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Sangeeta Tiwari
Department of Entomology, CCS, HAU; Hisar Haryana, India

Surinder Yadav
Department of Entomology, CCS, HAU; Hisar Haryana, India

Anasar Nadaf
Department of Entomology, CCS, HAU; Hisar Haryana, India

Correspondence
Sangeeta Tiwari
Department of Entomology, CCS, HAU; Hisar Haryana, India

Influence of some biochemical components on the incidence of *Maruca vitrata* (Geyer) on short duration pigeonpea *Cajanus cajan* (L.) Mill sp.

Sangeeta Tiwari, Surinder Yadav and Anasar Nadaf

Abstract
Twenty genotypes of short duration pigeonpea of were grown at Pulses Section, Department of plant breeding and genetics during kharif 2014-15 in randomized block design with three replication to study the impact of biochemical constitution on incidence of *Maruca* in pigeonpea. The data were recorded on different biochemical attributes. The results indicated that the lower total sugar content, protein content higher total phenol contents in pods appeared good indicator of resistance to *Maruca vitrata*.

Keywords: *Maruca vitrata, Cajanus cajan* (L.), pigeonpea, biochemical attributes

1. Introduction
Pigeonpea, *Cajanus cajan* (L.) Mill sp., (Family- Fabaceae) is one of the major pulse crops of the tropics and sub-tropics, grown in approximately 50 countries. It is grown in an area of 5.07 m ha and production of 3.71 m tonnes in Asia. India has the largest acreage and production of pigeonpea. About 90 per cent of the total global area falls in India with corresponding 93 per cent of global production (Anonymous.2000) [1]. Economically it is the second most important pulse crop after chickpea in India.

The pigeonpea yield has become stagnant over last four decades, largely because of insect pest damage. A large number of insect pests (more than 300 species) attack pigeonpea (Prasad and Singh, 2004) [2]. Insects that attack the reproductive structures of plant cause the maximum yield losses (Rangaiah and Sehgal 1984) [3]. During recent years due to introduction of short duration pigeonpea cultivars, the incidence of *M. vitrata* has been aggravated due to flowering of these varieties occur during periods of high humidity and moderate temperature which is congenial for the development of pest (Sharma *et al.*1999) [4]. *M. vitrata* larvae web the leaves and inflorescence, and feed inside on flowers, flower buds, and pods, young larvae bore into the flower buds and cause flower shedding by destroying the young floral parts enclosed in the sepals. The larvae move from one flower to another as they are consumed and a larva may consume 4 -6 flowers before larva development is completed. Third to fifth-instar larvae were capable of boring into the pods and consuming the developing grains (Taylor, 1967) [5]. In pigeonpea, losses due to *M. vitrata* have been estimated to be $US 30 million annually (Anonymous, 1992) [6]. Plant biochemical features may produced physical stimuli or bar insect activity. From the gene pool of crop species, certain crosses produce genotypes that vary from complete susceptibility to high level of resistance against insects. Resistant factors in cultivar have become crucial element in the success of many ongoing insect pest management programs. Therefore, keeping this idea in view, the research was carried out with objective of finding

Material and methods
The present investigation was carried out at the Pulses Research Farm of Departement. of Genetics & Plant Breeding and laboratory of department of Entomology at Chaudhary Charan Singh Haryana Agricultural University, Hisar using 20 promising genotypes *viz.*, AH 09-36, AH 09-38, AH-09-77, AH 10-17, AH 10-29, AH 12-01, AH 12-03, AH 12-04, AH-12-06, AH 12-06B, AH 12-07, AH 12-09, AH 12-11, AH 12-14, Paras, Manak, Pusa 992, AL 201, PL 229 and UPAS-120. Above genotypes were sown at the distance of 45 X 10 cm^2 using randomized block design replicated thrice. Each block has plot size 3 rows of 4 m length.

Larval population was recorded at weekly intervals starting on appearance of insect from 4th week of September, 2014 from randomly selected five plants per plot by using ground cloth sheet sampling method. Similarly, webs produced by *M. vitrata* were counted at weekly intervals starting from 4th week of September from randomly selected five plants per plot per replication and the total number of healthy and damaged pods were counted from randomly selected five plants, in each plot to work out the per cent pod damage by legume pod borer. Per cent grain damage was also calculated.

Leaves and pods of each genotype were collected at peak incidence of test insect and separated as infested and healthy and subjected to drying by using oven at 75° Cover night. After drying, the leaves and pods were powdered by using grinder. These powdered samples were analyzed for the total sugars, phenols and protein contents. The total phenol, di-hydroxy phenol, protein and total sugars were estimated from this powdered samples using procedures given by Swain and Hillis (1959), Johnson and Schaal (1952), Micro-Kjeldahl's method (AOAC, 1990) and Yemm and Willis (1954), respectively.

The data so obtained was correlated with larval population, web count and per cent pod damage. The result was as below.

Results and Discussion

The difference in protein content in healthy leaves as well as pods among the 20 pigeonpea genotypes were significant and the higher protein content in healthy leaves and pods was recorded in AH 10-29 (46.87 and 29.37 %, resp.) whereas lower protein content was recorded in AH 10-17 (31.87 and 21.41 %, resp.). In rest of the genotypes protein content in healthy leaves was in the range of 36.25 to 43.12 % and in Healthy pods it was 29.11 to 22.10 %. The relationship between per cent protein content in healthy leaves as well as pods were positive and significant with larval, web count and per cent pod damage. Sunitha *et al*. (2008) [7] reported a significant and positive correlation exists between proteins with pod damage caused by *Maruca vitrata* in pigeonpea. Similar report were also advanced by Halder *et al* (2006) [8] and Halder and Srinivasan (2007) [9]. The relationship between per cent protein content in infested leaves as well as pods were non-significant with larval, web count and per cent pod damage caused by *M. vitrata* on pigeonpea.

Significant variation in total phenols existed among the leaves and pods of different entries of the pigeonpea. The genotype AH 10-17 possessed higher total phenol in healthy leaves as well as pods (28.31 and 31.88 mg/g, resp.), while the corresponding low quantum were in Paras (19.58 and 6.69 mg/g, resp.) (Table. 1). Thus, indicates that increase in total phenol content reduces the pest incidence. This is in agreement with Chabra *et al.* (1984), Halder *et al* (2006) [8] and Halder and Srinivasan (2007) [9] who reported a significant and negative correlation prevails between phenols contents in pod with *M vitrata* incidence. Sunitha *et al*. (2008) [7] also reported that high phenol concentration in flowers and pods was responsible for resistance to *M. vitrata* in pigeonpea.

Highest total soluble sugar in healthy leaves was found in AH 10-17 (42.42 mg/g) and in healthy pod, it was found in paras (38.75 mg/g) However lowest total soluble sugar in healthy pod and leaves was recorded in AH 10-29 (11.23 and 31.12 mg/g, resp.) The results were in accordance with Halder *et al.* (2006) [8] who reported a significant and positive correlation in between total sugar, reducing sugar and non-reducing sugar, with per cent pod damage caused by *M. vitrata* in mungbean.

Table 1: Various biochemical components of pigeon pea

Genotype	Larval populatn per 5 plant	Web count per 5 plant*	Total pod damage (%)*	Protein (%)				Total phenols (mg/g dry matter)				Total soluble sugar (mg/g dry matter)			
				Leaves		Pods		Leaves		Pods		Leaves		Pods	
				Healthy	Infested	Healthy	Infested	Healthy	Infested	Healthy	Infested	Healthy	Infested	Healthy	Infested
AH09-36	2.7	4.09	4.6.41	42.5	38.75	25.62	14.37	27.3	21.71	30.12	25.89	13.59	9.46	35.00	15.58
AH09-38	2.62	4.00	49	39.37	41.87	28.12	22.50	25.82	21.84	12.3	6.15	17.33	11.95	36.87	6.21
AH09-77	3.63	5.77	63.24	43.12	40.00	26.25	21.80	20.45	7.43	15.02	7.02	41.11	11.73	35.00	7.88
AH10-17	1.69	1.63	28.53	31.87	31.00	21.41	17.50	28.31	13.31	31.88	9.31	42.42	27.46	34.15	5.63
AH10-29	2.45	4.83	54.1	46.87	44.37	29.37	23.12	19.58	18.44	19.47	8.69	11.23	8.33	31.12	9.22
AH12-01	3.01	4.59	44.81	45.62	38.12	28.36	23.75	26.67	20.61	12.53	5.22	40.39	32.8	38.75	18.58
AH12-03	3.38	5.09	58.06	44.37	38.12	28.12	20.62	23.93	18.17	23.25	6.70	39.58	26.59	40.00	14.78
AH12-04	3.33	4.84	55.16	36.87	37.50	28.54	19.37	25.53	20.81	19.53	13.71	41.11	28.31	36.87	6.80
AH12-06	2.56	3.25	36.04	38.75	36.87	24.56	21.87	27.9	21.84	17.13	11.80	14.12	11.12	35.00	7.88
AH12-06B	2.47	4.39	43.4	39.37	36.87	25.68	21.87	27.75	20.99	20.23	5.62	32.98	25.21	35.62	8.44
AH12-07	3.34	5.38	44.15	40.62	35.62	28.42	24.37	27.24	23.45	20.16	9.71	39.11	12	37.50	12.10
AH12-09	2.61	3.32	41.06	43.75	35.62	24.11	23.75	27.92	22.31	23.69	14.39	12.58	8.24	32.50	10.52
AH12-11	3.63	5.65	63.75	40.00	35.00	29.11	18.75	20.68	19.00	25.13	15.38	40.98	13.18	34.37	7.16
AH12-14	2.89	4.47	49.13	45.00	35.00	27.84	19.37	26.54	24.13	21.54	22.24	38.12	18.36	38.12	10.76
PARAS	5.74	7.85	67.65	46.25	35.00	28.60	23.75	19.58	20.73	6.59	22.46	41.11	18.15	44.37	15.58
Manak	3.23	2.63	48.29	36.25	35.00	26.25	21.25	27.04	22.01	29.54	24.63	12.45	5.22	34.37	13.50
PUSA992	3.17	2.89	50.72	38.75	34.37	22.10	19.37	20.86	16.76	25.43	18.39	13.2	4.46	38.75	10.70
AL201	3.02	3.58	48.51	39.37	34.37	27.95	27.50	23.92	17.13	20.1	20.70	17.33	13.18	38.12	13.43
PL229	3.36	4.83	52.78	38.75	32.50	27.22	23.12	20.67	9.74	20.11	20.89	41.11	32.13	34.77	32.13
UPAS-120	2.44	3.13	33.43	36.87	31.87	26.53	25.00	27.73	13.76	25.64	11.57	15.38	10.80	33.12	25.94
CD	1.52	3.11	16.84	2.09	1.23	2.11	1.87	0.13	0.11	1.37	1.76	0.13	0.11	0.22	0.19
SEm±	0.51	1.04	5.61	0.68	0.41	0.70	0.63	0.04	0.03	0.46	0.59	0.04	0.04	0.08	0.06

*Pooled mean of 8 standard weeks

Table 2: Correlation studies of different variables on larval count, web count and pod damage due to *Maruca vitrata*

	Larval count		Web count		Total pod damage (%)	
Variables	**Correlation**	**Regression equation**	**Correlation**	**Regression equation**	**Correlation**	**Regression equation**
Protein in healthy leaves (%)	0.4172*	Y= - 4.0667 + 0.0852*x*	0.6506**	Y=- 4.9726+ 0.2288*x*	0.5221**	Y= -5.7692+1.3430*x*
Protein in infested leaves (%)	0.0271	Y=3.3045 – 0.0066*x*	0.3141	Y= -0.4749+ 0.1315*x*	0.3552	Y= 9.1970 + 1.0913*x*
Protein in healthy pod (%)	0.4484**	Y= -1.1742 + 0.1587*x*	0.7014**	Y= -7.062+ 0.4258*x*	0.5823**	Y= -20.3799+2.5944*x*
Protein in infested pod (%)	0.1748	Y= 2.0475+0.04692*x*	0.1599	Y= 2.7169+0.0736 *x*	-0.0172	Y= 50.1708 – 0.05819*x*
Total phenols in healthy leaves	-0.6007**	Y= 6.7205 – 0.1476*x*	-0.5909**	Y= 10..4779 – 0.2490*x*	-0.8105**	Y= 111.0418-2.5082 *x*
Total phenols in infested leaves	0.0178	Y= 3.005+ 0.0031 *x*	0.0323	Y= 4.1285+ 0.0097 *x*	-0.0966	Y= 52.9036 – 0.2134*x*
Total phenols in healthy pods	-0.5519**	Y= 4.5196 – 0.0694 *x*	-0.6732**	Y= 7.3577 – 0.1453 *x*	-0.4467**	Y= 63.7494 – 0.7076 *x*
Total phenols in infested pods	0.3391	Y= 2.5137 + 0.0392 *x*	-0.0090	Y= 4.3355 – 0.0017 *x*	0.1804	Y= 45.1533 + 0.2680*x*
Total soluble sugar in healthy leaves	0.3840*	Y= 2.4156+ 0.0229*x*	0.5276**	Y= 2.7831+ 0.0540 *x*	0.3845*	Y= 41.5919 + 0.2590 *x*
Total soluble sugar in infested leaves	0.0346	Y= 3.0136 + 0.0030 *x*	0.1954	Y= 3.8267 + 0.0294 *x*	0.0042	Y= 48.8350+ 0.0046*x*
Total soluble sugar in healthy pod	0.6957**	Y= -3.6186+ 0.1845 *x*	0.5045**	Y= -4.0028+ 0.2295 *x*	0.4294*	Y= -3.0146+ 1.4337 *x*
Total soluble sugar in infested pod	0.1755	Y= 2.8009+ 0.0207 *x*	0.0909	Y= 4.0772+ 0.0184 *x*	-0.0393	Y= 49.6509 – 0.0585 *x*

*Significant at p=0.1

** Significant at p = 0.05

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