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Non–pesticidal management of okra shoot and fruit borer (*Earias vittella* Fab.) by changing dates of sowing

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The shoot and fruit borer, *Earias vittella* Fab. (Lepidoptera : Noctuidae) is an important insect pest of okra [*Abelmoschus esculentus* (L.) Moench]. The larva of *Earias vittella* bores the growing shoot of okra plant prior to fruit formation resulting in drying of shoot. On availability of fruit larva starts feeding to the okra fruit and thus causes direct yield loss. The present study focused on management of pest without chemical to avoid the problem of health hazard, pest outbreak and resurgence.

The field trial was conducted at Indian Institute of Vegetable Research, Varanasi , Uttar Pradesh, following recommended growing practices except pesticidal management. Seeds of okra variety Kashi Pragati (VRO-6) were sown on 1st March, 17th March and 2nd April during both the year, 2008 and 2009. In factorial randomized block design with plant spacing maintained in 60 x 30 ratio. T The observations were recorded at weekly interval by counting total number of healthy and damaged shoot and fruit of five randomly selected okra plant in each replication.

The different sowing dates revealed marked difference in shoot borer infestation . On an average early sown crop suffered less shoot borer infestation. The first sown crop harbored minimum population (22.4 %) followed by crop sown on second dates, recording 28.8 % shoot borer infestation. The highest infestation (32.8 %) was recorded on the late sown crop during 2008.The maximum & minimum damage recorded on 27th May (37.7 %) & 6th May (36.0 %) , respectively. (Table 1)

The same trend of shoot borer infestation followed in 2009 the damage percentage continuously increase in late sown crop viz. 23.2 %,27.7 % & 33.7 % for early, medium & late sown crop, respectively. The maximum & minimum damage recorded on 27th May (39.2%) & 6 th May (15.6%) , respectively (Table 2)

The average of both year follow same trend viz. 22.8%, 28.2% & 33.2% for early, medium & late sown crop, respectively. (Table 3)

The variation in date of sowing make difference in fruit borer infestation . On an average early sown crop suffered less fruit borer infestation. The first sown crop harbored minimum population (27.1 %) followed by crop sown on second dates, recording 30.5 % fruit infestation. The highest infestation (43.8 %) was recorded on the late sown crop during 2008.The maximum & minimum damage recorded on 3rd June (49.2%) & 6th May (20.1%), respectively. (Table 4)

The same trend of shoot borer infestation followed in 2009 the damage percentage continuously increase in late sown crop viz. 28.0%, 31.8% & 44.9% for early, medium & late sown crop, respectively. The maximum & minimum damage recorded on 3rd June (50.1 %) & 6th May (20.7%), respectively (Table 5).

The average of both year follow same trend viz. 27.8%, 31.2% & 44.4% for early, medium & late sown crop, respectively. (Table 6).

Dhawan *et al.,* (1990) reported *Earias* effect on different date of sowing cotton cv. F 286. LH 900 was sown on 3 dates, 13 May, 26 May and 13 June. Whereas F 286 was sown on 13 May only. The *Earias* spp. were highest on LH 900 sown on 26 May.

Rai and Satpathy (1999) also concluded late sown crop suffer more from borers.

Mandal *et al.,* (2007) also reported *Earias vittella* incidence in relation to different sowing dates. Sowing of crops during mid-February reduced incidence of pest.

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Table 1. Effect of Date of sowing on shoot damage by *Earias vittella* on okra during zaid season 2008.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May	13th May	20th May	27th May	3th June	10th June	17th june	
2nd March	6.7	20.0	29.7	39.1	27.6	21.6	12.2	22.4
	(8.9)	(26.6)	(33.0)	(38.7)	(31.7)	(27.7)	(20.4)	(26.7)
17th March	13.3	40.0	38.0	36.0	30.8	26.6	16.9	28.8
	(17.7)	(39.2)	(38.1)	(36.9)	(33.7)	(31.1)	(24.3)	(31.6)
1st April	26.7	40.0	40.3	38.1	31.8	31.8	21.1	32.8
	(30.8)	(39.2)	(39.4)	(38.1)	(34.3)	(34.3)	(27.3)	(34.8)
MEAN	15.6	33.3	36.0	37.7	30.1	26.7	16.7	28.0
	(19.1)	(35.0)	(36.8)	(37.9)	(33.2)	(31.0)	(24.0)	(31.0)
Difference between the treatments						C.D.(P =0.05) =	3.22	
Difference between the period of observations						C.D.(P =0.05) =	4.92	
Difference between the treatments x period of observations						C.D.(P =0.05) =	8.53	

Figures in the parentheses are arc sine transformed values.

Table 2. Effect of Date of sowing on shoot damage by *Earias vittella* on okra during zaid season 2009.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May.	13th May.	20th May	27th May	3th June	10th June	17ttjune	
2nd March	6.7	20.0	30.5	40.3	28.4	23.9	12.9	23.2
	(8.9)	(21.9)	(33.5)	(39.4)	(32.2)	(29.3)	(21.1)	(26.6)
17th March	13.3	26.7	38.9	37.2	30.8	27.8	19.0	27.7
	(17.7)	(30.8)	(38.6)	(37.6)	(33.7)	(31.8)	(34.7)	(32.1)
1st April	26.7	40.0	41.4	40.1	32.3	32.5	22.7	33.7
	(26.2)	(39.2)	(40.1)	(39.3)	(34.7)	(34.7)	(21.1)	(33.6)
MEAN	15.6	28.9	36.9	39.2	30.5	28.1	18.2	28.2
	(17.6)	(30.7)	(37.4)	(38.7)	(33.5)	(31.9)	(25.6)	(30.8)
Difference between the treatments					C.D.(P =0.05) =	3.88		
Difference between the period of observations					C.D.(P =0.05) =	7.45		
Difference between the treatments x period of observations					C.D.(P =0.05) =	12.91		

Figures in the parentheses are arc sine transformed values.

Table 3. Effect of Date of sowing on shoot damage by *Earias vittella* on okra during zaid season 2008 & 2009.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May	13th May	20th May	27th May	3th June	10th June	17thjune	
2nd March	6.7	20.0	30.1	39.7	28.0	22.8	12.6	22.8
	(8.9)	(24.2)	(33.3)	(39.0)	(31.9)	(28.5)	(20.8)	(26.7)
17th March	13.3	33.3	38.5	36.6	30.8	27.2	18.0	28.2
	(17.7)	(35.0)	(38.3)	(37.2)	(33.7)	(31.4)	(25.0)	(31.2)
1st April	26.7	40.0	40.9	39.1	32.1	32.1	21.9	33.2
	(28.5)	(39.2)	(39.7)	(38.7)	(34.5)	(34.5)	(27.9)	(34.7)
Mean	15.6	31.1	36.5	38.5	30.3	27.4	17.5	28.1
	(18.3)	(32.8)	(37.1)	(38.3)	(33.4)	(31.5)	(24.6)	(30.9)
Difference between the treatments					C.D.(P =0.05) =	1.05		
Difference between the period of observations					C.D.(P =0.05) =	3.45		
Difference between the treatments x period of observations					C.D.(P =0.05) =	3.14		

Figures in the parentheses are arc sine transformed values.

Table 4. Effect of Date of sowing on fruit damage by *Earias vittella* on okra during zaid season 2008.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May	13th May	20th May	27th May	3th June	10th June	17th June	
2nd March	22.9	27.7	33.6	24.2	41.3	22.0	17.8	27.1
	(28.6)	(31.8)	(35.4)	(29.2)	(40.0)	(27.9)	(25.0)	(31.2)
17th March	16.8	30.8	42.1	38.2	44.8	21.6	19.2	30.5
	(24.2)	(33.7)	(40.4)	(38.2)	(42.0)	(27.7)	(26.0)	(33.2)
1st April	20.4	37.6	53.6	65.0	61.4	42.6	25.6	43.8
	(26.8)	(37.8)	(47.1)	(53.7)	(51.6)	(40.8)	(30.4)	(41.2)
MEAN	20.1	32.1	43.1	42.5	49.2	28.7	20.9	33.8
	(26.5)	(34.4)	(41.0)	(40.5)	(44.5)	(32.1)	(27.1)	(35.2)
Difference between the treatments				C.D.(P =0.05) =	0.62			
Difference between the period of observations				C.D.(P =0.05) =	0.94			
Difference between the treatments x period of observations				C.D.(P =0.05) =	1.64			

Figures in the parentheses are arc sine transformed values.

Table 5. Effect of Date of sowing on fruit damage by *Earias vittella* on okra during zaid season 2009.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May	13th May	20th May	27th May	3th June	10th June	17th June	
2nd March	23.2	27.7	35.5	25.4	42.2	23.5	18.6	28.0
	(28.8)	(31.8)	(36.6)	(30.3)	(40.5)	(29.0)	(25.6)	(31.8)
17th March	17.6	31.6	43.3	39.6	45.8	23.7	21.0	31.8
	(24.8)	(34.2)	(41.1)	(39.3)	(45.6)	(29.1)	(41.2)	(36.0)
1st April	21.3	38.6	54.7	68.2	62.2	43.5	26.3	44.9
	(27.5)	(38.4)	(47.7)	(55.7)	(52.0)	(41.2)	(25.6)	(41.2)
MEAN	20.7	32.7	44.5	44.4	50.1	30.2	22.0	34.9
	(27.0)	(34.8)	(41.8)	(41.6)	(45.0)	(33.1)	(30.8)	(36.3)
Difference between the treatments				C.D.(P =0.05) =	0.60			
Difference between the period of observations				C.D.(P =0.05) =	0.92			
Difference between the treatments x period of observations				C.D.(P =0.05) =	1.60			

Figures in the parentheses are arc sine transformed values.

Table 6. Effect of Date of sowing on fruit damage by *Earias vittella* on okra during zaid season 2008 & 2009.

Treatment	Average shoot damage at indicated dates							Overall mean damage
	6th May	13th May	20th May	27th May	3th June	10th June	17th June	
2nd March	23.1	27.7	34.6	24.8	41.8	22.7	18.2	27.6
	(28.7)	(31.8)	(36.0)	(29.9)	(40.2)	(28.5)	(25.3)	(31.5)
17th March	17.2	31.2	42.7	38.9	45.3	22.7	20.1	31.2
	(24.5)	(34.0)	(40.8)	(38.6)	(42.3)	(28.4)	(26.6)	(33.6)
1st April	20.8	38.1	54.2	66.6	61.8	43.1	25.9	44.4
	(27.1)	(38.1)	(47.4)	(54.7)	(51.8)	(41.0)	(30.6)	(41.5)
MEAN	20.4	32.4	43.8	43.4	49.6	29.5	21.4	34.4
	(26.8)	(34.6)	(41.4)	(41.0)	(44.8)	(32.6)	(27.5)	(35.5)
Difference between the treatments				C.D.(P =0.05) =	0.31			
Difference between the period of observations				C.D.(P =0.05) =	0.52			
Difference between the treatments x period of observations				C.D.(P =0.05) =	0.63			

Figures in the parentheses are arc sine transformed values.

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