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Estimation of losses in yield due to infestation by pod borer (*Helicoverpa armigera*) in arhar for rain fed areas of Chhattisgarh

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Abstract
The present study was under taken on the varietal screening against pod borer *Helicoverpa armigera* in Pigeonpea at Rainfed areas of Kabirdham district under the SK College of Agriculture and Research Station, Kawardha, Indira Gandhi Krishi Vishwavidyalaya Raipur (Chhattisgarh) India. During 2008-2009 crop season ten selected pigeonpea genotypes *viz*.. BDN-2, UPAS-120, RPS-2007-63, Asha, RPS-2007-107, Rajeev lochan, RPS-2007-73, ICPL-87, RPS-2007-15 and RPS-2007-109 were tested against pod borer in the field conditions. The Number of pods per plant, Grain yield per plot and Grain yield kg/ha. Among genotypes, RPS-2007-109 recorded significantly highest pod damage and lowest pod damage was recorded on RPS-2007-73. The losses in yield due to infestation by pod borer Number of pods per plant was height recorded in the genotypes UPAS-120, Grain yield per plot (Kg/plot) and Grain yield kg/ha was height recorded in the genotypes BDN-2.

Keywords: Losses, yield due, pod borer, *Helicoverpa armigera* rain fed areas

Introduction
Pigeonpea is one of the major food legumes of the world which is widely grown in tropical and subtropical regions and occupies an important position in the economy of India (Varshney *et al*. 2012) [8]. Globally pigeonpea is cultivated on 4.92 million hectares with the production of 3.65 million tonnes and productivity 898 kg ha^{-1} (FAOSTAT 2012) [4]. In India, pigeonpea is grown in 3.86 million hectares with an annual production of 2.65 million tonnes with 741 kg ha^{-1} productivity (FAOSTAT, 2012) [4]. In India, the major pigeonpea growing states are Gujarat, Andhra Pradesh, Talengana, Maharashtra, Uttar Pradesh, Madhya Pradesh, Karnataka, Tamil Nadu, Jharkhand, Bihar and Chhattisgarh. Like other pulses, pigeonpea is grown under rainfed conditions; 96 percent of the pigeonpea area in India is rainfed. In Chhattisgarh, acreage under pigeonpea is 51.9 thousand hectares with production and productivity of 31 thousand tonnes and 597 kg ha^{-1}, respectively (Anonymous, 2013) [2]. This crop is being grown in Chhattisgarh since long back in Surguja, Rajnandgaon, Gariyaband, Raipur, Durg, Bastar, Bilaspur, Dantewada and Kabeerdham. However, major constraints in growing pigeonpea in Chhattisgarh are water logging, drought at later stage and frost. It grows well at a soil pH of 5.0–7.0. It does well in low fertility soils, making it a favorite among subsistence farmers. It is highly heat-tolerant and thrives well in hot and humid climates. Once established, it is one of the most drought tolerant legumes, and it can be grown under rainfed conditions with minimal irrigation. Insect pests are major biotic constraints of growing pigeonpea crop. However, the yield levels of this crop are not very encouraging. Among the factors responsible for low yield, the damage caused by insect pests is one of the major factors. It is attacked by several insect pests from seedling stage till harvesting stage. Pod borer complex is a major problem in production, which consisted of *Helicoverpa armigera* is the key pest causing 80 to 90 percent of loss (Kooner *et al.,* 2006) [5] causing considerable yield loss of 0.25 million tonnes of grain per annum worth more than 3750 million rupees per year. Pigeonpea yields have remained stagnant for the past 3 to 4 decades largely due to damage inflicted by insect pests (Sharma *et al.,* 2010 and Basandrai *et al.,* 2011) [7, 3]. Major constraints in growing pigeonpea in Chhattisgarh are pod bore and drought at later. Thus there is an urgent need to Evaluation of pigeon pea genotype against pod borer with also coupled with high yield variety.

Materials and Methods

This experiment was conducted in Rainfed areas of kabirdham district under the SK College of Agriculture and Research Station, Kawardha, Indira Gandhi Krishi Vishwavidyalaya Raipur (Chhattisgarh) India. Pigeonpea cultivars were Evaluation in Infestation of against pod borer (*Helicoverpa armigera*) for number of pods per plant, grain yield per plot and grain yield kg/ha, including ten genotype was used. The detail of genotype as follows: BDN-2, Asha, ICPL-87, RPS-2007-109, Rajeev Lochan, RPS-2007-63, UPAS-120, RPS-2007-15, RPS-2007-73 and RPS-2007-107. Sowing was done 8 July 2009 depending upon the availability of sufficient moisture in the fields. It was laid out in randomized block design with three dispersed replication. The Pigeonpea variety was sown in rows with the spacing 60cm. x 30cm and plot size 5 x 3 meters. All the recommended agronomic practices were adopted to raise the crop. with line sowing method, germination of seed 18 July 2009, observation to be recorded of the three stage for number of pods per plant, grain yield per plot and grain yield kg/ha, of the crop and time of harvesting 15 December 2009. The land was fertilized with N-20: P-40: K-20 in the form of urea, single super phosphate and muriate of potash respectively. All fertilizers were applied as basal at the final land preparation. The Weekly observation 05/10/2009, 13/10/09, 20/10/09, 27/10/09, 03/11/09, 10/11/09, 17/11/09, 24/11/09, 01/12/09, 08/12/09 and 15/12/09. Each genotype is replicated three times. At maturity (end of the crop) observation were recorded data were analyzed statistically for significance of simple RBD was estimated by Panse and Sukhatme.

Results and Discussion

The screen pigeonpea genotypes for the pod borer under field conditions the Number of pods per plant, Grain yield per plot and Grain yield kg/ha and the results recorded Table-1. Among the ten genotypes, RPS-2007-109 (1.29%) recorded significantly highest pod damage followed by RPS-2007-63 (1.27%) and RPS-2007-15 (1.25%), Rajeev lochan (1.23%), RPS-2007-107 (1.20%) and Asha (1.20%) Lowest pod damage was recorded on RPS-2007-73 (1.15%), UPAS-120 (1.03%) and BDN-2 (0.63%).

Table 1: Evaluation of pigeon pea genotype against pod borer (*Helicoverpa armigera*)

S. No.	Genotype	RI	RII	RIII	Total	Over all mean	
01	BDN-2	0.67	0.61	0.62	1.9	0.63	9
02	Asha	1.24	1.23	1.15	3.62	1.20	5
03	ICPL-87	1.17	1.23	1.20	3.6	1.20	7
04	RPS-2007-109	1.24	1.29	1.36	3.89	1.29	1
05	Rajeev lochan	1.30	1.20	1.21	3.71	1.23	4
06	RPS-2007-63	1.24	1.32	1.27	3.83	1.27	2
07	UPAS-120	1.04	1.09	0.96	3.09	1.03	8
08	RPS-2007-15	1.21	1.29	1.27	3.77	1.25	3
09	RPS-2007-73	1.19	1.21	1.06	3.46	1.15	6
10	RPS-2007-107	1.22	1.03	1.36	3.61	1.20	5

Number of pods per plant

The Number of pods per plant was height recorded in the genotypes UPAS-120 (217.200) followed by RPS-2007-109 (182.667), RPS-2007-63 (181.133), medium pods per plant was recorded in the genotypes Rajeev lochan (177.333), RPS-2007-107 (174.933), ICPL-87 (174.600), Asha (174.133) and low pods per plant was recorded in the genotypes RPS-2007-15 (169.600), RPS-2007-73 (168.267) and BDN-2 (165.400) respectively.

Grain yield per plot (Kg/plot)

The Grain yield per plot was height recorded in the genotypes BDN-2 (2.71), UPAS-120 (2.63), RPS-2007-63 (2.55) and Asha (2.23), medium Grain yield per plot was recorded in the genotypes Rajeev lochan (2.03), RPS-2007-107 (2.03) and RPS-2007-73 (1.92) and low Grain yield per plot was recorded in the genotype ICPL-87 (1.48) RPS-2007-15 (1.43) and RPS-2007-109 (1.40) respectively.

Grain yield kg/ha

The Grain yield kg/ha was height recorded in the genotypes BDN-2 (2822.92), UPAS-120 (2746.53), RPS-2007-63 (2656.25), Asha (2326.39), RPS-2007-107 (2118.06) and Rajeev lochan (2118.06), medium Grain yield (kg/ha) was recorded in the genotypes RPS-2007-73 (1996.53), ICPL-87 (1545.14) and low Grain yield (kg/ha) was recorded in the genotype RPS-2007-15 (1496.53) and RPS-2007-109 (1458.33) respectively.

For varietal screening studies ten selected pigeonpea genotypes BDN-2, UPAS-120, RPS-2007-63, Asha, RPS-2007-107, Rajeev lochan, RPS-2007-73, ICPL-87, RPS-2007-15 and RPS-2007-109 were tested in the field conditions. The performance of the genotypes was assessed basis on the pod damage in the field conditions. The results are in conformity with the findings of Anitha (2005) [1] who reported that the pigeonpea genotype BDN-2 with less pod damage and high grain yield with a unit slope and minimum residual mean square values indicated the stability reaction to pigeonpea pod borer *Helicoverpa armigera.*

Table 2: Estimation of losses in yield due to infestation by pod borer (*Helicoverpa armigera*)

S. No.	Genotype	Number of pods per plant		Grain yield per plot		Grain yield kg/ha	
01	BDN-2	165.400	10	2.71	1	2822.92	1
02	Asha	174.133	7	2.23	4	2326.39	4
03	ICPL-87	174.600	6	1.48	7	1545.14	7
04	RPS-2007-109	182.667	2	1.40	9	1458.33	9
05	Rajeev lochan	177.333	4	2.03	5	2118.06	5
06	RPS-2007-63	181.133	3	2.55	3	2656.25	3
07	UPAS-120	217.200	1	2.63	2	2746.53	2
08	RPS-2007-15	169.600	8	1.43	8	1496.53	8

09	RPS-2007-73	168.267	9	1.92	6	1996.53	6
10	RPS-2007-107	174.933	5	2.03	5	2118.06	5

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