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Studies on seasonal incidence of grasshopper and earhead bug in little millet (*Panicum sumatrense* R.) at Bastar, Chhattisgarh

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Abstract
The seasonal incidence study was carried out at New Upland Research cum Instructional Farm, Lamker, under Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Chhattisgarh during *Kharif* 2021. Results of seasonal incidence revealed that grasshopper and earhead bug recorded as a pest of little millet from August to October month. Grasshopper infestation was initiated in little millet during the second week of August (33rd SMW) with 3.84 per cent affected leaf. During the study period incidence was ranged from to 2.35 per cent with 4.22 per cent. The highest grasshopper incidence was recorded in 40th SMW with 4.22 per cent infestation respectively. The mean population of earhead bug was first time appeared September to October month. The population of earhead bug ranged from 0.33 to 0.89. The highest population of earhead bug was (0.89 earhead bug/plant) on 42th SMW of October month.

Keywords: Seasonal incidence, grasshopper, earhead bug, little millet

Introduction
Small millets, a group of crops or minor coarse cereals, namely little millet (*Panicum sumatrense*) it is a cereal crop that belongs to the grass family Poaceae. The term "millet" is used to refer to several types of small-seeded annual. It is an important indigenous crop in Indian subcontinent. In India, it is grown in Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha and Tamil Nadu. It is locally called by different names, Kutki in Hindi and Same/ savi in Kannada, Samai in Tamil Nadu, Samulla in Telugu, Chama in Malyalam. Little millet is presently grown throughout India is about one million hectares. In India, little millet cultivated in an area of 291 thousand hectares with annual production of 102 thousand tones and productivity of 349 kg ha^{-1} which is very less as compared to other cereal crops (Katara *et al*., 2019) [4]. In Bastar district of Chhattisgarh, which is one of the largest congregations of tribal population (67.4%), inhabitants mainly grow millets on upland situations and form major component of their daily food consumption (Thakur *et al*., 2017) [8]. Chhattisgarh has 5.88 million hectares of cultivable land. Rice is the principal crop of the region but maize and small millets also grown by farmers specially Bastar region. In 2006, Chhattisgarh occupied 248.5 thousand hectares of land (which is 21.18% of India's 1173.5 thousand ha under small millets with a total production of 52.1 thousand tons (which is only 10.22% of the total national production of 509.8 thousand tons) and yield of 210 kg/ha against national productivity of 434 kg/ha (Sahu and Sharma, 2018) [7]. Little millets are nutritious, healthy and versatile with similar comparison to other cereals and can be a worthy addition to diet. Little millet based value added products could enhance the income, empowers of millet farmers and nutrition in rural India. In view of this, greater emphasis is being laid to make all out efforts for increasing the domestic production of millets. On the other hand, this challenge of improving the indigenous production is being confronted with many constraints of varied kinds ranging from biotic to abiotic factor and among which insect pests are important factors.
Worldwide, at least 150 insect species are recorded as feeding on millets (Nwanze and Harris 1992) [5]. In India, nearly 32 per cent of the crop is lost due to insect pests (Borad and Mittal., 1983) [2]. The earhead bug (*Calocoris angustatus*) is an important earhead pest of millet, causing considerable damage. Nymphs and adults colonise the earheads in large numbers and suck the milky sap from developing grains.

As a result, the whole earhead becomes dusty black and gray as a result of head bug damage. Sometimes other bugs, like *Dysdercus koenigii* and *Nikita viridula*, also damage the developing grains. Surface grasshopper, *Chrotogonus hemipterus* generally causes minor leaf damage. The grasshopper, *Conocephalus maculatus* feeds on leaves as well as panicles (Kalaisekar *et al*., 2017) [3].

Material and Methods

The experiment was conducted at New Upland Research cum Instructional Farm, Lamker, Under Shaheed Gundadhoor College of Agriculture and Research Station, Kumhrawand, Jagdalpur. The little millet variety, CG kutki-1 was grown under unprotected condition with spacing of 22 x 10 cm in a plot size 15 x 30 m. The observation on seasonal incidence of earhead bug observation was number of adults and nymphs were visually counted on ten randomly selected plants from each plot at weekly intervals. The infestation of grasshopper was observed affected leaf per ten plants.

Geographical and weather conditions

Bastar is lies between 19º10' N latitude and 81º95' E longitude with an altitude of 552 meters above the mean sea level in which Lamker village lies at 19º62' N latitude and 80 º89' E longitude and located in Bastar Tehsil of Bastar district. The total rainfall during observation period varied from 7.00 mm in first week of October (40 SMW) to 163.2 mm second week of August (33 SMW). The crop received 55.5 mm average rainfall during the entire observation period. The maximum temperature during this period varied from 28.3 °C in second week of September (37 SMW) to 32.0 °C in the second week of October (42 SMW), whereas minimum temperature varied between 21.0 °C in the first week of October (40 SMW) to 22.6 °C in the second week of September (37 SMW). Relative humidity throughout the observation period varied between 90.0 – 96.0 per cent in the morning and 57.3 – 83.7 per cent during evening hours (Table 1).

Result and Discussion

Grasshopper (*Hieroglyphus* sp., *Cataloipus* sp.)

From the data presented (Table 1 and Fig. 1) revealed that the grasshopper affected leaf per cent ranged from 2.56 per cent in Neganar to 3.36 per cent in Katakandha with an average of 2.96 per cent for the Darbha block, 3.65 per cent in Garda to 4.46 per cent in Alnar with an average of 4.05 per cent was recorded in the Lohandiguda block and from 4.64 per cent in Kodenar to 5.69 per cent in Tirthum with an average of 5.16 per cent for Bastanar block. The maximum incidence of grasshopper at Bastanar block with 5.16 per cent and lowest at Lohandiguda block with 2.96 per cent of Bastar district.

Earlier findings of Rawat *et al.* (2021) [6] who reported that grasshopper caused infestation range from 13.33 to 26.67 per cent and 13.33 to 33.33 per cent, respectively at different locations and the per cent leaf affected by grasshopper ranged from 7.49 to 25.32 per cent with an average of 13.09 per cent at Berhampur, Odisha and Ranichauri, Uttarakhand. In furthermore, Anon. (2015) [1] reported that the grasshopper infestation was low at most of the locations. However, it was 10 to 12 per cent at village Jaisinghpura of Malpura tehsil and village Chandwaji of Amer tehsil.

Earhead bug (*Calocoris angustatus*)

The results of earhead bug revealed that mean population ranged from 0.24 at Neganar to 0.53 in Katakandha with an average of 0.47 for Darbha block Whereas, 0.24 Alnar to 0.34 in Garda with an average of 0.29 for the Lohandiguda block and from 0.17 in Tirthum to 0.46 in kodenar, with an average of 0.31 earhead bug/plant for the Bastanar block. The maximum mean population of earhead bug/plant in little millet crop was found at Darbha block with 0.47 while least at Lohandiguda block with 0.29 of Bastar district (Table 1 and Fig. 1).

Earlier, Anon. (2021) [1] recorded that gundhi bug population ranged from 0.56 to 1.35 gandhi bug/panicle was observed on little and foxtail millets in Mandya, on proso millet at ZARS, Bangalore.

Table 1: Seasonal incidence of grasshopper and earhead bug in little millet during *Kharif* 2021

SMW	Dates of observation	Max. Temp. (ºC)	Min. Temp. (ºC)	RH I (%)	RH II (%)	Total rainfall (MM)	GH (AL %)	Earhead bug (Population/plant)
33	13 Aug -19 Aug	29.4	22.2	96.0	83.7	163.2	3.84	0.00
34	20 Aug-26 Aug	30.3	21.9	93.5	69.5	71.7	2.63	0.00
35	27 Aug-2 Sep	30.0	22.3	91.3	76.9	96.8	3.45	0.00
36	3 Sep-9 Sep	29.7	22.0	92.7	73.6	83.7	2.55	0.00
37	10 Sep-16 Sep	28.3	22.6	92.0	77.3	44.6	2.35	0.33
38	17 Sep-23 Sep	30.4	22.3	90.0	68.0	11.2	3.71	0.43
39	24 Sep-30 Sep	30.3	22.2	94.6	69.0	26.2	2.94	0.59
40	1 Oct -7 Oct	32.0	22.0	93.4	57.3	7.00	4.22	0.65
41	8 Oct -14 Oct	31.6	21.0	93.7	57.6	38.2	3.67	0.74
42	15 Oct -21 Oct	30.5	21.4	94.4	68.1	12.5	2.65	0.89
	Seasonal mean	30.2	22.0	93.2	70.1	55.5	3.20	0.36

*R.H (I): Morning Relative humidity, R.H (II): Evening Relative humidity, GH: Grasshopper, AL: Affected leaf

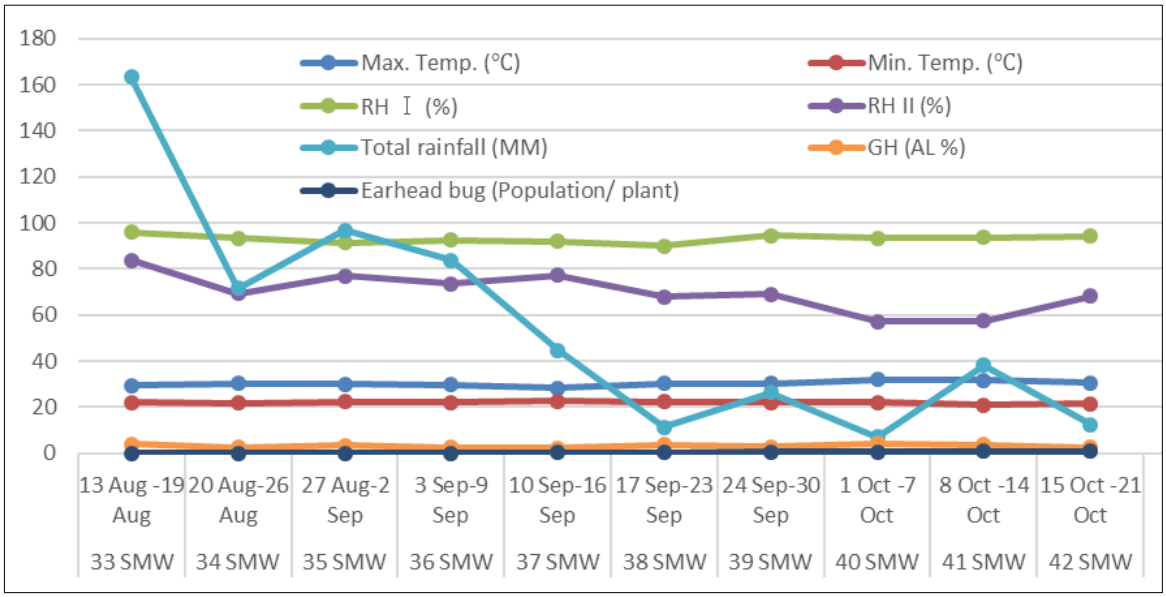

Fig 1: Seasonal incidence of grasshopper and earhead bug in little millet

Conclusion

Study of seasonal incidence revealed that grasshopper recorded as a pest of little millet from August to October month. During the study period grasshopper incidence was ranged from to 2.35 per cent with 4.22 per cent. The mean population of earhead bug was first time appeared September to October month. The population of earhead bug ranged from 0.33 to 0.89.

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