

**STUDY OF POPULATION DYNAMICS OF *CHRYSOCORIS STOLLI* WOLF
(HETEROPTERA_PENTATOMIDAE SCUTELLERINAE)****P.K.SEHGAL AND S.C.DHIMAN***Department of Zoology/Entomology Dolphin (P.G) Institutes of Biomedical &
Natural Sciences Manduwala Chakrata Road Dehradun Uttarakhand Pin 248007***ABSTRACT**

Population count was made on randomly selected ten plants. Weekly observation were taken and noted. On these basis monthly population was calculated and pooled in table –1. The count was made infield for two consecutive years, 2005 and 2006. The data of table-2 depict that population built up of *C.stolli* starts in the month of late February or March on *Cassia occidentalis* plants and on Bajra . *Pennisetum typhoid*. The population goes on peak level on these plants during July to September when in nature abundant food supply is available. Further, data of frequency (F), abundance (A) and density (D) table – 50 revealed that during 2005 at Saharanpur proper density varied from 1.35 to 4.15, frequency (F) was 30 to 100% percent and abundance was 1.42 to 4.08 during peak period of occurrence of bugs on *Pennisetum typhoid*'s (Bajra) crop. During 2006 density was 1.35 to 4.15, frequency 35 to 100% and abundance was 1.42 to 4.08. Calculation of frequency, density and abundance was carried using following formula. Density (D) = Total No. of individuals / Total No of quadrates studied. Frequency (F) = Number of quadrates in which the sp. Occurred / Total No. of quadrates studied. Abundance (A) = Total No. of individuals / Total No. of quadrates of occurrence.

KEY WORD: Population built up. Monthly population. Seasonal cycle. Extent of attack**P.K.SEHGAL***Department of Zoology/Entomology Dolphin (P.G) Institutes of Biomedical &
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INTRODUCTION

Population built up

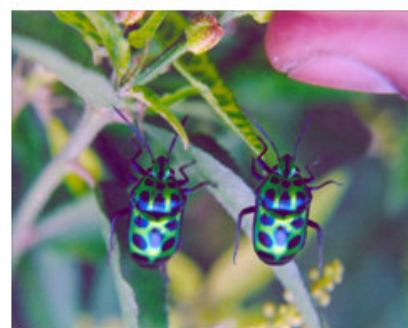
Studies on the population dynamics of insect pests are essential from an economic point of view. In view of this population dynamics of *C.stolli* was carried out in 5 blocks of district Saharanpur mainly Saharanpur proper, Behat.Nakur, Sarsawa and Nagal on Bajra and *Cassia occidentalis* *Chrysocoris stolli* bugs are large insect which causes considerable lose to the crop of economics value. *Chrysocoris stolli* wolf attack *Cassia occidentalis* family Leguminosae .It is an exotic wide spread weed in India which is attacked by a number of insects and *C.stolli* is the major one^{1,10,11,12,13} 1. *Cassia occidentalis* is a serious pest for forest crops and other vegetation

.Though ,it was imported in India as an ornamental plant by some India people during rule in India ,but since then it has been speeded like a wild fire in almost every part of India including Uttar Pradesh ,Uttarakhand and north eastern states .Various methods ,mechanical cultural, chemical and biochemical have tried to check the spread of this weed *Cassia occidentalis* is an important biocontrol agent of this weed and in India it was important from dist Bijnor 2010 to 2011 by the garment doctors .Since then in India various aspects of this potential biocontrol agent of *Cassia occidentalis* weed have been worked out studies on the effect of ecological factors on the occurrence of insect is of vital significanc^{4,5,6,7,8,9..}

Figure 1



Copulation Figure in Male and Female



Copulation Figure in Male and Female

MATERIALS AND METHODS

For maintaining the culture ,fifth instars nymphs of *Chrysocoris stolli* wolf approximately of some age along with fresh leaves and tender twigs of *Cassia occidentalis* plant were collected from the field area (Saharanpur, Block Behat, Nagal and dist Bijnor U.P) in polyethylene bags and restored in hurricane glass lamp chimneys and plastic jars⁹. The newly emerged pair were sorted out from the culture and were kept separately for further rearing in chimney and plastic jars , wire gauge cages were also used for maintaining the culture of *C.stolli* .For knowing the effect of different levels of temperature and R.H .On the adult and nymphal population of *C.stolli* ,temperature and humidity control cabinet was used. Population dynamics studies: Studies on population dynamics of *Chrysocoris stolli* were carried out in the field and above mentioned 5 regions, visited weekly. The population built up in different months, migration of the population, hibernation etc. was noted and recorded. To know the causative factors of population fluctuation in the field, experiments were carried out in the laboratory. For this purpose experiment at optimum temperature and humidity were critically carried out with the half of Temperature and humidity

control cabinet and response of the bugs at these levels at different time interval was also noticed^{1,8}.

RESULTS

Population built up

Studies on the population dynamics of insect pests are essential from economic point of view. In view of this population dynamics of *C.stolli* was carried out in 5 blocks of district Saharanpur mainly Saharanpur proper, Behat.Nakur, Sarsawa and Nagal on Bajra and *Cassia occidentalis*. Population count was made on randomly selected ten plants. Weekly observation were taken and noted. On these basis monthly population was calculated and pooled in table – 49.The count was made infield for two consecutive years, 2005 and2006.The data of table-49 depict that population built up of *C.stolli* starts in the month of late February or March on *Cassia occidentalis* plants and on Bajra... The population goes on peak level on these plants during July to September when in nature abundant food supply is available. During this period all stages of bugs are available in field such as eggs, nymphs and adults. Population begins to decline in October and finally goes on the low level in November. No bugs occur in nature during late November to February because due to low temperature *C.stolli*

hibernates in all the 5 block of district Saharanpur. Further, data of frequency (F), abundance (A) and density (D) table – 2, revealed that during 2005 at Saharanpur proper density varied from 1.35 to 4.15, frequency (F) was 30 to 100% percent and abundance was 1.42 to 4.08 during peak period of occurrence of bugs on *Pennisetum typhoides* (Bajra) crop. During 2006 density was 1.35 to 4.15, frequency 35 to 100% and

abundance was 1.42 to 4.08. Calculation of frequency, density and abundance was carried using following formula. Density (D) = Total No. of individuals Total No of quadrates studied Frequency (F) = Number of quadrates in which the sp. Occurred Total No. of quadrates studied. Abundance (A) = Total No. of individuals Total No. of quadrates of occurrence.

Figure 2



Field thermometer Dial hygrometer and

Hurricane glass lantern chimney

life cycle of *C. stollii* WOLF

Scale used for field and laboratory studies

Use of rearing *C. stollii*

Table-49
Population built of *chrysocoris stollii* on per ten plants of *pennisetum typhoides*(Bajra) and *Cassia occidentalis* during 2005 and 2006 in different block of Saharanpur district.

Year	Months	Saharanpur		Nagal		Sarsawa		Behat			Nakur	
		Bajra	Cassia	Bajra	Cassia	Bajra	Cassia	Bajra	Cassia	Bajra	Cassia	
2005	Jan.	-	-	-	-	-	-	-	-	-	-	-
	Feb.	-	-	-	-	-	-	-	-	-	-	-
	March	-	1	-	-	-	-	2	-	1	-	2
	April	-	2	-	2	-	-	6	-	3	-	6
	May	1	4	-	6	2	-	8	2	7	1	9
	June	3	5	2	7	4	-	15	5	11	2	13
	July	18	13	12	15	15	-	18	13	15	11	18
	Aug.	15	12	11	10	14	-	13	18	14	17	12
	Sep.	10	10	8	8	11	-	10	11	12	15	9
	Oct.	5	7	4	6	8	-	6	8	7	9	7
	Nov.	2	2	3	2	3	-	3	2	3	3	2
	Dec.	-	-	-	-	-	-	-	-	-	-	-
2006	Jan.	-	-	-	-	-	-	-	-	-	-	-
	Feb.	-	-	-	-	-	-	-	-	-	-	-
	March	-	2	-	3	-	-	2	-	1	-	2
	April	-	5	-	4	-	-	3	-	2	-	7
	May	2	6	1	7	1	-	7	2	7	2	6
	June	5	11	4	11	3	-	11	5	13	5	12
	July	17	18	13	20	17	-	18	10	17	17	20
	Aug.	13	12	10	17	15	-	15	5	12	15	13
	Sept.	10	8	8	11	10	-	12	3	9	10	8
	Oct.	5	5	3	6	8	-	9	2	5	8	5
	Nov.	1	2	1	2	3	-	2	1	2	2	2
	Dec.	-	-	-	-	-	-	-	-	-	-	-

2 Monthly population

As said earlier, *C. stollii* is not found throughout the year in its natural habitat. During winter months, from late November to late February, it hibernates in the adult stage. Hence, monthly population count was carried out in field on its main food plants *Pennisetum typhoides* (Bajra), and *Cassia occidentalis* during March to mid November. Data of observations were recorded during two consecutive years 2005 and 2006. Like population built up five blocks of Saharanpur district were selected, mainly Nagal, Behat, Nakur, Sarsawa, and Saharanpur proper. Population of eggs, nymphs and adults were counted on randomly selected per ten plants and data are recorded in table 1 to 2. The data of aforesaid table clearly show that population of *C. stollii* begins to develop in late February or March and first adults appear in the field which emerge out from hibernation. Initially, in March only adults were present, 19 on *Pennisetum*

typhoides (Bajra), 20 on Cassia per ten plants. In April, eggs and nymphal instars were also seen and their population was 4 eggs 15 nymphs 28 adults on Bajra, 9 eggs, and 15 nymphs' 22 adults on *Cassia occidentalis*. Gradually population of all the three stages, eggs, nymphs and adults, increased reaching on peak in July, August and September on all these plants. In August, it was 58 eggs, 53 nymphs and 57 adults on Bajra, 81 eggs, 66 nymphs, and 76 adults on *Cassia occidentalis*. From October, population began to decline, reaching on lowest level in November. During mid November there were 01 eggs. 08 nymphs and 17 adults on *Bajra* and 01 eggs, 02 nymphs and 17 adults on *Cassia occidentalis*. Monthly population data are clearly depicted in tables-51 to 52. In the last of November only late IV and V instar nymphs were present weighting for their final moulting into adults while adults already proceeded for hibernation due to decline in atmospheric temperature in this region.

Table 1
Monthly Population of *C.stolli*, on *Pennisetum typhoides* (Bajra) per ten plants during 2005 to 2006.

Year	Saharanpur proper						Behat						Sarsawa						Nagal						Nakur								
	2005			2006			2005			2006			2005			2006			2005			2006			2005			2006					
	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A
Jan	-----Hibernation in <i>C.stolli</i> -----																																
Feb	-----Hibernation in <i>C.stolli</i> -----																																
March	-	-	3	-	-	2	-	-	2	-	-	3	-	-	2	-	-	2	-	-	1	-	-	1	-	-	1	-	-	1	-	-	2
April	2	3	4	-	3	2	-	2	3	-	-	2	-	2	3	2	-	2	-	3	2	-	-	3	-	-	2	-	-	2	3		
May	4	2	4	2	2	2	2	3	4	4	3	4	3	2	4	3	2	4	3	2	3	3	2	2	1	2	3	3	2	1			
June	5	3	4	2	3	4	2	3	4	3	5	4	3	4	5	4	5	3	6	5	3	2	3	4	3	2	5	3	2	3			
July	13	8	10	14	6	10	12	10	12	10	8	10	13	8	5	6	7	10	13	10	10	12	8	8	8	8	12	10	12	9	10		
Aug.	5	6	8	6	6	8	10	6	8	5	5	6	6	5	4	3	2	5	5	6	3	7	6	5	6	3	4	5	8	6			
Sept.	7	8	9	10	10	8	6	8	6	5	6	7	4	5	6	3	2	3	4	5	6	7	8	4	3	5	4	3	5	6			
Oct.	2	4	3	3	4	3	4	4	5	4	3	5	6	7	8	5	6	3	2	4	6	3	5	6	3	7	8	6	5	6			
Nov.	-	-	2	-	-	1	-	-	2	-	-	3	-	1	2	-	-	3	-	-	2	-	2	1	-	2	1	1	3	5			
Dec.	-----Hibernation in <i>C.stolli</i> -----																																

E= Eggs, N= Nymphs, A= Adults

Table 2
Monthly population of *C.stolli* on *Cassia occidentalis* per ten plants during 2005 to 2006

Year	Saharanpur proper						Behat						Sarsawa						Nagal						Nakur								
	2005			2006			2005			2006			2005			2006			2005			2006			2005			2006					
	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A	E	N	A
Jan	-----Hibernation in <i>C.stolli</i> -----																																
Feb	-----Hibernation in <i>C.stolli</i> -----																																
March	-	-	2	-	-	2	-	-	3	-	-	2	-	-	2	-	-	1	-	-	2	-	-	1	-	-	2	-	-	2	-	-	3
April	-	2	2	-	2	3	-	-	2	2	-	2	-	2	3	-	2	3	2	3	2	3	2	1	-	2	3	2	-	1			
May	4	4	4	4	5	6	5	6	7	4	3	2	3	2	4	2	4	6	2	3	4	3	4	7	2	3	4	5	4	3			
June	5	6	7	5	6	7	5	6	7	6	7	5	7	5	6	4	3	2	3	4	5	4	5	6	7	6	5	5	6	7			
July	13	10	12	14	10	8	13	10	8	12	10	8	10	12	10	12	10	8	13	8	12	12	13	10	14	13	12	10	11	12			
Aug.	10	6	7	10	7	6	9	5	4	6	7	8	6	5	4	6	7	8	11	7	9	11	8	9	6	7	5	6	7	8			
Sept.	5	6	7	4	4	4	4	5	6	6	7	8	3	2	5	6	6	7	8	5	6	8	5	6	7	7	7	8	9				
Oct.	2	3	2	2	4	2	-	2	3	2	4	6	2	4	3	2	3	2	2	4	6	2	3	2	1	2	3	3	2	4			
Nov.	-	-	1	-	-	2	1	-	1	-	-	2	-	-	1	-	-	2	-	-	2	-	-	3	-	-	3	-	-	2			
Dec.	-----Hibernation in <i>C.stolli</i> -----																																

Table 3

Population built up studies of *C. stollii* in the peack season on *Pennisetum typhoides* (Bajra) crop during, 2005 and 2006 at saharanpur proper for frequency (F) Density (D) and Abundance (A).

Quadrat No. and No of <i>C.stollii</i> in each quadrat																											
Year and months (2005)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	No. of quadrat e of occurrence	No. of quadrat e applies	Total No. of <i>C.stollii</i> in all quadrates	Frequen cy (F)	Densit y (D)	Abu nda nce (A)	
Jan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April	1	-	-	2	1	-	-	-	-	1	-	-	-	1	-	-	1	-	-	-	06	20	07	30%	3.33	2.85	
May	4	5	3	2	2	4	3	5	3	2	-	-	2	3	-	4	5	6	7	3	17	20	63	85%	3.15	3.7	
June	6	5	6	-	3	4	3	-	2	2	1	3	3	4	5	6	7	3	-	6	17	20	69	85%	3.05	3.5	
July	6	5	6	3	3	5	5	7	2	3	2	3	3	2	5	6	7	3	5	6	20	20	87	100%	4.15	4.08	
Aug.	2	1	3	2	3	2	3	2	2	3	4	5	3	2	-	-	2	1	2	3	18	20	45	90%	2.02	2.5	
Sep.	5	-	6	3	2	3	4	-	3	3	2	-	2	3	6	5	4	3	4	5	17	20	63	86%	3.16	3.6	
Oct.	1	2	1	3	-	-	-	-	2	3	2	3	2	1	1	2	-	-	2	2	14	20	27	70%	1.35	1.42	
Nov.	1	1	2	-	-	-	-	-	-	-	-	3	2	-	1	-	-	-	-	1	07	20	11	35%	2.85	1.81	
Dec.																											

Year and Months 2006	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	No. of quadrat e of occurrence	No. of quadrat e applies	Total No. of <i>C.stollii</i> in all quadrates	Total occurred (F)	D	A	
Jan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
April	3	5	6	7	3	2	6	4	5	3	2	1	-	2	3	1	2	5	6	7	19	20	73	95%	3.65	3.81	
May	3	2	3	2	3	2	5	6	7	3	2	-	-	3	2	-	-	4	5	3	16	20	55	80%	2.7	3.03	
June	4	5	3	2	2	4	3	-	-	3	2	4	5	3	3	4	5	2	1	1	18	20	66	90%	2.8	3.01	
July	6	5	6	3	3	4	7	3	2	2	1	3	3	4	5	6	7	3	5	6	20	20	84	100%	4.15	4.08	
Aug.	5	3	3	2	3	4	5	-	-	3	1	-	6	2	3	4	3	3	2	3	17	20	55	80%	2.81	3.10	
Sep.	4	5	3	-	4	3	-	3	3	3	2	-	3	-	5	4	3	2	5	4	16	20	56	80%	2.7	3.03	
Oct.	1	2	1	3	-	-	-	-	2	3	2	3	2	1	1	2	-	-	2	2	14	20	27	70%	1.35	1.42	
Nov.	1	1	2	-	-	-	-	-	-	-	-	3	2	-	-	1	-	-	1	-	07	20	11	35%	2.85	1.81	
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

3. Extent of attack

For knowing extent of attack extensive surveys of field areas of Saharanpur were conducted. Ten plants of each host of *C.stolli*, viz,- *Cassia occidentalis*, *Pennisetum typhoides*, (Bajra) and *Litchi chinensis* were randomly selected and infestation of these plants by *C.stolli* was noted. The data for two consecutive years, 2005 and 2006, were recorded and presented in tables 55 to 59. The data of afore mentioned tables indicate that infestation percentage varied according to the host plant species and place. It was 20 to 80 percent for *Cassia occidentalis* and 20 to 60 percent for Bajra and 40 to 70 percent for Litchi during 2005. In 2006 it was 20 to 70 percent for Cassia and 40 to 70 percent for Bajra and 40 to 60 percent for Litchi in Saharanpur proper. Maximum infestation was recorded during July to September and minimum during February, March, and November. Among these plants, maximum infestation percentage was recorded for *Cassia occidentalis* and minimum for *Litchi chinensis*. Among the block of Saharanpur district, during 2005, on *Cassia occidentalis*, maximum 90% infestation occurred in three blocks namely Nakur, Behat and Nagal and minimum 10% infestation was recorded in two blocks, Saharanpur and Sarsawa. On Bajra infestation it was 90% as maximum in Behat block and 20% as the minimum in Saharanpur proper. For Litchi maximum 80% infestation was in Sarsawa and 40% as minimum infestation in Saharanpur proper, Behat, Nagal

and Nakur blocks. During 2006, maximum 90% infestation for *Cassia occidentalis* was in Nagal and Sarsawa while minimum 20% in Saharanpur proper, Nakur and Behat block. For *Litchi chinensis*, it was 70% as maximum in Behat, Nagal and Sarsawa blocks and 40% as minimum in Saharanpur proper And Nakur. For Bajra, it was 80% as maximum in Nakur and Sarsawa blocks and 20% as minimum in Nagal and Saharanpur blocks. It depends upon eco climatic condition of the region as well as availability of host plants. Good moisture is maintained in the nearby areas of Sarsawa and Nakur blocks Yamuna river. Moisture along with temperature is an essential abiotic factors for rapid buildup of pest population. Hence, in these two blocks extent of attack was observed slightly higher than other blocks such as Nagal and Saharanpur proper which are away from Yummuna river bank.

4. Intensity of attack

Simultaneously during the study of extent of attack, intensity of attack was also studied in field. For this purpose, host plants of *Pennisetum typhoides* (Bajra), *Cassia occidentalis* and *Litchi chinensis* were selected randomly indifferent blocks of Saharanpur district, leaves, inflorescence and spike affected by the feeding of *C.stolli* were noted and data are recorded in (Table 60). Moreover, the observation was taken for two consecutive years, 2005 to 2006.

Intensity of attack was calculated using following formula.

1.
$$\frac{\text{No. of affected leaves}}{\text{Total No. of leaves on a plants}} \times 100$$
2.
$$\frac{\text{No. of infested spike or inflorescence}}{\text{Total No. of spike or inflorescence studies.}} \times 100$$

On this basis, the calculation was done and data are recorded in table 60 which reveals that on a Bajra, plant extent of intensity for leaves varied from 16.6 to 33.3 percent, and 50 to 75 percent for spike. It was 25 to 71.1 percent for *Cassia occidentalis* leaves, and for pods it was 40 to 66.6 percent. On *Litchi chinensis* inflorescence, it was 50 to 75 percent. During 2006 for Bajra leaves intensity of attack was 25 to 22.2% and for its spike 33.3 to 60%. For *Cassia occidentalis* leaves it was 28.8 to 74.7% and for its pods 50 to 67.5 percent. It was 50 to 66 percent for *Litchi chinensis* influences. It is evident from the data that maximum intensity of attack was for *Cassia occidentalis* leaves and minimum for Bajra leaves.

Table 4
Infestation percentage of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, *Litchi chinensis* crops during 2005 to 2006.
SAHARANPUR PROPER

Year	2005			2005			2005			2006			2006			2006		
Months	Total No of plants			Infested plants			Infestation percentage			Total No. of plants observed			Infested plants			Infestation percentage		
Plants	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi
Jan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	10	-	-	3	-	6	30%	-	60%	10	-	-	4	-	-	40%	-	-
April	10	-	10	3	-	7	30%	-	70%	10	-	10	5	-	4	50%	-	40%
May	10	-	10	2	-	5	20%	-	50%	10	-	10	5	-	6	50%	-	60%
June	10	10	10	4	6	4	40%	60%	40%	10	10	10	4	7	5	40%	-	50%
July	10	10	10	8	5	-	80%	50%	-	10	10	10	7	5	6	70%	50%	60%
Aug.	10	10	-	5	4	-	50%	40%	-	10	10	-	5	6	-	50%	60%	-
Sept.	10	10	-	4	3	-	40%	30%	-	10	10	-	6	7	-	60%	70%	-
Oct.	10	10	-	3	2	-	30%	20%	-	10	10	-	3	2	-	30%	20%	-
Nov.	10	-	-	1	-	-	10%	-	-	10	-	-	2	-	-	20%	-	-
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5
Infestation percentage of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, and *Litchi chinensis* crops during 2005 to 2006.
At NAKUR

Year	2005			2005			2005			2006			2006			2006		
Months	Total No of plants			Infested plants			Infestation percentage			Total No. of plants observed			Infested plants			Infestation percentage		
Plants	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi
Jan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	10	-	-	4	-	-	40%	-	-	10	-	-	4	-	-	40%	-	-
April	10	-	10	5	-	6	50%	-	60%	10	-	10	5	-	8	50%	-	80%
May	10	-	10	7	-	7	70%	-	70%	10	-	10	6	-	6	60%	-	60%
June	10	10	10	6	6	6	60%	60%	60%	10	10	10	7	8	5	70%	80%	50%
July	10	10	10	9	7	4	90%	70%	40%	10	10	10	8	6	4	80%	60%	40%
Aug.	10	10	-	6	8	-	60%	80%	-	10	10	-	5	5	-	50%	50%	-
Sept.	10	10	-	5	5	-	50%	50%	-	10	10	-	4	4	-	40%	40%	-
Oct.	10	10	-	6	6	-	60%	60%	-	10	10	-	3	3	-	30%	30%	-
Nov.	10	-	-	3	-	-	30%	-	-	10	-	-	2	-	-	20%	-	-
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 6
Infestation percentage of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, and *Litchi chinensis* crops during 2005 to 2006.
At BEHAT

Year	2005			2005			2005			2006			2006			2006		
Months	Total No of plants			Infested plants			Infestation percentage			Total No. of plants observed			Infested plants			Infestation percentage		
Plants	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi
Jan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	10	-	-	5	-	-	50%	-	-	10	-	-	4	-	-	40%	-	-
April	10	-	10	6	-	6	60%	-	60%	10	-	10	5	-	6	50%	-	60%
May	10	-	10	7	-	7	70%	-	70%	10	-	10	6	-	7	60%	-	70%
June	10	10	10	7	6	5	70%	60%	50%	10	10	10	7	6	6	70%	60%	60%
July	10	10	10	9	7	4	90%	70%	40%	10	10	10	8	7	5	80%	70%	50%
Aug	10	10	-	5	8	-	50%	80%	-	10	10	-	6	6	-	60%	60%	-
Sept.	10	10	-	4	9	-	40%	90%	-	10	10	-	5	5	-	50%	50%	-
Oct.	10	10	-	3	6	-	30%	60%	-	10	10	-	4	4	-	40%	40%	-
Nov.	10	-	-	2	-	-	20%	-	-	10	-	-	2	-	-	20%	-	-
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7
Infestation percentage of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, and *Litchi chinensis* crops during 2005 to 2006.
At NAGAL

Year	2005			2005			2005			2006			2006			2006		
Months	Total No of plants			Infested plants			Infestation percentage			Total No. of plants observed			Infested plants			Infestation percentage		
Plants	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi
Jan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	10	-	-	4	-	-	40%	-	-	10	-	-	4	-	-	40%	-	-
April	10	-	10	5	-	6	50%	-	60%	10	-	10	5	-	6	50%	-	60%
May	10	-	10	6	-	5	60%	-	50%	10	-	10	6	-	7	60%	-	70%
June	10	10	10	7	6	6	70%	60%	60%	10	10	10	6	6	5	60%	60%	50%
July	10	10	10	9	5	4	90%	50%	40%	10	10	10	9	5	6	90%	50%	60%
Aug.	10	10	-	6	4	-	60%	40%	-	10	10	-	6	4	-	60%	40%	-
Sept.	10	10	-	5	8	-	50%	80%	-	10	10	-	5	3	-	50%	30%	-
Oct.	10	10	-	3	5	-	30%	50%	-	10	10	-	4	2	-	40%	20%	-
Nov.	10	-	-	2	-	-	20%	-	-	10	-	-	3	-	-	30%	-	-
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8
Infestation percentage of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, and *Litchi chinensis* crops during 2005 to 2006.
At SARSAWA

Year	2005			2005			2005			2006			2006			2006		
Months	Total No of plants			Infested plants			Infestation percentage			Total No. of plants observed			Infested plants			Infestation percentage		
Plants	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi	Cassia	Bajra	Litchi
Jan.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Feb.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
March	10	-	-	4	-	-	40%	-	-	10	-	-	3	-	-	30%	-	-
April	10	-	10	3	-	8	30%	-	80%	10	-	10	4	-	5	40%	-	50%
May	10	-	10	5	-	6	50%	-	60%	10	-	10	5	-	6	50%	-	60%
June	10	10	10	6	6	5	60%	60%	50%	10	10	10	6	8	7	60%	80%	70%
July	10	10	10	8	7	4	80%	70%	40%	10	10	10	9	6	6	90%	60%	60%
Aug.	10	10	-	7	5	-	70%	50%	-	10	10	-	6	3	-	60%	30%	-
Sept.	10	10	-	5	4	-	50%	40%	-	10	10	-	5	3	-	50%	30%	-
Oct.	10	10	-	4	3	-	40%	30%	-	10	10	-	4	3	-	40%	30%	-
Nov.	10	-	-	1	-	-	10%	-	-	10	-	-	3	-	-	30%	-	-
Dec.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 9
Intensity of attack of *C.stolli* on *Pennesitum typhodies* (Bajra), *Cassia occidentalis*, and *Litchi chinensis* crops during 2005 to 2006.

Plants	<i>Pennesitum typhodies</i> (Bajra)						<i>Cassia occidentalis</i>						<i>Litchi chinensis</i>		
	2005						2005						2005		
Date of observation	Total No. of leaves on plants	No. of infested leaves	Infestation percent	No. of spike observed	No. of infested spike	Infestation percent	Total no of leaves on plants	No. of infested leaves	Infestation percent	No. of pod	No. of infested pod	Infested on percent	No. of inflorescence on plants	No. of infested inflorescence	Percent of inflorescence
10-05-05	12	Nil	Nil	5	3	60	40	10	25	30	20	66.6	60	30	50
12-05-05	12	Nil	Nil	6	4	66.6	35	25	71.1	40	18	45	40	258	62
14-05-05	10	Nil	Nil	4	3	75	42	15	35	30	20	46.6	48	22	45
16-05-05	15	4	33.3	8	6	75	46	20	43.2	40	16	40	60	40	66.6
18-05-05	12	2	16.6	6	3	50	35	10	28.4	20	12	60	80	60	75
Years	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006	2006
Plants	Bajra	Bajra	Bajra	Bajra	Bajra	Bajra	Cassia	Cassia	Cassia	Cassia	Cassia	Cassia	Litchi	Litchi	Litchi
20-4-06	18	3	Nil	7	4	56.2	36	16	44.4	40	27	67.5	40	20	50
25-4-06	7	Nil	22.2	5	3	60	27	20	74.7	20	13	65	80	40	50
30-4-06	9	2	25	4	2	50	32	15	49.3	40	20	50	40	20	50
3-5-06	12	3	14.2	3	1	33.3	45	13	28.8	35	22	62	60	30	50
8-5-06	14	2	20.55	5	3	60	60	32	53.3	20	10	20	35	20	66

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