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Seasonal prevalence and composition of murid species in cucurbits

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Abstract
The species composition of murid was studied in vegetables fields of bottlegourd and bittergourd during sowing and harvesting seasons in CCS Haryana Agricultural University, Hisar. The present study advocates that three species of murids *Rattus rattus* (rat), *Mus musculus* (mice) and *Tatera indica* (gerbils) were found. The population of *R. rattus* was recorded maximum and and *T. indica* found least during sowing and harvesting season of bittergourd. The *R. rattus* was predominant species over *T. indica*. Murid prevalence during the sowing season in bottlegourd showed dominant population of *R. rattus* (3.67) as compared to *M. musculus* (2.00) and *T. indica* (1.44) while at the time of harvesting season population of *R. rattus* (5.22) was preponderant among all murids species.

Keywords: Bottlegourd, bittergourd, *Rattus rattus, Tatera indica and Mus musculus*

1. Introduction
Worldwide, rodents are the most important group of mammals in terms of the problems they create in agriculture, horticulture, forestry and public health. They show a wide range of adaptation, enabling them to successfully colonize and inhabit almost any type of habitat. Rodents are by far the prominent vertebrate pest problem in the world. They are responsible for substantial damage to food and cash crops, industrial and domestic property. More than 25 species of rodents have been recorded as pests in agriculture, causing a wide range of damage and losses in cereals, legumes, vegetables, root crops, cotton and sugarcane [24].

In Indian economy the rationale is agriculture and it contribute 27-30% in Gross National Productivity (GNP). Cucurbits belong to the family Cucurbitaceae. Among the vegetable crops cucurbits contribute more than 50% of total fresh vegetable production in developing countries [1]. Cucurbits includes the bittergourd (*Momordica charantia*), bottlegourd (*Lagenaria siceraria*), chayote (*Sechium edule*), Asia and fluted pumpkin (*Telfairia occidentalis*), wax gourd (*Benincasa hispida*), watermelon (*Citrullus lanatus*), ridge gourd (*Luffa acutangula*), sponge gourd (*Luffa cylindrica*), snake gourd (*Trichosanthes cucumerina*) cucumber (*Cucumis sativus*) and melon (*Cucumis melo*) [22].

Among the total mammalian species about 43% are represented by rodents showing highly diversified members [10]. In the world 33 families of rodents reported, out of these in India there are seven families viz, Sciuridae, Diplodidae, Platacanthomyidae, Spalacidae, Cricetidae, Muridae and Hystricidae. Muridae is the largest family, represented in India by 21 genera and 56 species [21]. Muridae consists of Latin mus (genitive muris), meaning "mouse" [2]. Old world rats, mice and gerbils are under the family Muridae. Among the vertebrates rodents are notorious pest which harm the crops as well as storage food [3]. Throughout the world rodents are cosmopolitan; highly adapted in different changing environment [19]. Rodents are gereralist in nature can persist on variety of food, adapt according to their different type of niche and can survive for long time without water. About 15 species of rodent are known to be the severe pest of public health hazard [25]. Rodents are highly notorious pest due to gnawing nature cause the economic losses and spoilage of food [6]. Damage to crops could be caused by mice at different stages like shortening of tillers to get access to nutrients, or by consuming newly planted seed and by using newly synthesized grain when crop matures [2]. *Tatera indica* and *Rattus rattus* cause extensive damage in bottlegourd at early and late stage [23]. Murids are strongly competitors with man for food; causes loss at pre harvest stage in cereals [31]. Along with the crop damage activities rodents are also involved in spreading zoonotic diseases [8]. By knowing the characteristics, seasonal pattern of abundance, extent of damage and the crop stage vulnerable to attack by rodents in different crops is important in appropriate management

practices. Keeping in view, the present investigation was carried out to study the species composition of field murids in vegetable crops.

2. Materials and methods

2.1. Murids study sites: The present investigation was carried out in vegetable crops, cucurbits (bittergourd and bottlegourd) 29°10'2 NL and 75°42'1 EL, CCS Haryana Agricultural University, Hisar (Haryana).

2.2. Murids capture: The wonder traps were set in cucurbits crops, vegetable field of CCS Haryana Agricultural University, Hisar as per standard technique (2x2m distance of row to row and trap to trap) for twenty days in sowing and harvesting season of bittergourd and bottlegourd during study period [4].

For identification of murids species composition and population structure wonder trap were set up in aforesaid area and murids were captured in the traps. Mustard oil and chapatti coated with jaggery were used as a bait material. After three days of prebaiting, the murids were trapped for three consecutive days and murids species were identified and after that they were released. The rodents trapped per day per trap was estimated by applying trap index method [5].

2.3. Statistical analysis.

Statistical analysis using variance (ANOVA) was carried out. The critical difference (CD) were worked out at 5% of significance to judge significance of difference between two treatment means.

3. Results

Table 1: Population dynamics of murids (sowing season) bittergourd

No. of murids trapped*				
Observation periods	***Mus musculus***	***Rattus rattus***	***Tatera indica***	**Mean**
2nd week	2.33 ± 0.33	3.33 ± 0.88	1.00 ± 0.58	2.22
3rd week	2.33 ± 0.67	4.00 ± 0.58	1.33 ± 0.67	2.56
4th week	1.00 ± 0.00	2.67 ± 0.66	1.33 ± 0.33	1.67
Mean	1.89[a]	3.33	1.22[a]	

*Mean ±S.E.
CD (p = 0.05) for Observation Period = NS; S.E. (m) =0.27
CD (p = 0.05) for murids = 0.81; S.E. (m) =0.27
CD (p = 0.05) for Observation Period × murids = NS
Values with the same superscript do not differ significantly

Table 2: Population dynamics of murids (harvesting season) bittergourd

No. of murids trapped*				
Observation periods	***Mus musculus***	***Rattus rattus***	***Tatera indica***	**Mean**
2nd week	3.00 ± 0.58	4.33 ± 0.67	1.00 ± 0.58	2.78
3rd week	3.33 ± 0.33	4.67± 0.67	1.33 ± 0.33	3.11
4th week	3.33 ± 0.88	2.67 ± 0.67	1.67 ± 0.67	2.56
Mean	3.22[a]	3.89[a]	1.33	

*Mean ±S.E.
CD (p=0.05) for Observation Period = NS; S.E. (m) =0.29
CD (p=0.05) for murids = 0.89; S.E. (m) =0.29
CD (p=0.05) for Observation Period × murids = NS
Values with the same superscript do not differ significantly

Table 3: Population dynamics of murids (sowing season) bottlegourd

No. of murids trapped*				
Observation periods	***Mus musculus***	***Rattus rattus***	***Tatera indica***	**Mean**
2nd week	2.00 ± 0.58	4.33 ± 0.88	1.33 ± 0.33	2.56
3rd week	2.33 ± 0.88	4.00 ± 0.58	1.00 ± 0.00	2.44
4th week	1.67 ± 0.33	2.67 ± 0.33	2.00 ± 0.58	2.11
Mean	2.00[a]	3.67	1.44[a]	

*Mean ±S.E.
CD (p = 0.05) for Observation Period = NS; S.E. (m) =0.31
CD (p = 0.05) for murids = 0.92; S.E. (m) =0.31
CD (p = 0.05) for Observation Period × murids = NS
Values with the same superscript do not differ significantly

Table 4: Population dynamics of murids (harvesting season) bottlegourd

No. of murids trapped*				
Observation periods	***Mus musculus***	***Rattus rattus***	***Tatera indica***	**Mean**
2nd week	3.00 ± 0.00	4.33 ± 0.67	1.33 ± 0.33	2.89[a,b]
3rd week	2.67 ± 0.88	8.33 ± 0.88	1.00 ± 0.58	4.00[b]
4th week	3.33 ± 0.88	3.00 ± 0.58	1.33 ± 0.33	2.56[a]
Mean	3.00	5.22	1.22	

*Mean ±S.E.
CD (p = 0.05) for Observation Periods = 1.18; S.E. (m) = 0.39
CD (p = 0.05) for murids = 1.18; S.E. (m) = 0.39
CD (p = 0.05) for Observation Period × murids = 2.04
Values with the same superscript do not differ significantly

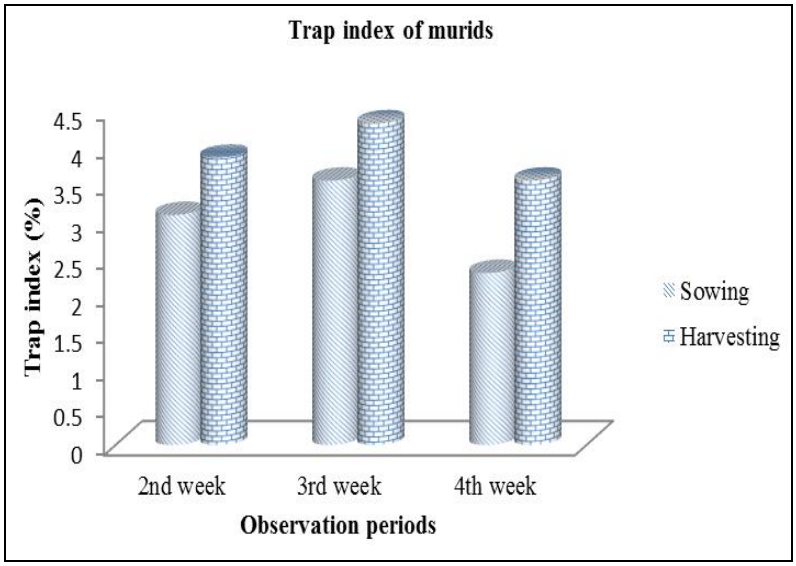

Fig 1: Trap index of murids population in bittergourd

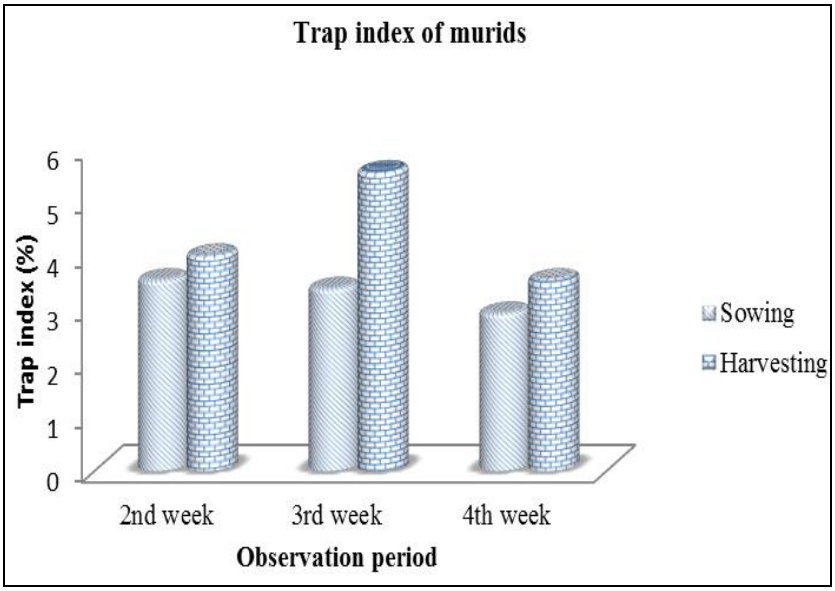

Fig 2: Trap index of murids population in bottlegourd

3.1. Species composition of murids under field conditions

Field incidence of murid were recorded during sowing season and harvesting season in cucurbits (bottlegourd, bittergourd). During the present investigation *M. musculus*, *R. rattus* and *T. indica* murid species were trapped in wonder traps set up in cucurbits.

The present investigation showed the highest population of *R. rattus* (3.33) during sowing season of bittergourd (Table 1). *M. musculus* (1.89) and *T. indica* (1.22) were at par with each other. Duration wise highest population of murids was observed during 3rd week and lowest in 4th week of September (Table 1). The results reveals that significantly least population of *T. indica* has been found as compared to *M. musculus* and *R. rattus* while the population of *M. musculus* and *R. rattus* were comparable as observed in harvesting season. Similar results were observed during harvesting of bittergourd (Table 2). Significantly higher population of *R. rattus* as compared to *M. musculus* and *T. indica* (Table 3). But, statistically the number of *M. musculus* and *T. indica* were at par with each other. As evident from (Table 3) duration wise lowest murid population was recorded in 4th week of sowing season while highest population has been recorded during 2nd week. A comparison among the murids prevalence (bottlegourd harvesting) has been depicted in Table 4. Results advocate that the population of *R. rattus* (5.22) was preponderant among all murids. The population of *R. rattus*, *M. musculus* and *T. indica* were significantly different from each other. But, during different observation periods, statistically comparable population of murids has been recorded during 4th week and 2nd week of harvesting season. While, the number of murids were at par during 2nd and 3rd week. Interaction between observation periods and species was significant (Table 4).

3.2. Trap index

During harvesting of bittergourd graphical representation (Fig. 1) showed trap index of murids species was found to be highest (4.32) in 3rd week followed by 2nd (3.96) and 4th (3.55). Lowest trap index was evaluated in 4th week during sowing of bittergourd (Fig. 1)

In a cursory analysis through graphical representation (Fig. 2) showed that highest trap index was found to be (5.56) in 3rd week which was followed by 2nd week (4.01) and 4th week (3.55) in bottlegourd harvesting while during sowing season lowest recorded trap index (3.01).

4. Discussion

R. rattus was the dominant species in both crops. During harvesting season of bittergourd trap index was highest in 3rd week (4.32) followed by 2nd week (3.96) and 4th week (3.55) while in case of bottlegourd harvesting season similar trend were found. In a report rodents cause the infestation in few districts of West Bengal. *R. rattus* was preponderant species followed by *M. musculus*, *R. norvegicus* and *Bandicota* sp. [13]. In another study, wheat and rice crop fields post-harvest live rodent burrow count ranged from 12.50 ± 3.15 to 110.55 ± 28.52 (no. of rodent burrows per ha) [28]. Pasahan and Sabhlok [20] reported that relative percentage of *B. bengalensis* was highest in various vegetable crops and *T. indica*, *R. meltada*, *M. booduga*, *R. rattus* and *M. musculus* respectively. In various studies showed that rodent abundance was more pronounced during the reproductive stages of the crop (milky and fruiting stages) and during harvest stage. It showed that as the crop matures availability and quality of food promote the population growth of rodents. A number of various studies have reported similar increasing trend of rodent population [2, 12]. The relative abundance of rodents changed from season to season in crop fields in Pothwar Plateau, Pakistan the presence of different rodent species viz. *Nesokia indica*, *T. indica*, *B. bengalensis*, *Mus* spp. and *Golunda ellioti* [11]. Population fluctuation was observed during spring and summer season. *T. indica* and *B. bengalensis* were the highest in spring while *B. bengalensis* became preponderant in summer. During the monsoon and autumn the proportion of *T. indica* increased highest showed the variation in species composition and diversity in rodents population [12]. Havoc caused by rodents in stores and godowns in North East Himalayan region in rural storage area was *R. rattus* (41%), *B. bengalensis* (25%), *M. musculus* (25%) and *R. sikkimensis* (9%) and in urban *R. rattus* (32%), *B. bengalensis* (29%), *M. musculus* (21%), *R. sikkimensis* (4.5%) and *R. norvegicus* (12.8) [30].

5. Conclusion

As our present study showed that population of murids was highest at the harvesting season of bottlegourd. The

reproductive and fruiting stage of crops provides the ample amount of diet to murids. Murids are the highly damaging vertebrates based on economic losses and health-related issues. Damage caused by rodents vary from crop to crop, climatic condition and seasonal fluctuations.

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