


STUDIES ON RELATION BETWEEN POD DAMAGE AND YIELD LOSS IN DIFFERENT COWPEA CULTIVARS AT PANTNAGAR-UTTARAKHAND-INDIA

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ABSTRACT

The relation between pod damage and yield loss was studied in different cowpea cultivars in both seasons of the Kharif in 2010 and Zaid in 2011. During the Kharif season, yield loss due to attack of pod borers was highest in PGCP -1 cultivar (1075.56 kg/ha) and lowest in PGCP-6 cultivar (434.44 kg/ha). However, during the Zaid season, the yield loss caused by pod borers at pod formation stage was much higher in the cultivar of PGCP-6 (962.23kg/ha) than those in PGCP-4 (454.45kg/ha). This study would be helpful to develop an integrated approach for controlling the insect pest to obtain maximum yield.

Keywords: Cowpea, cultivar, pod borer, Zaid season, Kharif season.

INTRODUCTION

Cowpea is one of the most ancient crops known to man. Its origin and subsequent domestication is associated with pearl millet and Sorghum in Africa. It is now a broadly adapted and highly variable crop, cultivated around the world primarily for seeds but also as a vegetable (for leafy greens, green pods, fresh shelled green peas and shelled dried peas), a cover crop and for fodder (Vishnu, 2006). A crop life table for cowpeas grown in northern Nigeria shows the estimated losses due to insect attack at various plant growth stages. The potential loss in yield due to insects is over 90%, with 70% of this loss occur during the flowering and pod formation stages (Raheja, 1976). Grain yield of cowpea, the most important grain in the Coast Province of Kenya, is very low mainly because of insect pests attack. It is, however, not clear which growth development stages at which pest attack occur lead to significant reduction in yields. Consequently, it is difficult to focus control strategies on a particular growth stage. A study was, therefore, conducted to determine the critical stage of cowpea growth at which insecticide application minimizes grain yield loss due to pests. The results indicated that controlling flowering and podding pests resulted in 15 fold increase in cowpea grain yield. It is concluded that control efforts should be focused on

flowering and podding pests (Kyamanywa, 1996).

As the pest spectrum is wide, and practically every part of the cowpea plant has an adopted pest species. While the pest status of the different insects may vary from one country or region to another, the losses reported suggest that any one major pest of cowpeas can cause substantial economic loss if left uncontrolled. Hence the “Studies on relation between pod damage and yield loss in different cultivar of cowpea at Pantnagar- Uttarakhand – India” was carried to generate the basic information to develop management strategies for suppressing pest population in cowpea.

MATERIALS AND METHODS

The experiments were conducted at Breeder Seed Production Centre, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar-263145, District Udham Singh Nagar (Uttarakhand) India, during *Kharif* season from August to October of 2010 and during *Zaid* season from March to June of 2011 on different five cultivars of cowpea.

Experiment was carried out on five cultivars of Cowpea; PGCP -1 (Pant lobia 1), PGCP – 4 (Pant lobia 2), PGCP - 12, PGCP – 6 and PGCP - 14. One cultivar was considered as one treatment and each was replicated three times with plot size of 4 x 3 m and 50 cm row spacing.

<i>R1</i>	<i>R2</i>	<i>R3</i>
PGCP - 6	PGCP - 12	PGCP - 1
PGCP - 12	PGCP - 14	PGCP - 4
PGCP - 4	PGCP - 1	PGCP - 6
PGCP - 14	PGCP - 6	PGCP - 12
PGCP - 1	PGCP - 4	PGCP - 14

LAYOUT OF THE EXPERIMENTS

Observation on pod damage at maturity: Pods damage at maturity was taken from 10 plants in each plot. Number of damage pod and total number of pods were counted and converted to percentage pod damage as indicated below.

$$\text{Percent poddamage} = \left[\frac{\text{Number of damaged pods}}{\text{Total number of pods}} \right] \times 100$$

Observation on yield: The grain yield obtained from each replication. The total yield per plot including the yield of three replication were taken, then computed on kg/ha and compared each cultivar to know the status of cultivar.

Statistical analysis: The data collected from various experiments were subjected to statistical analysis as prescribed for randomized block design. The critical difference (CD) at 5% level of significance was calculated.

RESULTS AND DISCUSSION

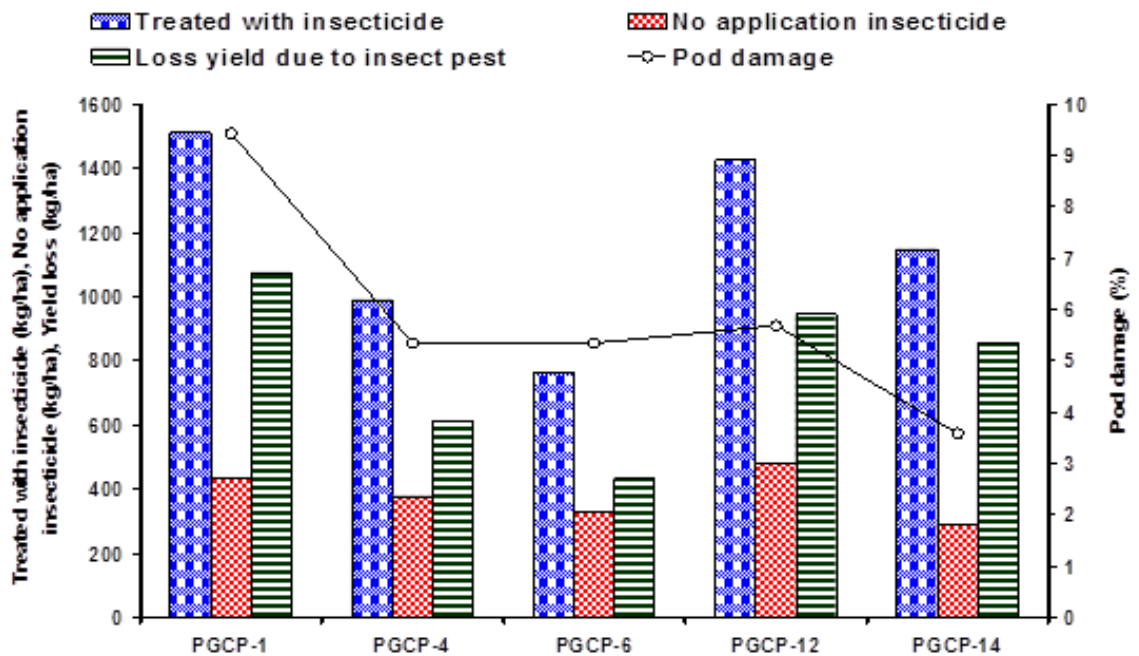
Relation between pod damage and yield loss in the *Kharif* season of the year 2010 and the *Zaid* season of the year 2011

Pod damage and yield loss during the *Kharif* season of 2010

The data in Table 1 and Fig.1 showed the grain yield in cultivars (PGCP -1, PGCP -4, PGCP -6, PGCP -12, PGCP-14) treated with insecticides were significantly higher than that in untreated cultivars during the *Kharif* season, 2010. Yield loss due to insect-pests mainly by pod borer attack was highest in PGCP -1(1075.56 kg/ha) followed by PGCP-12 (946 kg/ha), PGCP -14 (856.06 kg/ha), PGCP-4 (612.22 kg/ha) and the least was in PGCP-6 (434.44 kg/ha). In addition, the highest percentage of pod damage due to pod borers was recorded 9.43 in PGCP -1 followed by 5.69 in PGCP -12, 5.35 in PGCP -6 and PGCP -4, respectively and minimum was recorded 3.59 in PGCP -14, which indicate that the cultivars PGCP -14 has some tolerance against insect attack. The data shows that there was significantly higher pod damage and losses in yield when the crop was exposed during pod formation and maturity to insect attack than when the crop was protected during pod formation and maturity stage. This concludes that the pod damage due to pod borers during pod formation and maturity is most critical in causing yield losses.

Table 1. Crop loss assessment in different cultivars of cowpea in the *Kharif* season of the year 2010

Sl. No.	Cultivars	Pod damage (%)	Unprotected crop (no application of insecticide) (kg/ha)	Protected crop (treated with insecticide) (kg/ha)	Loss in yield due to insect pest (kg/ha)
1	PGCP-1	9.43	434.44	1510.00	1075.56
2	PGCP-4	5.35	377.78	990.00	612.22
3	PGCP-6	5.35	330.56	765.00	434.44
4	PGCP-12	5.69	480.00	1426.00	946.00
5	PGCP-14	3.59	291.94	1148.00	856.06
6	CD at 5%	5.20	8.92	19.29	5.37

**Fig. 1.** Crop loss assessment in different cultivars of cowpea during *Kharif* season of the year 2010

Pod damage and yield loss during *Zaid* season of 2011

The data given in Table 2 and Fig. 2 shows that there was no significant difference in all cultivars regarding percentage of pod damage. During pod formation stage, the grain yield in plots protected with some insecticides was significantly lower than those without

insecticide application. The yield loss due to pod damage during pod formation stage was much higher being 962.23 kg/ha in the cultivar PGCP-6 followed by 940.00 kg/ha in PGCP-1, whereas the yield losses due to insect attack in PGCP-4 was very low, which indicates it has some tolerance against insect pest.

Table 2. Crop loss assessment in different cultivars of cowpea during the *Zaid* season of the year 2011

Sl. No.	Cultivars	Pod damage (%)	Unprotected crop (no application insecticide) (kg/ha)	Protected crop (treated with insecticide) (kg/ha)	Loss in yield due to insect pest (kg/ha)
1	PGCP-1	2.36	400.00	1340.00	940.00
2	PGCP-4	2.28	355.55	810.00	454.45
3	PGCP-6	2.04	352.77	1315.00	962.23
4	PGCP-12	1.75	427.77	1005.00	577.23
5	PGCP-14	2.98	254.17	1150.00	895.83
6	CD at 5%	2.50	4.66	4.16	5.28

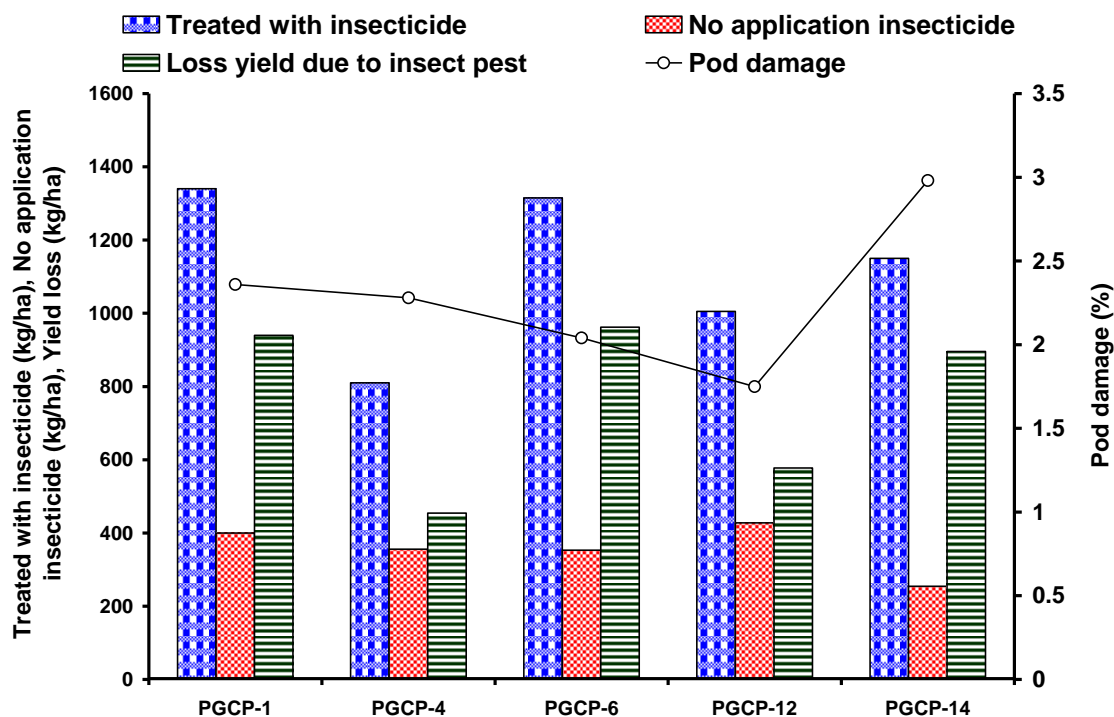


Fig. 2: Crop loss assessment in different cultivars of cowpea during the *Zaid* season of the year 2011

CONCLUSION

There is relation between pod damage and yield loss in the *Kharif* season of the year 2010 and the *Zaid* season of the year 2011. During the *Kharif* season, there were significantly higher pod damage and yield losses in the crop exposed to insect attack than those protected during pod formation and maturity stage. This concludes that the pod damage due to pod

borers during pod formation and maturity is most critical in causing yield losses in *Kharif* season. However, in *Zaid* season, the yield loss due to pod damage during pod formation stage was much higher with 962.23 kg/ha in the cultivar PGCP-6 followed by 940.00 kg/ha in PGCP-1, whereas the yield losses due to insect attack in PGCP-4 was very low, which indicates it has some tolerance against insect pest. This

study would be helpful to develop an integrated approach for controlling the insect pest to obtain maximum yield.

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TÓM TẮT

Nghiên cứu mối quan hệ giữa thiệt hại của trái và sự mất năng suất của các giống đậu trắng khác nhau tại Pantnagar-Uttarakhand-India

Thí nghiệm nghiên cứu mối quan hệ giữa thiệt hại trái và sự mất năng suất được nghiên cứu trong vụ Thu Đông 2010 và vụ Hè 2011. Trong vụ Thu Đông 2010, sự mất năng suất do sâu đục trái gây hại cao nhất ở giống đậu PGCP-1 (1075,56 kg/ha) và thấp nhất ở giống đậu PGCP-6 (434,44 kg/ha). Trong vụ Hè 2011, sự mất năng suất ở giai đoạn hình thành trái do sâu đục trái gây hại cao nhất ở giống đậu PGCP-6 (962,23 kg/ha) và thấp nhất ở giống đậu PGCP-4 (454,45 kg/ha). Nghiên cứu sẽ giúp ích cho cho việc quản lý côn trùng gây hại để tạo ra năng suất tối đa.