th SMW (6.62%).

During the year 2016-17, significantly lowest per cent pod damage was observed in crop sown on 31st SMW (6.34%) and it was at par with 24th SMW (6.88%). Significantly highest pod damage was recorded when crop sown in 26th SMW (13.78%).

In the year 2017-18, the per cent pod damage varied from 3.09 to 6.18 per cent. Significantly lowest per cent pod damage was observed in crop sown on 33rd SMW (3.09%) and highest per cent pod damage was recorded when crop sown in 26th SMW (6.18%).

Table.1 Impact of sowing period and variety on larval population of *H. armigera* in pigeonpea

Treatment	No. of larvae / plant				
	2014-15	2015-16	2016-17	2017-18	Pooled
Sowing Period (Main Plot Treatment)					
24th SMW (2nd week of June)	1.51[e]	1.18[e]	1.18[d]	1.12[a]	1.25[b]
	(1.79)	(0.88)	(0.89)	(0.76)	(1.06)
26th SMW (4th week of June)	1.47[d]	1.08[d]	1.17[d]	1.07[a]	1.20[b]
	(1.66)	(0.67)	(0.86)	(0.65)	(0.93)
28th SMW (2nd week of July)	1.36[c]	0.95[c]	1.11[c]	1.10[a]	1.13[b]
	(1.34)	(0.40)	(0.72)	(0.71)	(0.77)
31st SMW (4th week of July)	1.12[b]	0.55[a]	0.94[a]	1.01[a]	0.98[a]
	(0.75)	(0.19)	(0.39)	(0.53)	(0.46)
33rd SMW (2nd week of August)	0.99[a]	0.85[b]	1.00[b]	1.02[a]	0.96[a]
	(0.48)	(0.22)	(0.51)	(0.54)	(0.43)
S. Em. ± D	0.01	0.02	0.01	0.004	0.042
Y	--	--	--	--	0.009
D x Y	--	--	--	--	0.019
C. D. at 5% D	0.04	0.06	0.05	NS	0.128
Y	--	--	--	--	0.025
D x Y	--	--	--	--	0.056
C.V. (%)	6.13	13.41	9.06	17.60	11.73
Variety (Sub Plot Treatment)					
BDN-2	1.26[a]	1.01[b]	1.02[a]	1.09[a]	1.09[a]
	(1.09)	(0.51)	(0.54)	(0.70)	(0.70)
AGT-2	1.25[a]	0.93[a]	1.10[b]	1.04[a]	1.08[a]
	(1.06)	(0.36)	(0.72)	(0.58)	(0.66)
Vaishali	1.36[b]	1.01[b]	1.12[b]	1.06[a]	1.14[a]
	(1.34)	(0.52)	(0.75)	(0.63)	(0.79)
S. Em. ± V	0.02	0.02	0.01	0.002	0.02
P	0.02	0.02	0.02	0.004	0.00
D x V	0.04	0.03	0.03	0.011	0.03
V X Y	--	--	--	--	0.017
D x P	0.04	0.03	0.03	0.018	0.08
V x P	0.05	0.04	0.04	0.011	0.03
Y x D x V	--	--	--	--	0.04
Y x D x P	--	--	--	--	0.05
Y x V x P	--	--	--	--	0.04
D x V x P	0.08	0.08	0.07	0.053	0.06
Y x D x V x P	--	--	--	--	0.09
C. D. at 5% V	0.05	0.04	0.04	NS	NS
P	0.06	0.05	0.05	0.01	0.02
D x V	0.10	0.09	0.09	0.03	NS
V X Y	--	--	--	--	0.047
D x P	0.10	0.09	0.09	0.05	NS
V x P	NS	0.12	NS	0.03	NS
Y x D x V	--	--	--	--	0.11
Y x D x P	--	--	--	--	0.14
Y x V x P	--	--	--	--	0.11
D x V x P	0.23	0.21	NS	0.15	0.05
Y x D x V x P	--	--	--	--	0.24
C.V. (%)	11.29	13.26	11.99	14.80	13.34

Note: Figures outside parenthesis are $\sqrt{x+0.5}$ transformed value and those inside parenthesis are retransformed values, Treatment means with the letter(s) in common are at par by DNMRT at 5% level of significance. NS: Non-Significant, SMW: Standard Meteorological Week

Table.2 Impact of sowing period and variety on pod damage at green pod stage due to *H. armigera* in pigeonpea

Treatment		Pod damage (%)				
		2014-15	2015-16	2016-17	2017-18	Pooled
Sowing Period (Main Plot Treatment)						
24th SMW (2nd week of June)		13.25^{c}	14.91^{c}	15.21^{ab}	14.16^{c}	14.14^{ab}
		(5.25)	(6.62)	(6.88)	(5.98)	(5.96)
26th SMW (4th week of June)		12.34^{b}	13.34^{ab}	21.79^{c}	14.39^{d}	15.25^{b}
		(4.57)	(5.32)	(13.78)	(6.18)	(6.92)
28th SMW (2nd week of July)		11.63^{b}	14.59^{bc}	17.10^{b}	14.29^{cd}	14.36^{ab}
		(4.06)	(6.35)	(8.65)	(6.09)	(6.15)
31st SMW (4th week of July)		9.57^{a}	11.98^{a}	14.58^{a}	12.64^{b}	12.18^{a}
		(2.76)	(4.31)	(6.34)	(4.79)	(4.45)
33rd SMW (2nd week of August)		9.21^{a}	11.92^{a}	16.67^{b}	10.12^{a}	11.98^{a}
		(2.56)	(4.26)	(8.23)	(3.09)	(4.31)
S. Em. ±	**D**	0.27	0.50	0.64	0.06	0.778
	Y	--	--	--	--	0.345
	D x Y	--	--	--	--	0.770
C. D. at 5%	**D**	0.83	1.57	1.99	0.19	2.396
	Y	--	--	--	--	0.99
	D x Y	--	--	--	--	2.220
	C.V. (%)	10.13	16.01	15.83	8.16	14.06
Variety (Sub Plot Treatment)						
BDN-2		11.07^{a}	13.29^{b}	16.78^{a}	14.60^{c}	13.88^{a}
		(3.69)	(5.28)	(8.33)	(6.36)	(5.75)
AGT-2		11.16^{a}	11.80^{a}	17.05^{a}	11.29^{a}	12.71^{a}
		(3.75)	(4.18)	(8.60)	(3.83)	(4.84)
Vaishali		11.38^{a}	14.96^{c}	17.37^{a}	13.47^{b}	14.15^{a}
		(3.89)	(6.66)	(8.91)	(5.43)	(5.98)
S. Em. ±	**V**	0.35	0.40	0.48	0.06	0.53
	P	0.28	0.32	0.39	0.04	1.46
	D x V	0.49	0.56	0.68	0.29	1.17
	V X Y	--	--	--	--	0.50
	D x P	0.78	0.89	1.08	0.19	1.11
	V x P	0.63	0.73	0.88	0.11	0.63
	Y x D x V	--	--	--	--	1.11
	Y x D x P	--	--	--	--	0.91
	Y x V x P	--	--	--	--	0.71
	D x V x P	1.10	1.26	1.53	0.57	1.28
	Y x D x V x P	--	--	--	--	1.58
C. D. at 5%	**V**	NS	1.13	NS	0.16	NS
	P	0.81	0.92	1.12	0.11	NS
	D x V	NS	1.60	1.94	0.81	NS
	V X Y	--	--	--	--	1.38
	D x P	NS	2.52	3.07	0.54	NS
	V x P	NS	2.06	2.50	NS	NS
	Y x D x V	--	--	--	--	3.09
	Y x D x P	--	--	--	--	2.52
	Y x V x P	--	--	--	--	1.95
	D x V x P	NS	NS	4.33	NS	NS
	Y x D x V x P	--	--	--	--	4.37
	C.V. (%)	16.98	16.30	15.47	13.05	17.59

Note: Figures outside parenthesis are arcsine transformed value and those inside parenthesis are retransformed values, Treatment means with the letter(s) in common are at par by DNMRT at 5% level of significance. NS: Non-Significant, SMW: Standard Meteorological Week

Table.3 Impact of sowing period and variety on pod damage at harvest due to *H. armigera*in pigeonpea

Treatment	Pod damage (%)				
	2014-15	2015-16	2016-17	2017-18	Pooled
Sowing Period (Main Plot Treatment)					
24th SMW (2nd week of June)	18.54^{c}	21.56^{c}	17.82^{bc}	13.79^{d}	17.93^{d}
	(10.11)	(13.50)	(9.37)	(5.68)	(9.48)
26th SMW (4th week of June)	19.00^{c}	18.45^{b}	19.55^{c}	12.45^{bc}	17.37^{cd}
	(10.60)	(10.02)	(11.20)	(4.65)	(8.91)
28th SMW (2nd week of July)	15.17^{b}	16.85^{ab}	23.30^{d}	11.72^{ab}	16.76^{c}
	(6.85)	(8.40)	(15.64)	(4.13)	(8.32)
31st SMW (4th week of July)	11.80^{a}	16.53^{a}	15.25^{ab}	12.81^{cd}	14.10^{ab}
	(4.18)	(8.10)	(6.92)	(4.92)	(5.93)
33rd SMW (2nd week of August)	10.67^{a}	16.19^{a}	12.20^{a}	11.50^{a}	12.64^{a}
	(3.43)	(7.77)	(4.47)	(3.97)	(4.79)
S. Em. ± **D**	0.518	0.665	1.014	0.30	1.19
Y	--	--	--	--	0.30
D x Y	--	--	--	--	0.68
C. D. at 5% **D**	1.79	2.30	3.508	0.97	3.68
Y	--	--	--	--	0.87
D x Y	--	--	--	--	1.95
C.V. (%)	10.34	11.13	17.26	7.20	12.87
Variety (Sub Plot Treatment)					
BDN-2	14.91^{a}	16.97^{a}	15.95^{a}	10.72^{a}	14.64^{a}
	(6.62)	(8.51)	(7.55)	(3.46)	(6.39)
AGT-2	15.47^{a}	17.80^{a}	16.88^{a}	12.74^{b}	15.73^{a}
	(7.11)	(9.35)	(8.44)	(4.86)	(7.35)
Vaishali	14.73^{a}	18.98^{a}	20.04^{b}	13.91^{bc}	16.92^{a}
	(6.47)	(10.58)	(11.75)	(5.78)	(8.47)
S. Em. ± **V**	0.337	0.605	0.670	0.51	0.52
D x V	0.753	1.353	1.50	1.15	0.61
V X Y	--	--	--	--	0.55
Y x D x V	--	--	--	--	1.22
C. D. at 5% **V**	NS	NS	1.975	1.51	NS
D x V	NS	NS	NS	NS	NS
V X Y	--	--	--	--	1.54
Y x D x V	--	--	--	--	NS
C.V. (%)	8.68	13.08	14.72	15.94	13.41

Note: Figures outside parenthesis are arcsine transformed value and those inside parenthesis are retransformed values, Treatment means with the letter(s) in common are at par by DNMRT at 5% level of significance. NS: Non-Significant, SMW: Standard Meteorological Week

Table.4 Impact of sowing period and variety on grain yield of pigeonpea

Treatment	Grain yield kg/ha				
	2014-15	2015-16	2016-17	2017-18	Pooled
Sowing Period (Main Plot Treatment)					
24th SMW (2nd week of June)	1296[a]	1408[a]	1480[a]	1543[a]	1432[a]
26th SMW (4th week of June)	1272[a]	1413[a]	1365[ab]	1353[a]	1351[a]
28th SMW (2nd week of July)	1528[a]	1553[a]	1212[bc]	1312[a]	1401[a]
31st SMW (4th week of July)	1419[a]	1667[a]	1210[c]	1207[a]	1376[a]
33rd SMW (2nd week of August)	1341[a]	1455[a]	1196[c]	1239[a]	1308[a]
S. Em. ± D	58.44	77.74	47.32	72.42	32.54
Y	--	--	--	-	29.11
D x Y	--	--	--	-	65.08
C. D. at 5% D	NS	NS	154.33	NS	NS
Y	--	--	--	-	83.05
D x Y	--	--	--	-	187.48
C.V. (%)	12.79	15.56	10.98	16.33	14.22
Variety (Sub Plot Treatment)					
BDN-2	1368[b]	1608[a]	1275[a]	1352[a]	1401[a]
AGT-2	1219[c]	1472[ab]	1335[a]	1356[a]	1345[a]
Vaishali	1527[a]	1417[b]	1267[a]	1284[a]	1374[a]
S. Em. + V	47.90	46.45	45.56	23.21	52.76
D x V	107.098	103.88	101.87	51.90	46.99
Y x V	--	--	--	-	42.03
Y x D x V	--	--	--	-	93.98
C. D. at 5% V	141.30	137.04	NS	NS	NS
D x V	NS	NS	NS	NS	NS
Y x V	--	--	--	-	118.29
Y x D x V	--	--	--	-	NS
C.V. (%)	13.53	12.00	13.65	-	11.85

NS: Non Significant

Results show per cent pod damage pooled over years was significantly different among five periods of sowing. Significantly lowest per cent pod damage was recorded in crop sown during 33rd SMW (4.31%) and it was at par with 31st SMW (4.45%), 24th SMW (5.96%) and 28th SMW (6.15%). Significantly highest pod damage was recorded in 26th SMW (6.92%). Patel *et al.*, (2019) reported that lowest pod damage at green pod stage due to *H. armigera* was observed crop sown in 33rd SMW (14.93%) than early sown crop 24th SMW (20.26%).

Impact of variety

The data on per cent pod damage by *H. armigera* recorded at the time of the green pod stage of pigeonpea crop are presented in Table 2. During year 2014-15 and 2016-

17impact of varietyon per cent pod damage was found non-significant.

In the year 2015-16, variety significantly affected pod damage due *H. armigera*. Significantly lowest pod damage was recorded in variety AGT-2 (4.18%) and highest pod damage recorded in Vaishali (6.66%).

During the year 2017-18, significantly lowest per cent grain damage was recorded in AGT-2 (3.83%) as compared to Vaishali (5.43%) and BDN-2 (6.36%).

Pooled analysis showed that impact of variety on per cent pod damage green pod stage due to *H. armigera* was non-significant. Further studies are required to confirm above findings.

Impact of sowing period and variety on pod damage at harvest stage

Impact of sowing period

The data on the impact of sowing period on pod damage at harvest by *H. armigera* were at green pod stage are given in Table 3. Results show that during the year 2014-15, significantly lowest per cent pod damage was recorded in 33rd SMW (3.43%) and it was at par with 31st SMW (4.18%). The significantly highest pod damage was recorded in 26th SMW (10.60%).

In the year 2015-16, significantly lowest per cent pod damage was recorded in 33rd SMW (7.77%) and it was at par with 31st SMW (8.10%) and 28th SMW (8.40%). Crop sown in 24th SMW recorded significantly highest pod damage (13.50%). Almost similar trend was observed during the year 2016-17.

In 2017-18, the impact of sowing period on pod damage at harvest was significant. Significantly lowest per cent pod damage was observed in the crop sown in 33rd SMW (3.97%) and it was at par with 28th SMW (4.13%). Significantly highest per cent pod damage was recorded in crop sown during 24th SMW (5.68%).

Pooled analysis indicated significantly lowest pod damage was recorded in the crop sown on 33rd SMW (4.79%) and it was at par with 31st SMW (5.93%); whereas significantly highest per cent pod damage was observed in crop sown on 24th SMW (9.48). Present finding is in accordance with the earlier work by Patel *et al.,* (2019). They reported lowest per cent pod damage due to *H. armigera* when pigeonpea crop was sown in 33rd SMW (19.37%).

Impact of variety

The data on the impact of variety on pod damage at harvest stage by *H. armigera* are given in Table 3. Results show that during the year 2014-15 and 2015-16 the per cent pod damage was not affected significantly by different varieties.

During the year 2016-17, among three different varieties significantly lowest per cent pod damage was recorded in BDN-2 (7.55%) and it was at par with AGT-2 (8.44%) whereas significantly highest pod damage observed in Vaishali (11.75%).

In the year 2017-18, BDN-2 (3.46%) recorded significantly lowest per cent pod damage as compared to AGT-2 (4.86%) and Vaishali (5.78%).

Pooled analysis indicated that the differences in pod damage among varieties Vaishali, BDN-2 and AGT-2 were non-significant.

Impact of sowing period and variety on grain yield of pigeonpea

Impact of sowing period

Data on pigeonpea grain yield are given in

Table 4. During the year 2014-15, 2015-16 and 2017-18 the differences among sowing period for grain yield were non-significant. In the year 2016-17, significantly highest grain was observed in crop sown on 24th SMW (1480 kg/ha) and it was at par with 26th SMW (1365 kg/ha). The pooled over years data indicated that sowing period had non-significant influence on grain yield of pigeonpea. Late sown and late maturing varieties are vulnerable to the pod fly attack (Sharma *et al.,* 2010). Patel *et al.* (2019) reported the pod fly attack was lowest in 24th SMW whereas *H. armigera* damage was lowest in 33rd SMW. Hadiya *et al.,* (2020) also reported that the grain damage due to pod fly, *M.obtusa* was lowest when crop was sown early in 24th SMW as compared to 33rd SMW. Findings of above scientist suggest that early sown crop is more damaged by *H. armigera*, whereas late sown crop is more damaged by *M. obtusa*. This might have caused non-significant impact on grain yield of pigeonpea.

Impact of variety

Data on pigeonpea grain yield are given in Table 4. Results show that during the year 2014-15, significantly highest grain yield (1527 kg/ha) was recorded in variety Vaishali as compared to BDN-2 (1368 kg/ha) and AGT-2 (1219 kg/ha). During the year 2015-16, BDN-2 (1608 kg/ha) recorded significantly highest grain yield and it was at par with AGT-2 (1472 kg/ha), whereas the lowest grain yield damage found in Vaishali (1417 kg/ha). In the year 2016-17 and 2017-18, variety could not influence the grain yield of pigeonpea significantly. Pooled analysis also revealed non-significant influence of variety on grain yield of pigeonpea.

In conclusion pigeonpea crop sown in the 31st SMW (4th week of July) to 33rd SMW (2nd week of August) had significantly lower larval population of *H. armigera*, whereas the influence of variety on larval population was non-significant.

Significantly lowest per cent pod damage due to *H. armigera*, recorded at green pod stage, was observed in crop sown in 33rd SMW and it was at par with 31st SMW, 28th and 24th SMW. Differences in pod damage among three varieties (Vaishali, BDN-2 and AGT-2) were non-significant.

Acknowledgement

The authors are thankful to Director of Research and Dean Post Graduate Studies, Anand Agricultural University, Anand for providing all the necessary facilities and encouragement during present investigation. The authors are also thankful to the Unit Head, Agricultural Research Station, Anand Agricultural University, Derol for providing all the necessary facilities during study.

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How to cite this article:

Hadiya, G. D., S.D. Patel, R. L. Chavadhari, R. G. Machhar and Damor, C. B. 2020. Impact of Sowing Period and Variety on Pod Borer, *Helicoverpa armigera* Hubner in Pigeonpea. *Int.J.Curr.Microbiol.App.Sci.* 9(07): 2137-2146. doi: https://doi.org/10.20546/ijcmas.2020.907.249